Ultimate! BIPLANE 3D ARF

EPERFORMANCE SERIES™

INSTRUCTION MANUAL

Wingspan: 33.5" [850mm]
Fuselage Length: 37" [935mm]
Wing Area: 383 sq in [24.7dm2]
Weight Range: 27.5-31oz [780-880g]
Wing Loading: 10.3-11.6 oz/sq ft [32-36 g/dm2]
Motor: 35-30-950kV RimFire Outrunner Motor
Radio: 4-Channel Minimum with Micro Receiver and Four Micro Servos

WARRANTY

Great Planes® Model Manufacturing Co. guarantees this kit to be free from defects in both material and workmanship at the date of purchase. This warranty does not cover any component parts damaged by use or modification. **In no case shall Great Planes' liability exceed the original cost of the purchased kit.** Further, Great Planes reserves the right to change or modify this warranty without notice.

In that Great Planes has no control over the final assembly or material used for final assembly, no liability shall be assumed nor accepted for any damage resulting from the use by the user of the final user-assembled product. By the act of using the user-assembled product, the user accepts all resulting liability.

If the buyer is not prepared to accept the liability associated with the use of this product, the buyer is advised to return this kit immediately in new and unused condition to the place of purchase.

To make a warranty claim send the defective part or item to Hobby Services at the address below:

Hobby Services
3002 N. Apollo Dr., Suite 1
Champaign, IL 61822 USA

Include a letter stating your name, return shipping address, as much contact information as possible (daytime telephone number, fax number, e-mail address), a detailed description of the problem and a photocopy of the purchase receipt. Upon receipt of the package, the problem will be evaluated as quickly as possible.

READ THROUGH THIS MANUAL BEFORE STARTING CONSTRUCTION. IT CONTAINS IMPORTANT INSTRUCTIONS AND WARNINGS CONCERNING THE ASSEMBLY AND USE OF THIS MODEL.

GREAT PLANES® MODEL MANUFACTURING COMPANY

Champaign, Illinois
(217) 398-8970, Ext 5
airsupport@greatplanes.com

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INTRODUCTION

The Ultimate Biplane EP ARF is the third release in a line of electric built-up, all-out performance 3D planes. The Ultimate is a fantastic flyer and can perform virtually any aerobatic maneuver with authority. High-capacity LiPo battery packs will allow you the convenience of electric flying, combined with the same "ultimate" flight characteristics of planes much larger in size, like the Great Planes Ultimate Bipe 1.60 ARF. In addition to offering the flight performance of a large 3D plane in a small package, the exciting trim scheme from the Ultimate Biplane 1.60 ARF has been carried down to the Ultimate EP.

For the latest technical updates or manual corrections to the Ultimate Biplane EP visit the Great Planes web site at www.greatplanes.com. Open the "Airplanes" link, then select the Ultimate Biplane EP ARF. If there is new technical information or changes to this model, a "tech notice" box will appear in the upper left corner of the page.

AMA

We urge you to join the AMA (Academy of Model Aeronautics) and a local R/C club. The AMA is the governing body of model aviation and membership is required to fly at AMA clubs. Though joining the AMA provides many benefits, one of the primary reasons to join is liability protection. Coverage is not limited to flying at contests or on the club field. It even applies to flying at public demonstrations and air shows. Failure to comply with the Safety Code (excerpts printed in the back of the manual) may endanger insurance coverage. Additionally, training programs and instructors are available at AMA club sites to help you get started the right way. There are over 2,500 AMA chartered clubs across the country. Contact the AMA at the address or toll-free phone number below.

Academy of Model Aeronautics
5151 East Memorial Drive
Muncie, IN 47302
Tele: (800) 435-9262
Fax (765) 741-0057
Or via the Internet at:
http://www.modelaircraft.org

IMPORTANT!!! Two of the most important things you can do to preserve the radio controlled aircraft hobby are to avoid flying near full-scale aircraft and avoid flying near or over groups of people.

Scale Competition

Though the Great Planes Ultimate Biplane EP is an ARF and may not have the same level of detail as an "all-out" scratch-built competition model, it is a scale model nonetheless and is therefore eligible to compete in the Fun Scale class in AMA competition (we receive many favorable reports of Great Planes ARF's in scale competition!). In Fun Scale, the

"builder of the model" rule does not apply. Contact the AMA for a rule book with full details.

If you would like photos of the full-size Ultimate Biplane for scale documentation, or if you would like to study the photos to add more scale details, photo packs are available from:

Bob's Aircraft Documentation
3114 Yukon Ave
Costa Mesa, CA 92626
Telephone: (714) 979-8058, Fax: (714) 979-7279
www.bobsairdoc.com

PROTECT YOUR MODEL, YOURSELF & OTHERS...FOLLOW THESE IMPORTANT SAFETY PRECAUTIONS

1. Your Ultimate Biplane EP ARF should not be considered a toy, but rather a sophisticated, working model that functions very much like a full-size airplane. Because of its performance capabilities, the Ultimate Biplane, if not assembled and operated correctly, could possibly cause injury to yourself or spectators and damage to property.

2. You must assemble the model **according to the instructions**. Do not alter or modify the model, as doing so may result in an unsafe or unflyable model. In a few cases the instructions may differ slightly from the photos. In those instances the written instructions should be considered as correct.

3. You must take time to build **straight**, **true** and **strong**.

4. You must use an R/C radio system that is in first-class condition, and a correctly sized motor and components throughout the building process.

5. You must correctly install all R/C and other components so that the model operates correctly on the ground and in the air.

6. You must check the operation of the model before **every** flight to insure that all equipment is operating and that the model has remained structurally sound. Be sure to check clevises or other connectors often and replace them if they show any signs of wear or fatigue.

7. If you are not an experienced pilot or have not flown this type of model before, we recommend that you get the assistance of an experienced pilot in your R/C club for your first flights. If you're not a member of a club, your local hobby shop has information about clubs in your area whose membership includes experienced pilots.

8. While this kit has been flight tested to exceed normal use, if the plane will be used for extremely high stress flying, such as racing, or if a motor larger than one in the recommended range is used, the modeler is responsible for taking steps to reinforce the high stress points and/or substituting hardware more suitable for the increased stress.

9. **WARNING:** The cowl included in this kit is made of fiberglass, the fibers of which may cause eye, skin and respiratory tract irritation. Never blow into a part to remove fiberglass dust, as the dust will blow back into your eyes. Always wear safety goggles, a particle mask and rubber gloves when grinding, drilling and sanding fiberglass parts. Vacuum the parts and the work area thoroughly after working with fiberglass parts.

We, as the kit manufacturer, provide you with a top quality, thoroughly tested kit and instructions, but ultimately the quality and flyability of your finished model depends on how you build it; therefore, we cannot in any way guarantee the performance of your completed model, and no representations are expressed or implied as to the performance or safety of your completed model.

Remember: Take your time and follow the instructions to end up with a well-built model that is straight and true.

LITHIUM BATTERY HANDLING & USAGE

WARNING!! Read the entire instruction sheet included with the battery. Failure to follow all instructions could cause permanent damage to the battery and its surroundings, and cause bodily harm!

- ONLY use a LiPo approved charger. NEVER use a NiCd/NiMH peak charger!
- NEVER charge in excess of 4.20V per cell.
- ONLY charge through the "charge" lead. NEVER charge through the "discharge" lead.
- NEVER charge at currents greater than 1C.
- ALWAYS set charger's output volts to match battery volts.
- ALWAYS charge in a fireproof location.
- NEVER trickle charge.
- NEVER allow battery temperature to exceed 150° F (65° C).
- NEVER disassemble or modify pack wiring in any way or puncture cells.
- NEVER discharge below 2.5V per cell.
- NEVER place on combustible materials or leave unattended during charge or discharge.
- ALWAYS KEEP OUT OF REACH OF CHILDREN.

ADDITIONAL ITEMS REQUIRED

This is a partial list of items required to finish the Ultimate Biplane EP ARF that may require planning or decision-making before starting to build. Order numbers are provided in parentheses.

Radio Equipment

A 4-channel radio system with four micro servos and a micro receiver are required for this plane. The servos and receiver shown in the manual are Futaba® S3110 micro servos and the Futaba R114F micro receiver. The S3110 servo model is currently being replaced with the S3114 which is suitable for use in the Ultimate. Two 6" [150mm] servo extensions, two 16" [406mm] servo extensions, and a Y-harness are also required. Order numbers for these items are provided below.

- ❏ Four Futaba S3114 Micro HT Servo (FUTM0414)
- ❏ Futaba R114F FM Micro Receiver (Low Band – FUTL0442, High Band – FUTL0443)
- ❏ Futaba FM Single Conversion Short Crystal (Low Band – FUTL62**, High Band – FUTL63**)
- ❏ Two Futaba C-25 Extension Slim Wire 150mm (FUTM4506)
- ❏ Two Futaba 16" Servo Extension J (FUTM3955)
- ❏ Futaba 6" Dual Servo Extension J (FUTM4130)

Motor & Propeller Recommendation

The Ultimate Biplane EP ARF requires a C35-30-950kV brushless out-runner motor. The order numbers for this motor and accompanying propeller are provided below.

- ❏ Great Planes RimFire™ 35-30-950 Brushless Out-Runner Motor (GPMG4590)
- ❏ APC 11x3.8SF Slo-Flyer Propeller (APCQ5017)

Note: *Motors from other manufacturers may work with the Ultimate Biplane EP ARF. However, the included firewall pieces are designed to work specifically with the Great Planes motor listed.*

Electronic Speed Control

A brushless electronic speed control is required for this plane. We recommend using the Great Planes Silver Series 25A Brushless ESC 5V/2A BEC (GPMM1820).

Battery Pack & Charger

The Ultimate Biplane EP ARF has been tested with 11.1V LiPo packs ranging from 1250mAh to 2100mAh. Order numbers are provided for packs of this size. The lighter 1250mAh pack is suggested for maximum performance.

- ❏ Great Planes LiPo 1250mAh 11.1V 20C Discharge w/Balance (GPMP0609)
- ❏ Great Planes LiPo 1500mAh 11.1V 20C Discharge w/Balance (GPMP0613)
- ❏ Great Planes LiPo 2100mAh 11.1V 20C Discharge w/Balance (GPMP0617)

Do not *use Great Planes LiPo 1500mAh 11.1V 3S 8C Discharge (GPMP0831). This battery pack is not capable of supporting the current draw of the recommended power systems.*

A LiPo-compatible charger is required for these batteries, along with a cell balancer:

- ❏ Great Planes PolyCharge4™ DC LiPo Charger (GPMM3015)
- ❏ Great Planes Equinox™ LiPo Cell Balancer (GPMM3160)

Adhesives and Building Supplies

This is the list of adhesive and building supplies required to finish the Ultimate Biplane EP ARF. Order numbers are provided in parentheses.

- ❏ 1/2 oz. [15g] Thin Pro CA (GPMR6001)
- ❏ 1/2 oz. [15g] Medium Pro CA+ (GPMR6007)
- ❏ 1/2 oz. [15g] Thick Pro CA- (GPMR6013)
- ❏ Pro 30-Minute Epoxy (GPMR6047)
- ❏ Denatured Alcohol
- ❏ Drill Bits: 3/64" [1.2mm], 1/8" [3mm]
- ❏ #1 Hobby Knife (HCAR0105)
- ❏ #11 Blades (5-pack, HCAR0211)
- ❏ Hobbico® Steel T-Pins 1" (100) (HCAR5100)
- ❏ Great Planes Pro Threadlocker (GPMR6060)
- ❏ CA Applicator Tips (HCAR3780)
- ❏ Small Spring Clamps
- ❏ 220 Grit Sandpaper

Optional Supplies and Tools

Here is a list of optional tools mentioned in the manual that will help you build the Ultimate Biplane EP ARF.

- ❏ 21st Century® Sealing Iron (COVR2700)
- ❏ 21st Century Iron Cover (COVR2702)
- ❏ 2 oz. [57g] Spray CA Activator (GPMR6035)
- ❏ 4 oz. [113g] Aerosol CA Activator (GPMR634)
- ❏ CA Debonder (GPMR6039)
- ❏ Epoxy Brushes (6, GPMR8060)
- ❏ Mixing Sticks (50, GPMR8055)
- ❏ Mixing Cups (GPMR8056)
- ❏ Hobbico Duster™ Compressed Air (HCAR5500)
- ❏ Panel Line Pen (TOPQ2510)
- ❏ Rotary Tool such as Dremel® with Cutoff Wheel
- ❏ Hobbico Flexible 18" Ruler Stainless Steel (HCAR0460)

IMPORTANT BUILDING NOTES

- When you see the term ***test fit*** in the instructions, it means that you should first position the part on the assembly **without using any glue**, then slightly modify or *custom fit* the part as necessary for the best fit.

- Whenever the term ***glue*** is written you should rely upon your experience to decide what type of glue to use. When a specific type of adhesive works best for that step, the instructions will make a recommendation.

- Whenever just ***epoxy*** is specified you may use ***either*** 30-minute (or 45-minute) epoxy ***or*** 6-minute epoxy. When 30-minute epoxy is specified it is **highly** recommended that you use only 30-minute (or 45-minute) epoxy, because you will need the working time and/or the additional strength.

- **Photos** and **sketches** are placed **before** the step they refer to. Frequently you can study photos in following steps to get another view of the same parts.

- The stabilizer and wing incidences and engine thrust angles have been factory-built into this model. However, some technically-minded modelers may wish to check these measurements anyway. To view this information visit the web site at **www.greatplanes.com** and click on "Technical Data." Due to manufacturing tolerances which will have little or no effect on the way your model will fly, please expect slight deviations between your model and the published values.

ORDERING REPLACEMENT PARTS

Replacement parts for the Great Planes Ultimate Biplane EP ARF are available using the order numbers in the Replacement Parts List that follows. The fastest, most economical service can be provided by your hobby dealer or mail-order company.

To locate a hobby dealer, visit the Great Planes web site at **www.greatplanes.com**. Choose "Where to Buy" at the bottom of the menu on the left side of the page. Follow the instructions provided on the page to locate a U.S., Canadian or International dealer.

Parts may also be ordered directly from Hobby Services by calling (217) 398-0007, or via facsimile at (217) 398-7721, but full retail prices and shipping and handling charges will apply. Illinois and Nevada residents will also be charged sales tax. If ordering via fax, include a Visa® or MasterCard® number and expiration date for payment.

Mail parts orders and payments by personal check to:

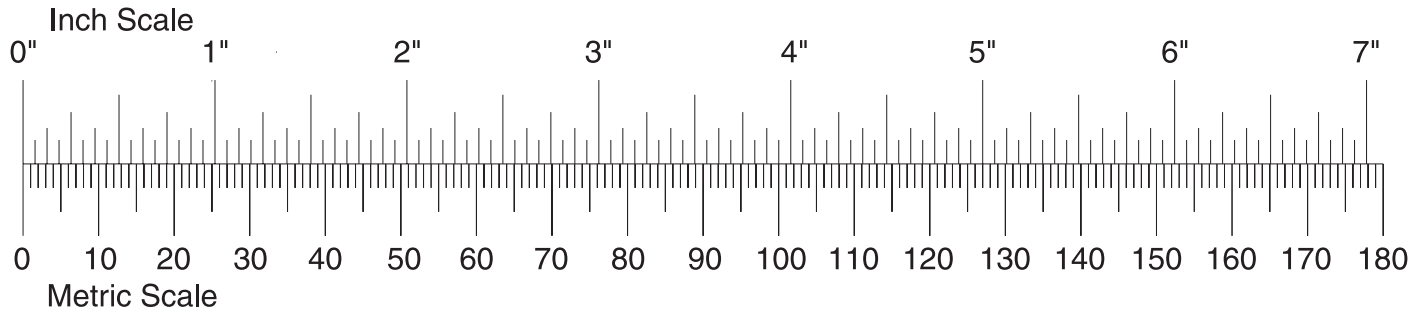
Hobby Services
3002 N. Apollo Drive, Suite 1
Champaign, IL 61822

Be certain to specify the order number exactly as listed in the **Replacement Parts List**. Payment by credit card or personal check only; no C.O.D.

If additional assistance is required for any reason, contact Product Support by telephone at (217) 398-8970, or by e-mail at **productsupport@greatplanes.com**.

