SPIRIT ELITE™ ARF

INSTRUCTION MANUAL

Wingspan: 78.5 in. [1981mm]
Wing Area: 645 sq. in. [41.6 sq dm]
Weight: 46 - 48 oz. [1304 - 1360g]
Wing Loading: 10.3 - 10.7 oz./sq. ft. [31.4 - 32.6 g/sq dm]
Length: 46 in. [1168mm]
Radio: 4 - 6 Channel (4 servo wing mixing functions required for advanced set-ups - see the back pages of this manual)

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.

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
1610 Interstate Drive Champaign, IL 61822
(217) 398-8970, Ext 2
airsupport@greatplanes.com

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INTRODUCTION

Thank you for purchasing the Great Planes Spirit Elite 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 Spirit Elite's high performance airfoils give the aircraft a superior Lift to Drag (L/D) ratio with outstanding performance in a high variety of wind conditions. The advanced wing design features flaps and ailerons to provide the ultimate in control when using computer radio mixing functions.

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

For the latest technical updates or manual corrections for the Spirit Elite ARF, visit the web site listed below and select the Great Planes Spirit Elite ARF. If there is new technical information or changes to this kit, a “tech notice” box will appear in the upper left corner of the page.

http://www.greatplanes.com/airplanes/index.html

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

1. Your Spirit Elite ARF should not be considered a toy, but rather a sophisticated, working model that functions very much like a full-size sailplane. Because of its performance capabilities, the Spirit Elite 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 use an R/C radio system that is in first-class condition.

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

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

7. If you are not already an experienced R/C pilot, you should fly the model only with the help of a competent, experienced R/C pilot.

We, as the kit manufacturer, provide you with a top quality 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.

If you 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.

In addition to joining an R/C club, we strongly recommend you join the AMA (Academy of Model Aeronautics). AMA membership is required to fly at AMA sanctioned clubs. There are over 2,500 AMA chartered clubs across the country. Among other benefits, the AMA provides insurance to its members who fly at sanctioned sites and events. Additionally, training programs and instructors are available at AMA club sites to help you get started the right way. 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*

ADDITIONAL ITEMS REQUIRED

Hardware and Accessories

- ❑ Radio with at least 4 channels (a minimum of a 5-channel radio with mixing functions is required for the advanced features)
- ❑ (6) mini servos (FUTM0033 S3101 servos recommended)
- ❑ Hi-Start or other launching device (DYFP8302)
- ❑ 1/4" Foam Rubber Padding (HCAQ1000)
- ❑ (2) 24" Servo Extensions (HCAM2200)
- ❑ (2) 6" Servo Extentions (HCAM2000)
- ❑ (2) "Y" Harnesses (HCAM2500, only one required for advanced features)
- ❑ (2) 12" Servo Extensions (HCAM2100, required for advanced features only)

Adhesives and Building Supplies

- ❑ 1/2 oz. Thin Pro CA (GPMR6001)
- ❑ 1/2 oz. Medium Pro CA+ (GPMR6007)
- ❑ 30-Minute Epoxy (GPMR6047)
- ❑ Hobby knife (HCAR0105)
- ❑ #11 blades (HCAR0211)
- ❑ Builder's triangle (HCAR0480)
- ❑ Electric drill and drill bits
- ❑ #1 Phillips screwdriver (HCAR1022)
- ❑ Pliers with wire cutter (HCAR0630)

Optional Supplies and Tools

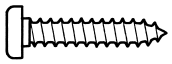
Here is a list of optional tools that will help you build the Spirit Elite ARF.

- ❑ Great Planes CG Machine™ (GPMR2400)
- ❑ Straightedge with scale (HCAR0475)
- ❑ Cutting mat (HCAR0456)
- ❑ CA Applicator tips (GPMR6033)
- ❑ CA Debonder (GPMR6039)
- ❑ CA accelerator (GPMR6034)
- ❑ 6-Minute Epoxy (GPMR6045)
- ❑ Milled Fiberglass (GPMR6165)
- ❑ Mixing Sticks (GPMR8055)
- ❑ Denatured Alcohol (for epoxy clean up)
- ❑ Felt-Tip Marker (TOPQ2510)
- ❑ Rotary tool such as Dremel
- ❑ Sealing Iron (TOPR2100)
- ❑ Covering sock (TOPR2175)
- ❑ Great Planes AccuThrow™ Deflection Gauge (for measuring control throws, GPMR2405)

IMPORTANT BUILDING NOTES

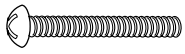
- There are two types of screws used in this kit:

Sheet metal screws are designated by a number and a length. For example #6 x 3/4"



This is a number six screw that is 3/4" long.

Machine screws are designated by a number, threads per inch and a length. For example 4-40 x 3/4"



This is a number four screw that is 3/4" long with forty threads per inch.

• When you see the term trial 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 Spirit Elite 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. The roll of MonoKote includes full instructions for application. Following are the colors used on this model and order numbers for six foot rolls.

