Spirit 100™
Almost-Ready-to-Fly

INSTRUCTION MANUAL

Wingspan: 100 in [2540mm]
Wing Area: 943 sq in [60.8 sq dm]
Weight: 4-4.5 lb [1800-2000g]
Wing Loading: 9.8-11 oz/sq ft [30-34 g/dm^2]
Length: 54 in [1370 mm]
Radio: 5 Channel minimum, 7-9 channel with sailplane mixing, 7 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 WARNINGS AND INSTRUCTIONS CONCERNING THE ASSEMBLY AND USE OF THIS MODEL.

GREAT PLANES® MODEL MANUFACTURING COMPANY
Champaign, Illinois
(217) 398-8970, Ext 5
airsupport@greatplanes.com

GPMZ0204 for GPMA1049 V1.0

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INTRODUCTION

Thank you for purchasing the Great Planes **SPIRIT 100 ARF** sailplane. Soaring offers a freedom that no other type of flying can provide! With a little practice and some help from mother nature, you will be able to defy gravity and enjoy flights that can last for hours. The advanced wing design incorporates flaps, spoilers and ailerons to provide the ultimate in control when using computer radio mixing functions. **Take your time and follow directions to end up with a well-built model that is straight and true.**

For the latest technical updates or manual corrections to the Great Planes Spirit 100 ARF, visit the Great Planes web site at www.greatplanes.com. Open the “Airplanes” link, then select the Spirit 100 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.

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

1. Your Spirit 100 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 Spirit 100 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. **WARNING:** The fuselage in this kit is made of fiberglass, the fibers of which may cause eye, skin and respiratory tract irritation. Never blow into the fuse 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.

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 47302-9252
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.

DECISIONS YOU MUST MAKE

This is a partial list of items required to finish the Spirit 100 ARF that may require planning or decision making before starting to build. Order numbers are provided in parentheses.

Radio Equipment

- ❏ 5 channel radio with standard size receiver and battery
  OR
- ❏ 7-9 channel radio with standard size receiver and battery is recommended for maximum flight performance
- ❏ (2) Y-harnesses (FUTM4130) or (4) 9" extensions (FUTM3910) utilizing a radio with flaperon mixing
- ❏ (4) Futaba® S3101 micro servos (FUTM0033) for ailerons and flaps
- ❏ (2) Futaba S3004 standard size servos (FUTM0004)

Spoilers

The spoilers are highly recommended as they make it much easier to land in smaller spaces or to lose altitude in a safe, controlled manner. You need an additional standard size servo to operate the spoilers.

- ❏ (1) Futaba S3004 standard size servo (FUTM0004)

ADDITIONAL ITEMS REQUIRED

Adhesives and Building Supplies

In addition to common household tools and hobby tools, this is the "short list" of the most important items required to build the Spirit 100 ARF. ***Great Planes Pro™ CA*** *and* ***Epoxy*** *glue are recommended.*

- ❏ 1/4" [6mm] R/C Foam Rubber (HCAQ1000)
- ❏ Velcro® Hook & Loop (GPMQ4480)
- ❏ 1/2 oz. [15g] Thin Pro CA (GPMR6001)
- ❏ Pro 30-Minute Epoxy (GPMR6047)
- ❏ Pro 6-Minute Epoxy (GPMR6045)
- ❏ Plan Protector (GPMR6167) or wax paper
- ❏ #1 Hobby Knife (HCAR0105)
- ❏ #11 Blades (5-pack, HCAR0211)
- ❏ 2 oz. [57g] Spray CA Activator (GPMR6035)
- ❏ Top Flite® MonoKote® Sealing Iron (TOPR2100)
- ❏ Mixing Cups (GPMR8056)
- ❏ Epoxy Brushes (6, GPMR8060)
- ❏ Silicone Glue (DEVR2500)
- ❏ Steel Shot
- ❏ Masking Tape (TOPR8018)
- ❏ Builder's Triangle Set (HCAR0480)
- ❏ Drill bits: 1/16" [1.6mm], 5/64" [2mm]

Optional Supplies and Tools

Here is a list of optional tools mentioned in the manual that will help you build the Spirit 100 ARF.

- ❏ CA Debonder (GPMR6039)
- ❏ 36" Metal Ruler (HCAR0475)
- ❏ Hobbico® Duster™ Can of Compressed Air (HCAR5500)
- ❏ Servo Horn Drill (HCAR0698)
- ❏ AccuThrow™ Deflection Gauge (GPMR2405)
- ❏ CG Machine™ (GPMR2400)
- ❏ Cover Sock (COVR2702)

IMPORTANT BUILDING NOTES

- 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.

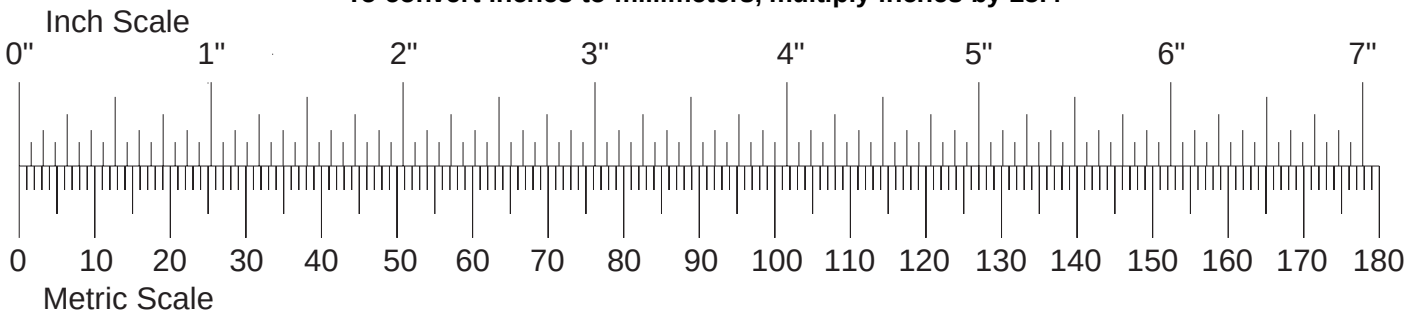
- The Spirit 100 ARF is factory-covered with Top Flite MonoKote film. Should repairs ever be required, MonoKote can be patched with additional MonoKote purchased separately. MonoKote is packaged in six-foot rolls, but some hobby shops also sell it by the foot. If only a small piece of MonoKote is needed for a minor patch, perhaps a fellow modeler would give you some. MonoKote is applied with a model airplane covering iron, but in an emergency a regular iron could be used. A roll of MonoKote includes full instructions for application. Following are the colors used on this model and order numbers for six foot rolls.

True Red	TOPQ0227
Cub Yellow	TOPQ0220
Black	TOPQ0208
Orange	TOPQ0202
White	TOPQ0204

COMMON ABBREVIATIONS

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

To convert inches to millimeters, multiply inches by 25.4

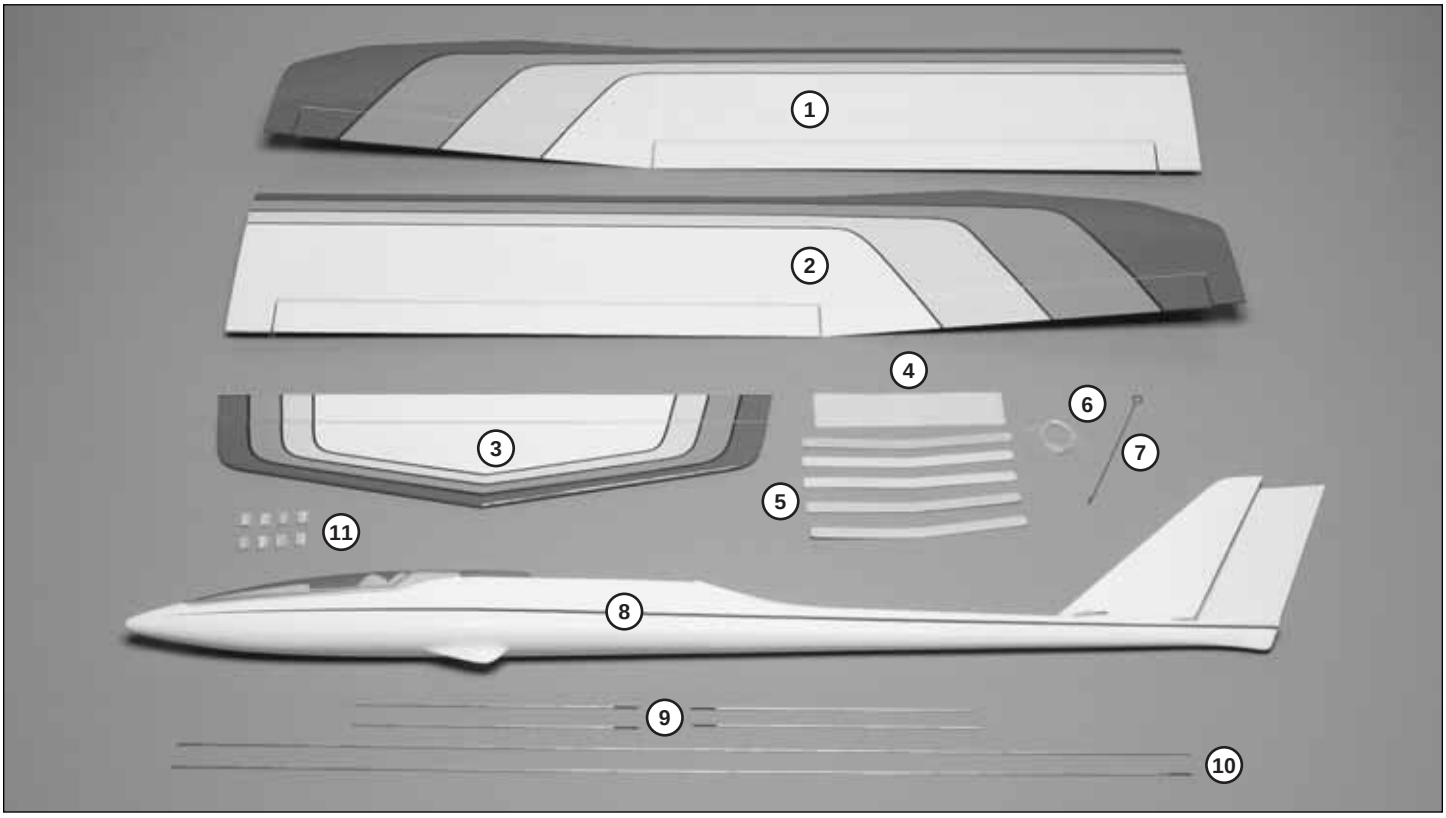


KIT INSPECTION

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 (Photographed)

1 Left Wing
2 Right Wing
3 Horizontal Stabilizer
4 Hinge Strip
5 Wing Joiners (4–Wood, 1–Aluminum)
6 Spoiler String
7 Spoiler Activation Rod
8 Fuse and Canopy
9 12" Pushrods (4)
10 42" Pushrods (2)
11 Servo Blocks (8)

Kit Contents (Not Photographed)

Nylon Clevis (6)
Nylon Faslink Pushrod Keeper (6)
Nylon Small Control Horn (4)
Silicone Clevis Keeper (6)
6-32 x 3/4" Socket Head Cap Screw (5)
6-32 Nylon Lock Nut (1)
#6 Flat Washer (5)
2 x 3/8" Sheet Metal Screw (18)
2-56 x 1/2" Screw (6)
2-56 x 3/4" Socket Head Cap Screw (2)

ORDERING REPLACEMENT PARTS

Replacement parts for the Great Planes Spirit 100 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" from 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. If a hobby shop is not available, replacement parts may also be ordered from Tower Hobbies at ***www.towerhobbies.com***, or by calling toll free (800) 637-6050.