Replacement Parts List

Order Number	Description	How to Purchase
	Missing pieces	Contact Product Support
	Instruction manual	Contact Product Support
	Full-size plans	Not available
GPMA2970	Fuselage	Contact Product Support
GPMA2971	Top Wing	Contact Product Support
GPMA2972	Bottom Wing	Contact Product Support
GPMA2973	Tail Surfaces	Contact Product Support
GPMA2974	Cowl	Contact Product Support
GPMA2975	Interplane Set	Contact Product Support
GPMA2976	Cabane Set	Contact Product Support
GPMA2977	Wheelpants	Contact Product Support
GPMA2978	Landing Gear	Contact Product Support
GPMA2979	Canopy	Contact Product Support
GPMA2980	Decal Sheet	Contact Product Support
GPMA2981	Spinner	Contact Product Support
GPMA2982	Hardware Set	Contact Product Support

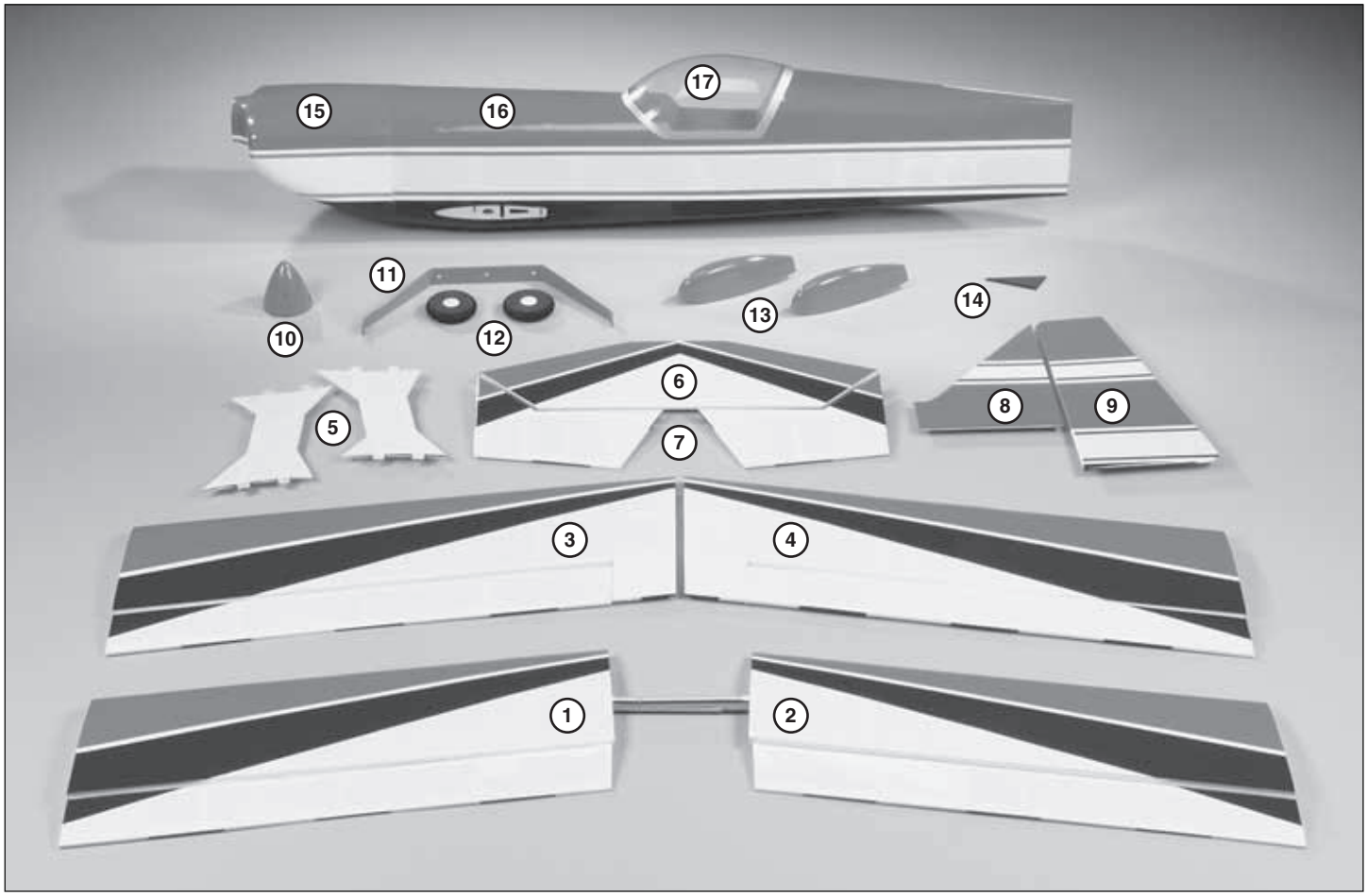


KIT INSPECTION

Before starting to build, take an inventory of this kit to make sure it is complete, and inspect the parts to make sure they are of acceptable quality. If any parts are missing or are not of acceptable quality, or if you need assistance with assembly, contact Product Support. When reporting defective or missing parts, use the part names exactly as they are written in the Kit Contents list.

Great Planes Product Support
3002 N. Apollo Drive, Suite 1
Champaign, IL 61822
Telephone: (217) 398-8970, ext. 5
Fax: (217) 398-7721
E-mail: airsupport@greatplanes.com

KIT CONTENTS



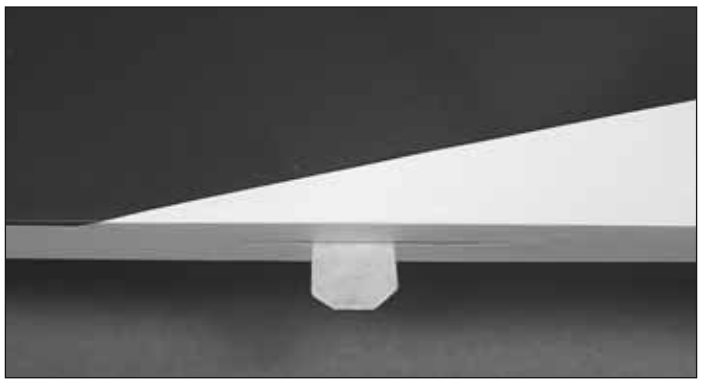
1. Left Bottom Wing Panel w/Aileron
2. Right Bottom Wing Panel w/Aileron
3. Left Top Wing Panel w/Aileron
4. Right Top Wing Panel w/Aileron
5. Interplane Struts (2)
6. Horizontal Stabilizer
7. Elevator Halves (L&R)
8. Vertical Fin
9. Rudder
10. Spinner
11. Landing Gear
12. Wheels
13. Wheel Pants
14. Tail Skid
15. Cowl
16. Fuselage
17. Canopy

BEFORE YOU BEGIN

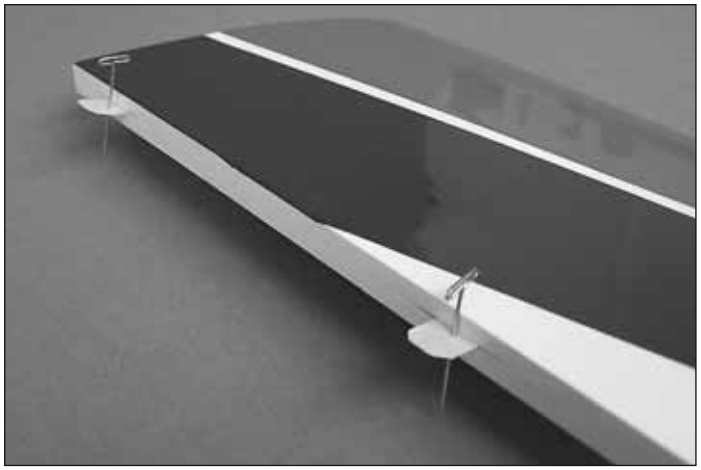
Before you begin assembly, closely inspect all of the covered components. Carefully remove the control surfaces that are taped in place. Use a covering iron with a covering iron sock on low/medium heat to tighten the covering in any areas that are loose, disconnected, or wrinkled.

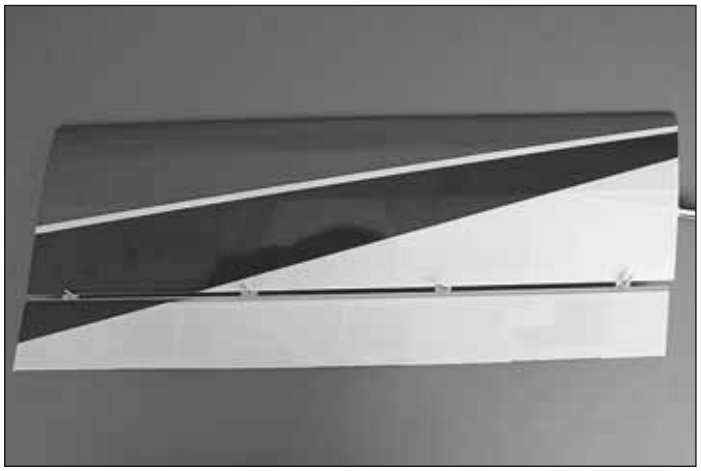
ASSEMBLE THE WINGS

Install the Ailerons



❑ 1. Test fit a CA hinge halfway into each hinge slot in the top and bottom **wing panels** and **ailerons**. If the hinges are difficult to insert or the covering needs to be cut open over the slots, use a sharp hobby knife to slightly enlarge the slot or slit open the covering. To improve the adhesion of the CA hinges, we recommend trimming the covering from just above and below the hinge slots.



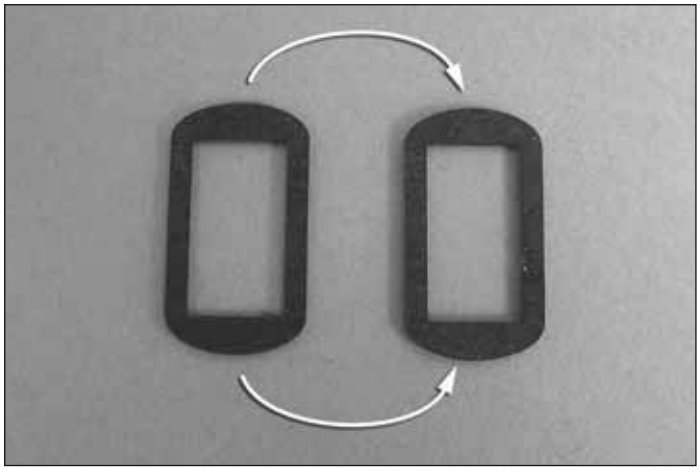


❑ 2. Push a small T-pin through the center of each CA hinge. The pins will keep the hinges centered during assembly. Insert the hinges into the hinge slots in the wing panels. Fit the ailerons onto the other ends of the hinges and align the outside tips of the ailerons with the wing tips.

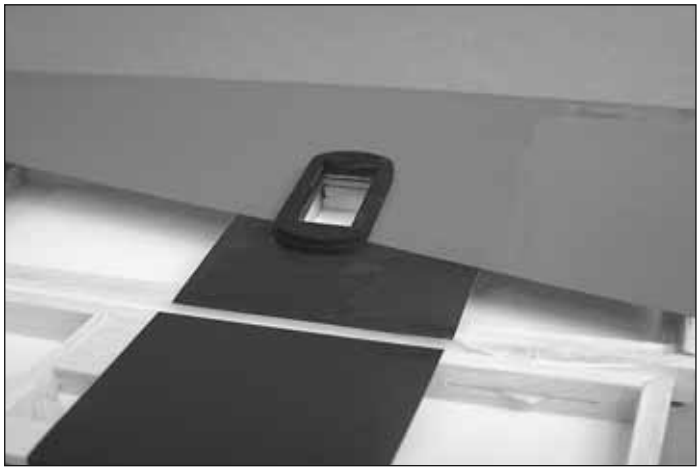
❑ 3. Remove the pins from the hinges and push the ailerons against the trailing edges of the wing panels. Deflect the ailerons down to their maximum throw (beveled leading edge of aileron is against the trailing edge of the wing) and apply 7-8 drops of thin CA glue to each hinge. Do not use CA accelerator on the hinges. Flip the wing panels over and apply the same amount of CA to the other side of each hinge. Allow the CA a minute or two to harden and then tug on each aileron to confirm they are well secured to the wings.

Install the Aileron Servos & Pushrods

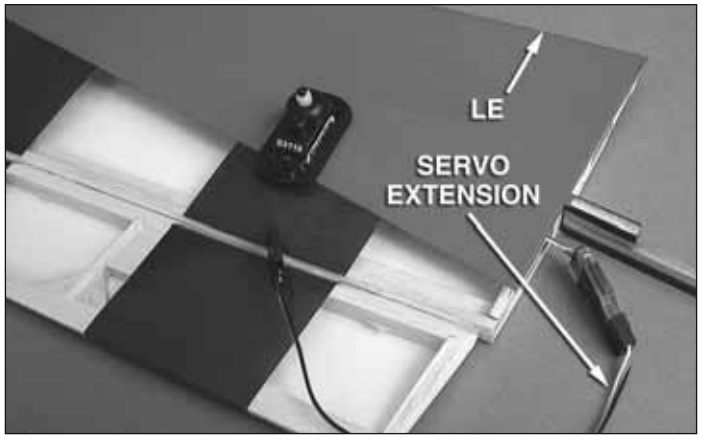
❑ 1. Trim the covering from the aileron servo bays on the underside of the bottom wing panels as shown.



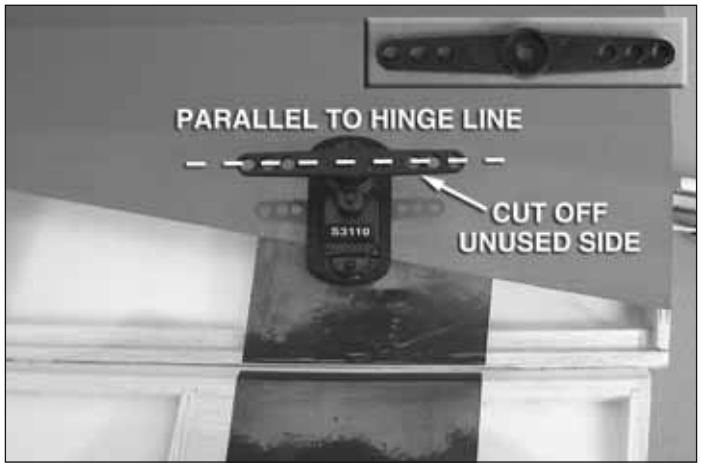
❑ 2. Glue two **aileron servo shims** together, being sure to keep the edges flush. Make two sets of these.



❑ 3. Trim approximately 1/16" [1.6mm] of covering from the perimeter of the aileron servo bays. Glue the aileron servo shims to the wing panels centered over the servo bays.



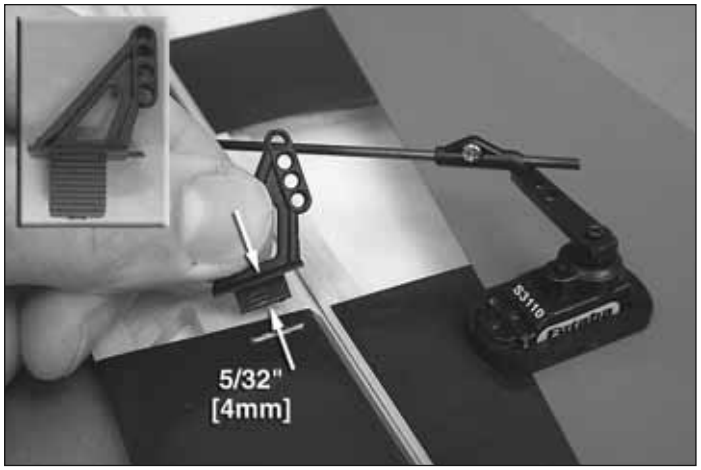
❑ 4. Feed the servo leads through the servo bays and out the cutouts in the wing root ribs. Position the servos in the servo bays with the splines toward the LE. Glue the aileron servos to the servo shims with medium or thick CA. Attach a 6" [150mm] servo extension to each aileron servo. Use tape to secure the extension to the servo lead.