White (TOPQ0204)
Sapphire Blue (TOPQ0226)
Teal (TOPQ0223)
Blue Mist (TOPQ0217)

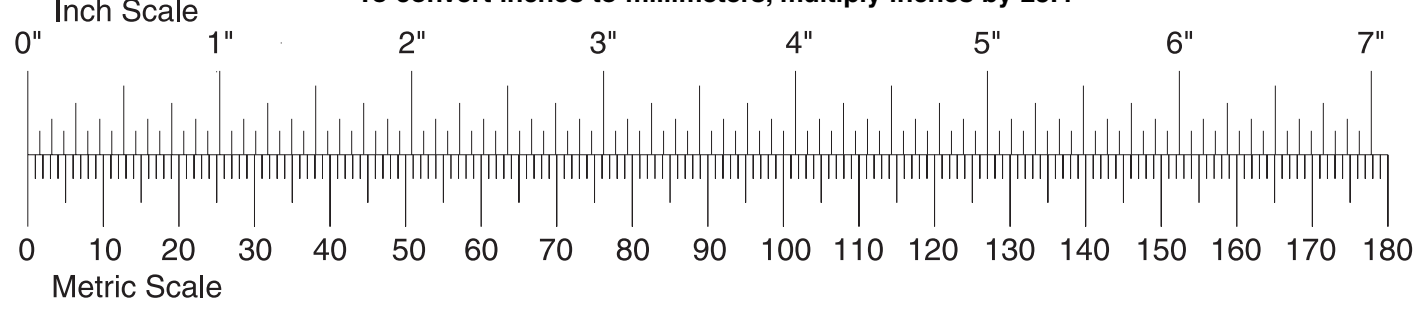
ORDERING REPLACEMENT PARTS

To order replacement parts for the Great Planes Spirit Elite ARF, use the order numbers in the **Replacement Parts List** that follows. Replacement parts are available only as listed. Not all parts are available separately (an aileron cannot be purchased separately, but is only available with the wing kit). Replacement parts are not available from Product Support, but can be purchased from hobby shops or mail order/Internet order firms. Hardware items (screws, nuts, bolts) are also available from these outlets. If you need assistance locating a dealer to purchase parts, visit **www.greatplanes.com** and click on "Where to Buy." If this kit is missing parts, contact **Great Planes Product Support**.

Replacement Parts List

Order Number	Description	How to Purchase
	Missing pieces	Contact Product Support
	Instruction manual	Contact Product Support
	Full-size plans	Not available
GPMA1995	Fiberglass Fuse	Contact Your Hobby Supplier to Purchase These Items
GPMA1996	Wing Kit	
GPMA1997	Tail Set	
GPMA1998	Canopy	
GPMA1999	Wing Joiner Rod	

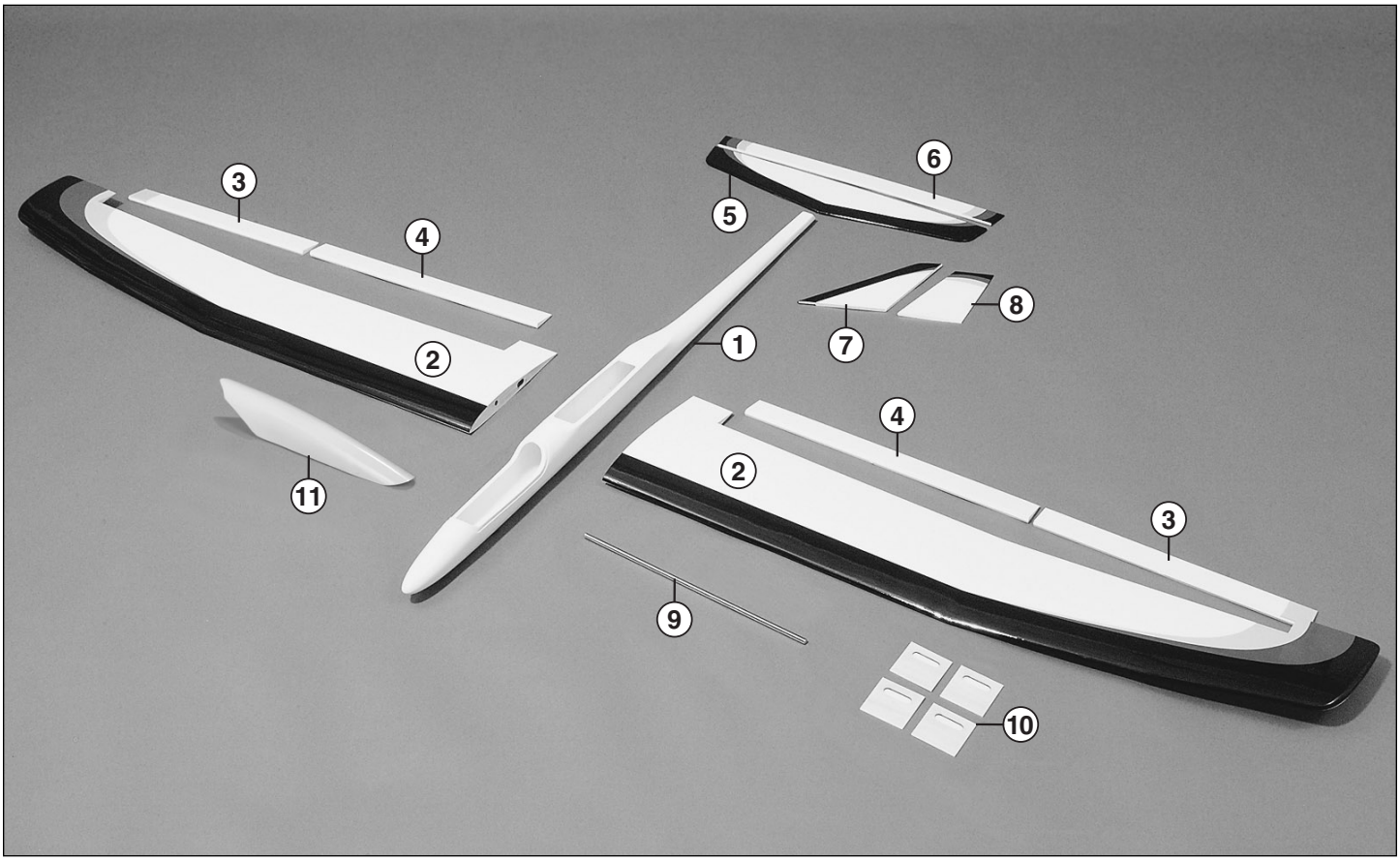
To convert inches to millimeters, multiply inches by 25.4



KIT CONTENTS

Before starting to build, use the **Kit Contents** list to 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 **Great Planes Product Support**. When reporting defective or missing parts, use the part names exactly as they are written in the Kit Contents list on this page.