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, contact Product Support by e-mail at ***productsupport@greatplanes.com***, or by telephone at (217) 398-8970.

Replacement Parts List

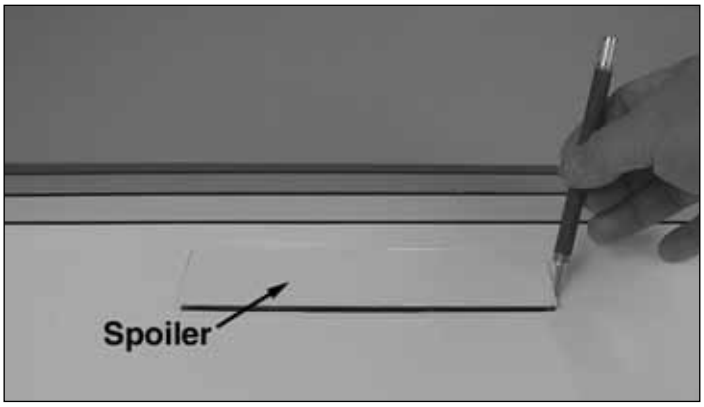
Order Number	Description	How to Purchase
	Missing pieces	Contact Product Support
	Instruction manual	Contact Product Support
	Full-size plans	Not available
	Kit parts listed below	Hobby Supplier
GPMA1989	Fuselage Set	
GPMA1987	Wing Set	
GPMA1988	Tail Set	
GPMA1989	Wing Joiner Set	
GPMA1990	Canopy and Pilot	
GPMA1991	Tow Hook Set	
GPMA1992	Decal Set	

ASSEMBLE THE WING

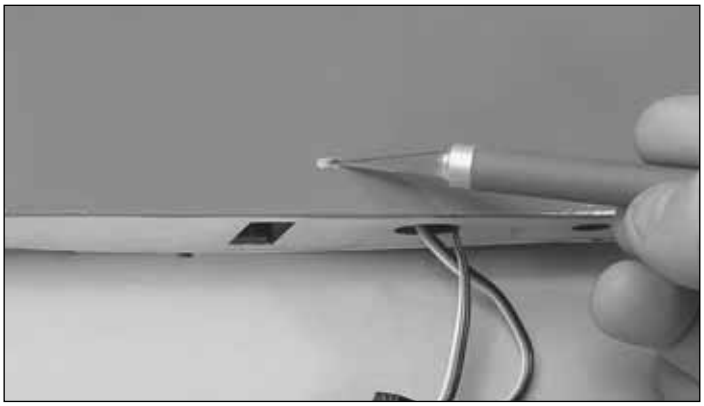
Spoiler Option

Spoilers are optional and can be made functional even after you have flown the plane.

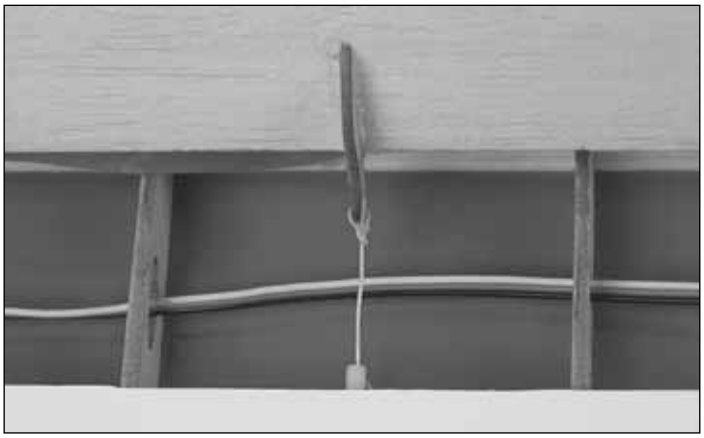
❏ ❏ 1. Use a sealing iron to securely attach the covering to the spoiler and the wood surrounding it.



❏ ❏ 2. Trim the covering around the ends and TE of the spoiler. DO NOT cut the along the LE

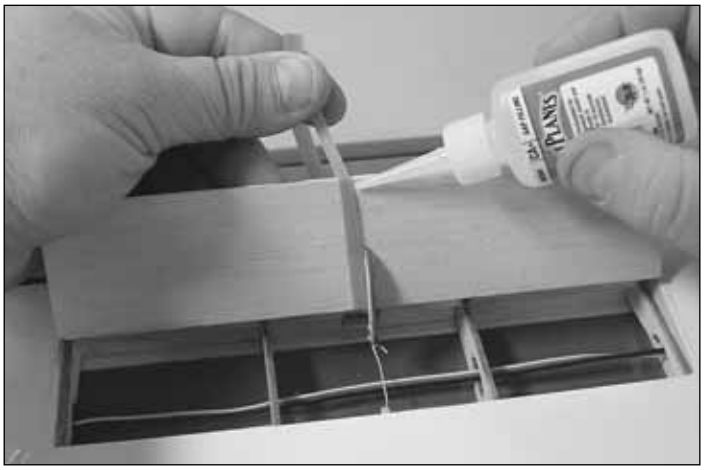


❏ ❏ 3. Trim covering from the spoiler string tube on the bottom of the wing.



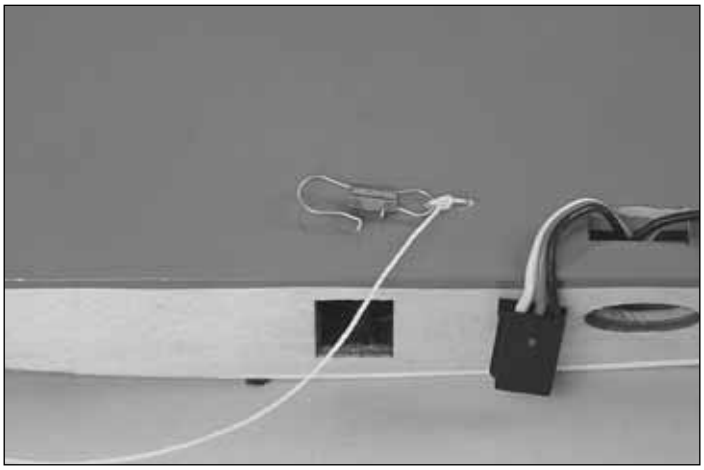
❏ ❏ 4. Insert the spoiler string in the string tube. Tie the end to the spoiler control horn and secure with a drop of thin CA.

❏ ❏ 5. Cut a #64 rubber band in half. Clean the rubber band with alcohol. Glue one end of the rubber band to the front sheer web with a drop of medium CA.

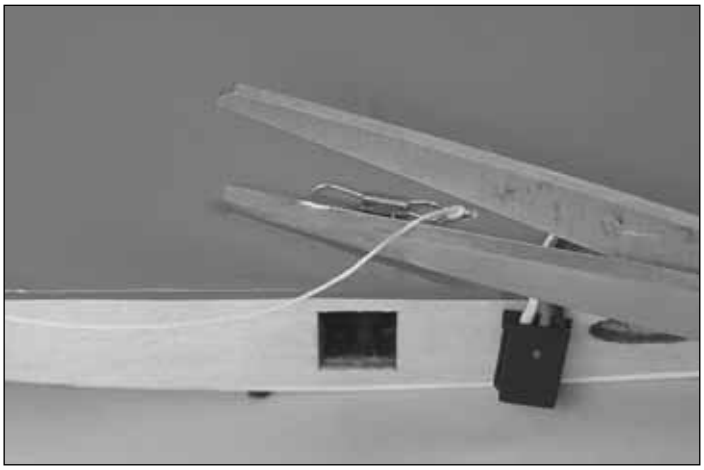


❏ ❏ 6. Pull the rubber band up the spoiler and glue near the TE with a drop of medium CA. **NOTE:** There should be just enough tension to close the spoiler.

❏ ❏ 7. Cut the rubber band just behind the glue joint.



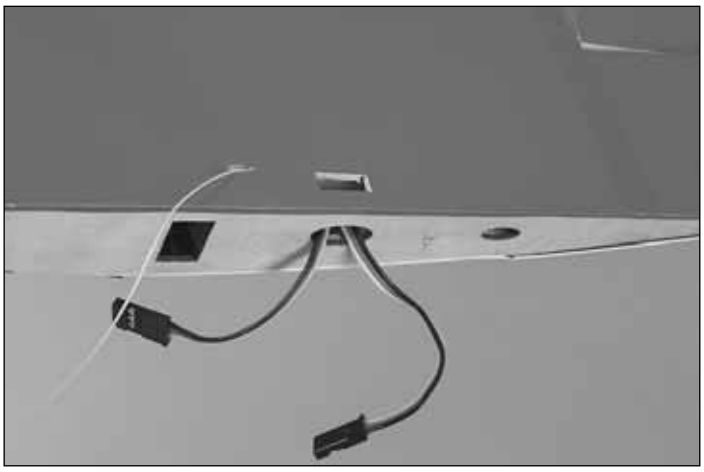
❏ ❏ 8. Pull the slack out of the spoiler string without opening the spoiler and tie the spoiler hook to the string so that the rear of the hook lines up with the front of the string opening.



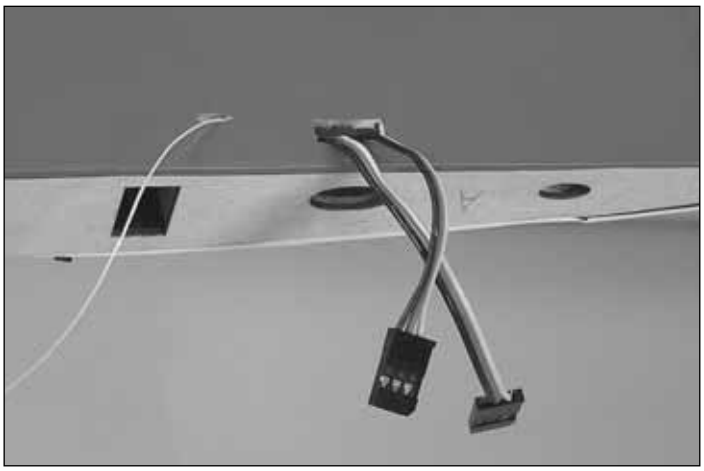
❏ ❏ 9. Trim the excess string from the spoiler hook.

