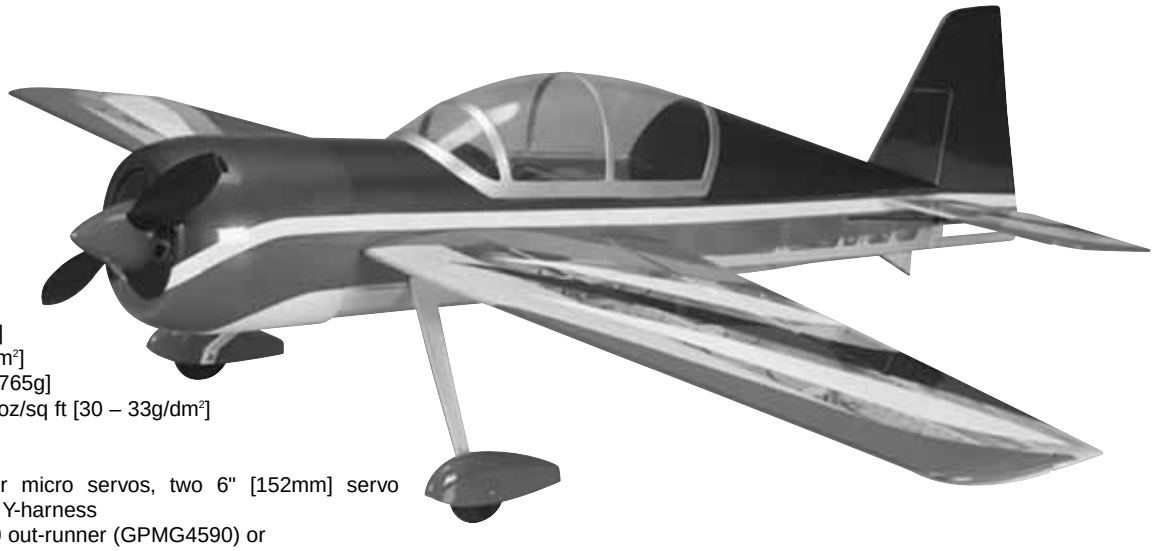
YAK 54™ 3D ARF

EPERFORMANCE SERIES

INSTRUCTION MANUAL



Wingspan: 41 in [1040mm]
Wing Area: 356 sq in [23dm²]
Weight: 24 – 27 oz [680 – 765g]
Wing Loading: 9.7 – 10.9 oz/sq ft [30 – 33g/dm²]
Length: 38 in [960mm]
Requires (not included):
Radio: 4-channel with four micro servos, two 6" [152mm] servo extensions and one Y-harness
Motor: RimFire™ 35-30-950 out-runner (GPMG4590) or Ammo™ 24-33-4040 in-runner brushless motor (GPMG5165)
Gear-Drive: 24mm gear-drive with 4.5:1 gear ratio
ESC: 25 amp brushless ESC
Battery: 3-cell 1250 to 2100mAh LiPo battery & LiPo-compatible charger

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 E Performance Series YAK 54 EP 3D ARF is the second release in a line of electric, built-up, all out performance 3D planes. Just like Reactor EP, the YAK 54 EP 3D ARF can perform virtually any aerobatic maneuver with authority. High-capacity LiPo battery packs will allow you the convenience of electric flying, combined with the flight characteristics of planes much larger in size, like the Great Planes YAK 54 1.60 ARF. In addition to the flight performance of a large 3D plane in a small package, the beautiful trim scheme from the YAK 54 1.60 ARF has been carried down to the YAK 54 EP 3D ARF.

For the latest technical updates or manual corrections to the YAK 54 EP 3D ARF visit the Great Planes web site at **www.greatplanes.com**. Open the "Airplanes" link, then select the YAK 54 EP 3D 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.

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

1. Your YAK 54 EP 3D 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 YAK 54 EP 3D ARF, 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 correctly install all R/C and other components so that the model operates correctly on the ground and in the air.

5. 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.

6. 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.

7. 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.

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.

DECISIONS YOU MUST MAKE

This is a partial list of items required to finish the YAK 54 EP 3D 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. Two 6" [150mm] servo extensions and a Y-harness are also required. Order numbers for these items are provided below.

- (4) Futaba S3110 Micro High Torque Servo [7.7g] (FUTM0046)
- Futaba R114F FM Micro Receiver (Low Band – FUTL0442, High Band – FUTL0443)
- Futaba FM Single Conversion Short Crystal (Low Band – FUTL62**, High Band – FUTL63**)
- (2) Futaba C-25 Extension Slim Wire 6" [152mm] (FUTM4506)
- Futaba 6" [152mm] Dual Servo Extension J (FUTM4130)

Motor Recommendations

The YAK 54 EP 3D ARF comes with a mounting box that will accommodate either a brushless in-runner motor with gear-drive or a brushless out-runner motor. The motors that have been tested and perform well in this plane are listed below. If using the in-runner motor with gear-drive, be sure to install the 11T pinion that is included with the gear-drive to achieve a gear ratio of 4.5:1.

- Great Planes Ammo™ 24-33-4040kV Brushless In-runner Motor (GPMG5165)
  Great Planes Gear-Drive 24mm Motors (GPMG0505)
- Great Planes RimFire™ 35-30-950kV Brushless Out-runner Motor (GPMG4590)

Note: Motors from other manufacturers may work with the YAK 54 EP 3D ARF. However, the included firewall pieces are designed to work specifically with the Great Planes motors listed.

Propeller

If using the Ammo Brushless In-runner motor with 4.5:1 gearbox or the RimFire Brushless Out-runner motor, you will need a 11x4.5 Slo-Flyer Electric Propeller (GPMQ6695).

ESC

A Brushless ESC (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

The YAK 54 EP 3D 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. A 20C discharge pack is necessary for best 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)

Note: 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.

Required Adhesive & Building Supplies

This is the list of adhesive and building supplies required to finish the YAK 54 EP 3D ARF. Order numbers are provided in parentheses.

- ❏ 1/2 oz. [15g] Thin Pro™ CA (GPMR6001)
- ❏ 1/2 oz. [15g] Medium Pro CA+ (GPMR6007)
- ❏ Pro 30-minute epoxy (GPMR6047)
- ❏ Denatured alcohol
- ❏ Drill bits: 5/64" [2mm], 1/8" [3mm]
- ❏ #1 Hobby knife (HCAR0105)
- ❏ #11 blades (5-pack, HCAR0211)
- ❏ Hobbico® Steel T-Pins 1" [25mm] (100, HCAR5100)
- ❏ Great Planes Pro Threadlocker (GPMR6060)
- ❏ Great Planes Double-Sided Servo Tape 1" [25mm] (GPMQ4442)
- ❏ CA applicator tips (HCAR3780)
- ❏ Small spring clamps
- ❏ 220-grit Sandpaper

Optional Supplies & Tools

Here is a list of optional tools mentioned in the manual that will help you build the YAK 54 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™ can of compressed air (HCAR5500)
- ❏ Panel Line Pen (TOPQ2510)
- ❏ Rotary tool such as Dremel®
- ❏ Hobbico flexible 18" [457mm] 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 motor 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 YAK EP 3D 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 Hobbico web site at **www.hobbico.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 e-mail at **productsupport@greatplanes.com**, or by telephone at (217) 398-8970.

Description	How to Purchase
Missing pieces	Contact Product Support
Instruction manual	Contact Product Support
Full-size plans	Not available
Kit parts listed below	Hobby Supplier

Replacement Parts List

GPMA2945 .....Wing Kit
GPMA2946 .....Fuse Kit
GPMA2947 .....Tail Set
GPMA2948 .....Landing Gear
GPMA2949 .....Wheel Pants
GPMA2950 .....Cowl
GPMA2951 .....Canopy
GPMA2952 .....Hatch
GPMA2953 .....Decal Sheet
GPMA2954 .....Hardware Set

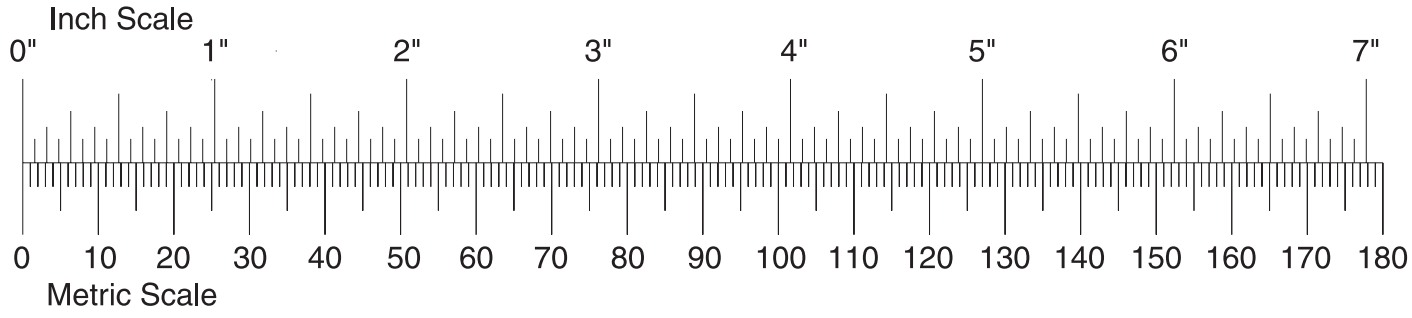
COMMON ABBREVIATIONS

Fuse = Fuselage
Stab = Horizontal Stabilizer
Fin = Vertical Fin
LE = Leading Edge
TE = Trailing Edge
LG = Landing Gear
Ply = Plywood
" = Inches
mm = Millimeters
ESC = Electronic Speed Control
SHCS = Socket Head Cap Screw

METRIC CONVERSIONS

1" = 25.4mm (conversion factor)

1/64"	=	.4mm	3/4"	=	19.0mm
1/32"	=	.8mm	1"	=	25.4mm
1/16"	=	1.6mm	2"	=	50.8mm
3/32"	=	2.4mm	3"	=	76.2mm
1/8"	=	3.2mm	6"	=	152.4mm
5/32"	=	4.0mm	12"	=	304.8mm
3/16"	=	4.8mm	18"	=	457.2mm
1/4"	=	6.4mm	21"	=	533.4mm
3/8"	=	9.5mm	24"	=	609.6mm
1/2"	=	12.7mm	30"	=	762.0mm
5/8"	=	15.9mm	36"	=	914.4mm