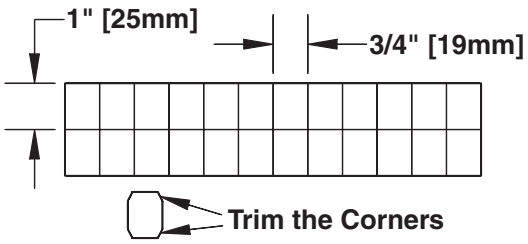
Great Planes Product Support:
Phone: (217) 398-8970
Fax: (217) 398-7721
E-mail: airsupport@greatplanes.com



Kit Contents (Photographed)	Kit Contents (Not Photographed)	
1 Fiberglass Fuselage	(1) 3mm ply Servo Tray	(6) Small Control Horns
2 Wing Panels (Left and Right)	(2) 3mm ply Servo Tray Doublers	(2) 8-32 x 3/4" Cap Screws
3 Ailerons (Left and Right)	(8) 5 x 10 x 10mm Hardwood Blocks	(2) #8 Flat Washers
4 Flaps (Left and Right)	(1) Left Wing Bolt Plate	(16) #2 x 3/8" Sheet Metal Screws
5 Stabilizer	(1) Right Wing Bolt Plate	(4) 2-56 x 3/8" Machine Screws
6 Elevator	(2) 5mm Dowels	(8) 2-56 x 5/8" Machine Screws
7 Fin	(1) 3mm Ply Pushrod Support	(4) .074 x 4" Threaded One End Pushrods
8 Rudder	(1) 3mm Ply Canopy Frame	(2) .074" x 36" Elev/Rudder/throttle Pushrods
9 7mm x 340mm Joiner Rod	(2) 3mm Ply Wing Bolt Plates	(2) Outer Pushrod Tubes
10 Aileron/Flap Servo Hatch Covers (4)	(1) 4-40 Nut	(1) 2" x 9" CA Hinge Strip
11 Canopy	(1) #4 Washer	(1) Eyelet
	(3) 4-40 Blind Nuts	(1) 4-40 Tow Hook
	(6) Clevis Retainer	(2) 3mm Ply Tow Hook Plates
	(6) Nylon Clevis	
	(6) Faslink	

WING ASSEMBLY

Install the Ailerons and Flaps



❑ 1. Cut the 2" x 9" [51 x 229mm] sheet into 3/4" x 1" [19 x 25mm] pieces.

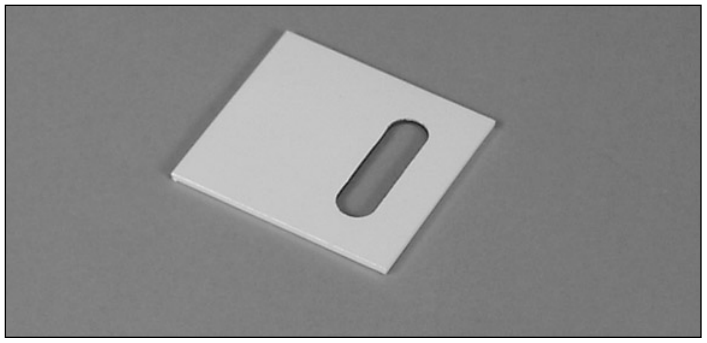
❑ ❑ 2. Trial fit three hinges into each of the ailerons and install onto the wing panels. Make sure the ailerons work freely to full deflection.

❑ ❑ 3. Hold the aileron to full deflection and place three drops of thin CA onto each hinge. Flip the wing over and place three drops onto the other side of each hinge. Be careful not to use too much CA or it may run down the hinge line. Exercise the aileron several times to loosen it up.

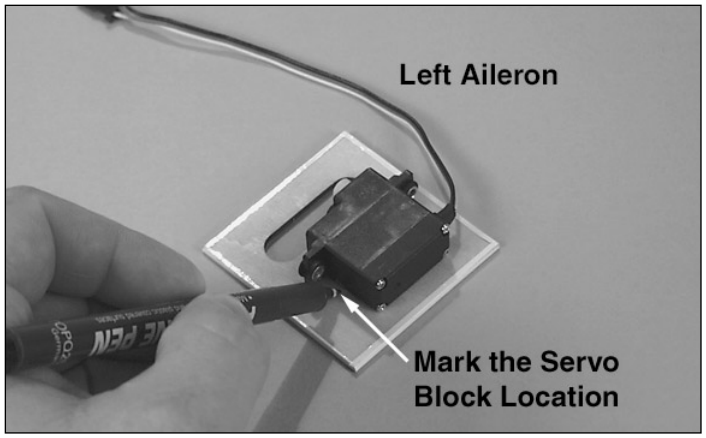
❑ 4. Repeat for the other wing panel.