❏ 10. Repeat steps 1-9 for the second spoiler.

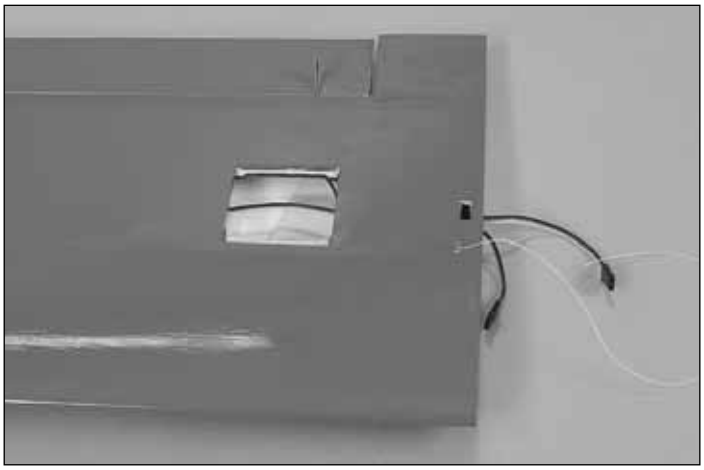
Install the Aileron and Flap Servos

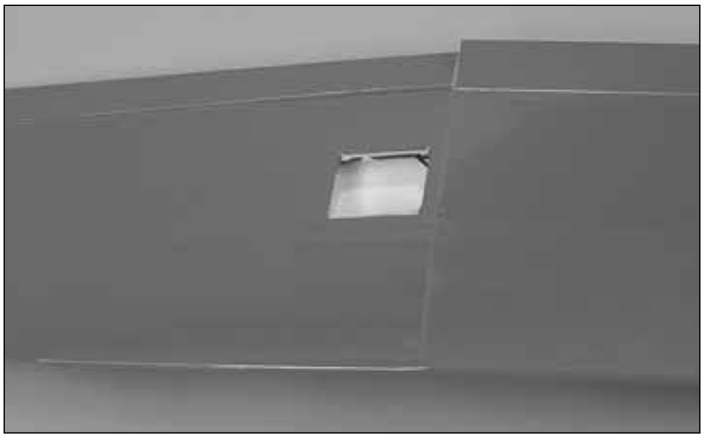


❏ 1. Cut a 3/16" x 1/2" [4 x 13mm] slot in the bottom of each wing panel aligned with the hole in the root rib and 3/16" [4mm] from the wing center.

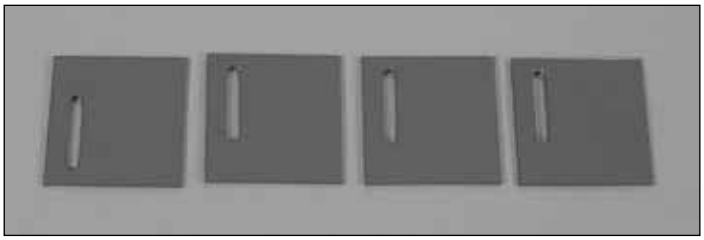


❏ 2. Pull the servo leads up through the 3/16" x 1/2" [4 x 13mm] slot.

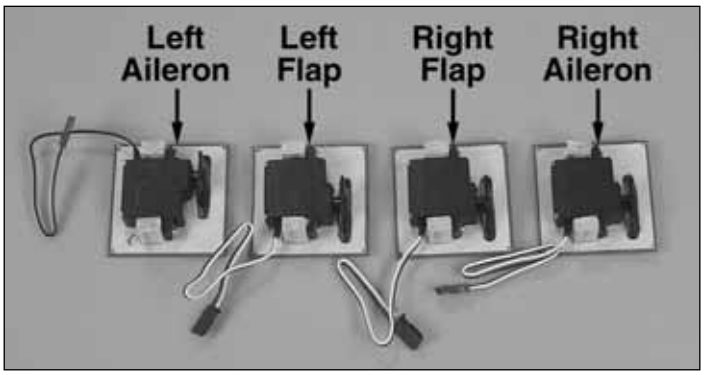




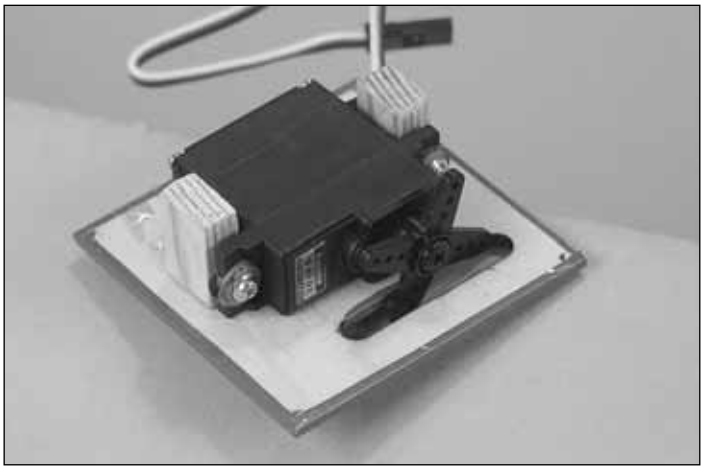
❏ 3. Locate the openings for the flap and aileron servos in the bottom of each wing panel. Trim out the covering and seal the edges using a sealing iron.



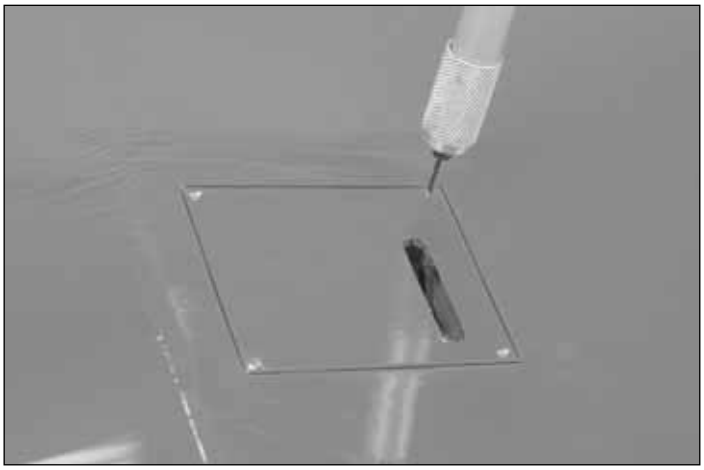
❏ 4. Locate the four servo hatch covers and trim out the servo arm openings. Seal the edges using a sealing iron.



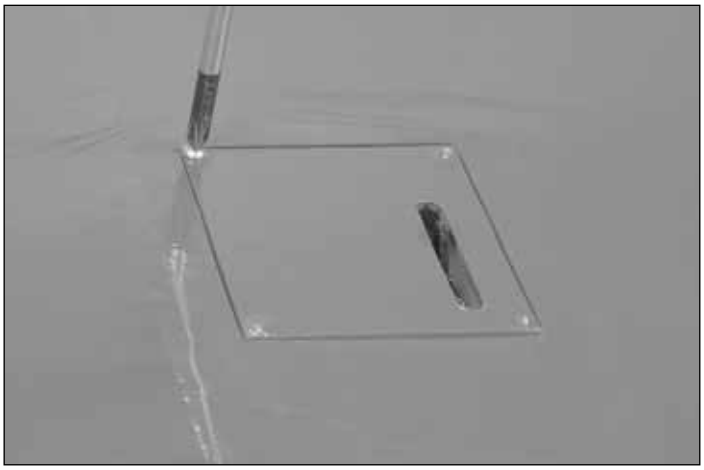
❏ 5. Trial fit your servos on the covers and mark the locations of the servo blocks. Using epoxy, glue the servo blocks to the hatch covers. **NOTE:** The flap servos should be oriented the same for both wing panels.



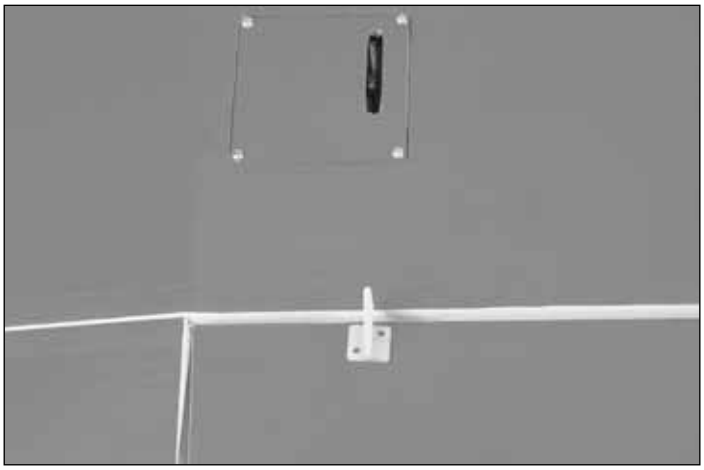
❏ 6. Attach the servos to the blocks using the hardware that comes with your radio system. **HINT:** Drill a 1/16" [1.6mm] pilot hole for the servo screws and strengthen the holes with a drop of thin CA.



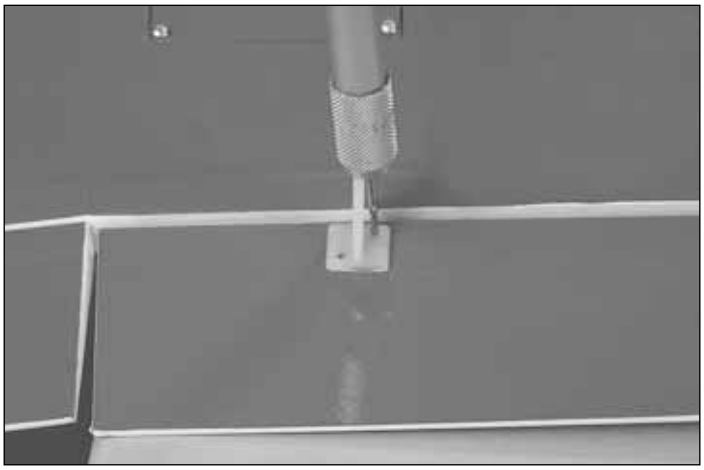
❏ 7. Attach the servo lead to the extension. Fit the servo hatch to the wing. Use the holes in the cover as a guide and drill four 1/16" [1.6mm] holes through the plywood servo hatch mounts.