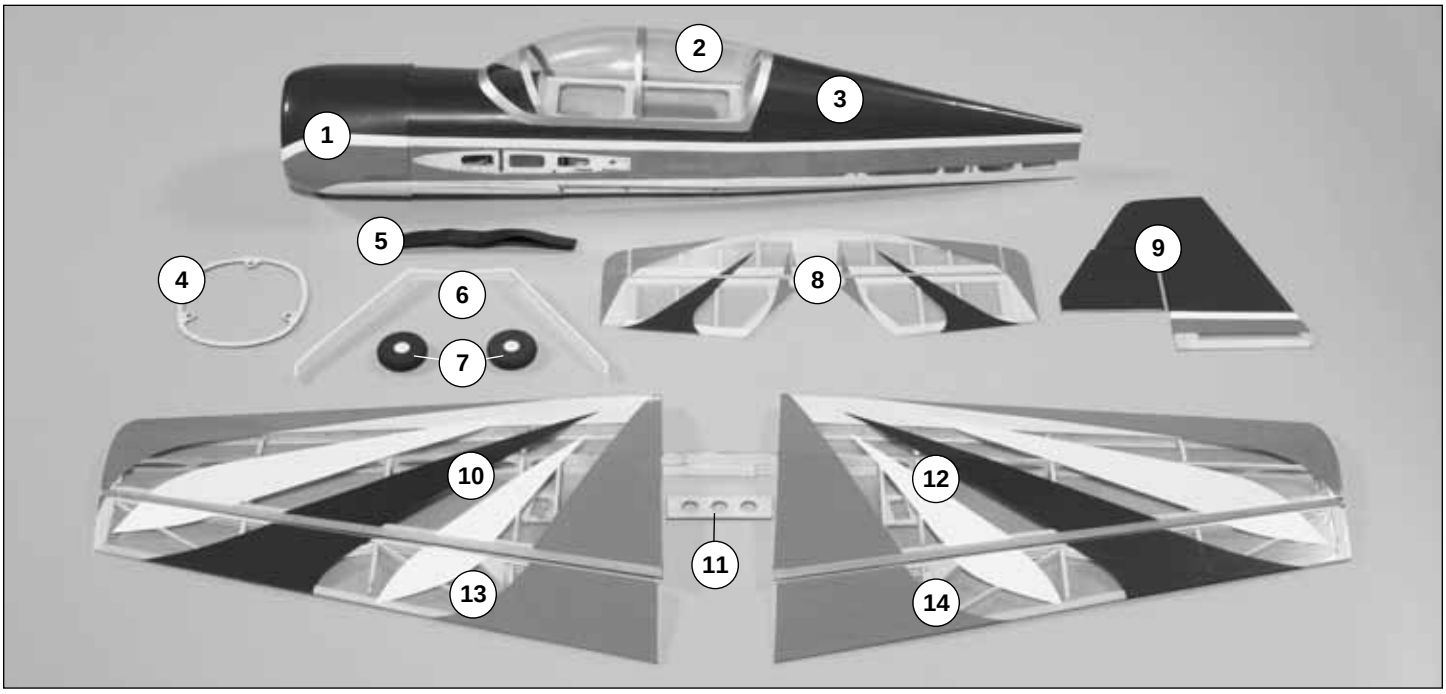


KIT INSPECTION

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



Kit Contents

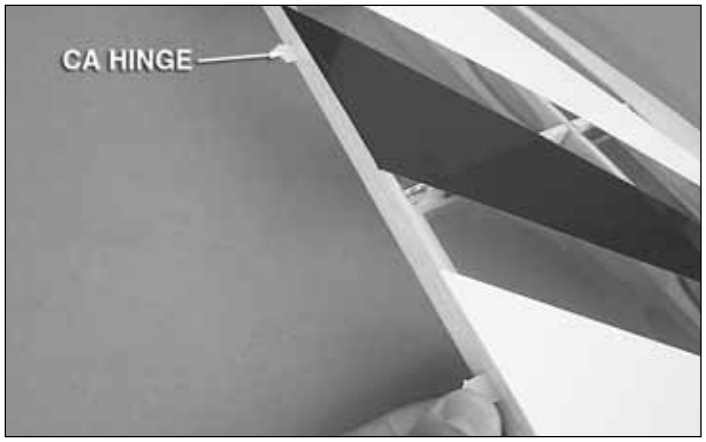
1. Cowl
2. Canopy
3. Fuselage
4. Cowl Ring
5. Hook & Loop Material
6. Landing Gear
7. Wheels (2)
8. Horizontal Stabilizer & Elevator Halves
9. Vertical Fin & Rudder
10. Left Wing Panel
11. Spar Doubler
12. Right Wing Panel
13. Left Aileron
14. Right Aileron

PREPARATIONS

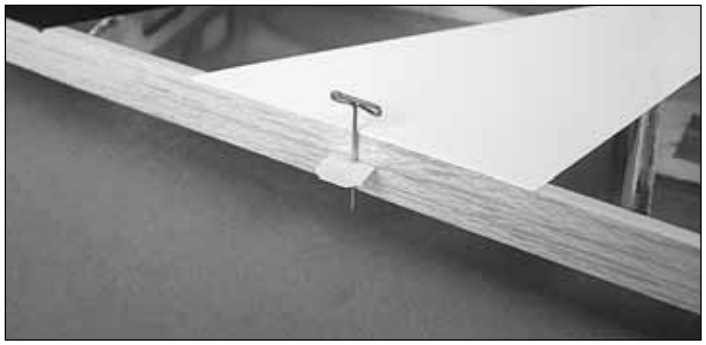
❏ 1. If you have not done so already, remove the major parts of the kit from the box and inspect for damage. If any parts are damaged or missing, contact **Product Support** at the address or telephone number listed in the ***"Kit Inspection"*** section on page 6.

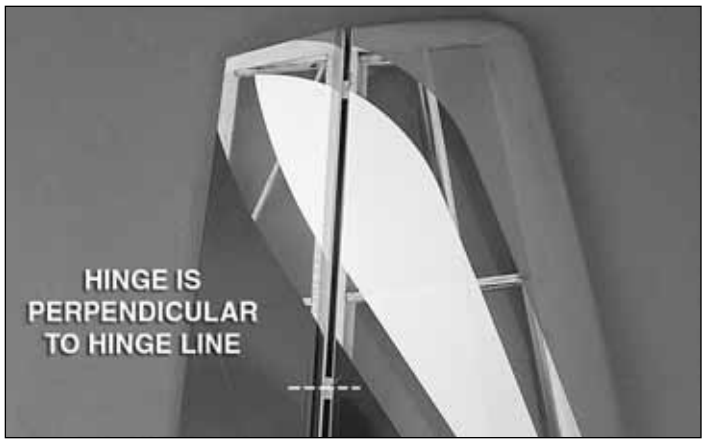
❏ 2. Carefully remove the tape and separate all the control surfaces. Use a covering iron with a covering sock on low/medium heat to tighten the covering if necessary. Apply pressure over sheeted areas to **thoroughly** bond the covering to the wood.

ASSEMBLE THE WING PANELS

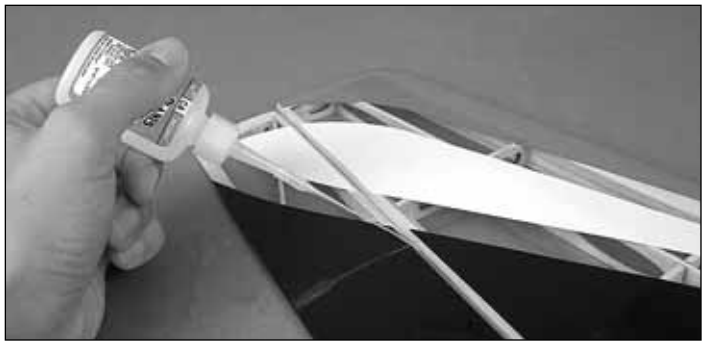


❏ 1. Use a sharp hobby knife to trim open the hinge slots in the **wing panels** and **ailerons**. Test fit the pre-cut CA hinges into the slots. If any are difficult to install, enlarge the slots with your knife.

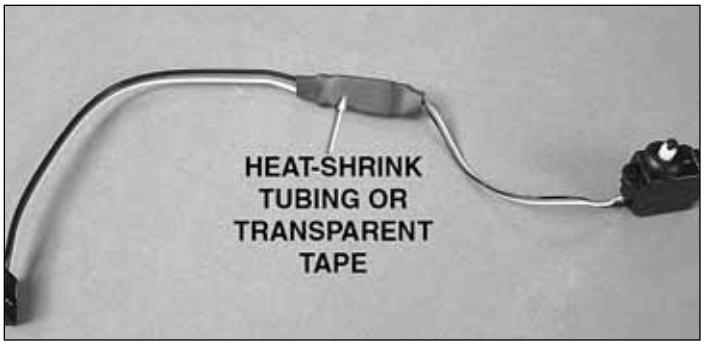




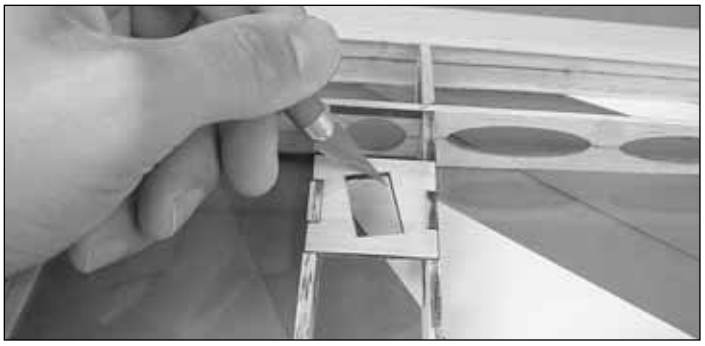
❏ 2. Insert the CA hinges halfway into the slots in the wing panels. Push small T-pins through the middle of the hinges to keep them centered. Insert the ailerons onto the other ends of the hinges. Align the outer tips of the ailerons flush with the wing tips. Pull the ailerons away from the panels far enough to confirm that the hinges remained perpendicular with the hinge line. If not, use a hobby knife or small screwdriver to nudge them straight.



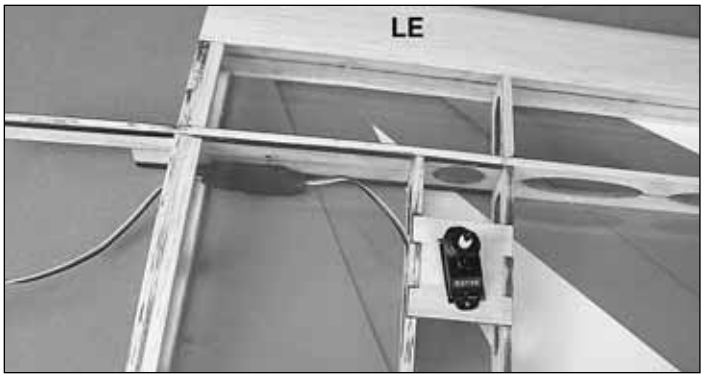
❏ 3. When satisfied, carefully remove the T-pins from the hinges. Use thin CA glue to secure the ailerons by applying 6 to 7 drops onto both sides of each hinge.



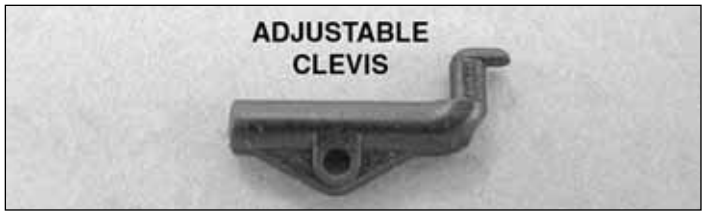
❏ 4. Attach a 6" [150mm] servo extension to each aileron servo and wrap the connection with heat-shrink tubing or transparent tape.



❏ 5. Trim the covering from the aileron servo bays on the undersides of the wing panels.



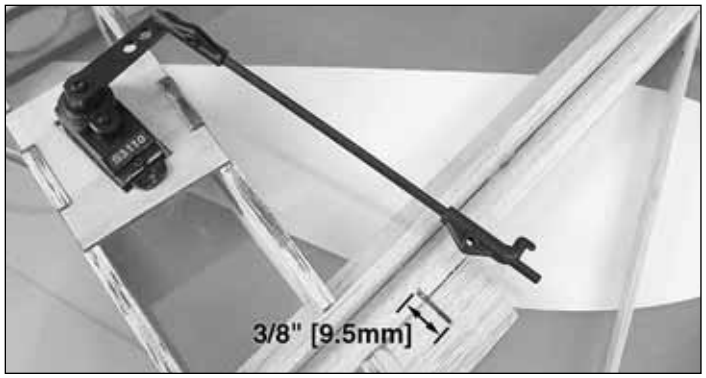
❏ 6. Insert the servo leads into the servo bays and pull them through the wing ribs. The servos can be installed using the hardware included with the servos or they can be glued in place. If gluing the servos in place, slit or puncture the covering just beneath the servo mounting tabs where they will contact the wing. This will ensure that the servo will be glued to the plywood servo bay, not just the covering. Glue the aileron servos into the servo bays using epoxy or CA glue with the servo splines facing the LE of the wings. After the glue has cured, confirm that the servos are properly secured to the wings and reinforce with extra glue if necessary.