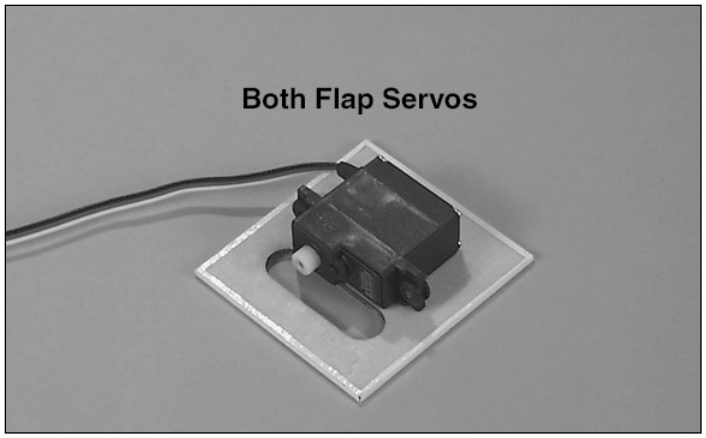
Install the Aileron and Flap Servos

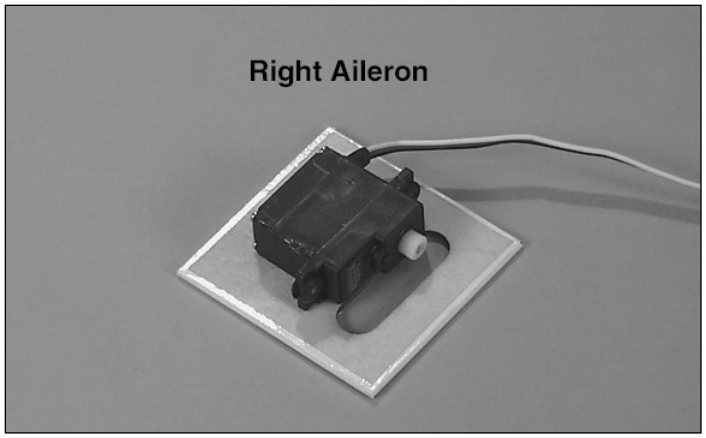
❑ 1. Locate the openings for the flap and aileron servos in the bottom of each wing panel. Trim out the covering and seal the edges using a sealing iron.



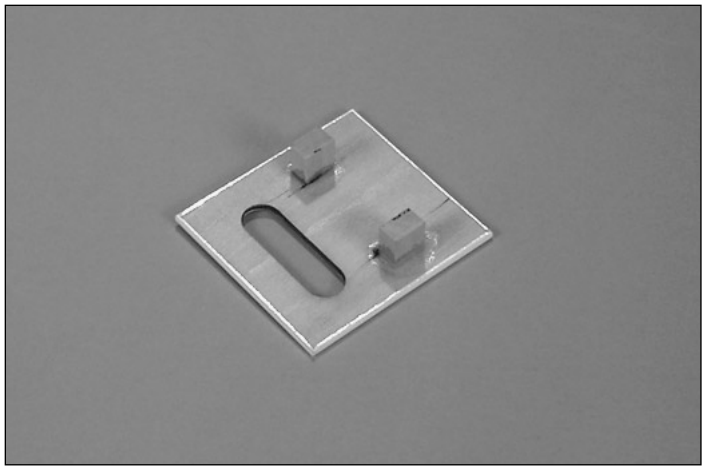
❑ 2. Locate the four servo hatch covers and trim out the servo arm openings. Seal the edges using a sealing iron.



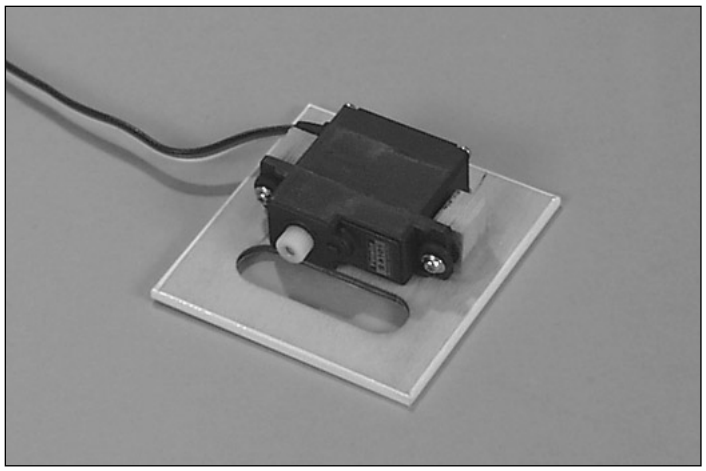




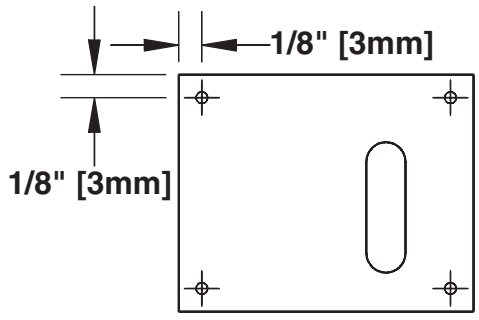
❑ 3. Trial fit your servos onto the covers and mark the locations of the servo blocks. Note the orientation of the servos and write the location of each servo on the cover. The flap servos should be oriented the same for both wing panels.



❏ ❏ 4. Using epoxy, glue the servo blocks to the hatch covers.