❑ 5. Use your radio system to center the aileron servos. Servo arms are provided to fit the splines of most micro servo models. Locate two double-sided servo arms that fit the model servos you are using. Test fit a double-sided servo arm onto each aileron servo. Determine which way the arm fits closest to being parallel with the aileron hinge line. Cut off the unused sides of the arms, leaving the sides that **point to the wing tips**.

❑ 6. Locate four **adjustable clevises** from the hardware package. Slide a clevis onto one end of each 2x215mm

carbon fiber pushrod. Loosely thread a 2x4mm self-tapping screw into each clevis. The screw head should be in the recessed end of the hole in the clevis. Hook the clevis to the outer holes in the servo arms.



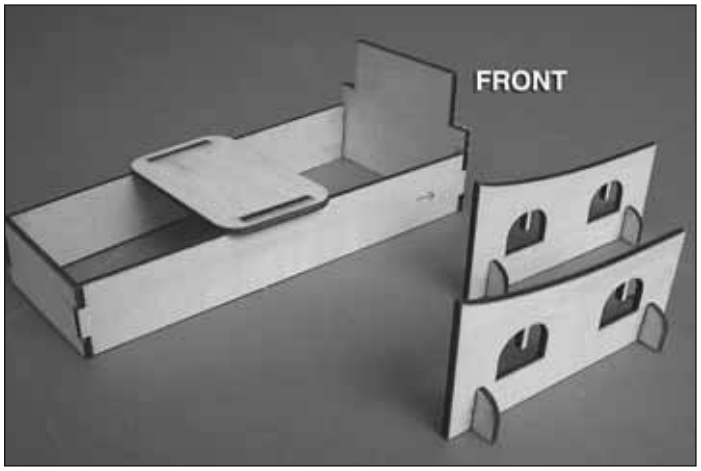
❏ ❏ 7. Cut the bottom from a control horn tab leaving approximately 5/32" [4mm] remaining on the control horn. Using the pushrod as a guide, position a control horn on the aileron in line with the outer hole of the servo arm and the holes in the control horn over the hinge line. Press the control horn tab into the aileron making an indentation. Cut a 1/16" [1.6mm] slot at the indentation 4-5mm deep using a sharp hobby knife. Be careful not to cut through the top of the wing.

❏ ❏ 8. Glue the control horn in place with medium or thick CA glue.

❏ ❏ 9. Attach a clevis to the outer hole of the control horn and slide the pushrod through the clevis connecting the aileron to the servo. Position the aileron in the neutral position and tighten the screws in the adjustable clevises (be sure that the pushrod is positioned so the excess pushrod can be cut off from one end and re-used). Cut off the excess pushrod beyond the control horn clevis. Save the excess pushrod. It will be used to join the top and bottom ailerons together. If you haven't done so, secure the servo arm to the servo using the screw included with the servo.

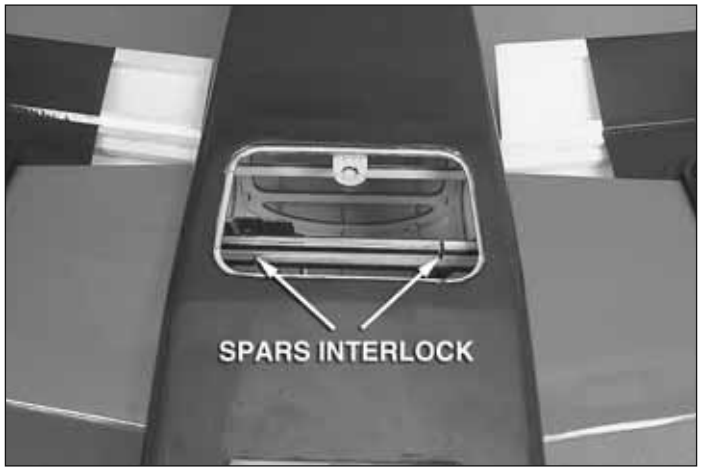
❏ 10. Repeat steps 7-9 for the other bottom wing panel. **Do not use the excess 2x215mm pushrod for the other aileron pushrod!** Use another 2x215mm pushrod to make the second aileron pushrod.

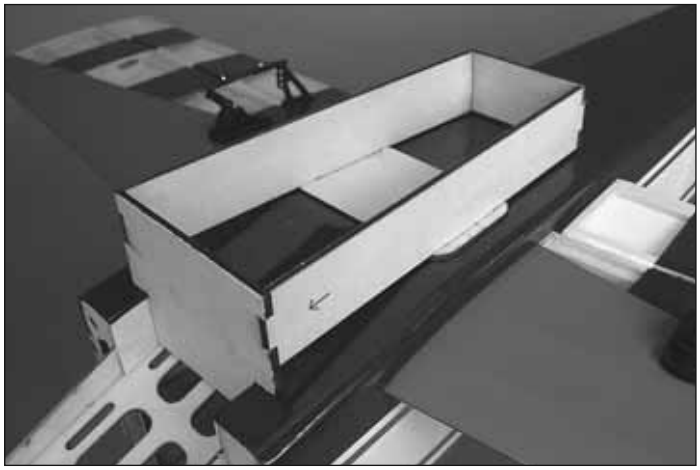
Attach the Wings



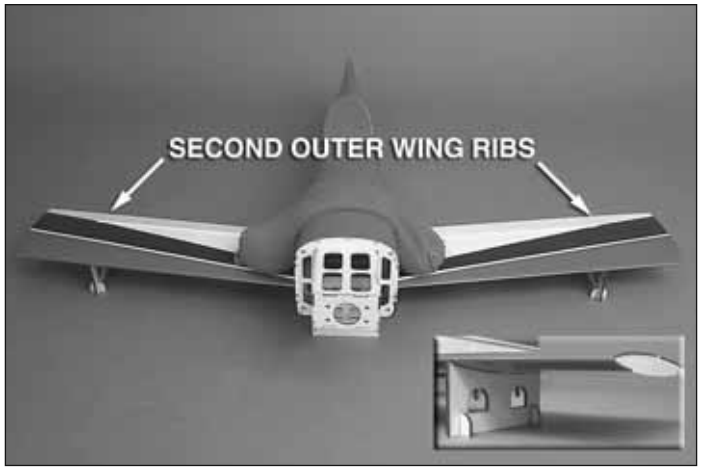
❏ 1. A fuselage stand is included to simplify gluing the wings to the fuselage. Glue the stand and wing supports together as shown. The arrows on the long side pieces should point toward the front (tall end).

❏ 2. Trim away the covering that overlaps onto the wing root ribs.





❑ 3. Test fit the wing panels into the wing pockets in the fuselage. The wing spars that extend beyond the root rib are designed to interlock with each other when the wings are fit in place. Confirm that the wing root ribs fully seat into the pockets. If not, sand the ends of the spars as necessary until they do. The fuselage stand is designed to fit into the fuselage hatch cutout and support the fuse just behind the firewall as shown.

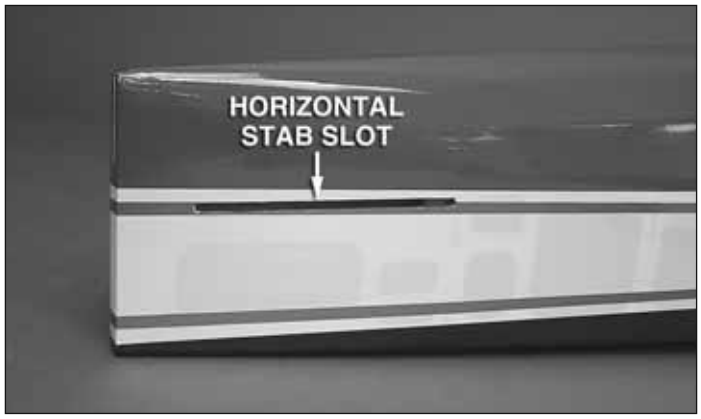


❑ 4. Before you begin this step, prepare a weighted object to hold the fuselage and wings in place while the epoxy cures. We used a sock filled with sand as shown in the picture. Coat the root ribs of the bottom wing panels with 30-minute epoxy (Do not put epoxy on the spars until instructed to do so in the next step). Put a coating of epoxy in the wing pockets as well. Insert the wing panels into the fuselage and place the plane onto the fuselage stand. Place your weight onto the top of the fuselage to hold it down. Slide the wing supports underneath the second outer wing ribs. The front edge of the supports should line up with the LE of the wing panels. Confirm that the wing panels are fully seated in the pockets and the wing is sitting flat on the supports. Wipe away any excess epoxy with denatured alcohol and let the epoxy cure undisturbed.

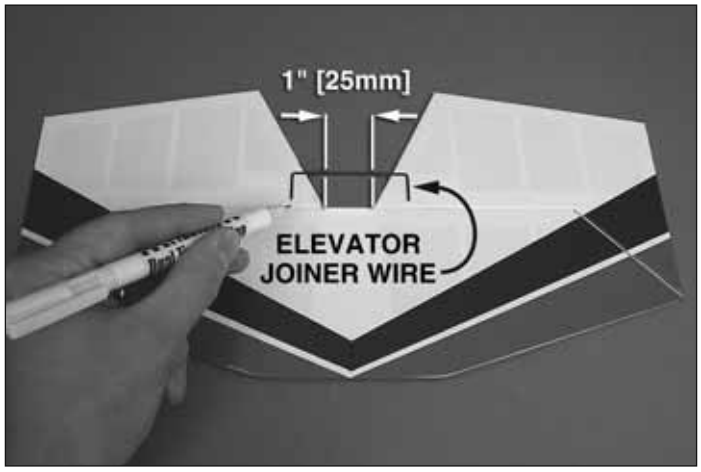
❑ 5. Apply a coat of epoxy to the **plywood spar doubler** on the side with the thin balsa laminate. Coat the aft side of the wing spars with epoxy. Use small clamps to hold the spar doubler to the aft side of the spars while the epoxy cures.

BUILD THE FUSELAGE

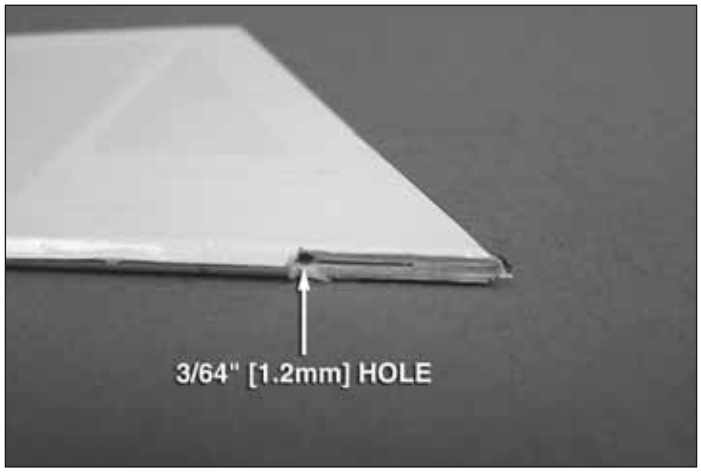
Assemble the Tail Section



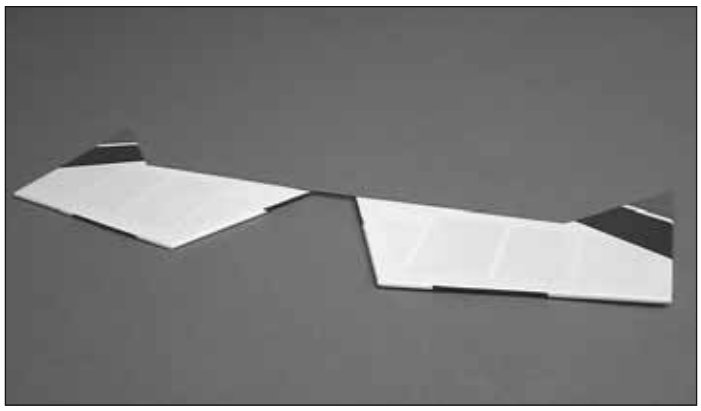
❏ 1. Trim the covering from the horizontal stabilizer slot in the fuselage.



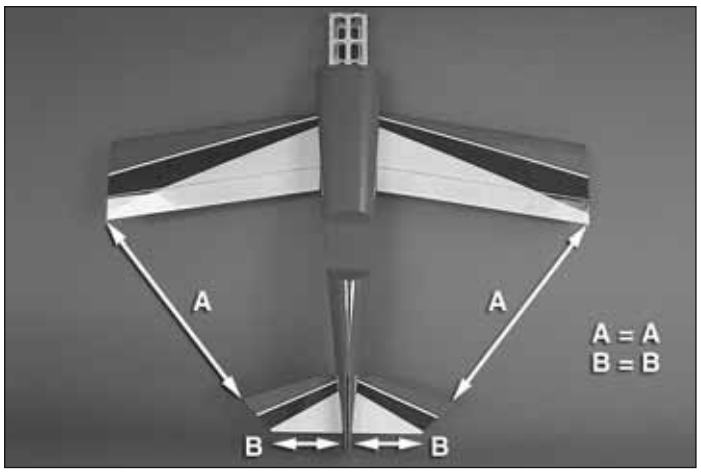
❏ 2. Place the **horizontal stabilizer** on your work surface and align the **elevator halves** behind it. Separate the elevator halves 1" [25mm] apart as shown. Center the **elevator joiner wire** over the elevator halves. Mark the position of the joiner wire ends at the LE of each elevator half.

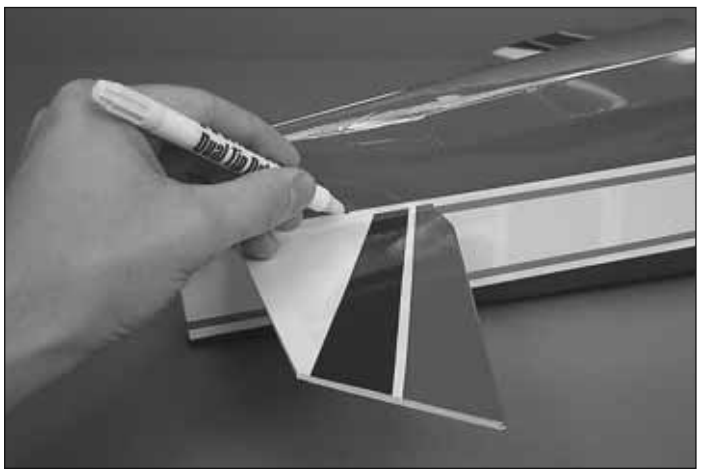


❏ 3. Using a 3/64" [1.2mm] drill bit, make a 3/4" [19mm] deep hole into each elevator half at the marks you made. Be sure you are drilling through the center of the elevators, perpendicular to the LE. Trim away approximately 1/16" [1.6mm] of the LE between the holes you made and the inside edge of the elevators.

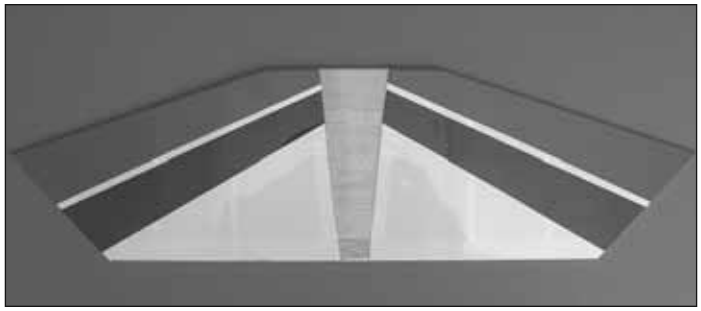


❏ 4. Test fit the elevator joiner wire into the holes. Lay the elevators down on a flat work surface and confirm that they lay flat. If not, remove the joiner wire and “tweak”, or twist it until they do. Do not attempt to bend the joiner wire while it is inside the elevator halves.





❏ 5. Position the horizontal stab in the stab slot, being sure that it is as far forward in the slot as it will go. Center the stab left and right in the fuse, and square its position by measuring the distance between the tips of the stab and the wing tips and making them equal. When satisfied, use a fine, felt-tip pen to trace the outline of the fuselage onto the stab.