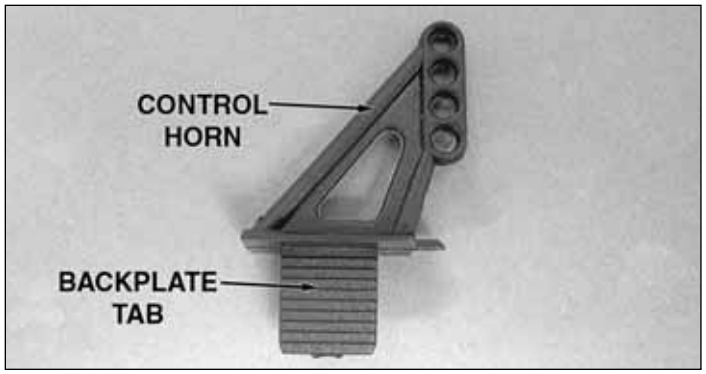


❏ 7. Locate two **double-sided servo arms** that fit the output splines of your aileron servos and four **adjustable clevises**.

❏ 8. Temporarily connect your aileron servos and battery pack to your radio and center the servos and trim levers on the transmitter. Test fit the double-sided servo arms parallel to the aileron hinge line. If the servo arm does not fit onto the servo spline parallel to the hinge line, remove it from the servo and rotate it 180°. Decide which way fits best (closest to parallel) and cut off the arm that isn't used. Be sure to make a left and right servo arm.

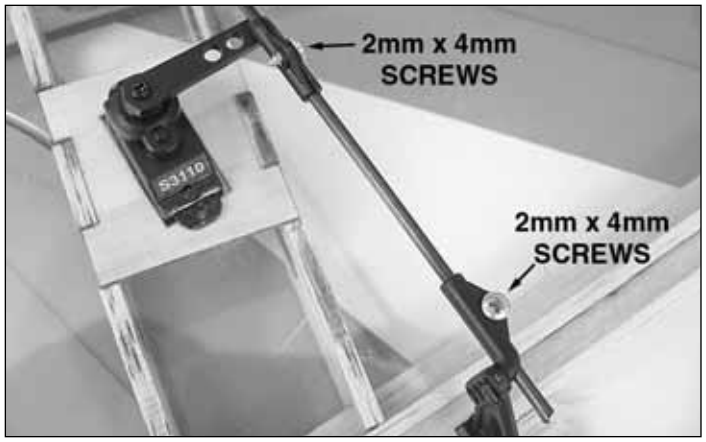
❏ 9. Fit two adjustable clevises onto both 5/64" x 3-1/2" [2mm x 90mm] **aileron pushrods**. Push one of the clevises from each pushrod into the outer holes of the servo arms.





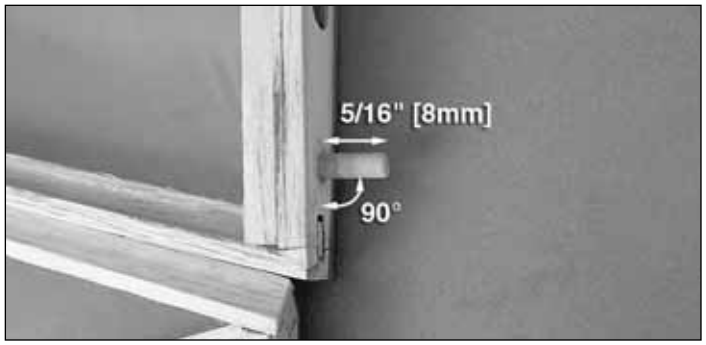
❏ 10. Locate the aileron double rib that has a rectangular mounting block at the LE. Using the position of the pushrods as a guide, cut a slot 3/8" [9.5mm] long perpendicular to the hinge line just behind the bevel of the LE of the aileron for each **control horn** in the center of the mounting block. The slot only needs to be wide enough to accommodate the thickness of the **control horn backplate tab** on the control horn (approximately 1/16" [1.6mm] thick). Do not cut all the way through the ailerons! 3/16" to 1/4" [5mm to 6mm] deep is sufficient.

❏ 11. Trim the control horn backplate tabs to length so that the control horns seat flat in the slots you made. Confirm that the holes in the control horn are centered over the hinge line. When satisfied, coat the backplate tabs with medium CA and press them into the slots.

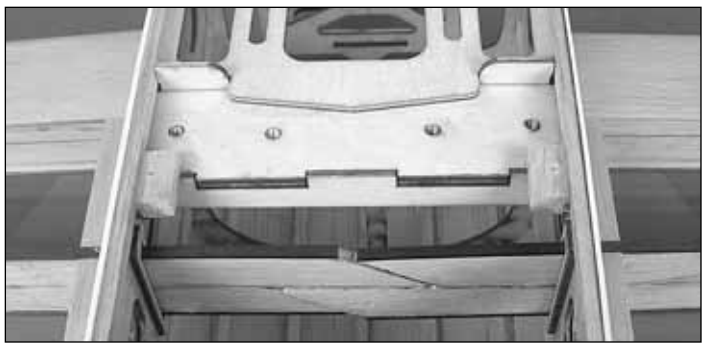


❏ 12. Use the position of the control horn to adjust the length of the pushrods as needed. Remove the servo arms from the aileron servos. Connect the other adjustable clevises on the aileron pushrods to the control horns and reattach the servo arms. Fine tune the length of the pushrods inside the clevises so that the ailerons are in the neutral position when the servo arms are parallel to the hinge line. Lock the clevises onto the pushrods by threading a 2mm x 4mm screw into each clevis screw hole and tighten carefully. The excess rod ends can be cut away.

INSTALL THE WING PANELS



❏ 1. Use medium or thick CA to glue the **anti-rotation dowels** into the wing root ribs. The dowels should protrude beyond the wing root ribs by 5/16" [8mm]. If the dowels are slightly loose inside the holes in the wings, try to glue the dowels as perpendicular to the root ribs as possible.

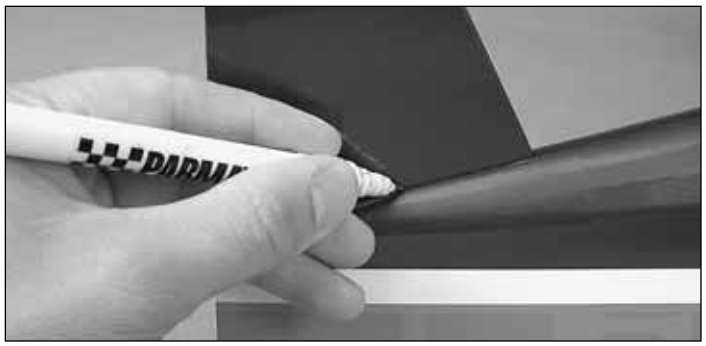


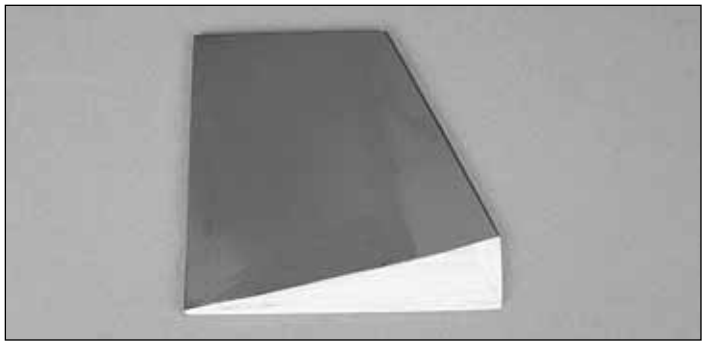
❏ 2. Before gluing, test fit both wing panels into the fuselage to confirm a proper fit. The center spar extends into the fuselage and interlocks with the spar of the other wing panel.

❏ 3. Thoroughly coat the root ribs of the wing panels and the wing pockets in the fuselage with 30-minute epoxy and slide them into place. **Do not** put epoxy on the interlocking spars at this time. Being sure that the wing panels are fully seated into the wing pockets, use clamps to hold the interlocking spar halves together while the epoxy on the root ribs cures to ensure that the wings are glued straight in the fuse. Clean up any excess epoxy with a paper towel dampened with denatured alcohol.

❏ 4. Coat one side of each **spar doubler** with epoxy as well as the front and back of the spar halves. Position one spar doubler against the front of the spar halves and one against the back. Use clamps to hold the spar doublers in place while the epoxy cures.

ASSEMBLE THE TAIL SECTION

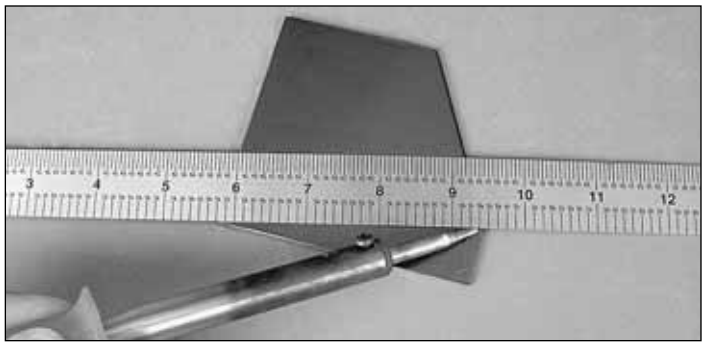




❏ 1. Fit the vertical fin into place and use a felt-tip pen to trace around the fin where it meets the fuse. Remove the fin from the fuse and trim the covering away 1/16" [1.6mm] below the line that you made. Be careful not to cut through the wood as this will weaken it. See the following ***Expert Tip*** for removing covering.

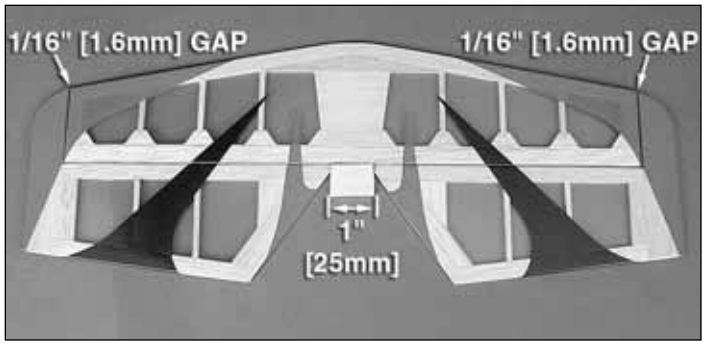
HOW TO CUT COVERING FROM BALSA

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

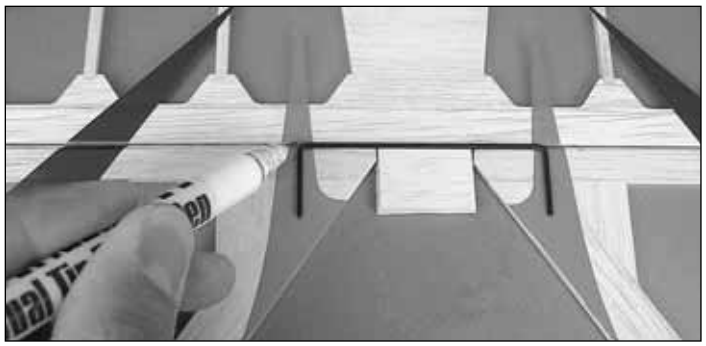


Use a straightedge to guide the soldering iron at a rate that will just melt the covering and not burn into the wood. The hotter the soldering iron, the faster it must travel to melt a fine cut. Peel off the covering.

❏ 2. Wipe away the lines you drew and glue the fin into place.

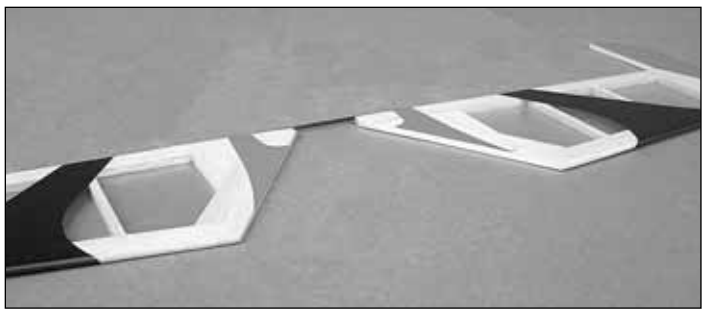


❏ 3. The **elevator halves** should be positioned behind the **horizontal stabilizer** so that there is a 1/16" [1.6mm] gap between the ends of the stab and elevators. We cut a piece of scrap wood 1" [25mm] long and put it between the elevator halves as shown to properly space them apart.