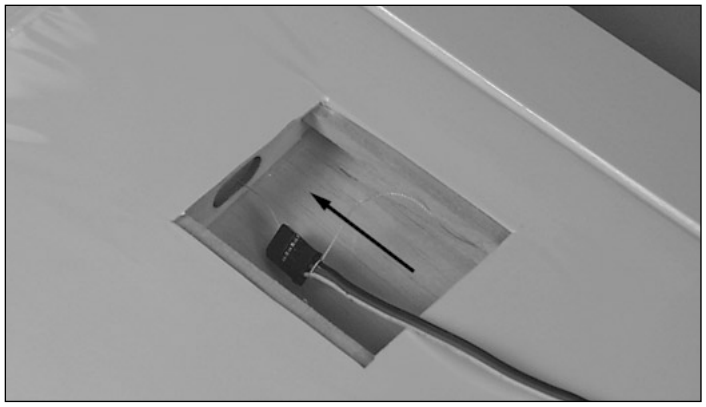
❏ ❏ 5. Attach the servos to the blocks using the hardware that comes with your radio system. **Hint:** Drill a 1/16" [1.5mm] pilot hole for the servo screws and strengthen the holes with a drop of thin CA.



❏ ❏ 6. Temporarily install the servos into the wing. Mark and drill a1/16" [1.5mm] pilot hole in the corners of the hatch covers.

❏ ❏ 7. Use thin CA to strengthen the holes in the wing.

❏ ❏ 8. Attach 24" [101mm] servo extensions to the aileron servos. ***Hint:*** *It is a good idea to tape (or shrink wrap) the connection since it will not be easily accessible in the future.*



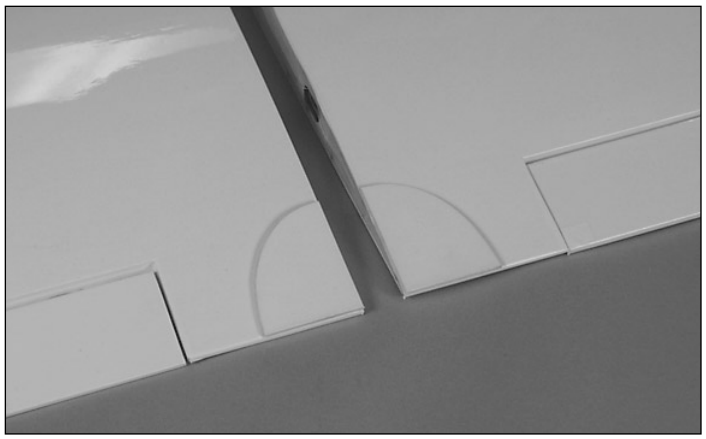
❏ ❏ 9. Tie the string to the extension and pull it through the wing.

❏ ❏ 10. Trim out the servo wire access hole on the bottom of the wing and route the wires through. ***Hint:*** *It's a good idea to label each of the servo wires.*

❏ 11. Repeat this procedure for the flap servo extension and then the two servos in the other wing panel.

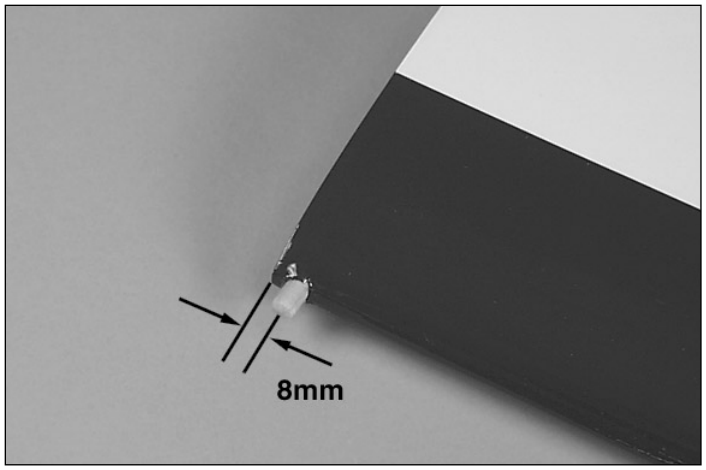
❏ 12. Temporarily, attach the hatch covers with the #2 x 3/8" self-tapping screws. We will do final servo adjustments and pushrod installation later.

Install the Wing Dowels and Bolt Plates



❏ 1. Glue the two precovered wing bolt plates to the top of the wing at the trailing edge. ***Hint:*** *Remove the covering underneath for a good glue bond.*

❏ 2. Round the front edge of the two 5mm dowels.

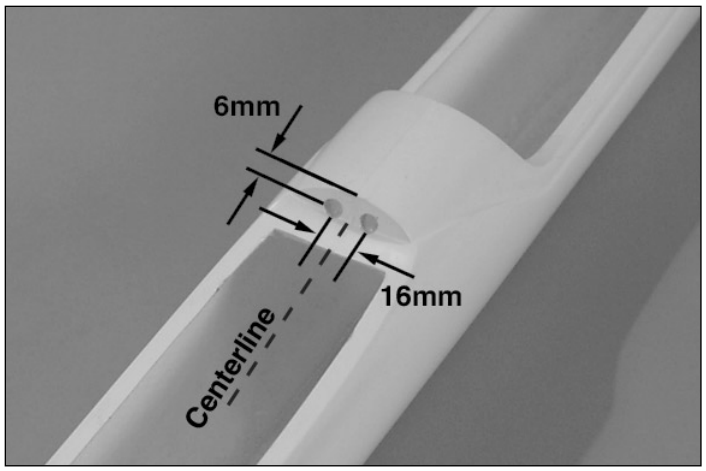


❏ 3. Trim off the covering that hides the dowel holes. Trial fit the two wing dowels into the wing panels.