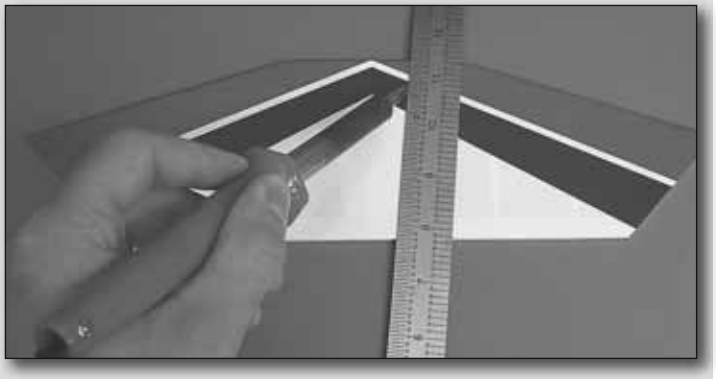


❏ 6. Trim the covering from the stab just inside the lines you drew. Wipe away the lines with denatured alcohol.

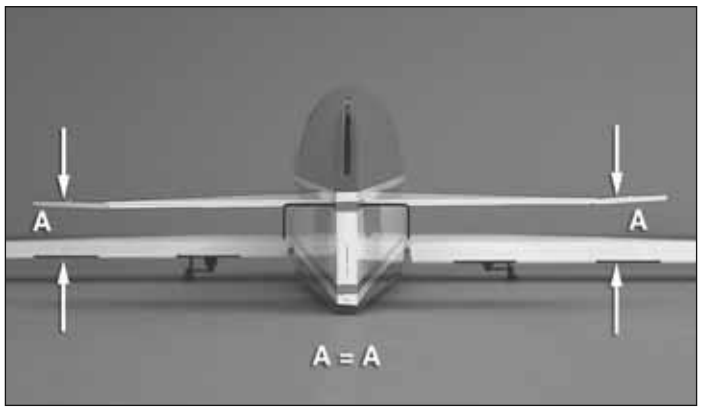
EXPERT TIP

HOW TO CUT COVERING FROM BALSA

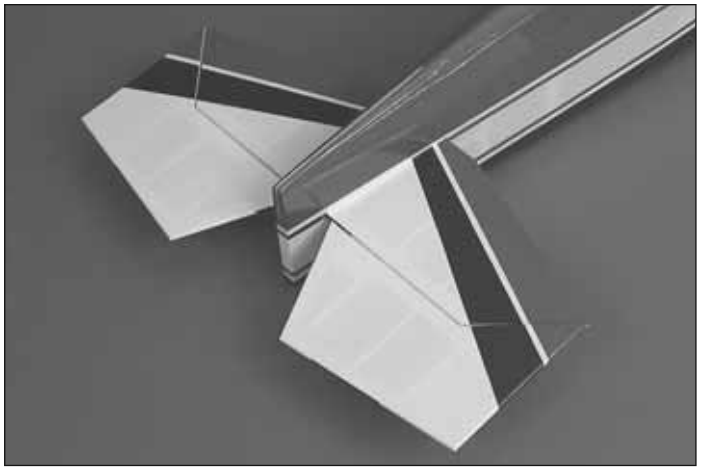
Use a soldering iron to cut the covering from the stab. The tip of the soldering iron doesn't have to be sharp, but a fine tip does work best. Allow the iron to hear fully.



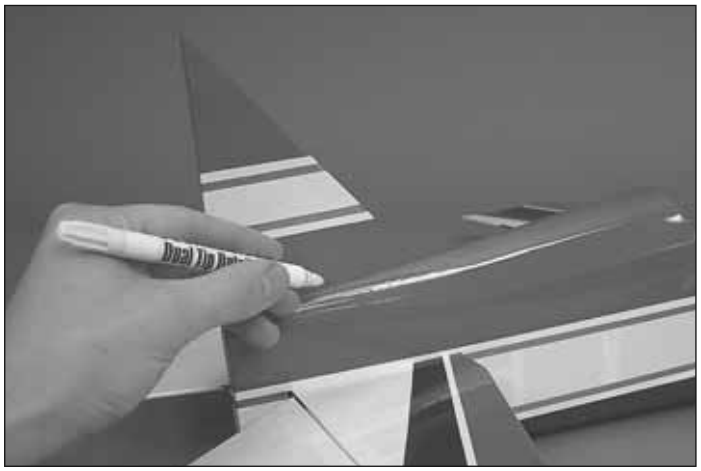
Use a straightedge to guide the soldering iron at a rate that will just melt the covering and not burn into the wood. The hotter the soldering iron, the faster it must travel to melt a fine cut. Peel off the covering.



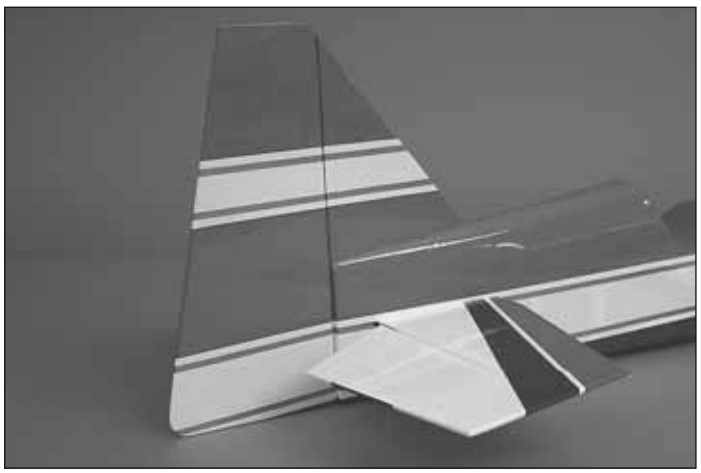
❏ 7. Insert the elevator joiner wire into the aft end of the stab slot. Slide the stab into the fuselage and center its position. Stand back several feet and view the model from behind. Ensure that the stab is level in the fuselage by confirming it is parallel with the bottom wing. If not, use tape or a weight to level the stab. When satisfied, glue the stab into the fuselage.



❏ 8. As you did with the ailerons, join the elevator halves to the stabilizer using the elevator joiner rod and CA hinges. Before gluing the hinges, be sure that the elevator halves move freely up and down. Glue joiner wire in place using thin CA.



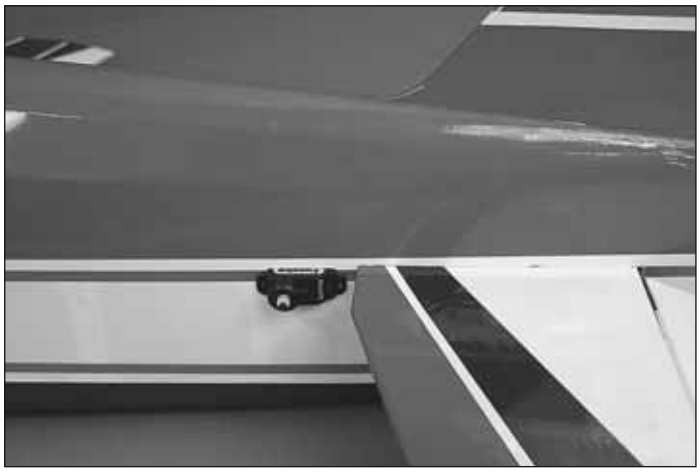
❏ 9. Trim the covering from the **vertical fin** slot in the fuselage. Fit the vertical fin into the fuselage and trace the fuse shape onto the fin. Remove the fin, cut the covering below the lines you drew, and glue the fin into position. Do not remove the covering from the trailing edge of the fin.



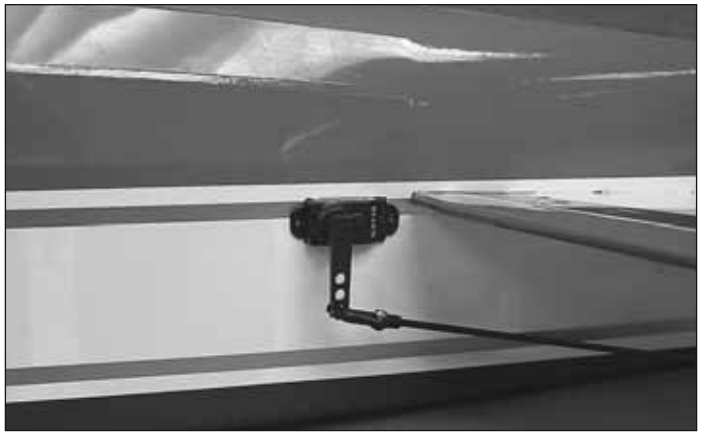
❏ 10. Attach the rudder with CA hinges.

Install the Tail Servos & Pushrods

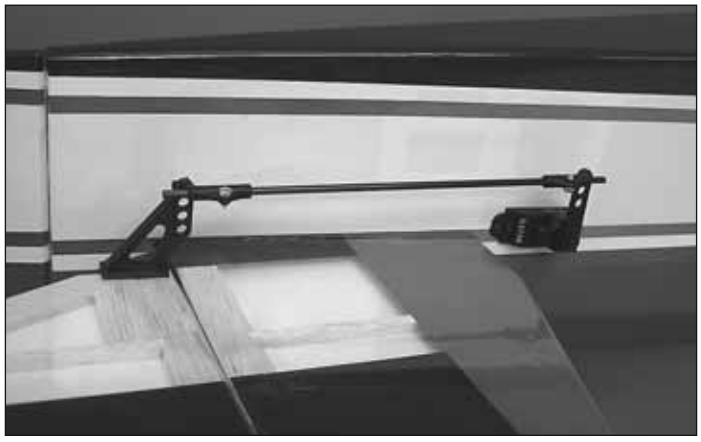
❏ 1. Trim the covering from the elevator and rudder servo bays.



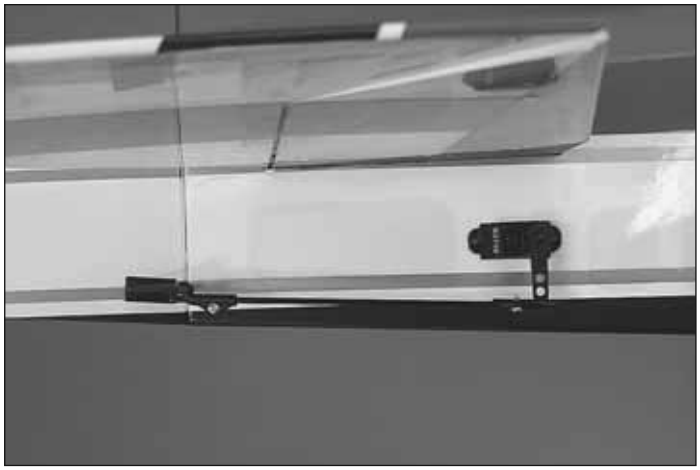
❏ 2. Connect a 16" [406mm] servo extension to the rudder and elevator servos. Feed the servo extensions into the servo bays and through the length of the fuselage. To improve the adhesion of the servos to the servo bays, trim away the covering just beneath the servo mounting tabs. Glue the servos into the servo bays with the splines facing forward.



❏ 3. With the elevator servo centered, attach a double-sided servo arm vertically. Determine which way the arm fits best. Cut the unused side from the servo arm, leaving the bottom side as shown. As you did with the ailerons, loosely thread a 2x4mm self-tapping screw into an adjustable clevis and slide it on a 2x135mm carbon pushrod. Attach the clevis to the outer hole of the elevator servo arm.

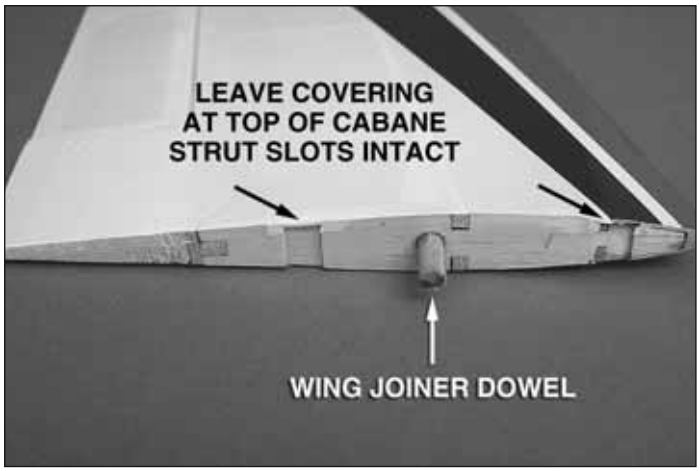


❏ 4. Using the pushrod as a guide for the location of the control horn, cut a slot in the left elevator half for the horn. Install the control horn onto the underside of the left elevator half and glue it into place (do not cut the control horn tab shorter before installation). Clip a control horn backplate onto the control horn tab and glue it into place. The control horn tab extending beyond the backplate can now be cut off. Connect the pushrod to the control horn with another adjustable clevis. Center the elevator, carefully tighten the screws into the adjustable clevises onto the pushrod, and cut off the excess pushrod beyond the clevises. Be sure to secure the servo arm to the servo with the arm screw.



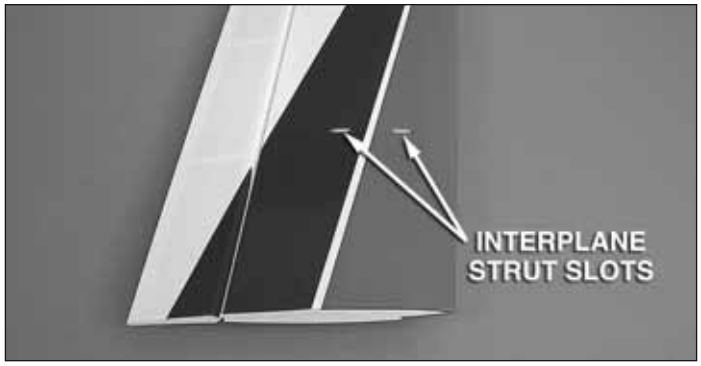
❑ 5. Install the 2x135mm rudder pushrod in the same manner.

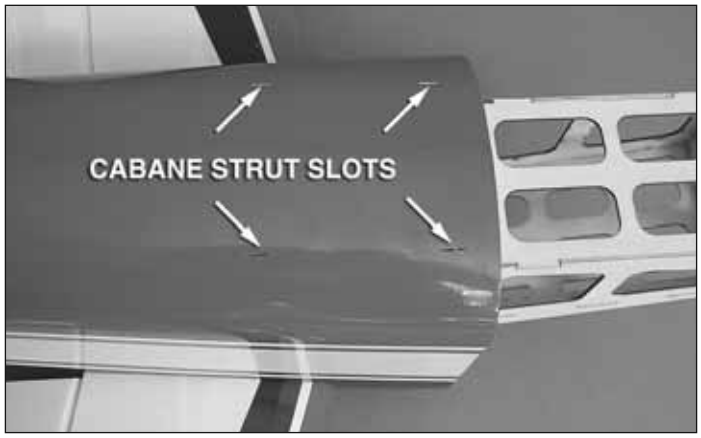
Install the Top Wing



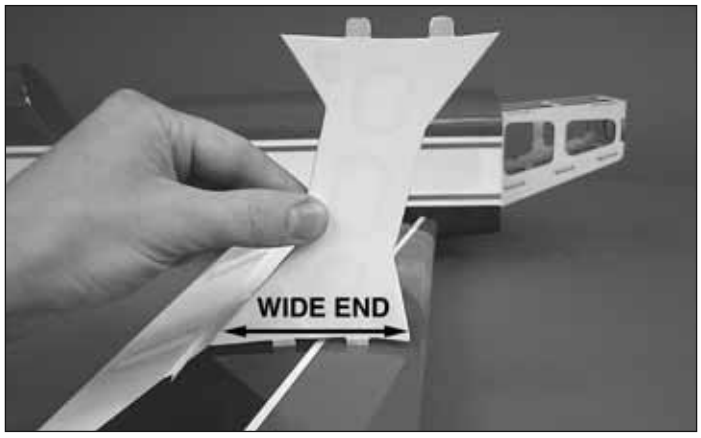
❑ 1. Trim the covering that overlaps onto the root ribs of the top wing panels. Leave the covering at the tops of the cabane strut slots intact. Glue the 6x21mm **wing joiner dowel** halfway into one of the top wing panels.