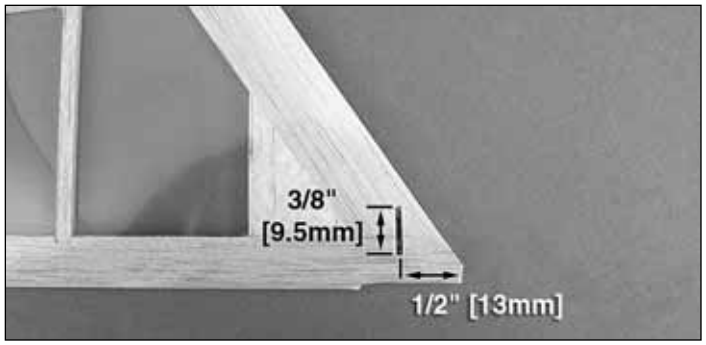


❏ 4. Center the elevator joiner wire over the elevator halves and mark its location near the LE of each elevator.

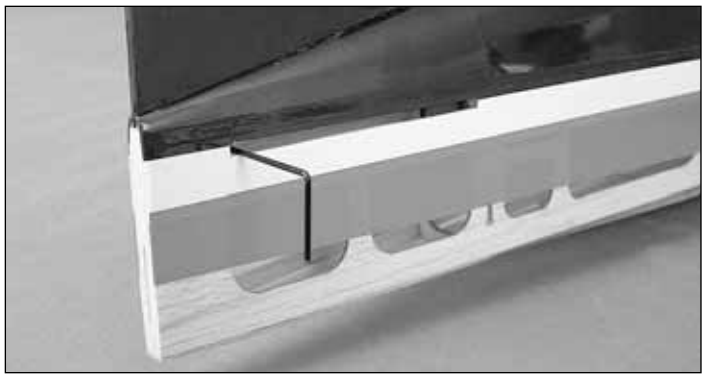
❏ 5. Using a #54 or 5/64" [2mm] bit, drill 7/8" [22mm] deep holes at the marks you made through the LE of the elevators. Use a hobby knife to trim away a bit of the beveled LE inside these marks. Test fit the elevator joiner into the elevator halves.



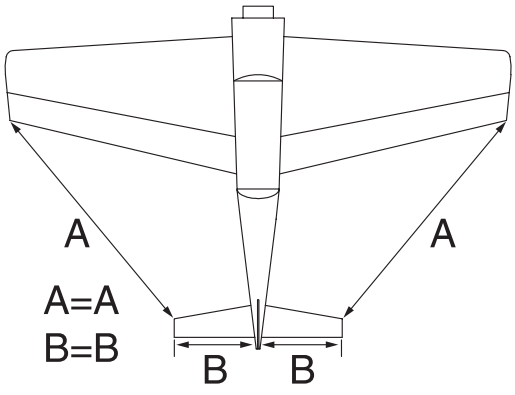
❏ 6. Lay the elevators on your work surface and confirm that they both lay flat. If not, "tweak" or bend the elevator joiner wire slightly until they do. **Do not glue the joiner wire in place at this time.**

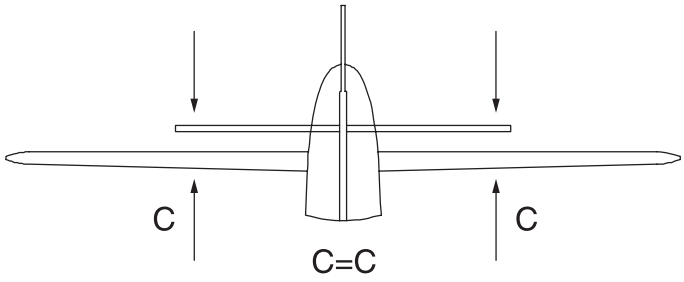


❏ 7. Carefully cut a slot for the elevator control horn on the underside of the left elevator half. The slot should be 1/2" [13mm] from the inside edge and 3/8" [9.5mm] long. Test fit the control horn into the slot, being sure that the control horn holes are positioned over the hinge line.



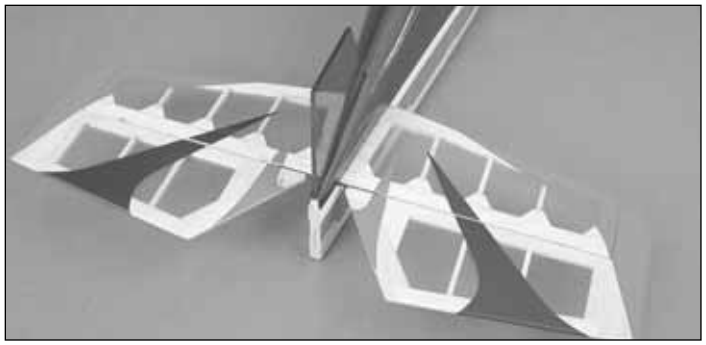
❏ 8. Trim the covering from the tail of the fuselage for the horizontal stabilizer. Insert the elevator joiner wire into the back of the stab slot.



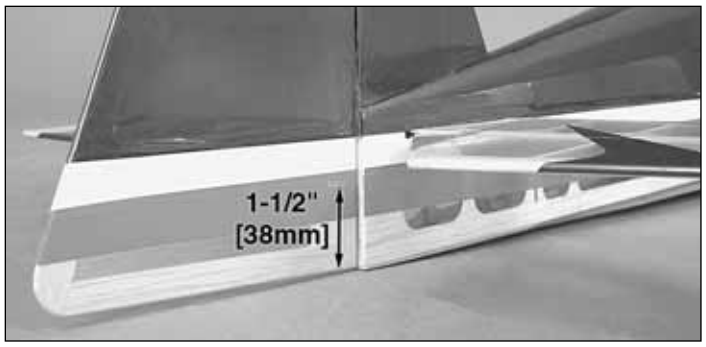


❏ 9. Position the horizontal stabilizer into the stab saddle, centering it left and right and making it square to the wings. Mark the outline where the stab meets the fuse as you did

with the vertical fin and remove the covering inside your marks. Reposition the stab into the fuse and stand back several feet behind the model and view it from the rear. Confirm that the stabilizer is parallel with the wing panels. If not, use tape or a weight to straighten it. Thin CA glue or epoxy can be used to glue the stabilizer in place.

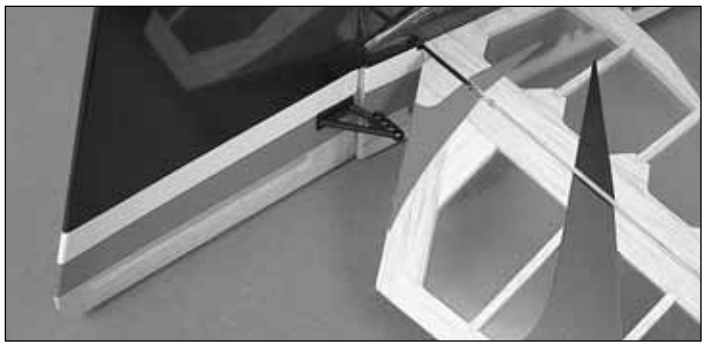


❏ 10. Use a hobby knife to cut open the hinge slots in the elevators and horizontal stabilizer. Before gluing, roughen the elevator joiner wire with sandpaper and clean it off with alcohol. Prepare the elevators by inserting a CA hinge into each hinge slot. Use T-pins to keep the hinges centered. Put a light coating of epoxy or thick CA onto the ends of the elevator joiner wire. Install the elevators onto the joiner wire while fitting the CA hinges into their mating slots in the horizontal stabilizer. As you did with the ailerons, use thin CA to glue the hinges.



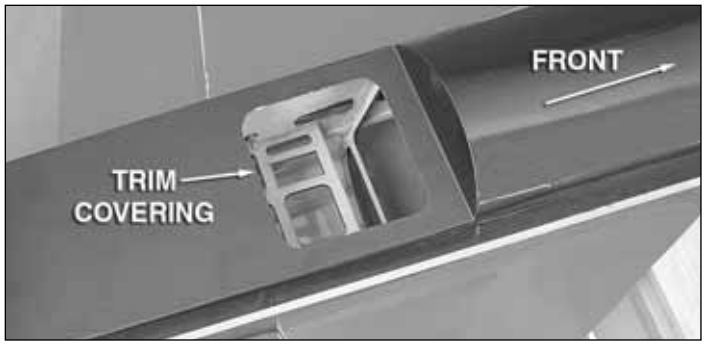
❏ 11. Cut a slot for the rudder control horn 1-1/2" [38mm] from the bottom of the rudder. Test fit the control horn into the slot, being sure that the control horn holes are positioned over the hinge line. Attach the rudder to the fuselage and fin using three CA hinges.

❏ 12. Insert a control horn into the slot on the underside of the left elevator. Press a **control horn backplate** onto the control horn tab on top of the elevator. Apply a few drops of CA glue to the control horn and backplate to secure them in place. The control horn tab can be trimmed flush with the backplate.

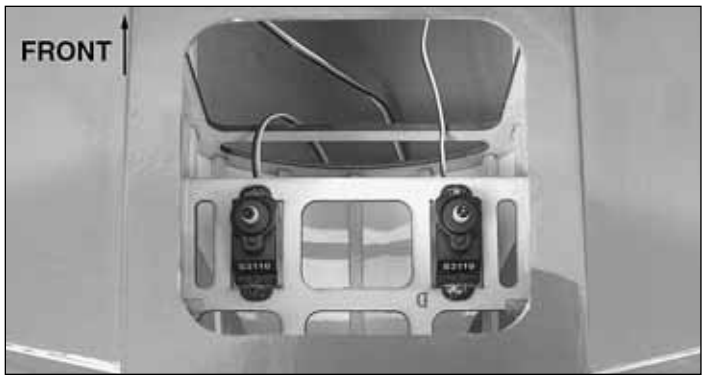


❏ 13. Attach a control horn to the right side of the rudder in the same manner.

INSTALL THE TAIL SERVOS & PUSHRODS

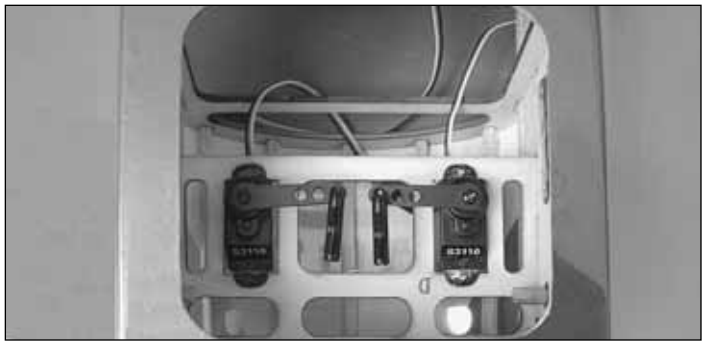


❏ 1. Trim the covering from the forward lightening hole in the cockpit floor as shown. Also trim the covering from the pushrod exit slots on both sides of the fuselage.