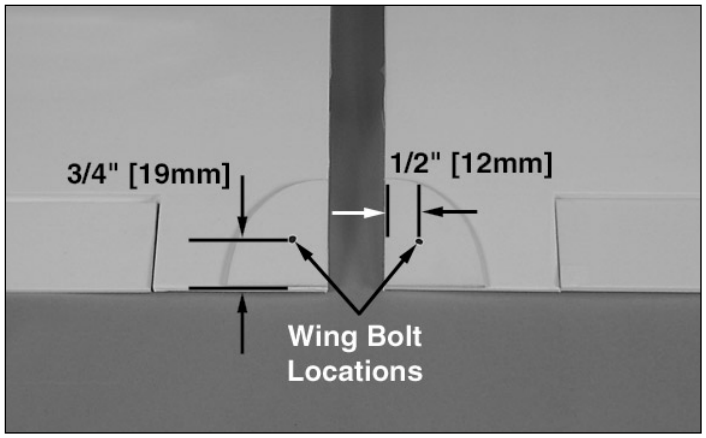
❏ 4. Using 30 minute epoxy, liberally coat the inside of the hole and wing dowel. Insert the dowel until only 3/8" [5mm] or so sticks out. ***IMPORTANT:*** *This is a very high stress area. Take your time to get a nice strong glue joint.* Wipe off the excess glue that squeezes out.

FUSELAGE ASSEMBLY

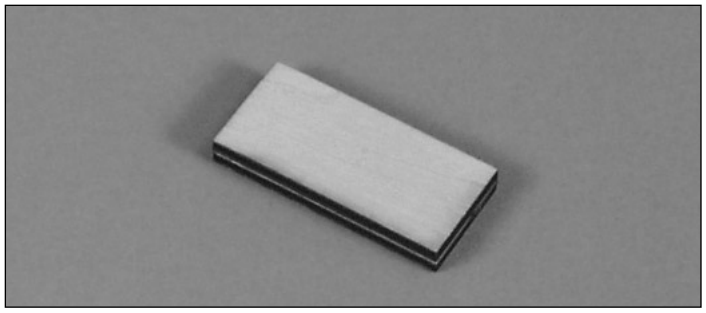
Mounting the Wing

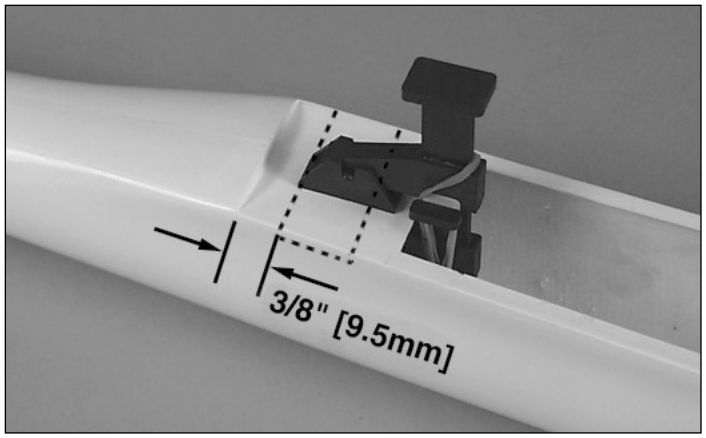


❏ 1. Carefully mark and drill two 3/16" [5mm] holes for the wing dowels where shown.

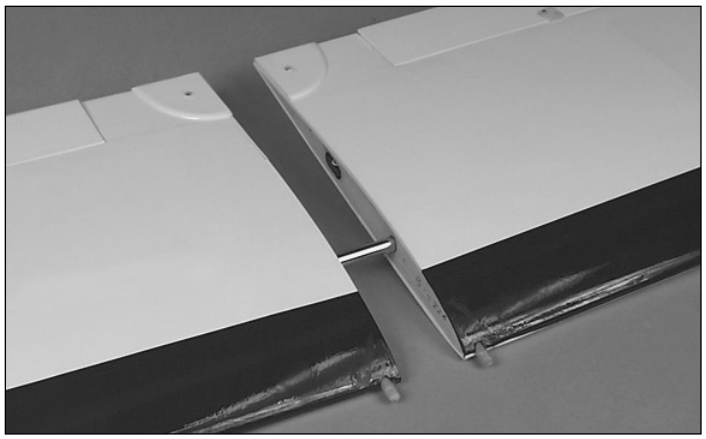


❏ 2. Mark wing bolt locations onto the wing as shown.

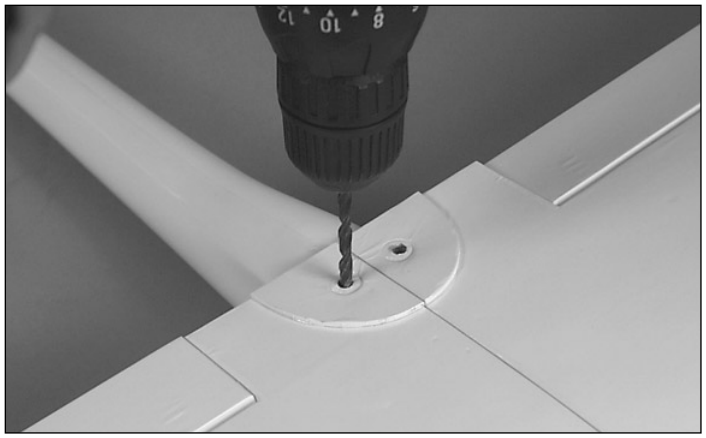




❏ 3. Using epoxy, glue the two 2.5 x 20 x 41mm plywood wing bolt plates together. After they are cured, glue them inside the fuselage where shown. Be sure to use plenty of glue to fill any unevenness inside the fuselage.