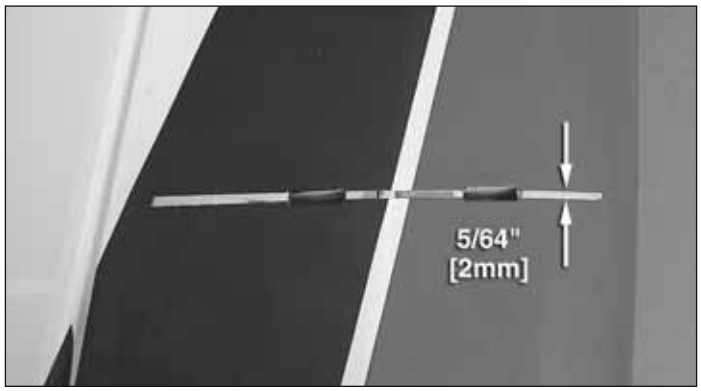
❑ 2. Coat both root ribs of the top wing panels and the protruding end of the wing joiner dowel with 30-minute epoxy. **Be careful not to get epoxy into the cabane strut slots!** Join the wing panels and use tape to hold them together tightly while the epoxy cures. Use denatured alcohol to wipe away any excess epoxy. A toothpick or something similar can be used to scrape any epoxy that may have squeezed into the cabane slots when the wing panels were joined.





❑ 3. Trim the covering from interplane strut slots in the bottom wing as well as the cabane slots in the fuselage.

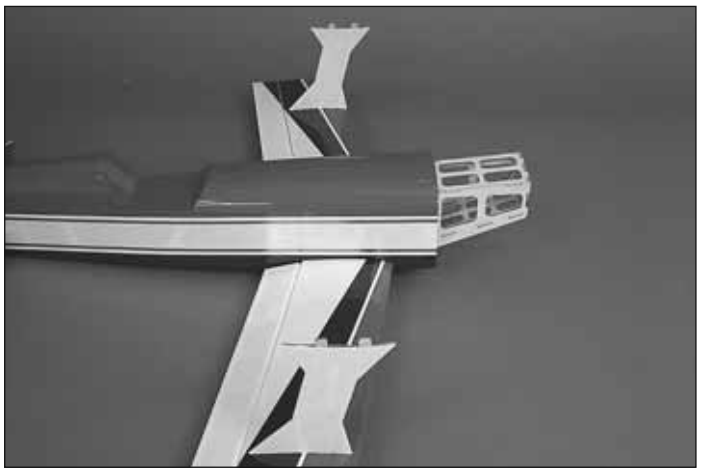




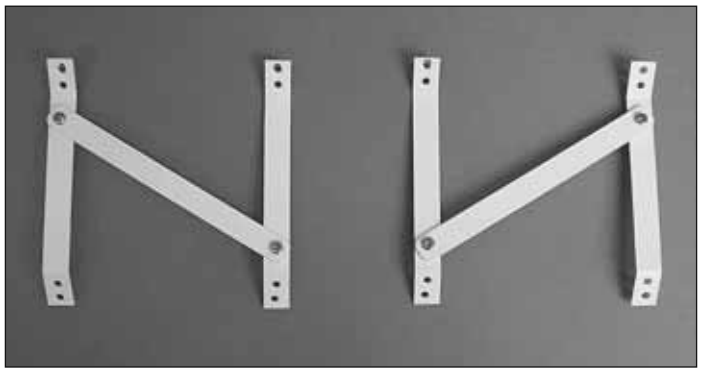
❑ 4. Test fit the **interplane struts** into the slots in the bottom wing. The wider end of the strut is the bottom end. Mark the forward and aft end of the struts onto the wing. Trim away a narrow strip of covering from between the marks you made (approximately 5/64" [2mm] wide).

❏ 5. Trim the covering from the interplane strut slots on the underside of the top wing. Repeat step #4 for the top interplane strut slots.

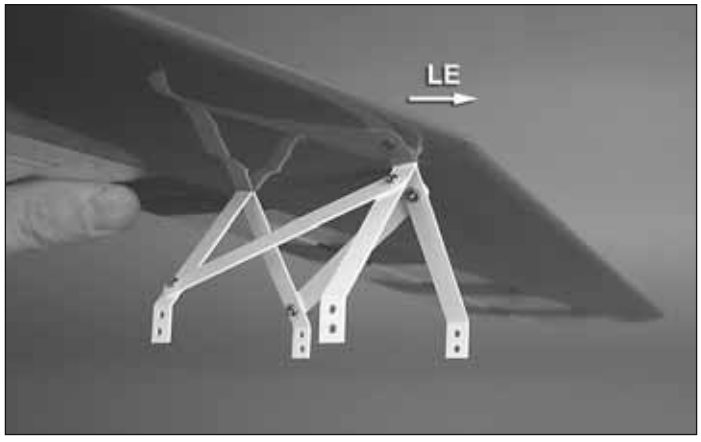
Read all of steps 6-9. Test fit all parts together (without glue) before proceeding.



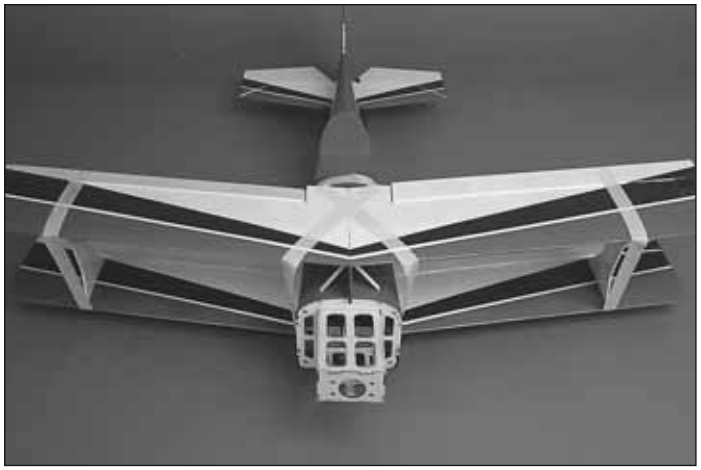
❏ 6. Test fit everything first, then glue the interplane struts perpendicular to the bottom wing using medium or thick CA.

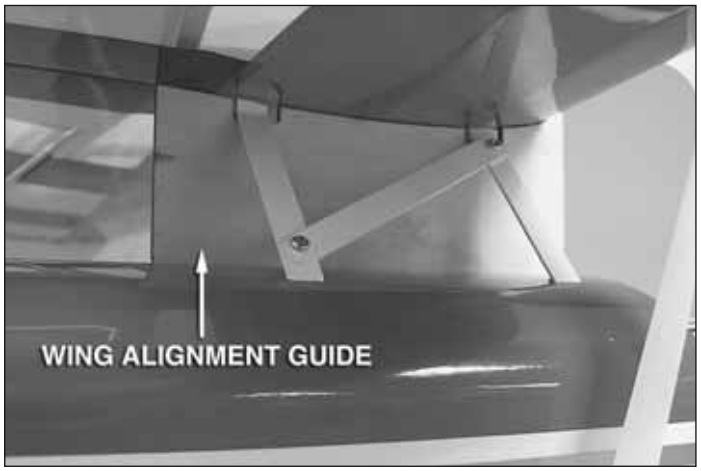


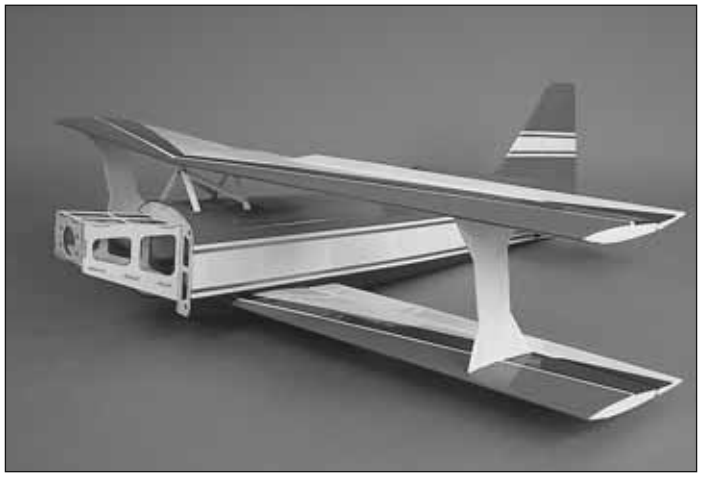
❏ 7. Assemble the cabane struts using four 2x5mm machine screws, four 2mm nuts, and thread locking compound. Be sure to make a left and right strut.



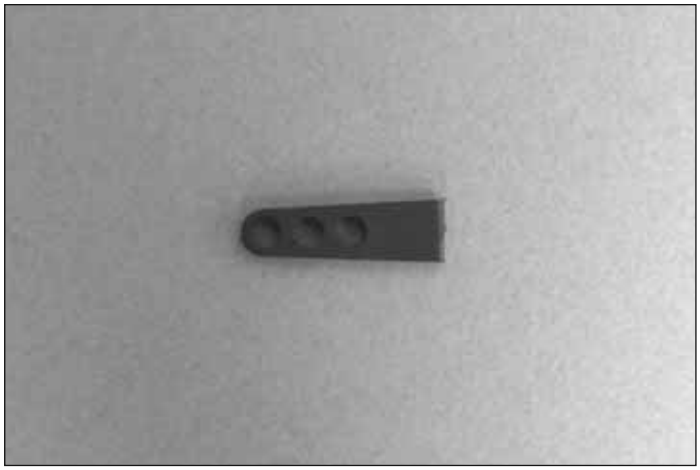
❏ 8. Test fit the cabane struts into the underside of the top wing. The strut ends should slide into the slots all the way to the top surface of the wing. If they cannot, epoxy has probably gathered in the slots. Use a hobby knife to clean out the slots until the struts can fit properly.



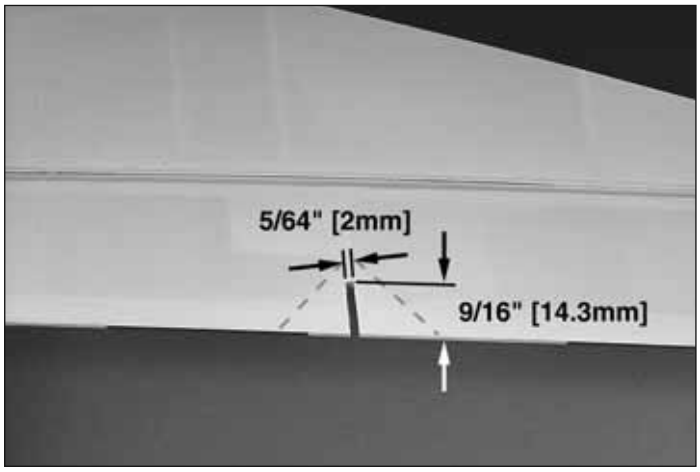


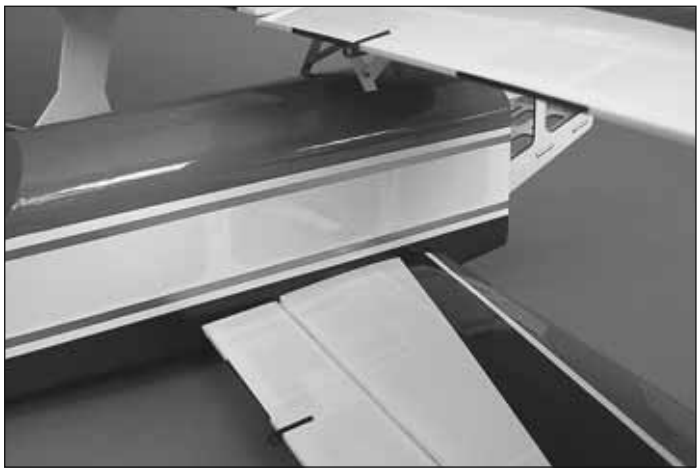


❏ 9. It is recommended to use 30-minute epoxy for this step (the extra working time is beneficial). Coat the top and bottom ends of the cabane struts with epoxy and insert them into the slots in the top wing. Put a bead of thick CA glue onto the top edges of the interplane struts and onto the sides of the interplane strut tabs. Fit one of the interplane struts into the underside of the top wing. Fit the bottoms of the cabane struts into the slots in the fuselage. Fit the other interplane strut to the top wing. Use denatured alcohol to wipe away any excess epoxy from around the cabane struts. A plywood wing alignment guide is included to correctly set the height of the center of the top wing above the fuselage when gluing the cabanes. Fit it in place as shown and use tape to hold the top wing tightly in place against the interplane struts and against the alignment guide while the glue hardens.



❑ 10. Cut four sides from servo arms left over in the hardware bag. Cut them off close to the center so they are as long as possible.



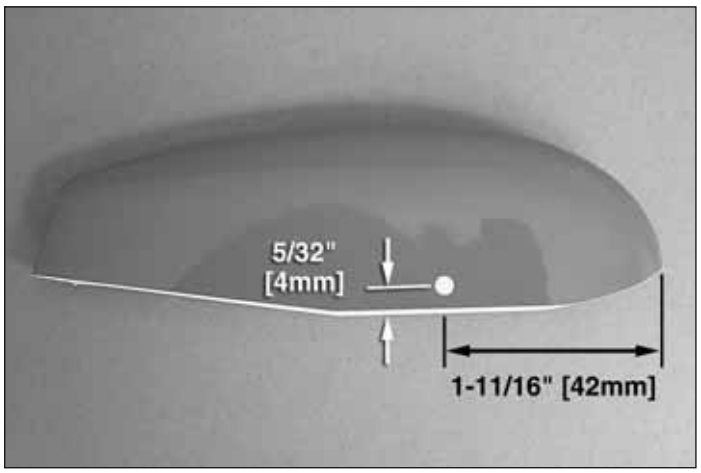


❑ 11. Use a sharp hobby knife to cut a slot in each aileron 9/16" [14.3mm] long and 5/64" [2mm] wide centered in the triangle block, inline with the aileron ribs as shown. Roughen the sides of the servo arm pieces with sandpaper and glue them into the slots using thick CA. **Do not get any glue in the outer holes of the servo arm pieces!** The outer holes of the servo arm pieces should protrude beyond the trailing edge of the ailerons. These will be used to join the top and bottom ailerons together.

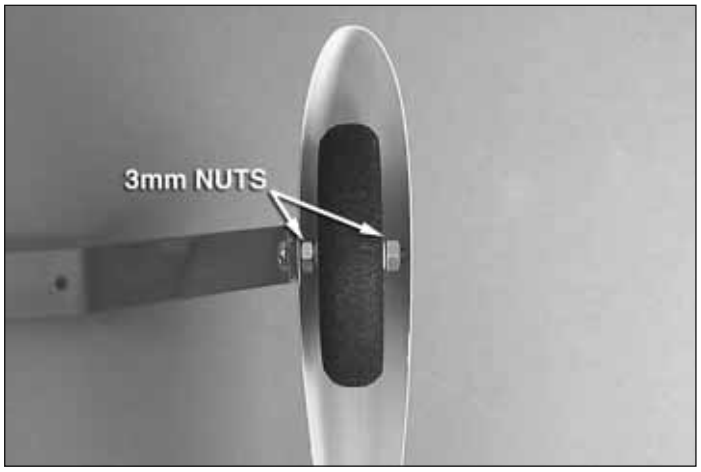
❑ 12. Center the ailerons and join the top and bottom together using adjustable clevises and the remainder of the 2x215mm aileron pushrods. Tighten the adjustable clevises with 2x4mm self-tapping screws and cut away the excess pushrod.

FINISH THE MODEL

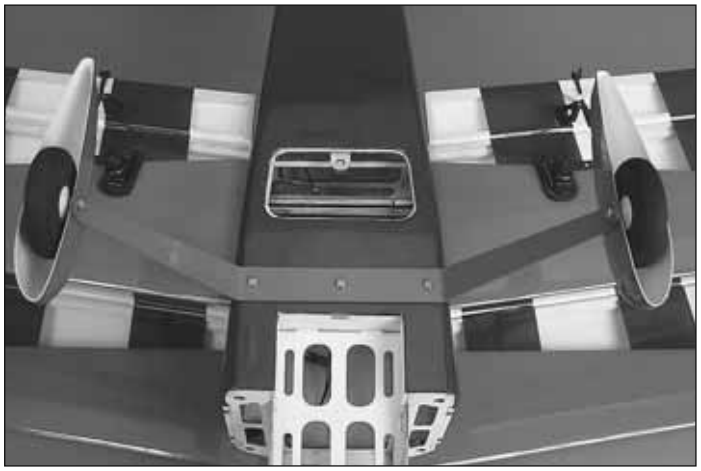
Install the Landing Gear



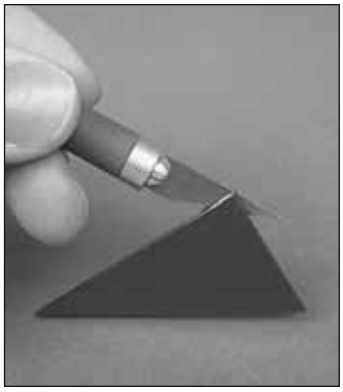
❑ 1. Measure and mark 1-11/16" [42mm] from the front and 5/32" [4mm] from the bottom of the **wheel pants**. Drill a 1/8" [3mm] hole at your marks on one side of each wheel pant (be sure to make a left and right pant). Accuracy during this step will ensure that your wheels are centered in the pants. When drilling the hole, make a pilot hole with a smaller bit first, then enlarge the hole to the correct diameter.