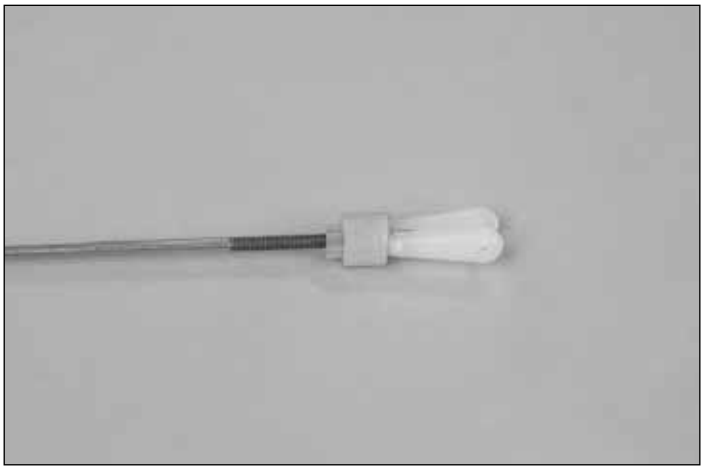
❏ 8. Temporarily mount the servo hatch cover to the wing with four #2 x 3/8" [9.5mm] screws. Remove the screws and hatch. Then, harden the holes in the wing with thin CA. Allow the glue to dry and remount the servo hatch cover.



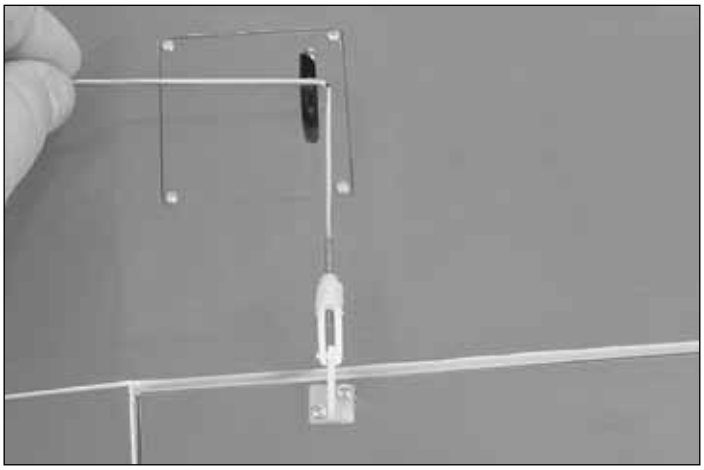
❏ ❏ 9. Align the aileron control horn with the servo arm. Glue the control horn to the aileron with a small drop of CA.



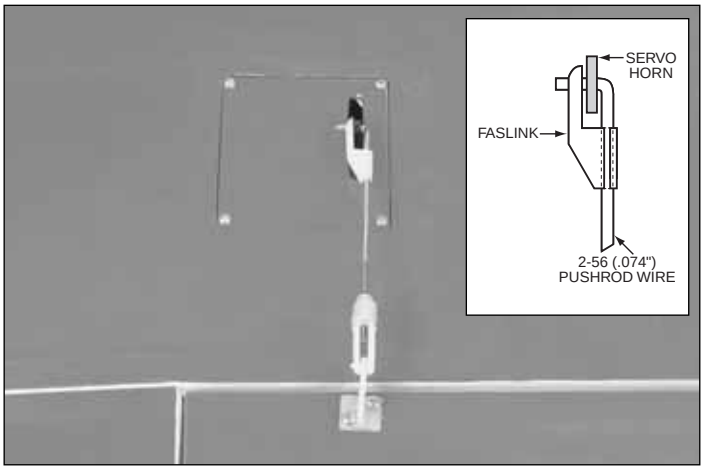
❏ ❏ 10. Drill two 1/16" [1.6mm] holes through the aileron. Secure the control horns with two 2-56 x 1/2" [13mm] screws and the nylon control horn back.



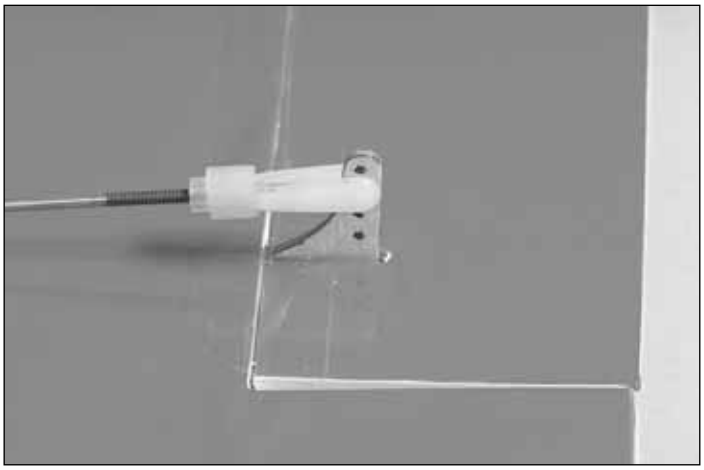
❏ ❏ 11. Screw a nylon clevis 15 turns onto each of the four 12" [305mm] pushrods. Slide a silicone retainer on each of the nylon clevis.



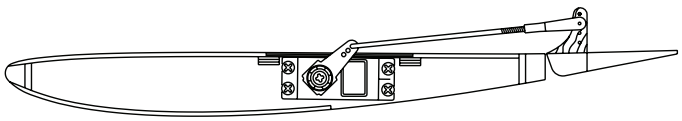
❑ ❑ 12. Attach the aileron clevis to the outer hole on the control horn. With the servo and aileron centered mark the location the pushrod crosses the servo arm. Bend a right angle in the pushrod at the mark.



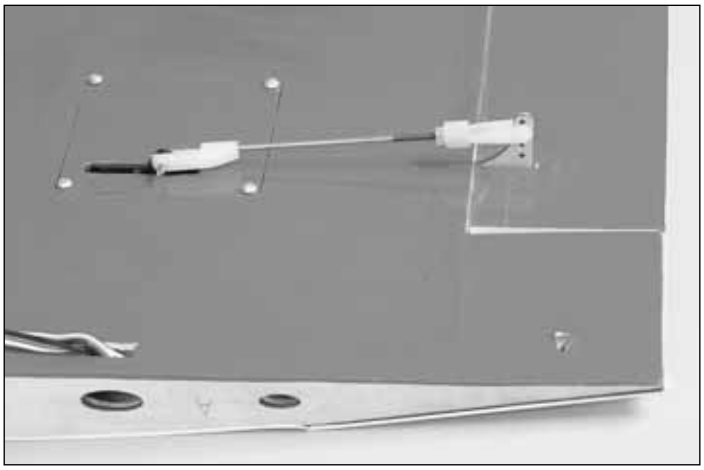
❑ ❑ 13. Cut the pushrod 1/4" [6mm] past the bend. Push the pushrod through the servo arm. Retain the pushrod with the nylon faslink.



❑ ❑ 14. Harden the control horn with thin CA and drill out the second hole with a 1/16" drill. Attach the flap clevis to the second hole on the control horn.



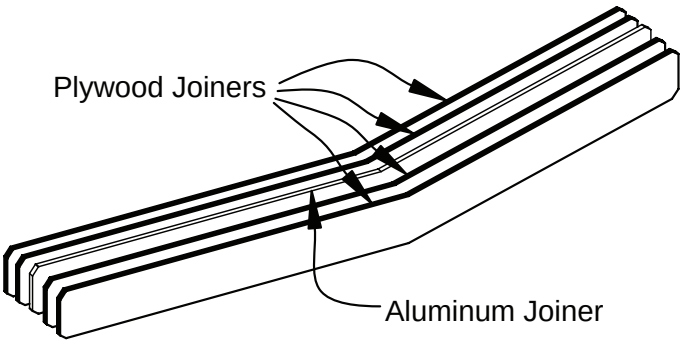
❑ ❑ 15. Plug the flap servo to the flap channel on your radio. Make sure the servo arm is in the position shown in the sketch. Align the flap with the wing TE and mark the location the pushrod crosses the servo arm. Bend a right angle in the pushrod at the mark.



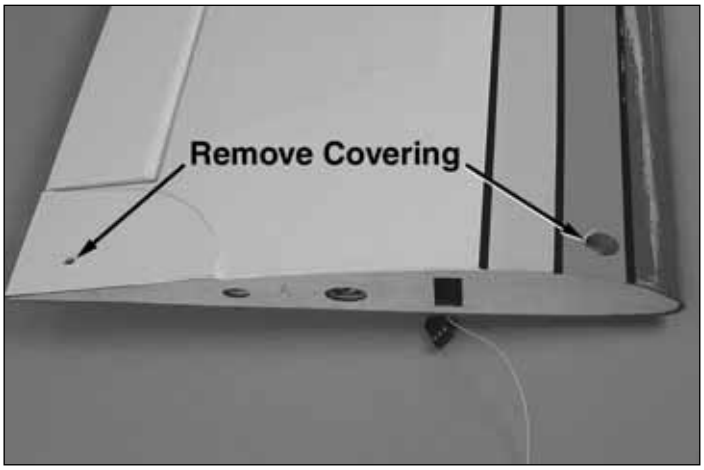
❑ ❑ 16. Cut the pushrod 1/4" [6mm] past the bend. Push the pushrod through the servo arm. Retain the pushrod with the nylon faslink.

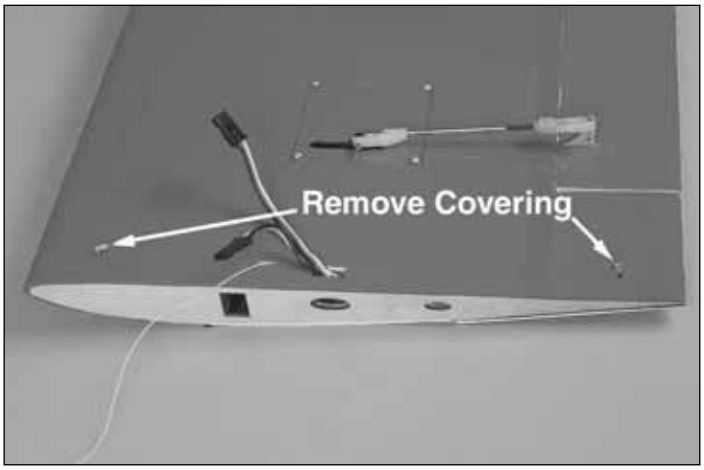
❑ 17. Repeat steps 7-14 for the other wing half.

Finish the Wing



❑ 1. Make a sandwich of the wing joiners as shown in the sketch. Glue the wing joiners together with 6-minute epoxy and clamp together. Use a paper towel dampened with alcohol to remove the excess epoxy that has squeezed out of the joiners.



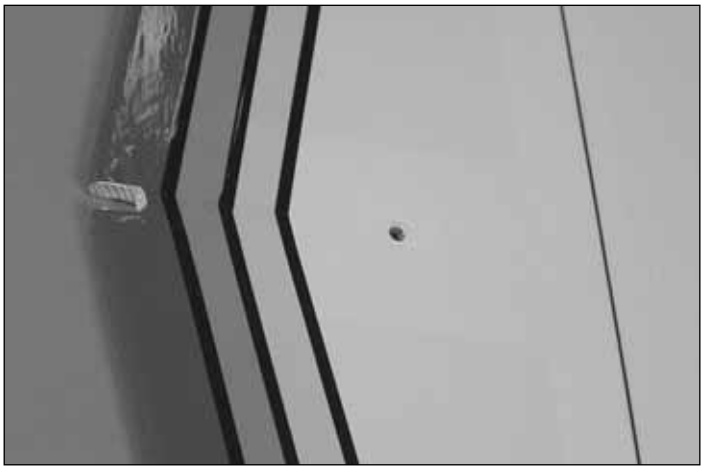


❑ 2. Remove the covering from the top and bottom of the four wing bolt holes on the wing.