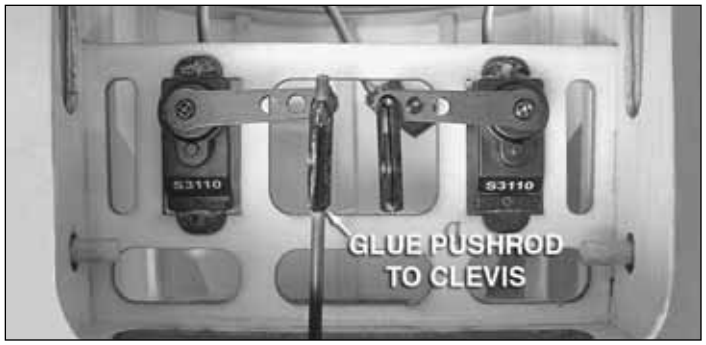


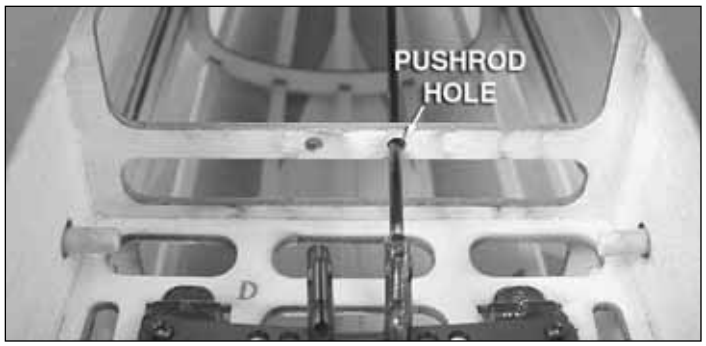
❏ 2. Glue or install the elevator and rudder servos with the screws included with the radio system to the servo tray with the splines facing forward. Use your radio system to center the servos.

❏ 3. Attach adjustable clevises to the elevator and rudder control horns in the second hole as shown.



❏ 4. As you did with the ailerons, test fit the double-sided servo arms perpendicular to the servo cases. If the servo arm does not fit onto the servo spline perpendicular to the servo case, remove it from the servo and rotate it 180°. Decide which way fits best (closest to perpendicular) and cut off the arm that isn't used. Attach an adjustable clevis to the outer holes of both arms and attach the arms to the servos (in the directions shown) with the servo arm screws .





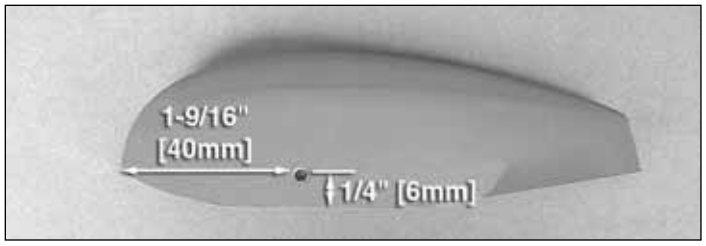
❏ 5. Slide the 5/64" x 18" [2mm x 462mm] elevator pushrod through the pushrod exit slot in the fuselage. Be sure that the pushrod passes through the pushrod holes in the fuselage formers. Insert the forward end into the clevis attached to the elevator servo, and the aft end into the clevis attached to the elevator control horn. Use a small clamp or tape to hold the elevator in the neutral position. Glue the pushrod to the clevis

in the servo arm using thin CA. (Do not glue the clevis to the servo arm!). Confirm that your servo arm is still perpendicular to the servo case. Install a 2mm x 4mm sheet metal screw into the clevis on the elevator control horn and carefully tighten it down. Cut off the excess pushrod beyond the clevises.

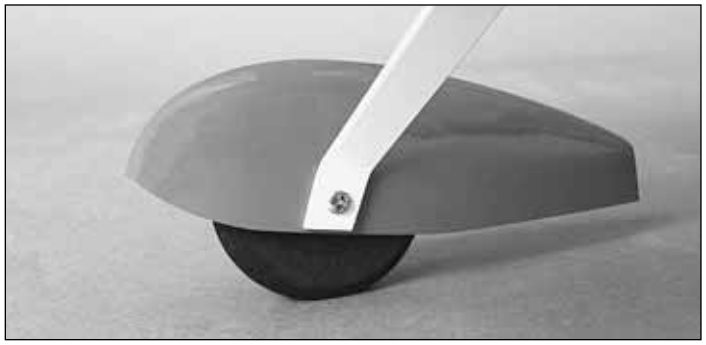
❏ 6. Repeat step 5 for the rudder pushrod using the 5/64" x 19" [2mm x 490mm] carbon rod.

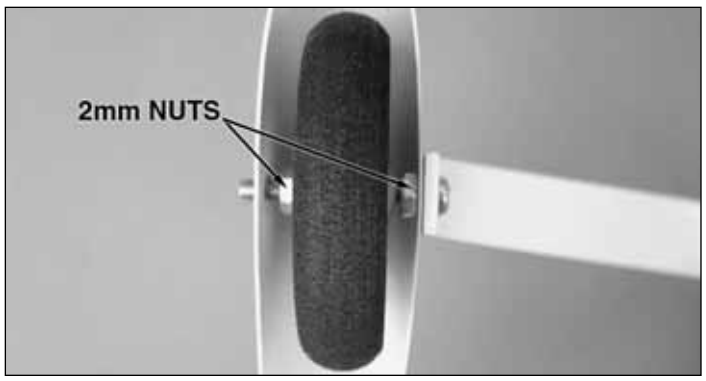
INSTALL THE LANDING GEAR

❏ 1. Trim the covering from the landing gear slots in the fuselage.

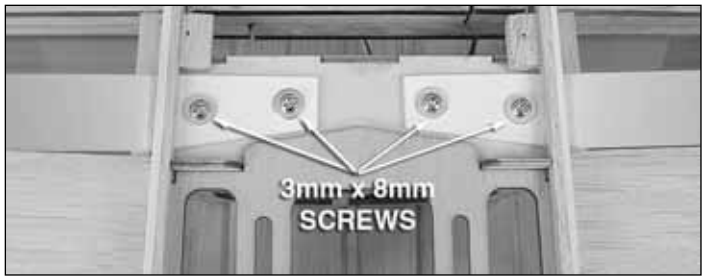


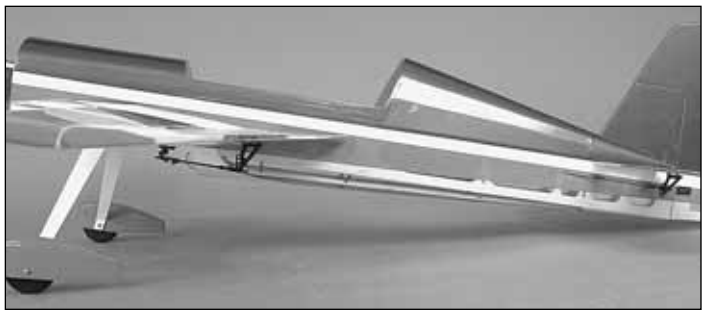
❏ 2. Measure and mark 1-9/16" [40mm] from the front and 1/4" [6mm] from the bottom of the **wheel pants**. Drill a 1/8" [3mm] hole at your marks on each side of both wheel pants. Accuracy during this step will ensure that your wheels are positioned straight inside the pants. When drilling the hole, make a pilot hole with a smaller bit first, then enlarge the hole to the correct diameter.



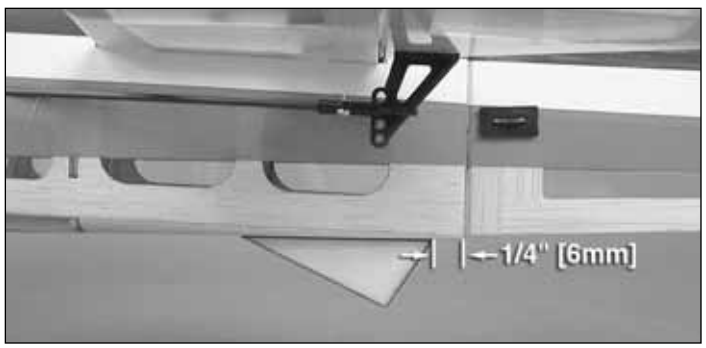


❏ 3. Fit the 3mm x 25mm machine screw (axle) through the hole in the **landing gear** and through the inside hole in the pant. Thread a 3mm nut onto the screw followed by a wheel. Apply a drop of thread-locking compound near the base of the screw and finish tightening the nut. Thread another nut onto the screw against the wheel, but still allowing the wheel to rotate freely on the axle. Secure this nut with thread-locking compound. The end of the axle screw will pass through the outside hole in the pant.





❏ 4. Attach the landing gear to the fuselage using four 3mm x 8mm machine screws, four 3mm washers, and thread-locking compound.

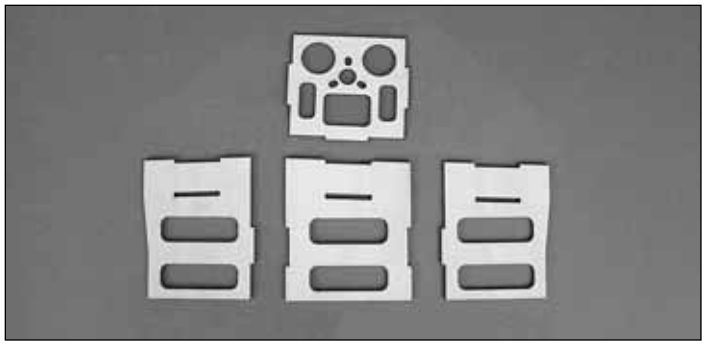


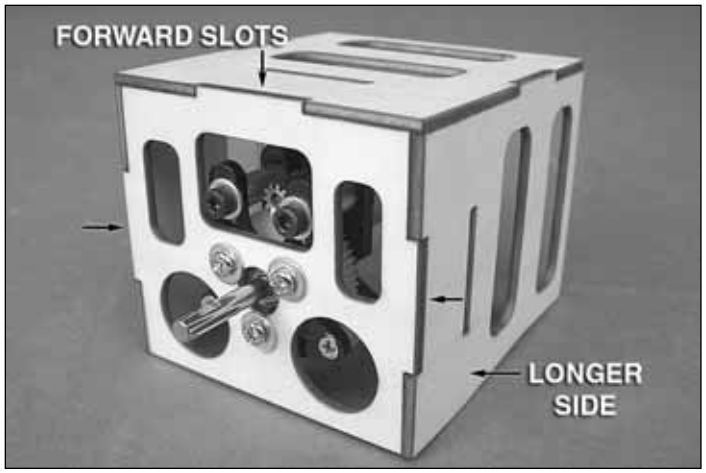
❏ 5. Glue the **tail skid** to the underside of the fuselage 1/4" [6mm] from the aft end. The longest side of the skid goes against the fuselage. Be sure to remove the covering from the fuselage where the skid will be glued before you attach it.

MOUNT THE MOTOR

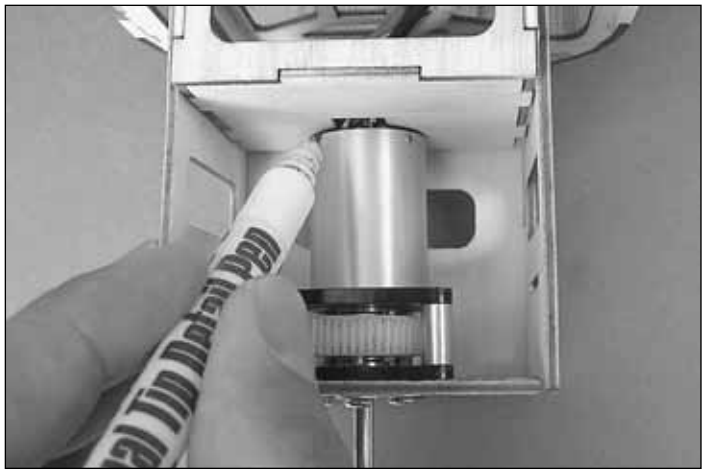
The Yak 54 EP ARF includes motor mount parts for both the Great Planes brushless C35-30-950 out-runner motor and the brushless B24-33-4040 in-runner equipped with the Great Planes 24mm gear drive. Other motors may be able to be installed; however, modification to one of the mounting box firewalls would be necessary to suit the size and mount pattern of your equipment.