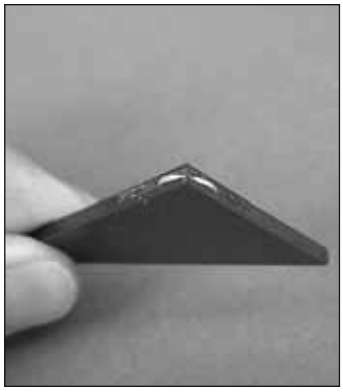


❏ 2. Fit a 3x20mm machine screw (axle) through the hole in the **landing gear** and through the hole in the wheel pant (the angled side of the landing gear faces the rear of the plane). Thread a 3mm nut onto the screw followed by a wheel. Apply a drop of thread locking compound near the base of the screw and tighten the nut against the inside of the pant. Apply a drop of thread locking compound near the end of the screw. Thread another 3mm nut onto the screw against the wheel, but left slightly loose to allow the wheel to freely rotate on the axle. Oil the axle if necessary. Repeat this step for the other side of the gear.



❏ 3. Trim the covering from the three landing gear mounting holes on the underside of the fuselage. Mount the landing gear to the fuse with three 3x12mm machine screws and thread locking compound. Rotate the wheel pants on the axles so that they align with the fuselage.

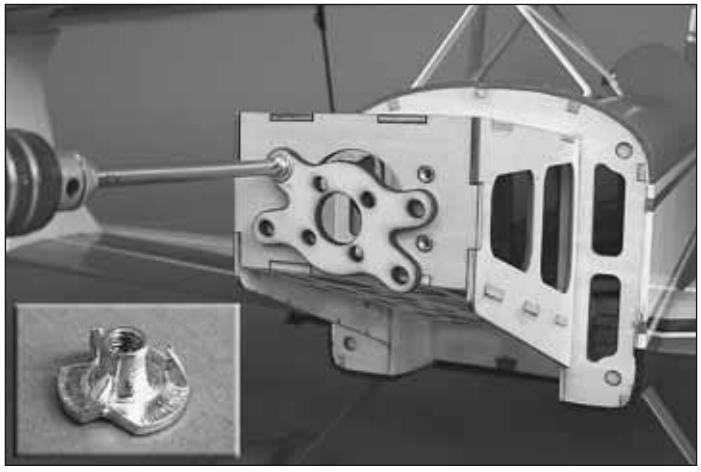




❏ 4. Use a hobby knife to cut the covering over the slot in the bottom of the **tail skid**. Glue the tail skid washer into the slot as shown. The washer will help to prevent wear to the skid when flying from a paved runway.

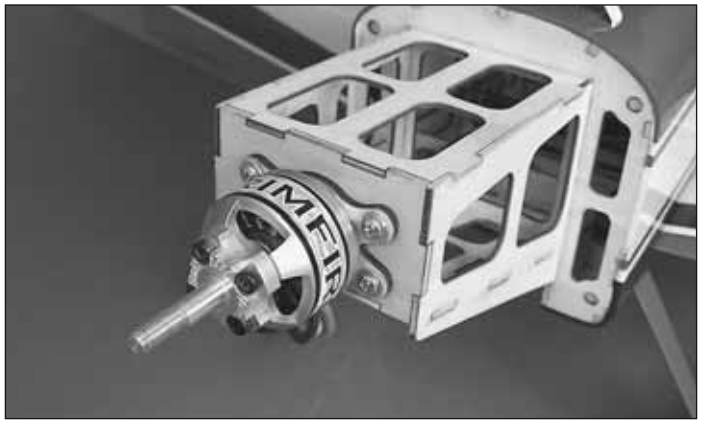
❏ 5. Position the tail skid approximately 1/4" [6mm] from the aft end of fuselage and mark its position. Trim a 3/32" [2.4mm] strip of covering down the center of the fuselage between the marks you made. Trim the covering that overlaps onto the longest side of the tail skid and glue the skid in place.

Install the Out-Runner Motor



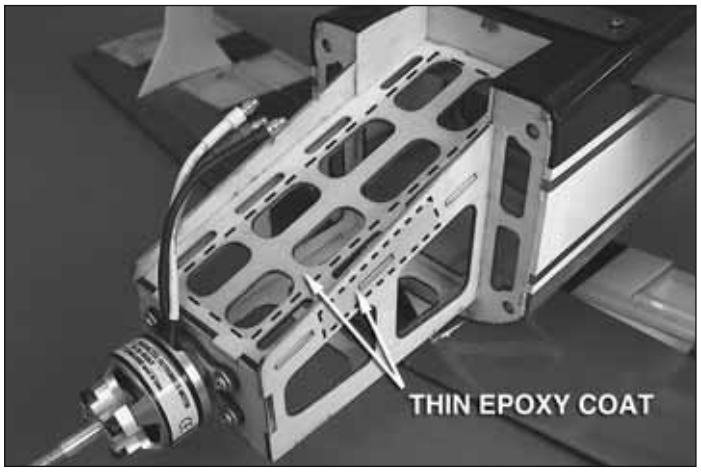
❏ 1. Install four 3mm blind nuts into the back of the motor mounting box. Use a 3x10mm machine screw, 3mm flat washer, and a **plywood motor adapter** to draw the blind nuts tight (the motor adapter is necessary for this step because the blind nuts will protrude slightly beyond the front of the mounting box).

❏ 2. Attach the prop adapter to the front of the motor case using the screws included with the motor. Harden the motor mounting holes in the plywood motor adapter with thin CA glue. Use the flat head screws included with motor and thread locking compound to attach the plywood motor adapter to the back of the motor.



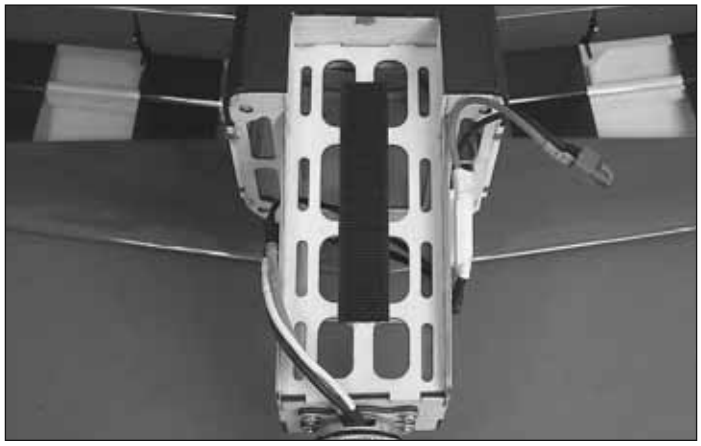
❏ 3. Use four 3x10mm machine screws, four 3mm flat washers, and thread locking compound to attach the motor to the mounting box.

Install the Electronics



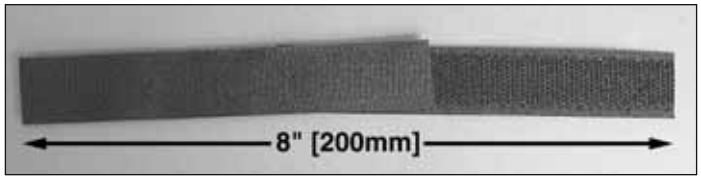
❏ 1. Brush a thin coat of epoxy onto the bottom of one side of the motor mounting box and down the center of the battery mounting tray. The smooth surface of the epoxy will improve the adhesion of the double-sided tape and hook & loop material.

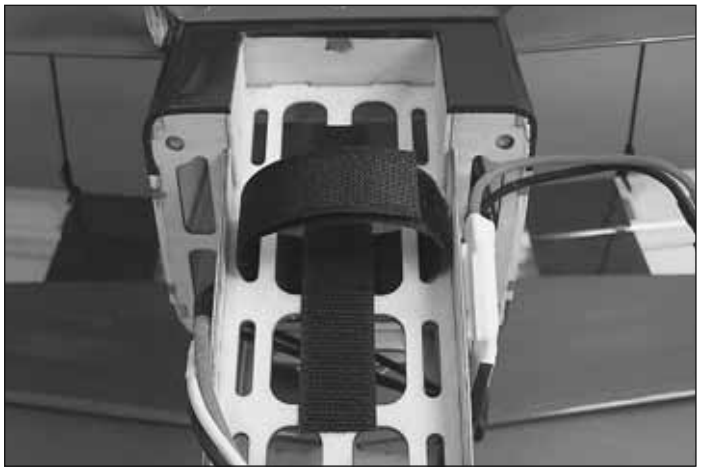
❏ 2. Connect the ESC to the motor leads and feed the receiver lead through the front of the fuselage. The excess length of motor leads can be wrapped through the side of the motor mounting box to keep them out of the way as shown. Use a piece of the included **double-sided foam tape** to secure the ESC to the side of the motor mounting box. Position the ESC on the aft end of the mounting box so that the ESC receiver lead will reach the receiver.



❏ 3. Attach the hook side of the included hook & loop material to the battery mounting tray.

❏ 4. Brush a thin coat of epoxy onto the aft side of the wing spar. Connect the servos and ESC to the receiver. If you are using a 4-channel receiver, a Y-harness or dual servo extension is needed to join the aileron servos into one channel. When the epoxy has hardened, use a piece of double-sided foam tape to secure the receiver to the wing spar.

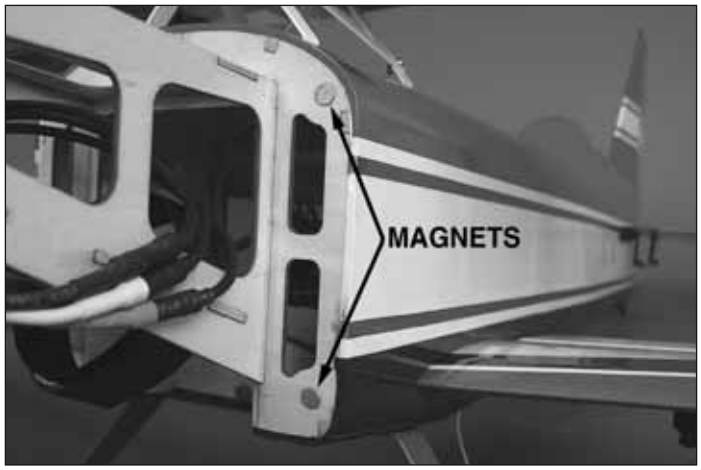




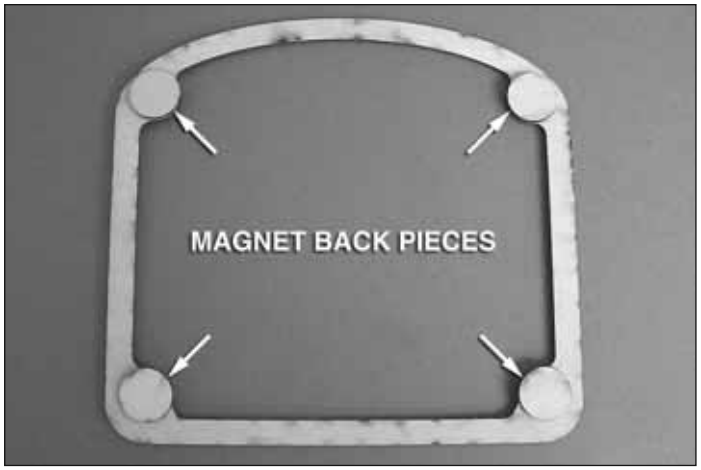
❏ 5. Make a battery strap out of the supplied hook and loop material 8" [200mm] long by overlapping two pieces and cutting it to length. Feed it through the battery tray in the location shown. The battery strap can be glued to the battery tray with medium CA to keep it in place.

❏ 6. Use your radio system to confirm that the motor rotates in the correct direction (do not install the propeller). If the motor rotates backwards, unplug two of the three motor leads and swap their positions.

Install the Cowl

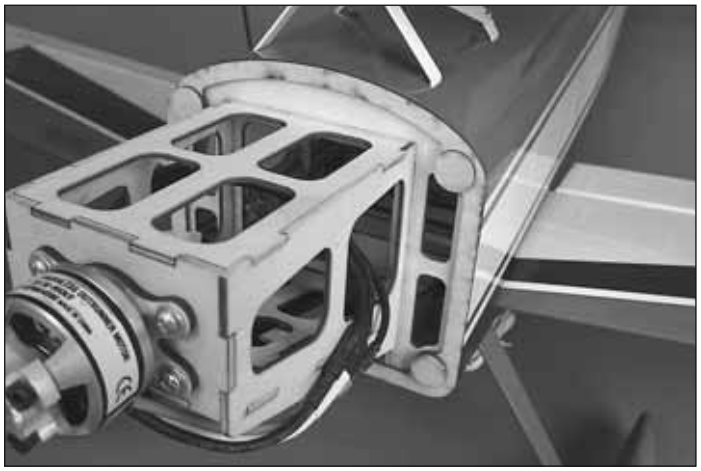


❏ 1. Lightly sand the magnet first, then put a light coating of medium CA glue into the magnet holes in the firewall and install a magnet into each hole. Do not use excess CA as it will pool in the bottom of the holes and prevent the magnets from being glued in flush with the firewall. Be sure the magnets are fully seated before the glue hardens. A plastic or wooden tool handle is useful for lightly tapping the magnets in place. Apply a skin coating of thin CA glue onto the face of the magnets overlapping onto the wood around them to help secure them in place. Allow the thin CA glue to harden **without using accelerator**.

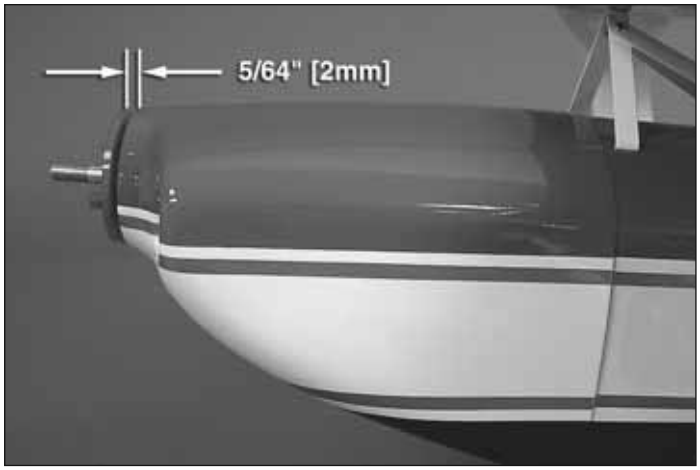


❏ 2. Glue the magnet back pieces over the holes in the **cowl ring**. Glue a magnet into each hole in the cowl ring with medium CA glue. **Be sure that the magnets are glued into the cowl ring in the correct orientation so that the cowl ring will be magnetically drawn to the magnets in the firewall.** As you did with the firewall, apply a skin coating of thin CA over the magnets in the cowl ring.

❏ 3. Prepare the inside of the **cowl** by lightly scuffing it with 220-grit sandpaper. When satisfied, clean the inside with alcohol.

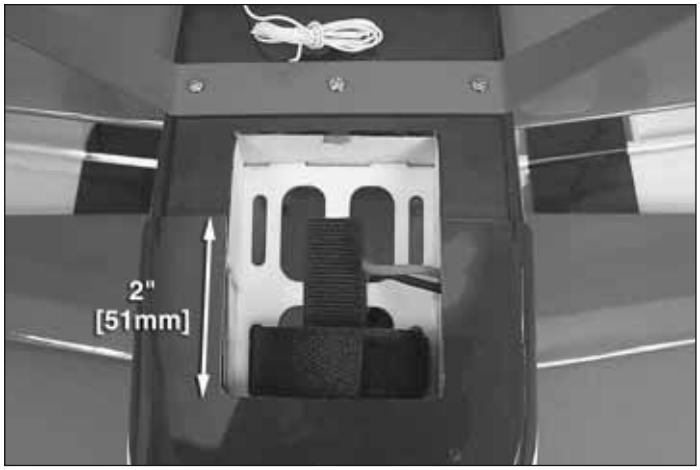


❏ 4. Magnetically attach the cowl ring onto the firewall.