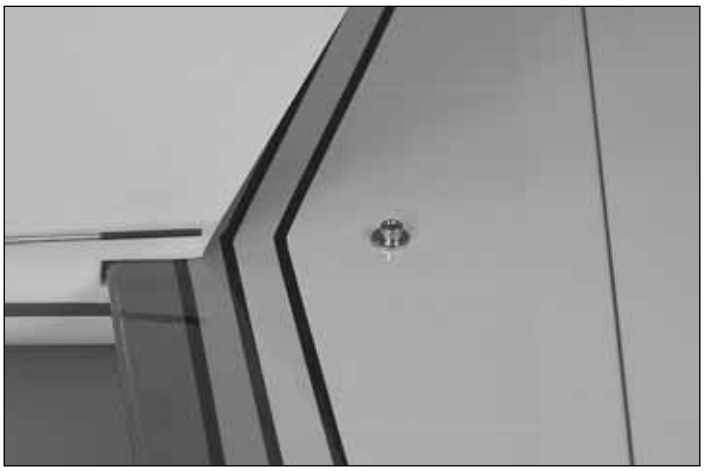
❑ 3. After the epoxy on the wing joiner has fully cured fit the joiner in the wing. It might be necessary sand the joiner so it will fit in the wing. The fit needs to be tight so sand small amounts and take your time.

ASSEMBLE THE FUSE

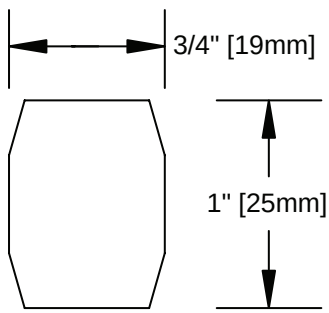
Attach the Tail



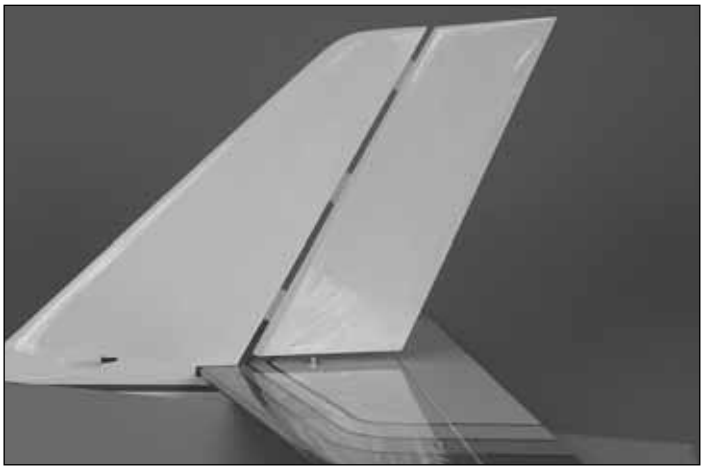
❑ 1. Trim the covering on the horizontal stabilizer from the LE slot and the bolt hole. Apply thin CA to the exposed wood in the LE slot.

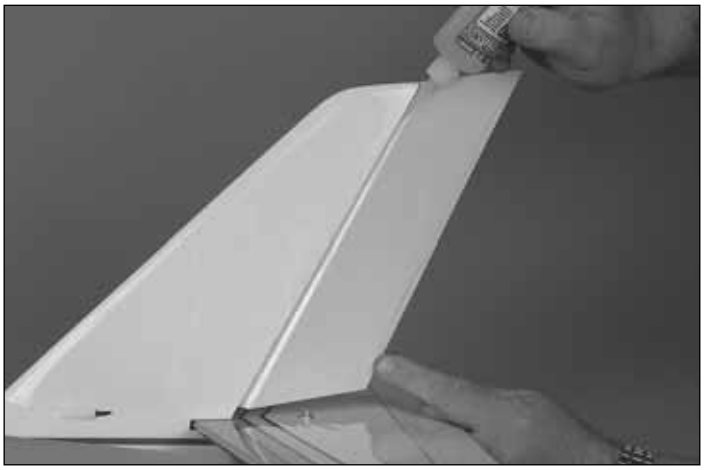


❑ 2. Mount the stabilizer to the fuse with a 6-32 x 3/4" [19mm] socket head cap screw and #6 washer.



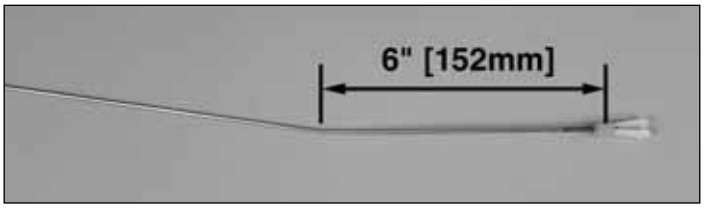
❑ 3. Cut three 3/4" x 1" [19 x 25mm] CA hinges from the supplied 2" x 9" [50 x 230mm] CA hinge strip. Snip off the corners so they go into the rudder/fin easier.





❏ 4. Fit the rudder to the fin with the hinges. Glue both sides of each hinge with 3 drops of thin CA.

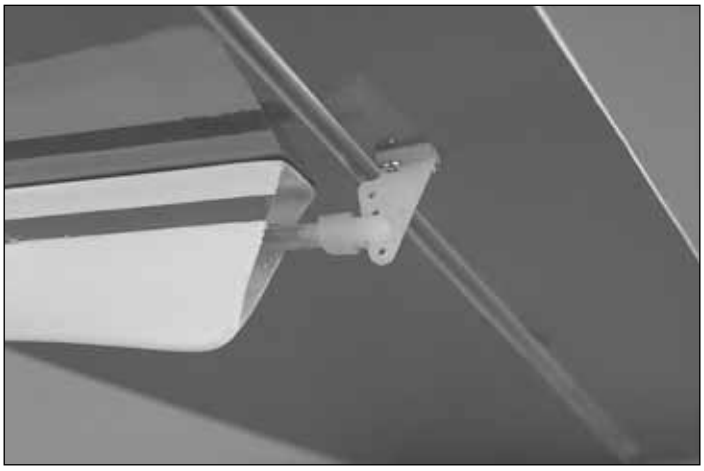
❏ 5. Screw a nylon clevis 15 turns onto both of the 42" [1067mm] pushrods. Slide a silicone retainer on each of the nylon clevises.



❏ 6. If necessary, bend a slight angle in one of the pushrods 6" [150mm] from the end of the clevis. Slide this pushrod into the rudder pushrod tube.

❏ 7. Align the rudder control horn with the rudder pushrod. Glue the control horn to the rudder with a small drop of CA.

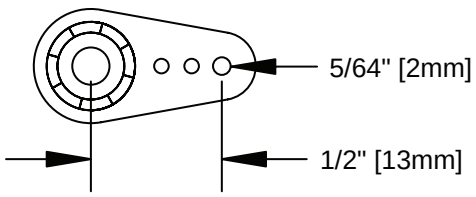
❏ 8. Drill two 1/16" [1.6mm] holes through the rudder. Secure the control horn with two 2-56 x 3/4" [19mm] SHCS and the nylon control horn back. Attach the clevis to the outer hole on the control horn.



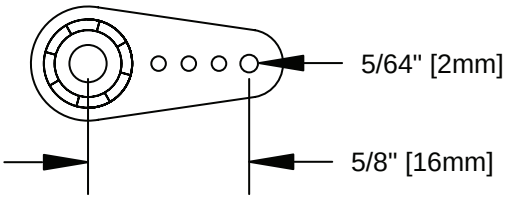
❏ 9. Slide the second 42" [1067mm] pushrod into the elevator pushrod tube from the rear.

❏ 10. Mount the elevator control horn with two 2-56 x 5/8" [15.9mm] screws. Attach the clevis to the second from the outer hole.

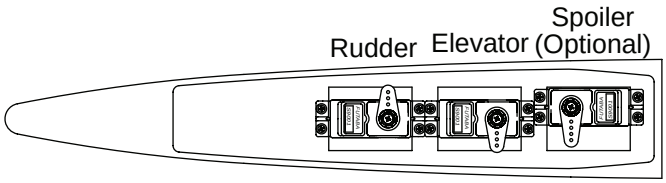
Install the Fuselage Servos



❏ 1. Make two single sided servo arms that have the outer hole 1/2" [13mm] from the servo mounting hole. Enlarge the outer hole with a 5/64" drill bit.

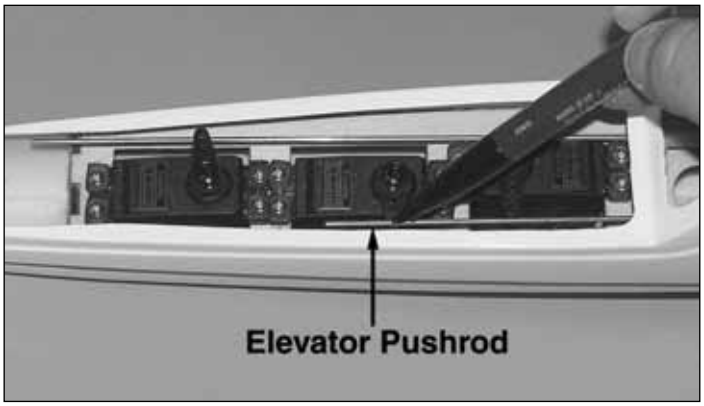


❑ 2. If you will be using the spoiler option make a servo arm that has the outer hole at least 5/8" [16mm] from the servo mounting hole. Enlarge the outer hole with a 5/64" drill bit.

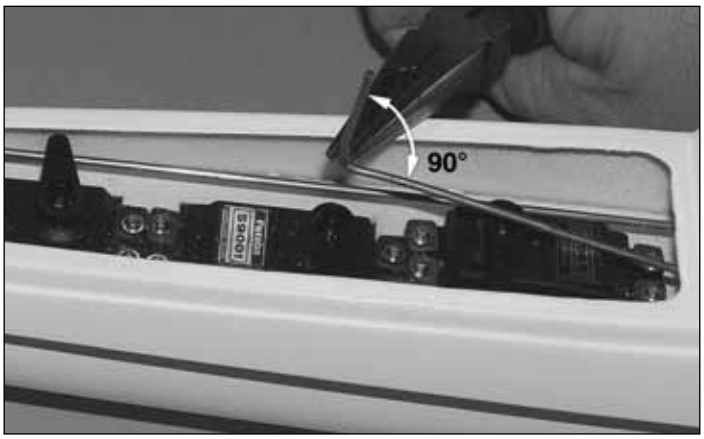


❑ 3. Mount the rudder and elevator servos with the hardware provided with the servos. If you will be using spoilers install the spoiler servo also. **NOTE:** The spoiler servo mounts as far right as it will go in the servo tray.