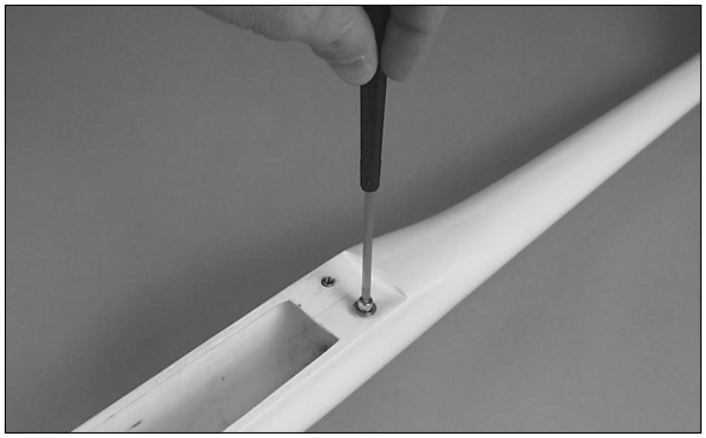


❏ 4. Slide the wing panels together using the 7mm wing joiner.



❑ 5. Install the wing onto the wing saddle. Line up the center line of the wing with the center line of the fuselage and drill a 5/32" [4mm] hole at the marks. Drill completely through the wing and wing bolt plates inside the fuselage.

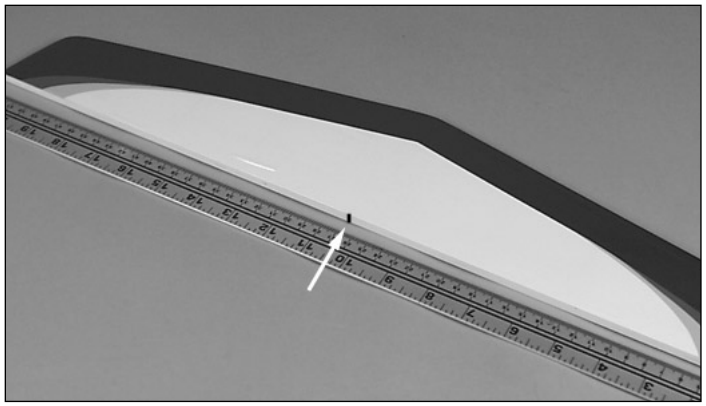
❑ 6. Remove the wing and enlarge the holes in the fuselage to 7/32" [5.5mm].



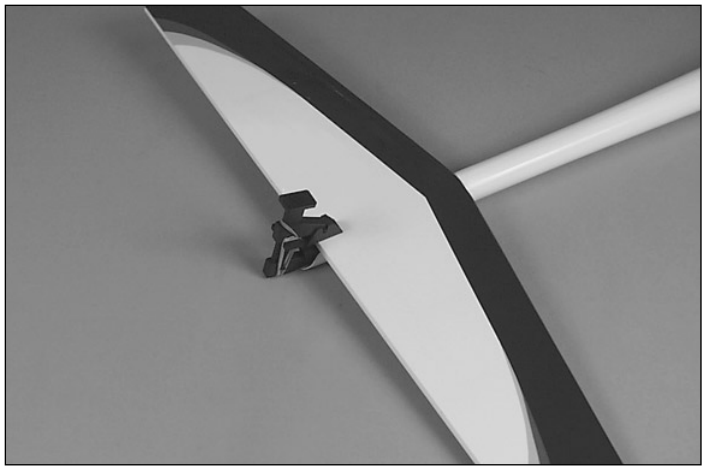
❑ 7. Install the two 8-32 blind nuts into the fuselage. Use the 8-32 Cap screw with a washer to “pull” them into the wood.

❑ 8. Trial fit the wing onto the saddle. Secure the wing in place using the two 8-32 Cap screws with washers.

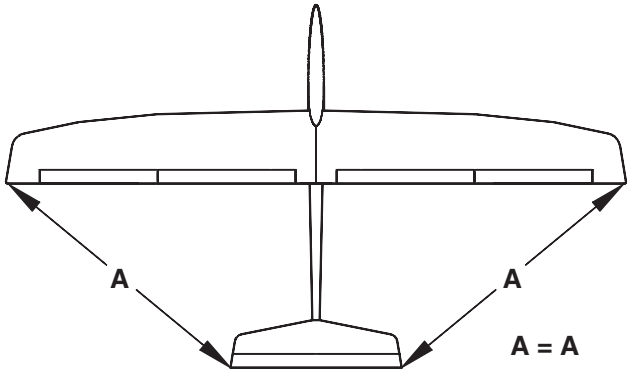
Install the Stabilizer (Stab)



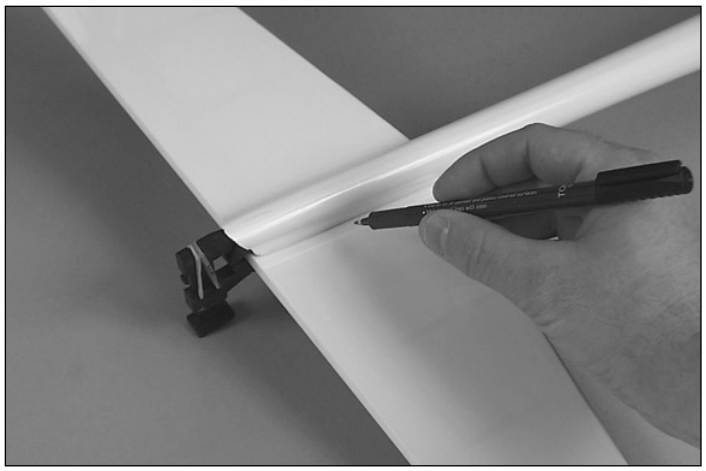
❑ 1. Measure and mark the center of the trailing edge of the stab.



❑ 2. Place the stab onto the mount and clamp the trailing edge so it is centered on the fuselage.