❏ 5. Slide the cowl over the cowl ring and onto the fuselage. Confirm that the spinner backplate properly fits your motor shaft. If not, ream or drill it to the correct diameter. Temporarily install the spinner backplate onto the prop shaft. Adjust the position of the cowl on the fuselage so that the colors line up with the stripes on the fuselage. The spinner backplate should be centered over the front cowl, and the backplate should be approximately 5/64" [2mm] beyond the front of the cowl. When satisfied, tack glue the cowl to the cowl ring in the corners with medium CA by reaching through the front openings in the cowl. A CA applicator tip is very useful in this step. **Do not allow CA glue to adhere the cowl ring to the firewall!** Apply the CA sparingly in this step, using accelerator if desired.

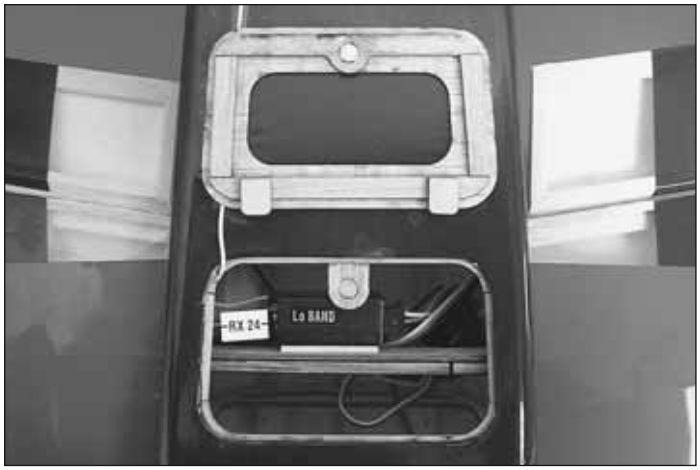
❏ 6. Carefully remove the cowl (and cowl ring) from the fuselage and apply a fillet of medium or thick CA glue along the **front only** of the cowl ring where it touches the cowl.



❏ 7. Use a rotary tool such as a Dremel with a cutoff wheel installed to open up the cowl for battery installation as shown. The cutout should be as wide as the battery tray and 2" [51mm] long. Also, open up a cool air inlet for the battery just below the prop opening in the cowl.

Final Assembly

❏ 1. Use a hobby knife to cut a small notch at the edge of the battery hatch opening for the receiver antenna wire. Tape the receiver antenna to the underside of the fuselage. Be sure that it does not interfere with the elevators or rudder.



❏ 2. Glue a magnet into the fuselage hatch and one into the fuselage. The magnets should be attracted to each other when the hatch is installed. The fuselage hatch is for occasional radio access, so a handle is not included. When access is needed, use a small, flathead screwdriver to pry the aft end of the hatch away from the fuse.

❏ 3. Attach the propeller and spinner to the prop adapter.

❏ 4. Before attaching the canopy, apply the instrument panel decal to the cockpit. The canopy can be taped in position as shown.

Apply the Decals

1. Use scissors or a sharp hobby knife to cut the decals from the sheet.

❏ 2. Be certain the model is clean and free from oily fingerprints and dust. Prepare a dishpan or small bucket with a mixture of liquid dish soap and warm water—about one teaspoon of soap per gallon of water. Submerse the decal in the soap and water and peel off the paper backing. **Note:** Even though the decals have a “sticky-back” and are not the water transfer type, submersing them in soap & water allows accurate positioning and reduces air bubbles underneath.

❏ 3. Position decal on the model where desired. Holding the decal down, use a paper towel to wipe most of the water away.

❏ 4. Use a piece of soft balsa or something similar to squeegee remaining water from under the decal. Apply the rest of the decals the same way.

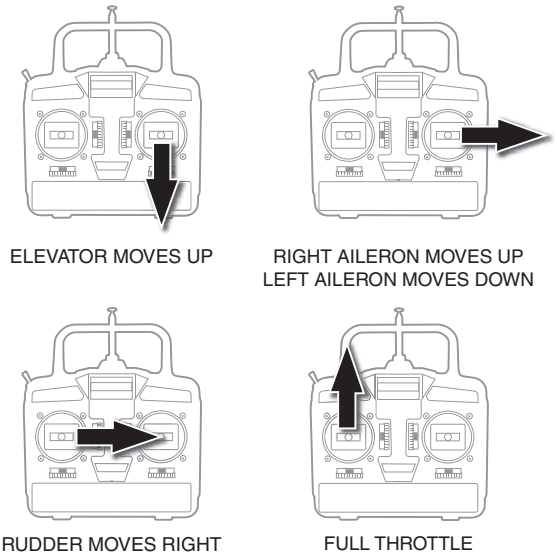
GET THE MODEL READY TO FLY

Check the Control Directions

❏ 1. Turn on the transmitter and receiver and center the trims. If necessary, remove the servo arms from the servos and reposition them so they are centered. Reinstall the screws that hold on the servo arms.

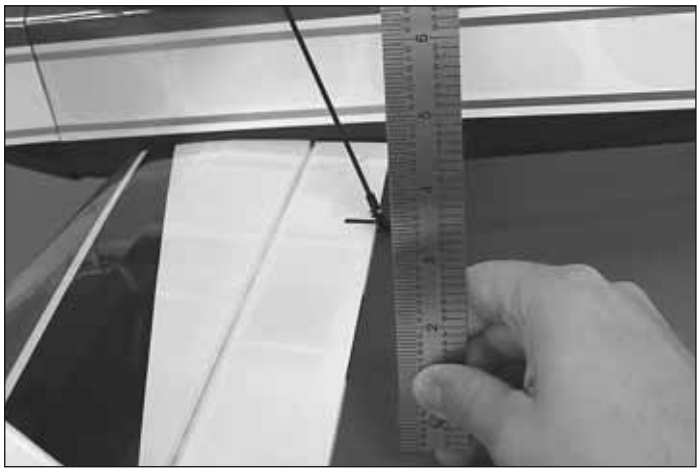
❏ 2. With the transmitter and receiver still on, check all the control surfaces to see if they are centered. If necessary, adjust the clevises on the pushrods to center the control surfaces.

4-CHANNEL RADIO SETUP (STANDARD MODE 2)



❏ 3. Make certain that the control surfaces and the throttle respond in the correct direction as shown in the diagram. If any of the controls respond in the wrong direction, use the servo reversing in the transmitter to reverse the servos connected to those controls. Be certain the control surfaces have remained centered. Adjust if necessary.

Set the Control Throws



Use a ruler to accurately measure and set the control throw of each control surface as indicated in the chart that follows. If your radio does not have dual rates, we recommend setting the throws at the ***low*** rate setting for your first few flights. **NOTE:** The throws are measured at the **widest part** of the elevators, rudder and ailerons.

These are the recommended control surface throws:

	High Rate	Low Rate
ELEVATOR:	1" [25mm] up 1" [25mm] down	5/16" [8mm] up 5/16" [8mm] down
RUDDER:	2-1/2" [64mm] left 2-1/2" [64mm] right	1-5/8" [41mm] left 1-5/8" [41mm] right
AILERONS:	5/16" [8mm] up 5/16" [8mm] down	1/8" [3mm] up 1/8" [3mm] down

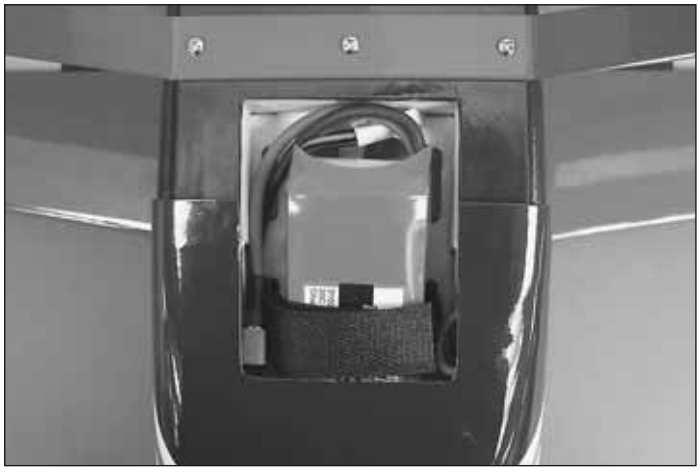
3D RATES:

ELEVATOR:	1-5/8" [41mm] up 1-5/8" [41mm] down
RUDDER:	3" [76mm] left 3" [76mm] right
AILERONS:	1/2" [13mm] up 1/2" [13mm] down

IMPORTANT: The Ultimate Biplane EP ARF has been **extensively** flown and tested to arrive at the throws at which it flies best. Flying your model at these throws will provide you with the greatest chance for successful first flights. If, after you have become accustomed to the way the Ultimate flies, you would like to change the throws to suit your taste, that is fine. However, too much control throw could make the model difficult to control, so remember, “more is not always better.”

Balance the Model (C.G.)

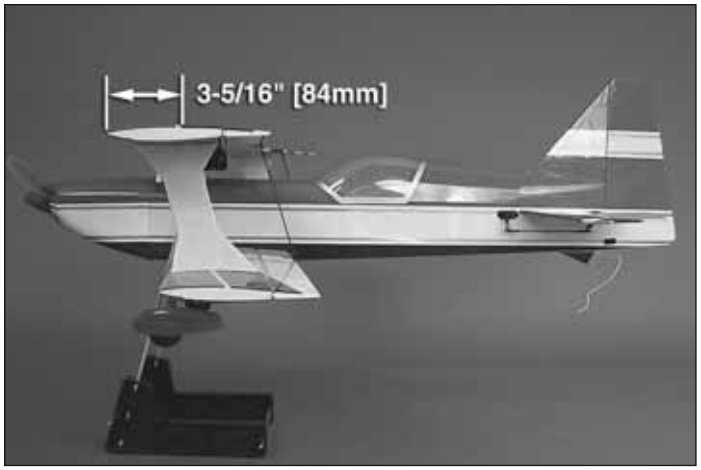
More than any other factor, the **C.G.** (balance point) can have the **greatest** effect on how a model flies, and may determine whether or not your first flight will be successful. If you value this model and wish to enjoy it for many flights, **DO NOT OVERLOOK THIS IMPORTANT PROCEDURE**. A model that is not properly balanced will be unstable and possibly unflyable.



At this stage the model should be in ready-to-fly condition with all of the systems in place including the motor, landing gear, and the radio system. Temporarily install the battery pack in place for balancing purposes.

❏ 1. Use a felt-tip pen or 1/8" [3mm]-wide tape to accurately mark the C.G. on the underside of the top wing, at the center where the two top wing panels are joined. **The C.G. is located 3-5/16" [84mm] back from the center LE of the top wing.**

This is where your model should balance for the first flights. Later, you may wish to experiment by shifting the C.G. up to 1/8" [3mm] forward or 3/8" [9.5mm] back to change the flying characteristics. Moving the C.G. forward may improve the smoothness and stability, but the model may then require more speed for takeoff and make it more difficult to slow for landing. Moving the C.G. aft makes the model more maneuverable, but could also cause it to become too difficult to control. In any case, **start at the recommended balance point** and do not at any time balance the model outside the specified range.



❏ 2. With all parts of the model installed (ready to fly) and battery installed, place the model on a Great Planes CG Machine, or lift it at the balance point you marked.

❏ 3. If the tail drops, the model is "tail heavy" and the battery pack must be shifted forward to balance. If the nose drops, the model is "nose heavy" and the battery pack must be shifted aft to balance. If possible, relocate the battery pack and receiver to minimize or eliminate any additional ballast required.

The Ultimate Biplane EP ARF is designed so that additional weight should not need to be added for balancing purposes. Changing to a lighter (1250mAh) or heavier (2100mAh) battery pack will shift the balance point from the forward position to the aft position, or vice-versa. Moving the battery pack on the battery tray will make smaller changes in the C.G. position.

❏ 4. **IMPORTANT:** If you found it necessary to add any permanent weight for balancing purposes, recheck the C.G. after the weight has been installed.

Balance the Model Laterally

❏ 1. With the wing level, have an assistant help you lift the model by the engine propeller shaft and the bottom of the fuse under the TE of the fin. Do this several times.

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

PREFLIGHT

Identify Your Model

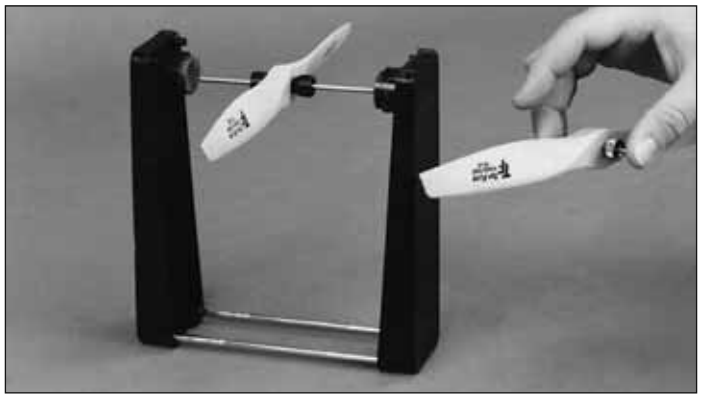
No matter if you fly at an AMA sanctioned R/C club site or if you fly somewhere on your own, you should always have your name, address, telephone number and AMA number on or inside your model. It is **required** at all AMA R/C club flying sites and AMA sanctioned flying events. Fill out the identification tag on the back cover and place it on or inside your model.

Charge the Batteries

Follow the battery charging instructions that came with your radio control system to charge the batteries. You should always charge your transmitter battery the night before you go flying, and at other times as recommended by the radio manufacturer.

CAUTION: Unless the instructions that came with your radio system state differently, the **initial** charge on **new** transmitter and receiver batteries should be done for 15 hours **using the slow-charger that came with the radio system**. This will "condition" the batteries so that the next charge may be done using the fast-charger of your choice. If the initial charge is done with a fast-charger the batteries may not reach their full capacity and you may be flying with batteries that are only partially charged.

Balance the Propeller



Carefully balance your propeller and spare propellers before you fly. An unbalanced prop can be the single most significant cause of vibration that can damage your model. Not only will engine mounting screws and bolts loosen, possibly with disastrous effect, but vibration may also damage your radio receiver and battery. Vibration can also cause your fuel to foam, which will, in turn, cause your engine to run hot or quit.

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

Range Check

Ground check the operational range of your radio before the first flight of the day. With the transmitter antenna collapsed and the receiver and transmitter on, you should be able to walk at least 100 feet away from the model and still have control. Have an assistant stand by your model and, while you work the controls, tell you what the control surfaces are doing. Repeat this test with the motor running at various speeds with an assistant holding the model, using hand signals to show you what is happening. If the control surfaces do not respond correctly, do not fly! Find and correct the problem first. Look for loose servo connections or broken wires, corroded wires on old servo connectors, poor solder joints in your battery pack or a defective cell, or a damaged receiver crystal from a previous crash.

MOTOR SAFETY PRECAUTIONS

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

- Get help from an experienced pilot when learning to operate electric motors.
- Use safety glasses when running electric motors.
- Do not operate the motor in an area of loose gravel or sand; the propeller may throw such material in your face or eyes.
- Keep your face and body as well as all spectators away from the plane of rotation of the propeller as you operate the motor.
- Keep these items away from the prop: loose clothing, shirt sleeves, ties, scarfs, long hair or loose objects such as pencils or screwdrivers that may fall out of shirt or jacket pockets into the prop.
- The motor gets hot! Do not touch it during or right after operation.

AMA SAFETY CODE (EXCERPTS)

Read and abide by the following excerpts from the Academy of Model Aeronautics Safety Code. For the complete Safety Code refer to *Model Aviation* magazine, the AMA web site or the Code that came with your AMA license.