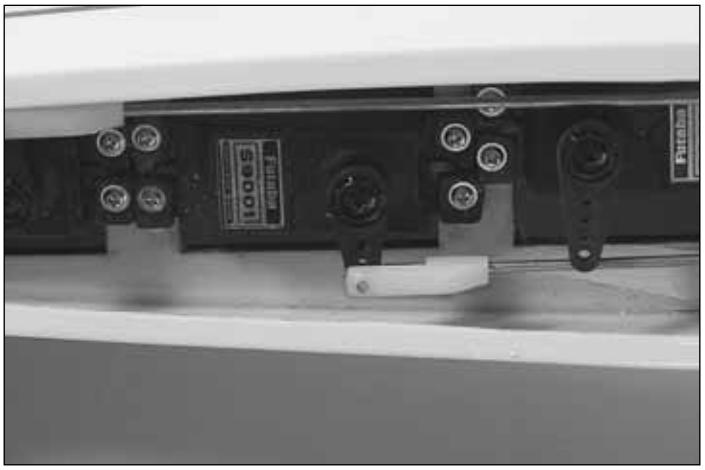
❑ 4. Plug the servos and battery into your receiver. Turn on the transmitter to center the servos. Attach the servo arms to the servos as shown in the sketch.



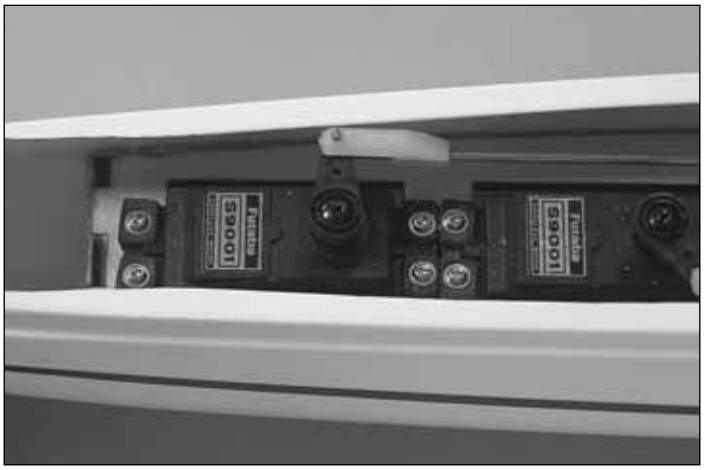
❑ 5. Center the elevator and mark the pushrod where it crosses the hole in the servo arm.



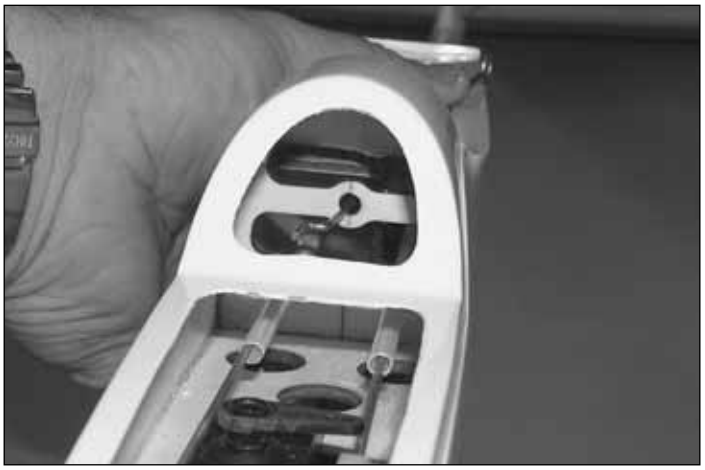
❑ 6. Bend the pushrod 90° up at the mark you made.



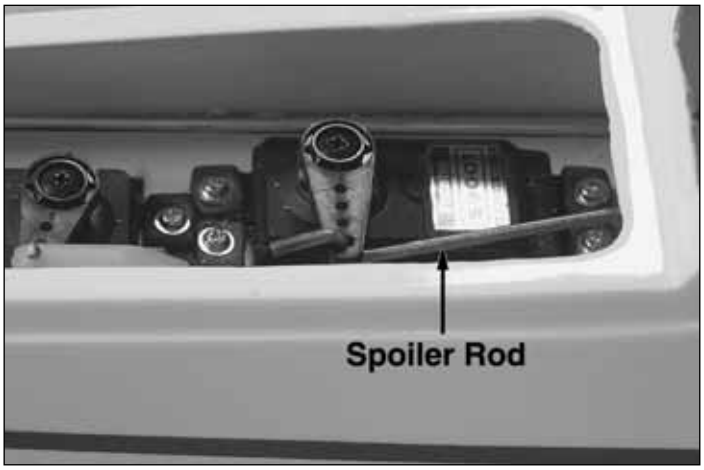
❑ 7. Attach the pushrod to the servo arm with a Faslink. Trim the excess pushrod from flush with the Faslink.



❑ 8. Attach the rudder pushrod in the same manner you did the elevator.

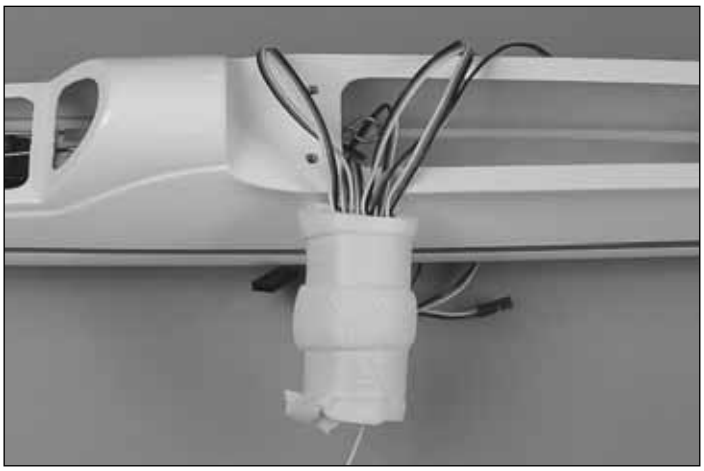


❑ 9. If you will be using spoilers slide the spoiler activation rod forward through the hole in the former at the front of the wing opening.

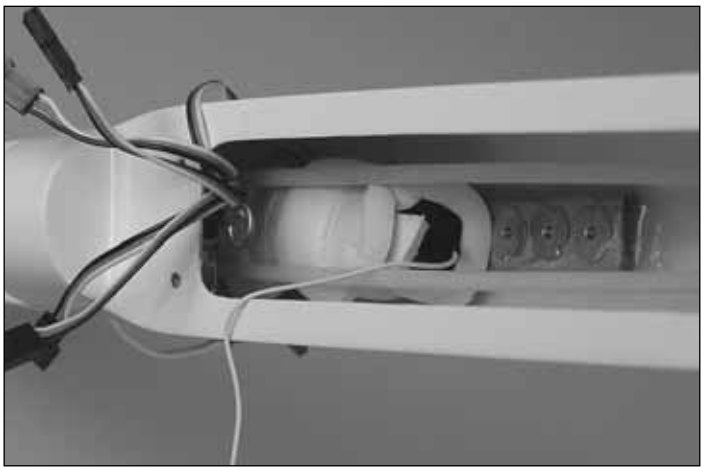


❏ 10. Attach the Z-bend end of the spoiler activation rod to the spoiler servo.

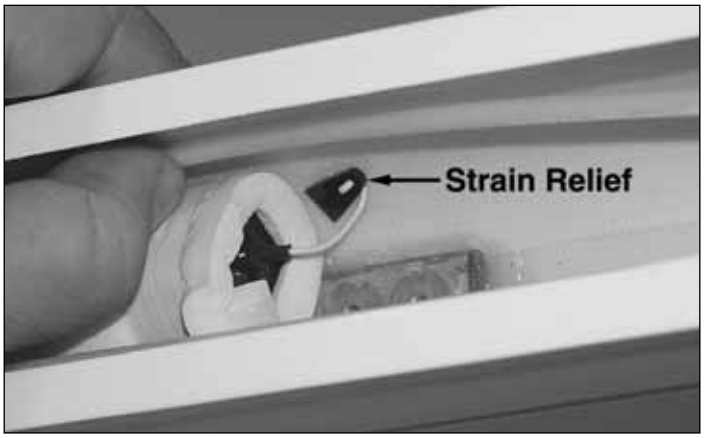
Final Radio Installation



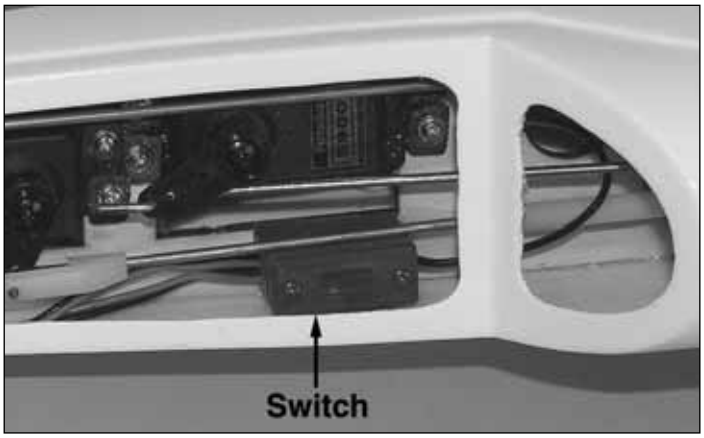
❏ 1. Attach the switch, charge jack, servos and servo extensions to the receiver. Wrap the receiver in foam.



❏ 2. Push the receiver into the bottom of the fuse and retain it with a small piece of Velcro®.

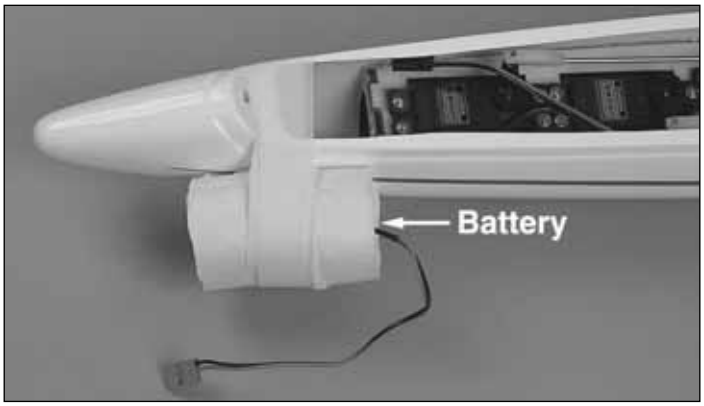


❏ 3. Drill a 1/16" [1.6mm] hole through the fuse side for the antenna. Take a cut-off piece of servo arm with at least two holes in it, and feed the antenna through two of the holes, making a strain relief which protects the antenna from accidentally being torn out of the receiver. Position the strain relief so that there is a small amount of slack between the receiver and the when the strain relief is positioned against the inside of the fuse.