In-runner Brushless Motor with 24mm Gear Drive

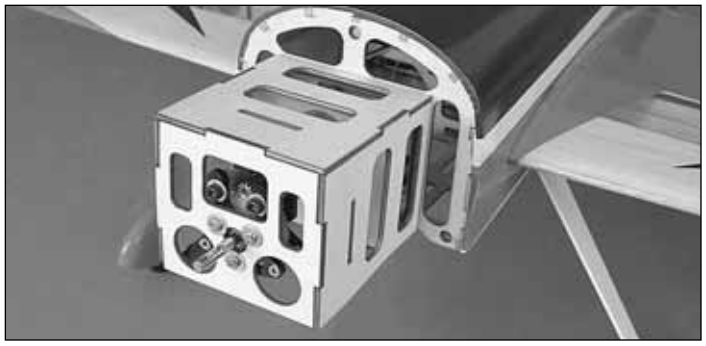




❏ 1. Locate the four pieces that make up the **motor mounting box**. Attach the front piece to the motor gearbox using three 3mm x 6mm machine screws (included with gearbox), three 3mm washers, and thread-locking compound. Assemble the box as shown with medium CA glue (the longer side piece being on the left of the box). The front piece is installed in the forward slots.

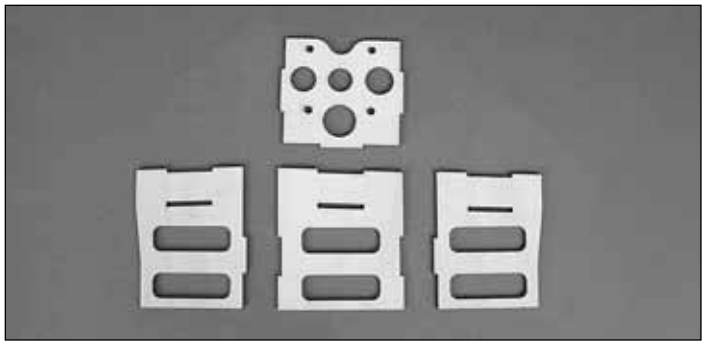


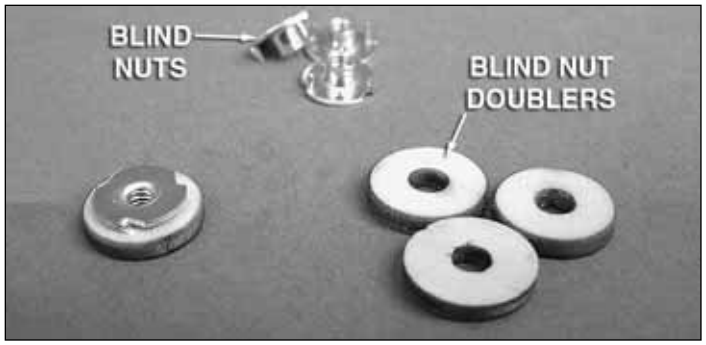
❏ 2. Slide the assembly over the box already attached to the fuselage. Trace around the motor onto the fuselage. This area will need to be cut away in order for the motor to fit through.

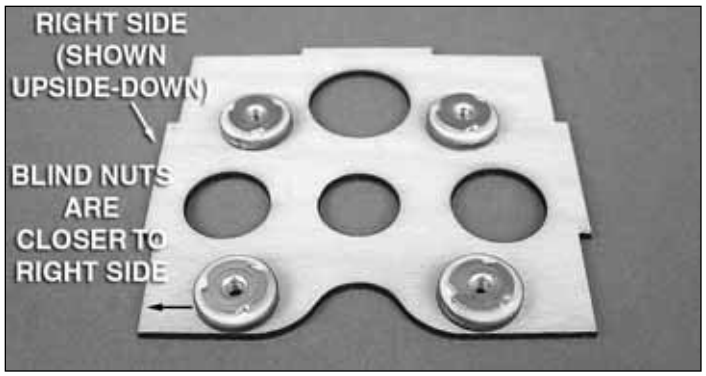


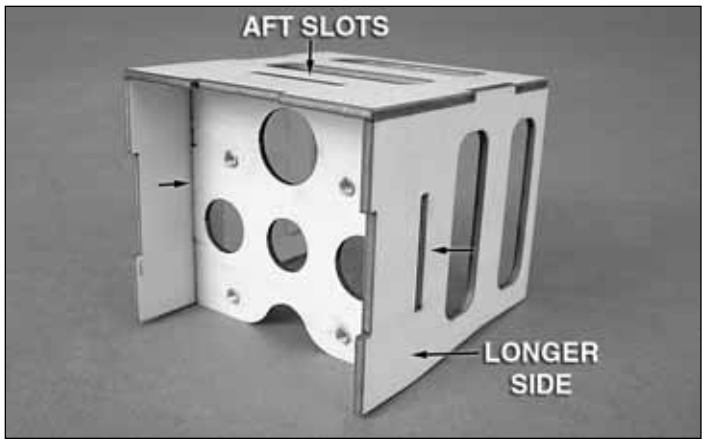
❏ 3. When satisfied, thoroughly glue the mounting box assembly to the fuselage, being sure that the box is flat against the fuselage firewall.

Out-runner Brushless Motor

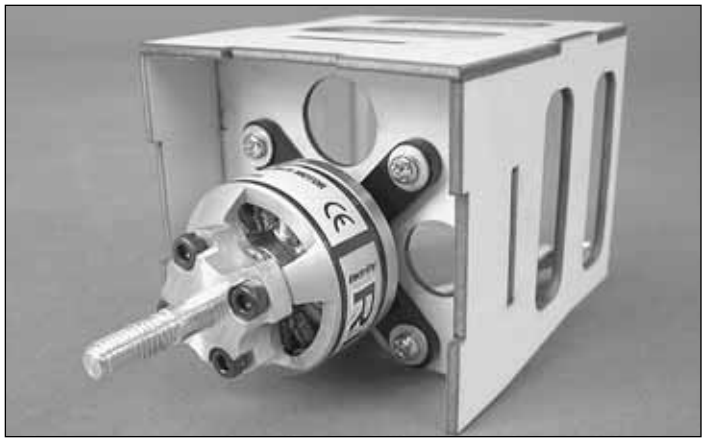




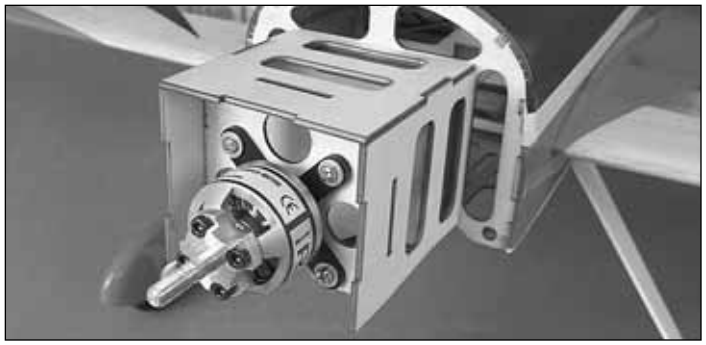




❏ 1. Locate the four pieces that make up the **motor mounting box** and the four **blind nut doublers**. Install 3mm blind nuts into each of the four blind nut doublers. Glue the doublers to the **back** of the front piece of the mounting box. The holes in the front piece are slightly off-center to accommodate the motor right thrust. When gluing the doublers to the front piece, be sure that the blind nuts are closer to right side when the mounting box is glued together. Assemble the box as shown with medium CA glue (the longer side piece being on the left of the box). The front piece is installed in the aft slots.

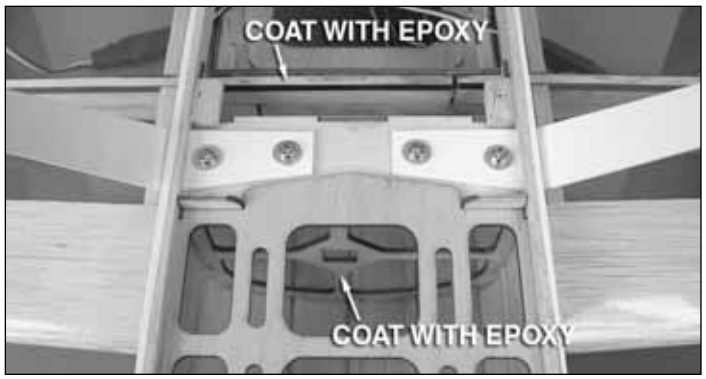


❏ 2. Attach the aluminum adapter to the back of the out-runner using the screws supplied with the motor. Attach the motor to the mounting box with four 3mm x 6mm machine screws, four 3mm washers, and thread-locking compound.



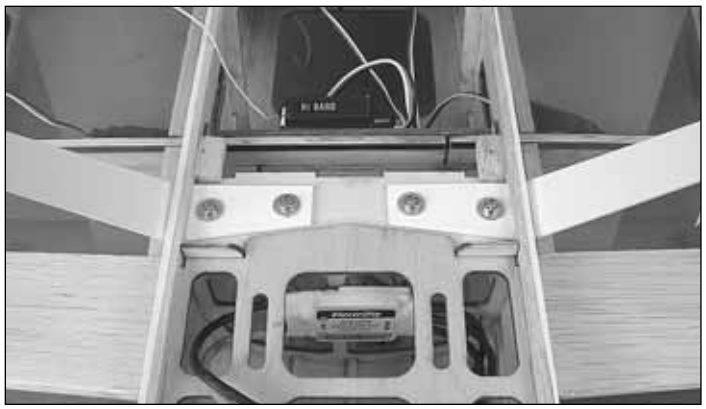
❏ 3. Thoroughly glue the mounting box assembly to the fuselage by sliding it on the box already attached to the fuselage. Be sure that the box is flat against the fuselage firewall.

INSTALL THE RADIO & ESC

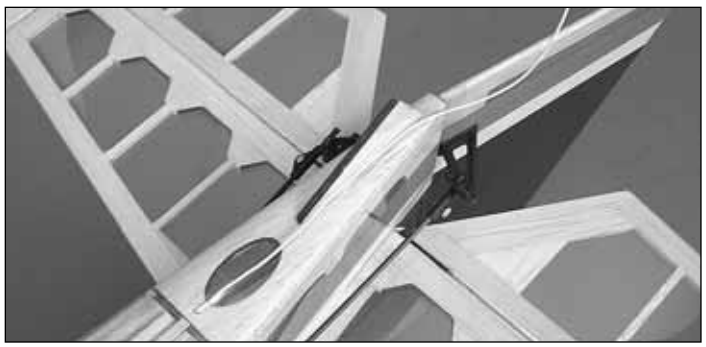


❏ 1. The ESC and receiver will be secured inside the plane with double-sided servo tape (not included). For better adhesion of the tape, brush on a light coating of epoxy to the fuselage former above the landing gear and the back of the wing spar as shown.

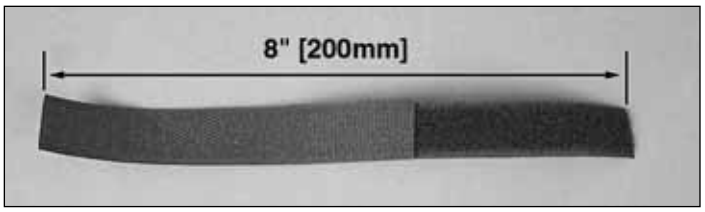
❏ 2. Connect the servo leads to the receiver. If you are using a 4-channel receiver, you will also need a dual servo extension or Y-harness for the aileron servos. Feed the motor leads on your ESC through the bottom of the firewall mounting box. Connect the ESC to the motor and to the receiver.



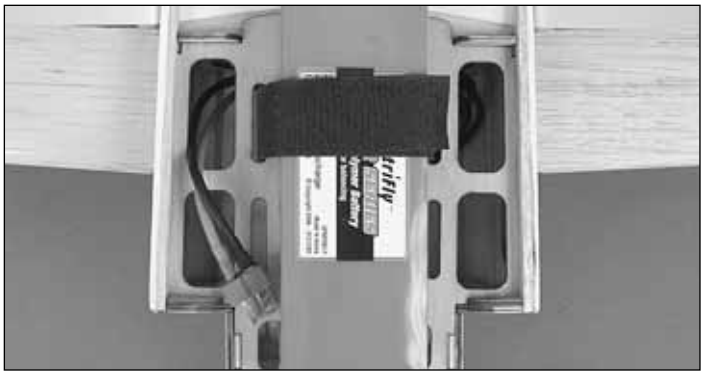
❏ 3. Cut pieces of double-sided servo tape (not included) to secure the receiver and ESC where you applied epoxy in step #1.