General

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

2) I will not fly my model aircraft higher than approximately 400 feet within 3 miles of an airport without notifying the airport operator. I will give right-of-way and avoid flying in the proximity of full-scale aircraft. Where necessary, an observer shall be utilized to supervise flying to avoid having models fly in the proximity of full-scale aircraft.
3) Where established, I will abide by the safety rules for the flying site I use, and I will not willfully and deliberately fly my models in a careless, reckless and/or dangerous manner.
5) I will not fly my model unless it is identified with my name and address or AMA number, on or in the model. Note: This does not apply to models while being flown indoors.
7) I will not operate models with pyrotechnics (any device that explodes, burns, or propels a projectile of any kind).

Radio Control

1) I will have completed a successful radio equipment ground check before the first flight of a new or repaired model.
2) I will not fly my model aircraft in the presence of spectators until I become a qualified flier, unless assisted by an experienced helper.
3) At all flying sites a straight or curved line(s) must be established in front of which all flying takes place with the other side for spectators. Only personnel involved with flying the aircraft are allowed at or in the front of the flight line. Intentional flying behind the flight line is prohibited.
4) I will operate my model using only radio control frequencies currently allowed by the Federal Communications Commission.
5) **I will not knowingly operate my model within three miles of any pre-existing flying site except in accordance with the frequency sharing agreement listed** [in the complete AMA Safety Code].
9) Under no circumstances may a pilot or other person touch a powered model in flight; **nor should any part of the model other than the landing gear, intentionally touch the ground, except while landing**.

CHECK LIST

During the last few moments of preparation your mind may be elsewhere anticipating the excitement of the first flight. Because of this, you may be more likely to overlook certain checks and procedures that should be performed before the model is flown. To help avoid this, a check list is provided to make sure these important areas are not overlooked. Many are covered in the instruction manual, so where appropriate, refer to the manual for complete instructions. Be sure to check the items off as they are completed.

❏ 1. Check the C.G. according to the measurements provided in the manual.
❏ 2. Be certain the battery and receiver are securely mounted in the fuse. Simply stuffing them into place with foam rubber is not sufficient.
❏ 3. Extend your receiver antenna.
❏ 4. Balance your model *laterally* as explained in the instructions.
❏ 5. Add a drop of oil to the axles so the wheels will turn freely.
❏ 6. Make sure all hinges are **securely** glued in place.
❏ 7. Confirm that all controls operate in the correct direction and the throws are set up according to the manual.
❏ 8. Make sure that all servo arms are secured to the servos with the screws included with your radio.
❏ 9. Secure the connections between servo wires and Y-connectors or servo extensions with tape, heat shrink tubing, or special clips suitable for that purpose.
❏10. Balance your propeller (and spare propellers).
❏11. Tighten the propeller nut and spinner.
❏12. Place your name, address, AMA number and telephone number on or inside your model.
❏13. If you wish to photograph your model, do so before your first flight.
❏14. Range check your radio when you get to the flying field.

FLYING

The Ultimate Biplane EP ARF is a great-flying model that flies smoothly and predictably. The Ultimate Biplane does not, however, possess the self-recovery characteristics of a primary R/C trainer and should be flown only by experienced R/C pilots.

CAUTION (THIS APPLIES TO ALL R/C AIRPLANES): If, while flying, you notice an alarming or unusual sound such as a low-pitched "buzz," this may indicate control surface flutter. Flutter occurs when a control surface (such as an aileron or elevator) or a flying surface (such as a wing or stab) rapidly vibrates up and down (thus causing the noise). In extreme cases, if not detected immediately, flutter can actually cause the control surface to detach or the flying surface to fail, thus causing loss of control followed by an impending crash. The best thing to do when flutter is detected is to slow the model **immediately** by reducing power, then land as soon as safely possible. Identify which surface fluttered (so the problem may be resolved) by checking all the servo grommets for deterioration or signs of vibration. Make certain all pushrod linkages are secure and free of play. If it fluttered once, under similar circumstances it will probably flutter again unless the problem is fixed. Some things which can cause flutter are; Excessive hinge gap; Not mounting control horns solidly; Poor fit of clevis pin in horn; Side-play of wire pushrods caused by large bends; Excessive free play in servo gears; Insecure servo mounting; and one of the most prevalent causes of flutter; Flying an over-powered model at excessive speeds.

Takeoff

If you have access to a smooth, paved runway, we suggest using it to takeoff, especially for the first few flights. Position the Ultimate Biplane onto the runway pointed into the wind. Slowly advance the throttle stick to half throttle leaving the elevator in the neutral position. As the tail rises off the ground, slowly increase throttle and apply a bit of up elevator to lift the model into the air. As you become accustomed to the takeoff characteristics of the Ultimate, they can be performed quickly, only requiring five to ten feet of runway until the model is airborne.

If you do not have access to a smooth runway, the Ultimate can be hand launched. For the first flight, it is a good idea to have someone launch the airplane for you. This allows you to keep your hands on the radio sticks and correct any trim problems that are present.

Have the person launching the Ultimate hold the plane by the fuselage just in front of the canopy. Throttle up to full power, and have your helper give the plane a gentle underhanded toss at about 30-degree angle upward into the wind. The high thrust-to-weight ratio will allow the plane to accelerate to flying speed almost instantly. Climb to a comfortable altitude and throttle back to a lower power setting.

Flight

For reassurance and to keep an eye on other traffic, it is a good idea to have an assistant on the flight line with you. Tell him to remind you to throttle back once the plane gets to a comfortable altitude. While full throttle is usually desirable for takeoff, most models fly more smoothly at reduced speeds.

Take it easy with the Ultimate Biplane EP ARF for the first few flights, gradually getting acquainted with it as you gain confidence. Adjust the trims to maintain straight and level flight. After flying around for a while, and while still at a safe altitude with plenty of battery charge, practice slow flight and execute practice landing approaches by reducing the throttle to see how the model handles at slower speeds. Add power to see how she climbs as well. Continue to fly around, executing various maneuvers and making mental notes (or having your assistant write them down) of what trim or C.G. changes may be required to fine tune the model so it flies the way you like. Mind your batteries, but use this first flight to become familiar with your model before landing.

Landing

To initiate a landing approach, lower the throttle while on the downwind leg. Allow the nose of the model to pitch downward to gradually bleed off altitude. Continue to lose altitude, but maintain airspeed by keeping the nose down as you turn onto the crosswind leg. Make your final turn toward the runway (into the wind) keeping the nose down to maintain airspeed and control. Level the attitude when the model reaches the runway threshold, modulating the throttle as necessary to maintain your glide path and airspeed. If you are going to overshoot, smoothly advance the throttle (always ready on the right rudder to counteract torque) and climb out to make another attempt. When you're ready to make your landing flare and the model is a foot or so off the deck, smoothly increase up elevator until it gently touches down. Once the model is on the runway and has lost flying speed, hold up elevator to place the tail on the ground.

One final note about flying your model. Have a goal or flight plan in mind for **every** flight. This can be learning a new maneuver(s), improving a maneuver(s) you already know, or learning how the model behaves in certain conditions (such as on high or low rates). This is not necessarily to improve your skills (*though it is never a bad idea!*), but more importantly so you do not surprise yourself by impulsively attempting a maneuver and suddenly finding that you've run out of time, altitude or airspeed. Every maneuver should be deliberate, not impulsive. For example, if you're going to do a loop, check your altitude, mind the wind direction (anticipating rudder corrections that will be required to maintain heading), remember to throttle back at the top, and make certain you are on the desired rates (high/low rates). A flight plan greatly reduces the chances of crashing your model just because of poor planning and impulsive moves. **Remember to think.**

Have a ball!
But always stay in control and fly in a safe manner.

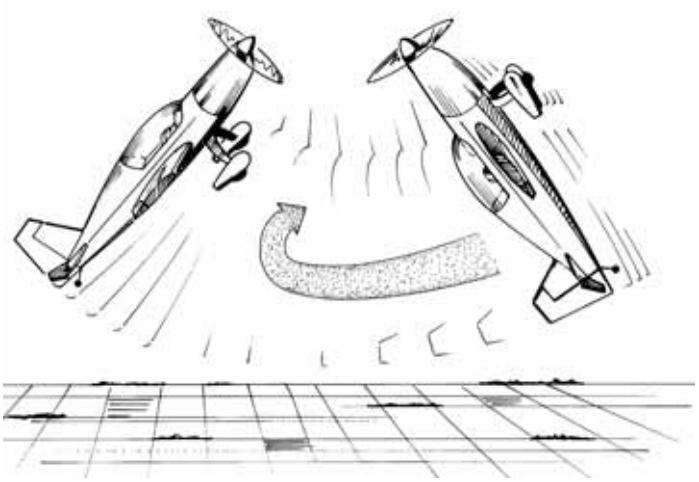
GOOD LUCK AND GREAT FLYING!

3D FLYING

Because of the power-to-weight ratio on 3D planes, straight and level flight should be at a reduced throttle and full power should only be used when the airplane is "loaded" during a maneuver. Learn to manage the throttle and experiment while in the maneuver. The power needed will depend on the maneuver being performed. C.G. also plays a large role in the 3D capability of models as well. Experiment, but keep in mind that being tail heavy is not always the best way to go.

Another thing to remember is that maximum control throw is not necessary for all 3D maneuvers. Occasionally, too much throw can place the model too far into a stall, causing it to become uncontrollable. Practice your maneuvers at a higher altitude while you become accustomed to your particular plane's stall characteristics.

WATERFALLS



With the model pointing straight up (almost in a hover), push full down elevator and full throttle. As the model rotates and begins to point downwards, reduce the throttle (to keep the model from being pulled downwards). As the model flattens out, add power back in to pull the model around. A lot of models will require a little bit of rudder correction (usually right rudder) during this maneuver. Some planes will require aileron correction to keep the wings level.

UPRIGHT FLAT SPINS

Pull the nose up slightly and slowly decrease power. As the model slows down to a few mph, slowly add in full left rudder and power. Next, start adding in up elevator as needed to keep the model flat in the spin. Most airplanes will require some aileron as well to keep the wings level. This is one of the maneuvers to experiment on; try different C.G. positions and different amounts of throw and power to see how flat the spin will go. It is possible to maintain altitude in the flat spin and in some cases it is also possible to climb during the spin.

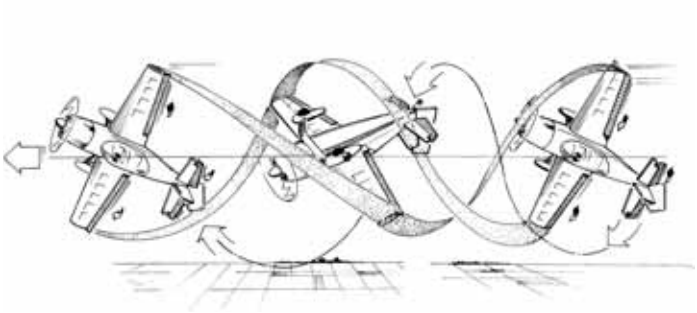
INVERTED FLAT SPINS

This is the same as the up-right flat spin except most planes like to spin in the opposite direction, for example: right rudder and down elevator.

THE WALL

Fly straight across the field at a moderate speed and simply pull full up until vertical. Adjust the power as necessary to maintain a hover.

KNIFE EDGE TUMBLE



This is an impressive looking maneuver that really isn't as difficult as it looks. (Before learning this maneuver you must be able to confidently Snap and Tumble your plane and stop the aircraft exactly, without over rotating.) Fly the model Knife Edge from the right at a moderate airspeed, using just enough rudder to maintain Knife Edge, not climbing or diving. Perform one full right negative Tumble by maintaining your rudder setting while applying full throttle, full down elevator, and full right aileron, releasing in time to end again flying Knife Edge to the right. Note that you may need to use some positive elevator and/or left aileron to stop the Tumble at exactly Knife Edge. This maneuver is easier to the right because torque helps stop the Tumble and it can be done at varied airspeeds with proper throttle and rudder modulation.

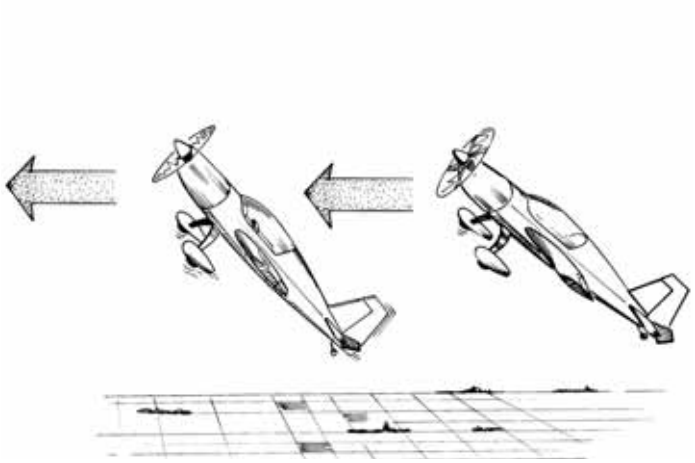
VERTICAL HOVER

Fly a straight pass across the field at 75ft high and 100ft out and pull the model vertical. Roll the model until the top of it is facing you and slowly begin to reduce power. As the model begins to slow down to 10mph or so, slowly add a little bit of power back in. You will have to adjust the throttle as needed, but make your adjustments smooth. Some right aileron may be needed to keep the model from torque rolling. Use the rudder and elevator to keep the nose pointing straight up. Be patient as this maneuver will take a while to learn.

TORQUE ROLL

This is the same as the vertical hover but without the use of right aileron to keep the model from rolling. If needed, you can use a little left aileron to speed the roll up. As the model rotates around, the controls will appear to be reversed to you but only the orientation of the model has changed.

HARRIER



The harrier is nothing more than a high angle of attack flying stall. Check the stall characteristics of your plane before proceeding with this maneuver. Bring your plane across the field at 75 ft high and 100 ft out away from yourself. Slowly pull back on the elevator while reducing throttle. The nose of the plane should come up. Depending on the plane/setup, you may have to make constant aileron (wing walking) and rudder corrections for this maneuver. As the nose of the plane comes up, start adding in a little bit of power to help maintain airspeed. The rudder is now used to turn the model. This maneuver will take some practice as there are a lot of small corrections made to keep most planes in the maneuver.

This is one maneuver where less control is needed. Too much elevator and the model goes into an uncontrollable stall. The C.G. of the plane will have a large effect on the stability of the model during this maneuver. Some planes perform better with more elevator deflection and a farther forward C.G. while other planes prefer a further aft C.G. and less elevator deflection. Elevator to flap mixing can be used on airplanes with marginal wing area, and some planes won't stall so elevator to spolieron mixing will be needed.

This model belongs to:

Name

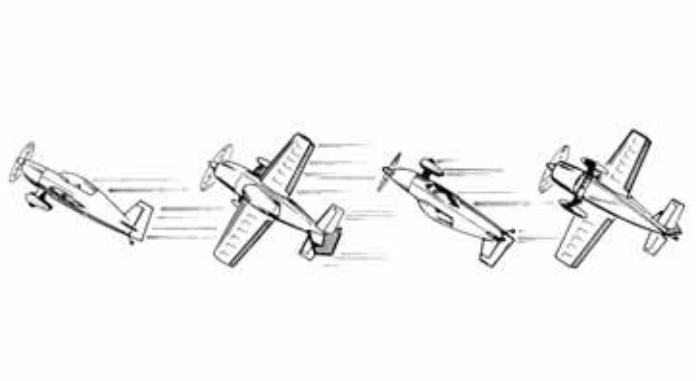
Address

City, State Zip

Phone number

AMA number

ROLLING HARRIER



Once you get comfortable with the up-right harrier, it's time to work rolls into the mix. From an up-right harrier, add in left aileron and change from up elevator to down elevator when inverted. If you are comfortable with four point rolls and slow rolls, inputting rudder on the knife edges can improve the maneuver considerably. To turn the model, simply input the elevator or rudder a little sooner or later in the rotation. It's all a matter of timing.

PINWHEEL

Climb vertically and bring the model to a vertical hover, but do not stop long enough to let the torque pull the model around (climbing or sliding slightly will not be noticeable to spectators but will keep air flowing over the ailerons and provide you roll authority to stop the torque). When the model is hanging, rock the plane left with rudder, then apply full throttle and full right rudder and hold both, completing 3/4 of a VERY tight Knife Edge Loop and flying out Knife Edge. When done correctly, the plane pivots around the wingtip in a very small area. This maneuver can be done either direction.