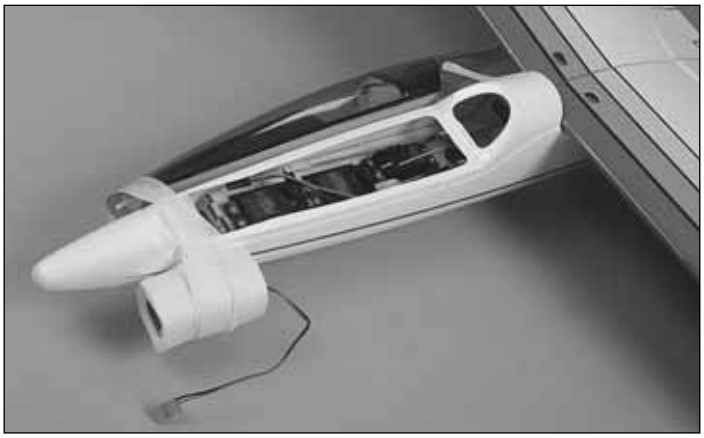
❏ 4. Mount your switch in the canopy area with silicone glue, making sure it does not interfere with the pushrods or canopy.

Set the C.G.

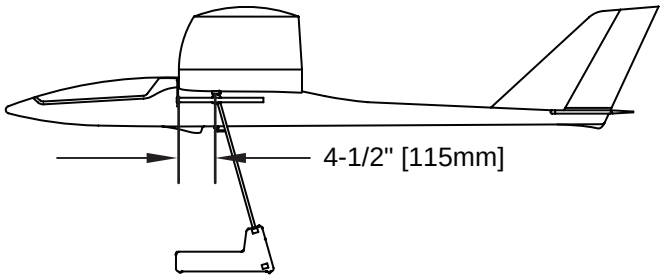


❏ 1. Wrap the receiver battery in foam and tape. Tape the battery to the outside of the fuse. **NOTE:** The battery will be installed after the CG is set.

❑ 2. Connect the wing servos and, if used, the spoiler hooks to the loop end of the spoiler activation rod. The spoiler cables will need to be pulled slightly to reach the loop on the wire. Be careful no to over-extend the spoilers by pulling too hard on the cable. Mount the wing with the four 6-32 x 3/4" [19mm] SHCS and washers.



❑ 3. Tape the canopy to the opposite side of the fuse from the battery.

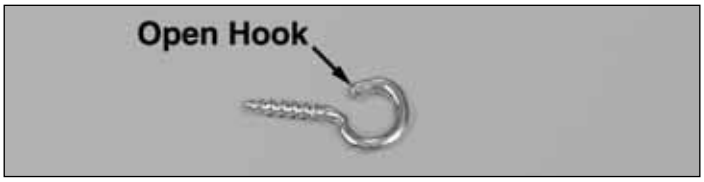


❑ 4. Accurately mark the balance point on the bottom of the wing on both sides of the fuselage. Use thin strips of tape or a felt-tip pen to make the marks. **The balance point (CG) is located 4-1/2" [115mm] back from the LE where the wing meets the fuse.** This is the balance point at which the model should balance for your first flights. After initial trim flights you may wish to experiment by shifting the balance up to 1/4" [6mm] forward or back to change the flying characteristics.

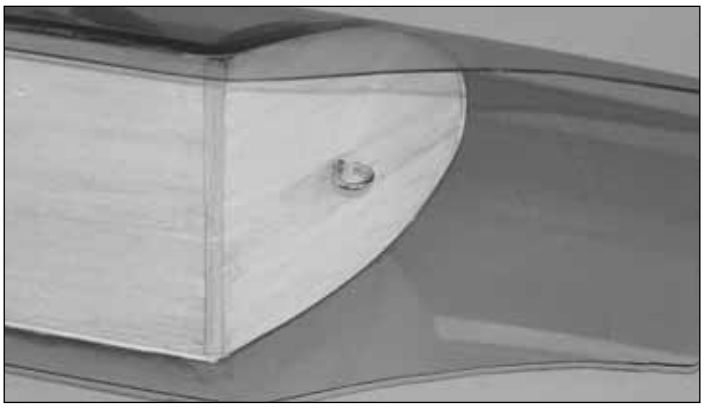
❑ 5. Mix small amounts of the steel shot with epoxy and pour it into the nose of the plane to set the CG.

❑ 6. After the epoxy has cured and the CG is confirmed install the battery in the fuse.

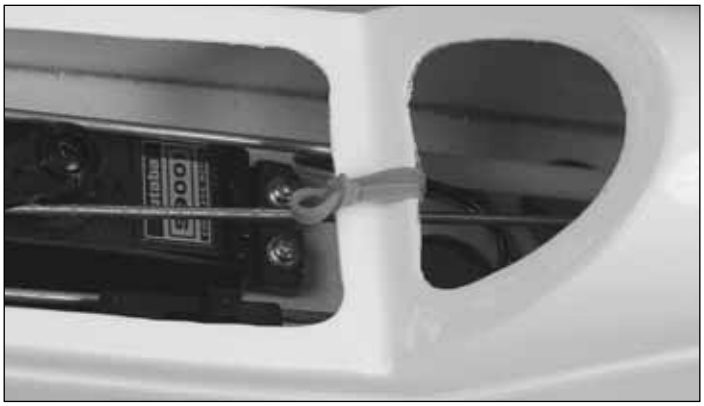
Mount the Canopy and Tow Hook



❑ 1. Use needle nose pliers to open up the canopy hook so there is a 1/16" [1.6mm] gap.



❑ 2. Drill a 3/64" [1.2mm] hole through the back of the canopy. Screw the canopy hook into the canopy and secure it with thin CA.



❑ 3. Attach a small rubber band to the fiberglass support at the end of the hatch.

❑ 4. Loop the rubber band over the canopy hook. Slide the canopy in place.

❏ 5. Mount the 6-32 tow hook to the fuse with the 6-32 nut to lock it in place.

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.

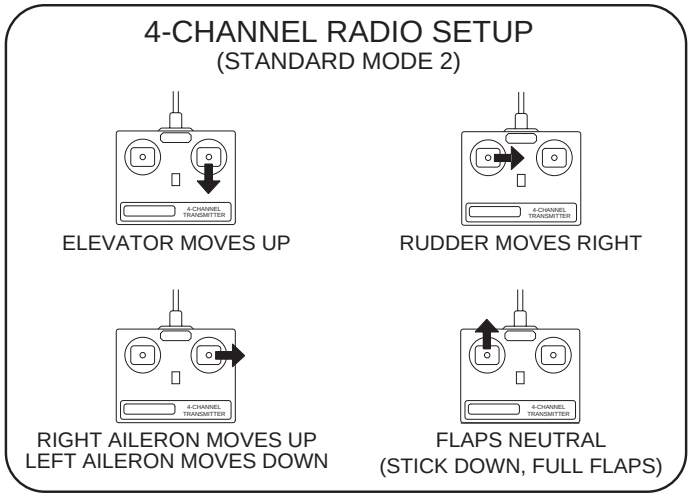
4. Use a piece of soft balsa or something similar to squeegee remaining water from under the decal. Apply the rest of the decals the same way.

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 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 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 high rate setting.

These are the recommended control surface throws:

	High Rate	**Low Rate**
ELEVATOR:	5/8" [16mm] up 5/8" [16mm] down	1/2" [13mm] up 1/2" [13mm] down
RUDDER:	1-1/2" [38mm] right 1-1/2" [38mm] left	1" [25mm] right 1" [25mm] left
AILERONS:	3/4" [19mm] up 3/4" [19mm] down	3/8" [9.5mm] up 3/8" [9.5mm] down
	Full	**Half**
FLAPS:	2" [50mm]	1" [25mm]
SPOILERS:	2-1/4" [57mm]	1" [25mm]

IMPORTANT: The Spirit 100 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 Spirit 100 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 Laterally

❏ 1. With the wing level, have an assistant help you lift the model by the tip of the fuse and the bottom 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 decal sheet 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 and receiver batteries 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.

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. 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.

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].

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. 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.
- ❏ 3. Balance your model *laterally* as explained in the instructions.
- ❏ 4. Make sure all hinges are **securely** glued in place.
- ❏ 5. Confirm that all controls operate in the correct direction and the throws are set up according to the manual.
- ❏ 6. Make sure any servo extension cords you may have used do not interfere with other systems (servo arms, pushrods, etc.).
- ❏ 7. Place your name, address, AMA number and telephone number on or inside your model.
- ❏ 8. Cycle your receiver battery pack (if necessary) and make sure it is fully charged.
- ❏ 9. If you wish to photograph your model, do so before your first flight.
- ❏ 10. Range check your radio when you get to the flying field.

FLYING

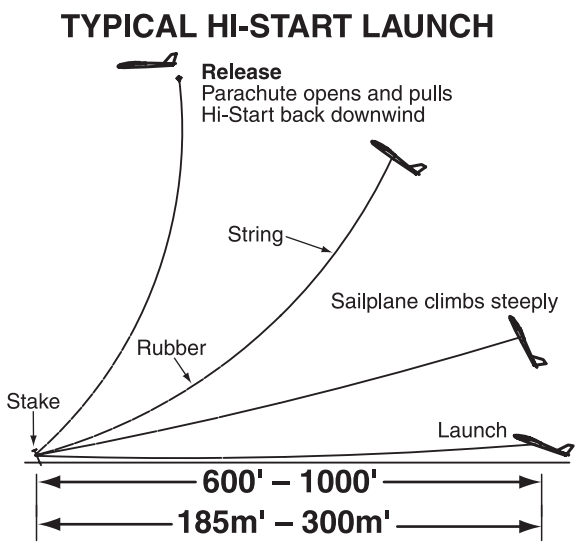
If you are not thoroughly familiar with the operation of R/C models, ask an experienced modeler to check to see you have the radio installed correctly and all the control surfaces do what they are supposed to.

Trimming Flights

It is a good idea to do a couple of trim flights before each flying session to make sure the plane is still in trim and the radio is working properly.

Hold the Spirit 100 ARF under the wing with the nose pointed slightly down and directly into the wind. Launch the model with the wings level and the nose pointing at a spot on the ground about 50 feet in front of you. If the sailplane is launched with the nose up or launched too hard it will climb a few feet, stall and fall nose first straight down. With the nose pointed down slightly the sailplane will accelerate down until it picks up enough flying speed, then level off and glide forward. Adjust the trims on your transmitter to get the plane to fly straight ahead in a smooth glide path.

Hi-Start Launch



A hi-start is the most common way to launch your Spirit 100 ARF. Follow the directions that came with the hi-start and lay it out directly into the wind. Place the stake at the far upwind edge of the flying field so the parachute will blow back onto the flying field.

Hook the parachute up to the tow hook. Pull the plane back approximately twice as far as the rubber is long or whatever the hi-start instructions recommend.