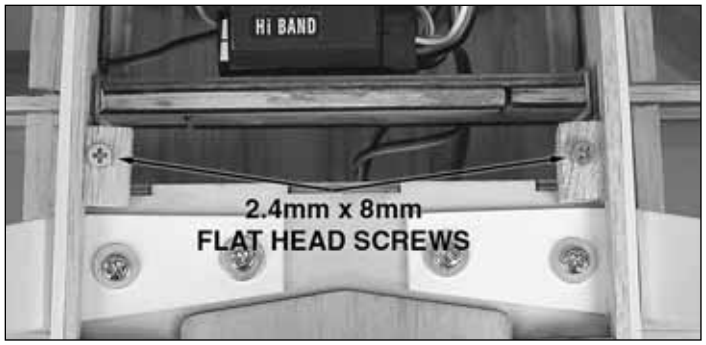
❏ 4. Route the receiver antenna out of the **battery hatch** and down the underside of the fuselage. Use clear tape to hold the antenna in place. For a cleaner look, we ran the receiver antenna through the inside of the fuselage to the back. The antenna exits from a small hole drilled in the location shown.

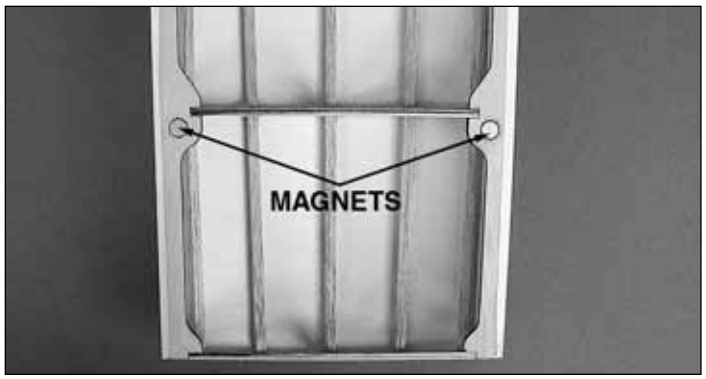


❏ 5. Make a battery strap out of the supplied hook and loop material 8" [200mm] long by overlapping two pieces and cutting it to length. Feed it through the battery tray in the location shown. The battery strap can be glued to the battery tray with medium CA to keep it in place.

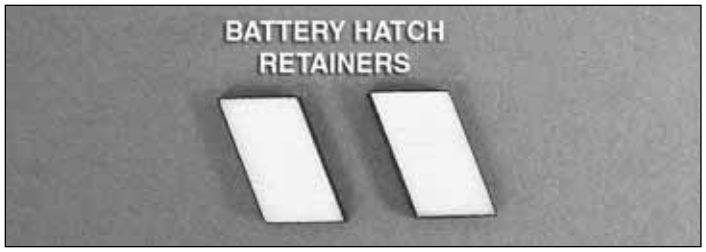


❏ 6. Test fit your battery into place and adjust the battery strap as necessary. When you balance the model, the exact position of the battery pack will be determined. When you know where the pack will need to be to balance the airplane, mark its position onto the battery tray and put a piece of adhesive-backed hook and loop material onto the pack and battery tray to help hold it in place during flight.



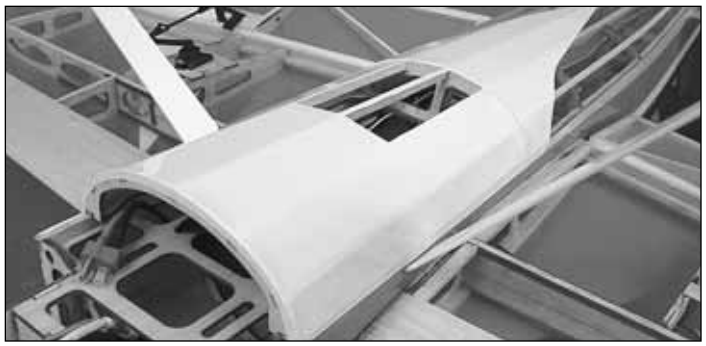


❏ 7. Install two 2.4mm x 8mm flat head self-tapping screws into the pre-drilled holes in the battery hatch blocks. Glue two magnets into the battery hatch with medium CA as shown.



❏ 8. Locate the two plywood **battery hatch retainers**. Glue the two pieces together using CA. Draw a line on the back former of the battery hatch that continues the shape of the lightening hole arc across the webbing. Glue the battery hatch retainer to the back former as shown at the line you drew.

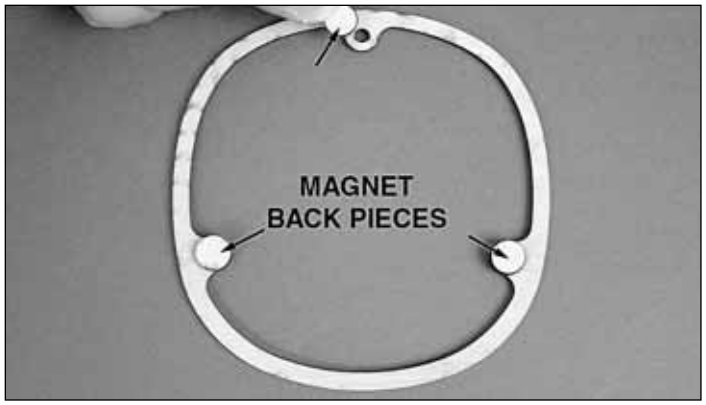
❏ 9. Trim the covering between the spars at the back of the battery hatch for cool air exits.

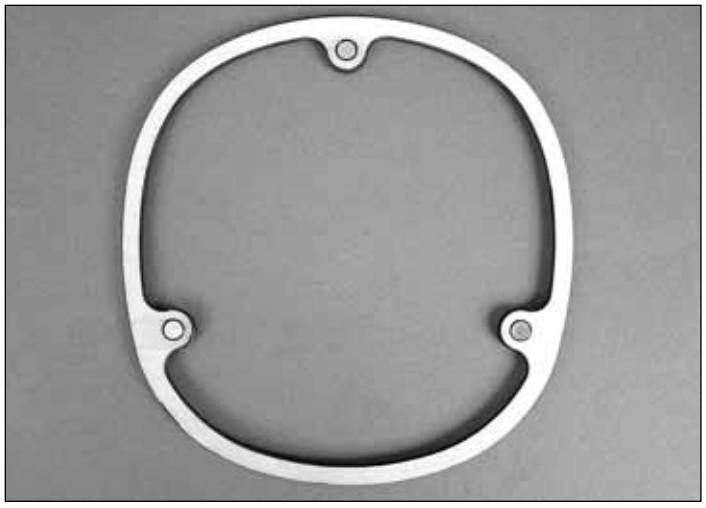


❏ 10. Test fit the battery hatch onto the fuselage. Adjust the height of the flat head screws in the battery hatch blocks until the hatch attaches to the fuselage securely. When satisfied, apply a couple drops of thin CA glue to the exposed threads of the screws.

FINAL ASSEMBLY

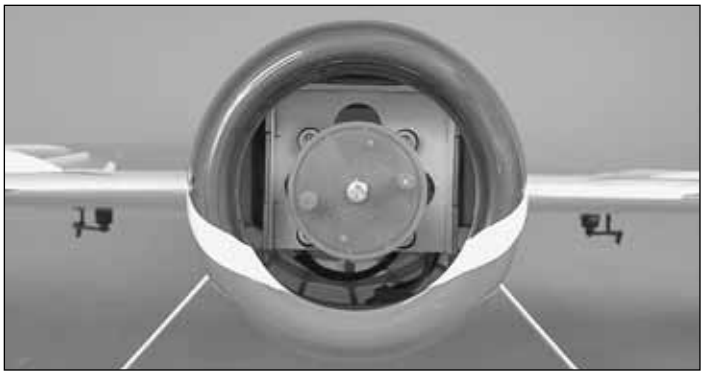
❑ 1. Prepare the inside of the **cowl** by lightly scuffing it with 220-grit sandpaper. When satisfied, clean the inside with alcohol.

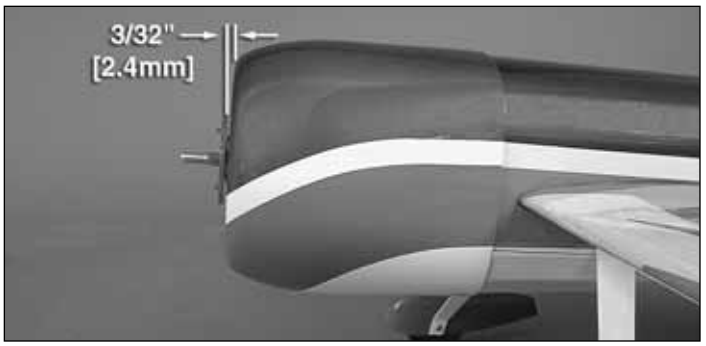




❑ 2. Glue the three plywood magnet back pieces to the **cowl ring**. Glue a magnet into each of the three holes in the cowl ring by coating the insides of the holes with medium CA. A light skin coating of thin CA over the magnets that overlaps onto the cowl ring will help secure the magnets in place. Let the CA glue cure without accelerator.

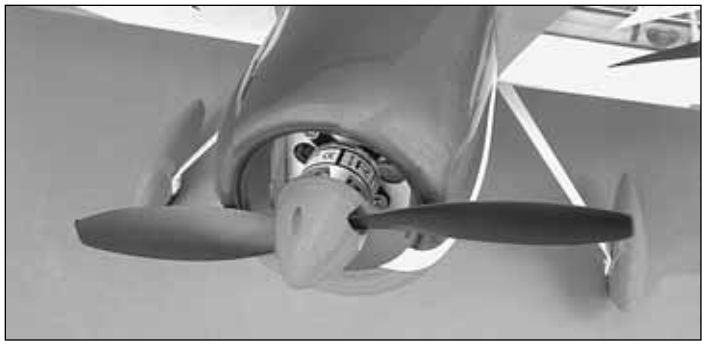
❑ 3. Glue three magnets into the holes in the fuselage as shown. **Be sure that the magnets are glued with the correct polarity facing out! The magnets in the fuselage must be attracted to the magnets in the cowl ring.** As you did with the cowl ring, apply a light skin coating of thin CA over the magnets after they have been glued into the fuselage. Let the CA cure without accelerator.



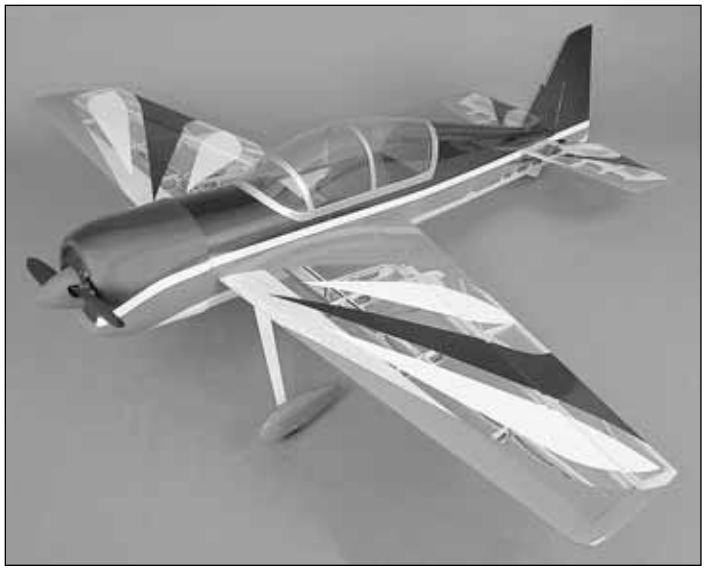


❑ 4. Magnetically attach the cowl ring onto the fuselage. Slide the cowl over the cowl ring and onto the fuselage. Confirm that the **spinner backplate** properly fits your motor shaft. If not, ream or drill it to the correct diameter. Temporarily install the spinner backplate onto the prop shaft. Adjust 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 in the front cowl opening, and the backplate should be approximately 3/32" [2.4mm] beyond the front of the cowl. When satisfied, tack glue the cowl to the cowl ring in three or four spots by reaching through the front opening in the cowl. A CA applicator tip is very useful in this step.

❑ 5. Remove the cowl (and cowl ring) from the fuselage and apply a fillet of medium or thick CA glue along the **front** of the cowl ring where it touches the cowl.



❏ 6. Reattach the cowl to the fuselage. Install the propeller, prop washer, and prop nut onto the prop shaft. Install the **spinner cone** using the included spinner screws.



❏ 7. Finish up the assembly by taping the **canopy** in position. Clear tape works fine for this.

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 and 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.

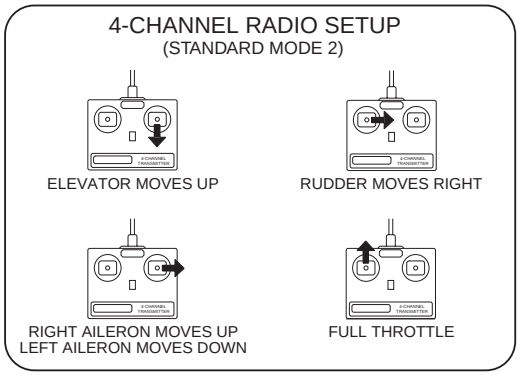
4. Use a piece of soft balsa or something similar to squeegee remaining water from under the decal. Apply the rest of the decals the same way.

GET THE MODEL READY TO FLY

Check the Control Directions

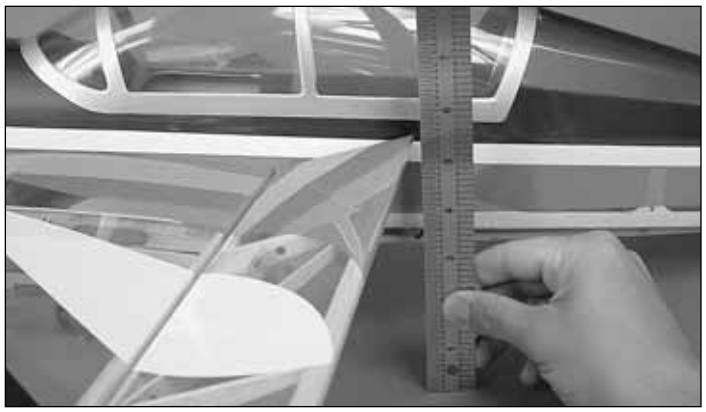
❏ 1. Turn on the transmitter and receiver and center the trims. If necessary, remove the servo arms from the servos and reposition them so they are centered. Reinstall the screws that hold on the servo arms.

❏ 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.



❏ 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 Great Planes AccuThrow (or 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 for your first few flights at the **low rate** setting.

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:	1-1/8" [28mm] up	5/8" [16mm] up
	1-1/8" [28mm] down	5/8" [16mm] down
RUDDER:	2-1/2" [64mm] right	1-1/4" [32mm] right
	2-1/2" [64mm] left	1-1/4" [32mm] left
AILERONS:	7/8" [22mm] up	1/2" [13mm] up
	7/8" [22mm] down	1/2" [13mm] down

3D RATES

3D ELEVATOR:	2" [51mm] up
	2" [51mm] down
3D RUDDER:	3-1/2" [89mm] right
	3-1/2" [89mm] left
3D AILERONS:	1-1/2" [38mm] up
	1-1/2" [38mm] down

IMPORTANT: The Yak 54 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 Yak 54 EP ARF 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."

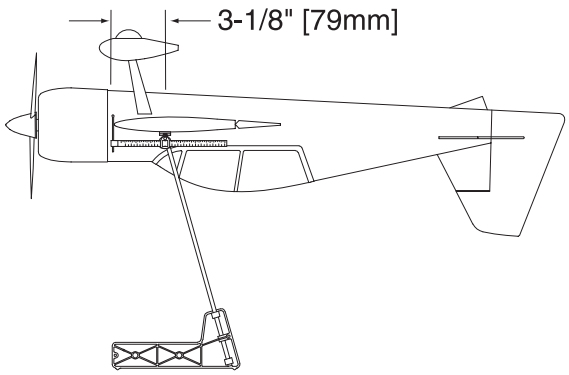
Balance the Model (C.G.)

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, battery pack, and the radio system.

❏ 1. Use a felt-tip pen or 1/8" [3mm]-wide tape to accurately mark the C.G. on the top of the wing on both sides of the fuselage. The C.G. is located 3-1/8" [79mm] back from the LE of the 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 1/2" [13mm] forward or 1/2" [13mm] 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 the battery pack installed, place the model upside-down 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 and/or receiver must be shifted to balance. If the nose drops, the model is "nose heavy" and the battery pack and/or receiver must be shifted aft to balance. If possible, move the battery pack and receiver to minimize or eliminate any additional ballast required.

❏ 4. **IMPORTANT:** If you found it necessary to move the battery pack or receiver for the Yak 54 EP ARF to balance, recheck the C.G. after this has been done.

Balance the Model Laterally

❏ 1. With the wing level, have an assistant help you lift the model by the motor 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

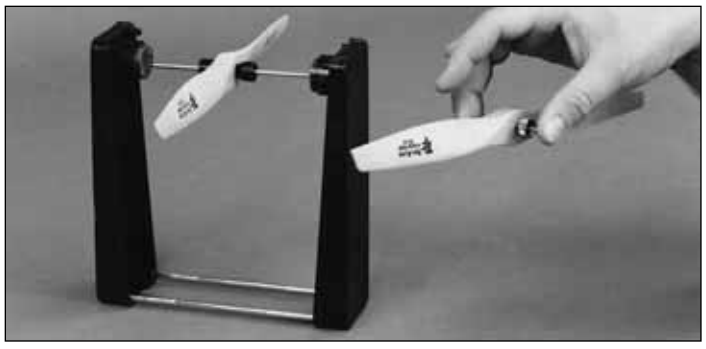
No matter if you fly at an AMA sanctioned R/C club site or if you fly somewhere on your own, you should always have your name, address, telephone number and AMA number on or inside your model. It is **required** at all AMA R/C club flying sites and AMA sanctioned flying events. Fill out the identification tag on page 27 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 batteries should be done for 15 hours u**sing 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 Propellers



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 motor mounting screws and bolts loosen, possibly with disastrous effect, but vibration may also damage your radio receiver and battery.

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.

LITHIUM BATTERY HANDLING & USAGE

WARNING!! Read the entire instruction sheet included with your 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 the 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.

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 and make sure it has a strain relief inside the fuselage to keep tension off the solder joint inside the receiver.
- ❏ 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 connections between servo wires and Y-connectors or servo extensions, and the connection between your battery pack and the on/off switch with vinyl 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 Yak 54 EP ARF is a great-flying model that flies smoothly and predictably. The Yak 54 EP ARF 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 Yak 54 EP ARF 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 Yak 54 EP ARF, 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 Yak 54 EP ARF 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 Yak 54 EP ARF hold the plane by the fuselage just below the canopy. Throttle up to full power, and have your helper give the plane a gentle underhanded toss at about 30° 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 Yak 54 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.

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, regaining tail wheel control.

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.**

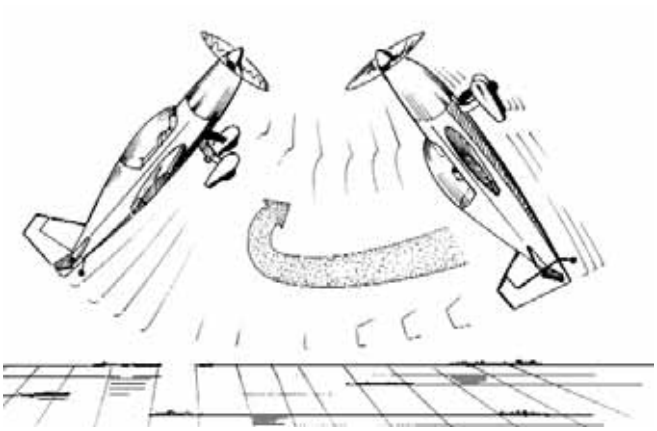
3D FLYING

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 a little, but keep in mind that being tail heavy is not always the best way to go.

Propeller thrust and thrust vectoring need to be considered for 3D aerobatics. A large diameter prop with a low pitch will provide a lot of pull for the aircraft but will not offer enough air moving across the tail surfaces (thrust vectoring) for 3D. Due to the large number of factors involved, some experimentation will be necessary to find the right propeller pitch and diameter for your model. If you feel that the effectiveness of the tail surfaces is not enough, try a smaller propeller with a higher pitch.

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 the model 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 a little aileron correction to keep the wings level as well.

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 get the flat spin without falling and it is also possible to climb during the spin.

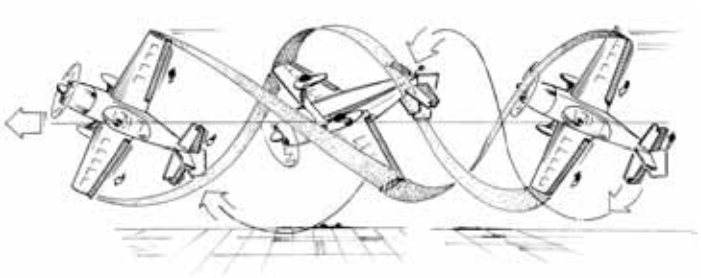
Inverted Flat Spins

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 full throttle so the model has reasonable 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.

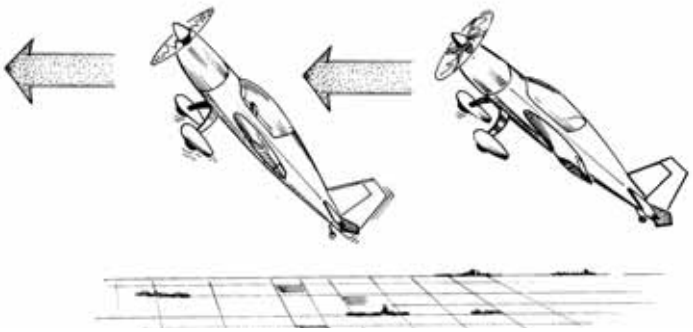
Vertical Hover

Fly a straight pass across the field at 75 feet high and 100 feet 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 10 mph 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 feet high and 100 feet 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.

Rolling Harrier

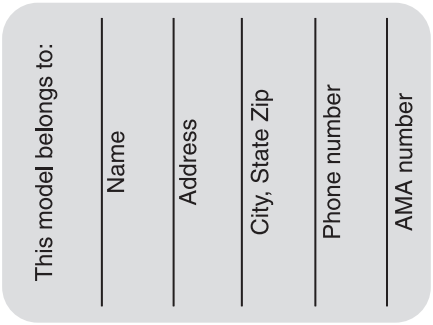
Once you get comfortable with the up-right harrier, it's time to work rolls into the mix. From an up-right harrier, add in left aileron and change from up elevator to down elevator when inverted. If you are comfortable with four point rolls and slow rolls, inputting rudder on the knife edges can improve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

Pinwheel

Climb vertically and bring the model to a hanger, 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 3/4s of a VERY tight Knife Edge Loop and flying out Knife Edge. When done correctly, the plane pivots around the wing tip in a very small area. This maneuver can be done either direction.

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

GOOD LUCK AND GREAT FLYING!



Make a copy of this identification tag and put it on or inside your model.

BUILDING NOTES

Kit Purchased Date: _____

Where Purchased:_____

Date Construction Started: _____

Date Construction Finished: _____

Finished Weight: _____

Date of First Flight: _____

FLIGHT LOG