Hold the plane above your head with the wings level and the nose pointed slightly up and directly into the wind. Give the plane a gentle push forward to get it flying and it will climb up like a kite. You should not have to touch the elevator during the launch. Use the **rudder stick** to keep it going straight up. You will find the ailerons are not very responsive during the first part of the launch. As the rubber relaxes the plane will fly off the hi-start.

The wing and airframe of ANY sailplane—even those having composite structures—can be destroyed by excessive stress if a winch is not used properly. Sailplanes with a built-up balsa/ply wing and thin airfoil are especially vulnerable.

Proper winch operation is the responsibility of its user. Without appropriate restraint, wing failure can result. Therefore:

- ***Do NOT attempt full pedal launches with the Spirit 100 ARF.***
- ***Understand that you minimize the risk of wing failure by launching with a Hi-Start.***
- ***If you must launch with a winch, please use the winch pedal responsibly!***

Great Planes subjects all new airplane kit and ARF models to rigorous stress-testing. Tests showed no weakness in the Spirit 100 ARF wing during hi-start or winch launching. Winch launches were conducted in a reasonable manner, knowing that overzealous use could fold the wings.

First Flights

Use these flights to get the “feel” of the controls and the Spirit 100 ARF’s flying characteristics. Adjust the trims on your transmitter (a little at a time) until the plane will fly straight and level with the transmitter sticks in their neutral positions.

The Spirit 100 ARF is a very gentle plane that flies well in light to moderate winds. Practice coordinating ailerons and rudder until you can get a tight turn that is relatively flat. Bank the sailplane with rudder and ailerons first, then add elevator to pull it around. When setting up to land, point the nose into the wind just downwind of where you want to land. Line up with your landing spot and slowly feed in flaps (or Crow). Add more or less flaps to control your descent angle and speed so you end up hitting the spot.

ADVANCED FEATURES

There are several types of mixing the Spirit 100 ARF can take advantage of if you have a “computer radio”.

Launch Camber: Lowering the flaps and ailerons during the launch will produce a steeper climb, giving you better altitude. A good place to start is about 15 degrees of flap and 5 degrees of aileron drop (the flaps will drop about three times more than the ailerons). This automatically puts some washout in the wing which adds stability for arrow straight launches. If you don’t have a switch for launch camber, just use the flaps for launch.

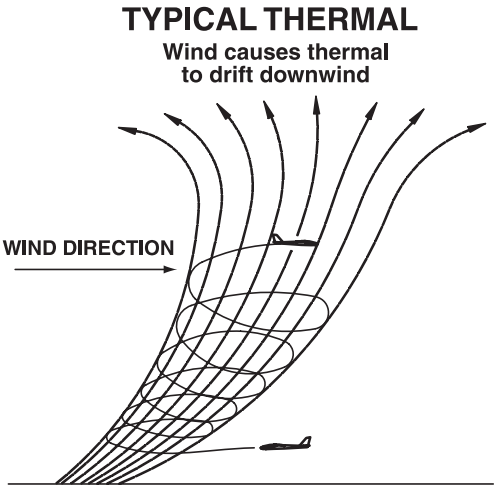
Crow: This is used to lose altitude quickly and to control your glide for spot landings. This mixing is tied to the flap stick (throttle)and allows the ailerons to come up as the flaps drop. Be sure to use plenty of aileron differential when using CROW mixing because the ailerons become less effective at very high angles of deflection. Also use maximum rudder coupling at full CROW. If you don’t have CROW capabilities just use flaps and make sure you have full rudder throw when the flaps start coming down. It is a good idea to **get lined up on the spot** before dropping the flaps very much because the rudder will become sluggish with the flaps down at slow speeds. Note: You will need to mix in a little down elevator with the flaps to keep the plane tracking straight.

Aileron/Rudder Coupling: This is used to allow the sailplane to make efficient, non-slipping, non-skidding turns. You will need to experiment to find the proper amount of throw required to do this but 1" [25mm] of rudder throw at full aileron is probably a good place to start.

Elevator/Camber Coupling - This is a neat type of mixing that allows the TE (ailerons and flaps) to respond to the elevator. When properly set up, this can be very useful when floating around in light air or when trying to thermal very tightly. This mixing can change the flying characteristics of the plane so start off small and get used it. A good place to start would be 1/8" [3mm] of TE drop at full up elevator.

Controlling the Wing Trailing Edge (Camber): The wing camber is usually controlled by a 3-position switch. The traditional way of setting this switch is to have: the middle position set to neutral camber, one direction for reflex (the entire TE raises about 1/16" [1.5mm]) and the other direction for positive camber (the entire TE drops about 3/32" [2.5mm]). This way of programming the switch is great for good thermal-days or days with a lot of wind where you might need the reflex capability for zooming up wind. The other way we set this switch is to have the “back” position for neutral camber, the middle position for a slight amount of positive camber [1/32" [1mm] - 1/16" [2mm]) and the forward position for more positive camber [3/32" [2.5mm] - 1/8" [3mm]). The middle position can be used once good air is located or when trying to gain a few extra seconds of air time. Normally the L/D will not be as great as neutral camber but the sailplane will float better. The forward position is when the sailplane is low and encounters lift, don’t panic, just hit the switch. The SPIRIT ELITE will really slow up and will thermal “on a dime”. This set-up is great for duration type flying without a lot of wind.

FACTS ABOUT THERMALS



Thermals are a natural phenomenon that happen outside, by the millions, every single day of the year. Thermals are responsible for many things including forming several types of clouds, creating breezes and distributing plant seeds and pollen. If you have ever seen a dust devil (which is nothing more than a thermal that has picked up dust), you have seen a thermal in action. Their swirling action is very similar to that of a tornado but much gentler. Most thermals have updrafts rising 200-700 feet per minute but have been known to produce updrafts of over 5,000 feet per minute These strong thermals can rip a plane apart or carry the plane out of sight before the pilot can get out of the updraft.

Thermals are formed by the uneven heating of the earth and buildings, etc. by the sun. The darker colored surfaces absorb heat faster than the lighter colors which reflect a great deal of the sun’s energy back into space. These darker areas (plowed fields, asphalt parking lots, tar roofs, etc.) get warmer than the lighter areas (lakes, grassy fields, forests, etc.). This causes

the air above the darker areas to be warmer than the air over the lighter areas and the more buoyant warm air rises as the cooler, denser air forces its way underneath the warmer air. As this warm air is forced upward it contacts the cooler air of the higher altitudes and this larger temperature difference makes the thermal rise quicker. The thermal is gradually cooled by the surrounding cooler air and its strength diminishes. Eventually the thermal stops rising and any moisture contained in the once warm air condenses and forms a puffy cumulus cloud. These clouds, which mark the tops of thermals, are usually between 2000 and 5000 feet high.

THERMAL SOARING

As the glider approaches a thermal, the wing tip that reaches the rising air first will be lifted before the opposite wing tip. This causes the plane to "bank" and turn away from where we would like the plane to go. The best way to get back in is to continue the bank and turn 270 degrees straight into the thermal.

When you are thermal soaring, try to fly as smoothly and straight as possible. Trim the plane to fly in a straight line and **only** touch the controls when you have to. Watch the sailplane carefully and it will tell you what it is encountering.

When the sailplane flies directly into a thermal it will either start rising or stop sinking. Either case is reason enough to start circling. Fly straight until you feel like you are in the strongest lift, then fly a **couple of seconds farther** so your circle will be centered in the strongest lift. Thermals travel with the wind, so be careful that you don't get too far downwind that you can't get back. If you find yourself getting too high, don't dive the plane to get out of the lift. Sailplanes are very efficient aircraft and they will build up a lot of speed and could "blow up" in the rough air of a thermal. The easiest way to lose altitude is to apply full rudder and full up elevator. This will put the plane into a tight spin that will not over stress the airframe but it will enable it to lose altitude very quickly. This is especially helpful if the sailplane gets sucked into a cloud or it gets too high to see.

As you might expect, with all this air rising, there is also air sinking. This air is the sailplane pilot's nightmare that can really make soaring challenging. "Sink" is **usually** not as strong as the thermals in the same area but sometimes can be. Because of this, it is important you do not let the sailplane get too far downwind.

Watch the birds! - Thermals suck up small insects many birds love to eat. A bunch of swallows flying around in one area may indicate a thermal. Soaring birds (hawks, vultures, eagles etc.) are the best thermal indicators. They not only show you where the thermal is but they also show you where the center is. These "Masters of the sky" will often fly right along with sailplanes.

Practice those landings! Most thermal contests are won or lost during the landing. Establish a particular landing pattern and try to stick to it for all landings. Learn to shift your pattern to account for the wind and particular flying field characteristics. Flaps can be very useful during contest landings. They allow you to bring the sailplane in for a landing higher or faster than normal to guard against any last minute sink or gusts and dump the extra altitude and speed at the last second. They can also be used to help control your skid. Flaps will stop the plane from sliding a little quicker. You can also "steer" the plane while it is sliding along the ground. Don't expect to be able to "horse it around" but you can gain valuable inches by using the rudder to guide it towards the spot as it slides to a stop. Be very careful not to "ground loop" the plane since you will lose your landing points if the plane flips over.

SLOPE SOARING

To be able to slope soar, you need a slope with a smooth piece of land (or water) out in front of it and a breeze blowing pretty close to straight up the slope. The higher and steeper the hill or cliff the better. Also the larger and smoother the land out in front the better. The air flowing towards the hill, is forced up and can generate a very large area of lift. Behind the hill is a large area of turbulent air that can be very dangerous to try to fly in. The faster the wind is blowing the stronger the lift and turbulence will be.

To fly off a slope, stand near the edge and throw the sailplane (nose down) into the wind. As the sailplane flies out into the "band" of lift it will begin to gain altitude. Turn and fly parallel to the slope and make all of your turns into the wind (especially when you are close to the slope). You will be surprised at the altitude you can gain just from slope lift. Thermals will often be "popped loose" by these slopes. If you catch a thermal and follow it downwind, be very careful to stay high enough to make it back to the slope without flying through the turbulent air. Landings can be very tricky on some slopes. On gentle slopes you can often fly very close to the top of the slope and "slide" into the top of the slope without encountering any turbulent air. On steeper slopes you may have to be a little more aggressive to get the plane out of the lift. In any case it is a good idea to plan your landing before you launch your plane.

BALLAST

In strong wind conditions, you may want to add ballast (weight) to the sailplane to increase its wing loading which increases its normal flying speed. Increasing the weight of your sailplane does not change its "glide ratio" but it does make it **fly** faster which makes it sink a proportional amount faster. Because of this faster sink rate, you need to be very cautious when ballasting for a thermal contest. In duration type contests only use ballast on very windy days that also have a **lot** of thermal activity. Center the weight directly on the center of gravity of the plane so you can add ballast without having to re-balance the plane. When learning to ballast your plane, start out small and work your way up.

HAVE FUN AND GOOD LIFT!!