❑ 3. Measure from the wing tip to the stab tip on both sides. Being careful to keep the trailing edge centered, adjust the front of the stab left or right until properly aligned.



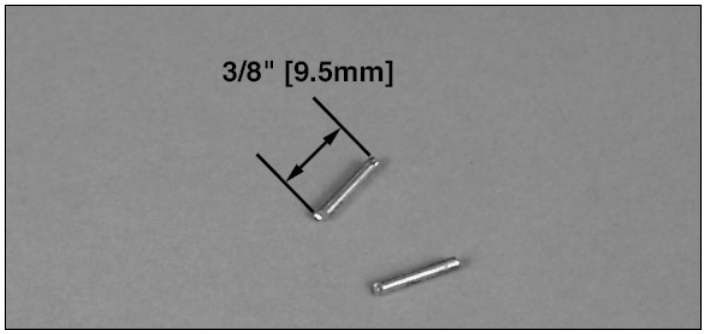
❑ 4. Mark the underside of the stab on each side of the stab saddle.

❑ 5. Remove the covering inside of the marks. **IMPORTANT!!! Do not cut into the wood or you will seriously weaken the structure.**

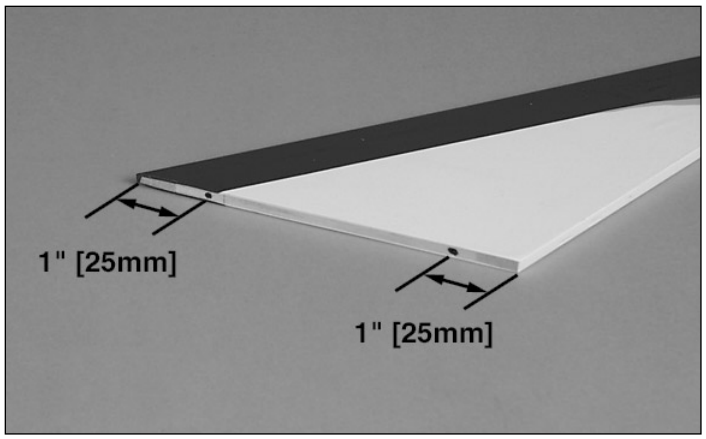
❑ 6. Using a sanding block, roughen up the stab saddle a little to provide a better gluing surface. Note: Don't worry if your stab is not parallel with the wing. We will address that later.

❑ 7. Using epoxy, glue the stab onto the stab saddle. Be sure to line it up with the marks you made earlier. Check and double check this alignment until the glue is completely cured.

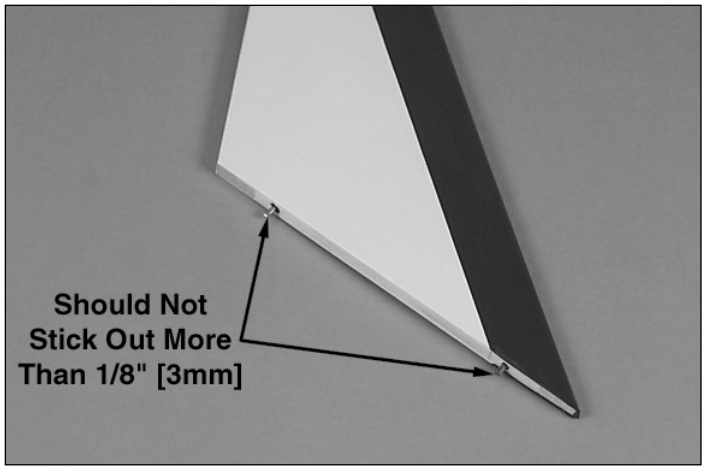
Install the Fin



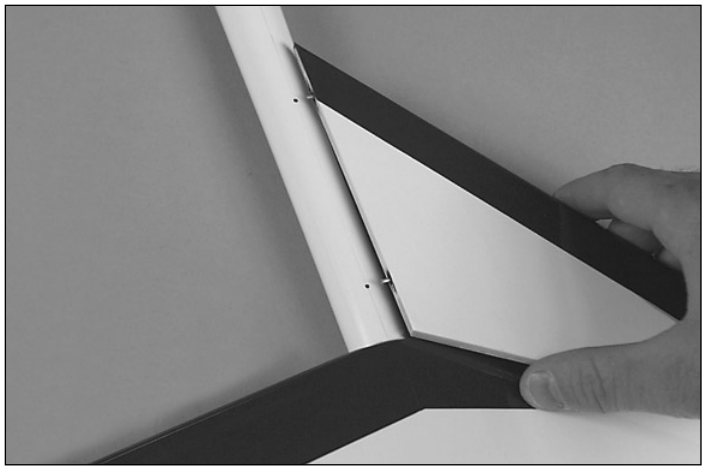
❑ 1. Cut a 3/8" [9.5mm] piece from the non-threaded end of each .074" x 36" wire pushrods. This will create two alignment pins for the fin.



❑ 2. Drill two 1/16" holes [1.5mm] into the bottom of the fin where shown. Make sure they are centered!!



❑ 3. Glue the alignment pins into the holes using thin CA so they stick out of the stab no more than 1/8" [3mm].

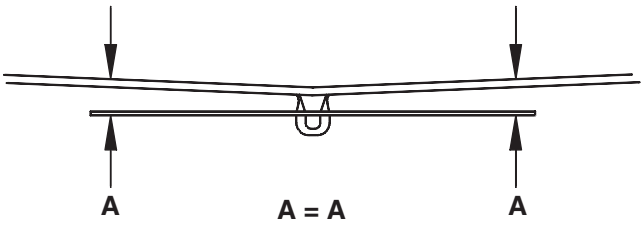


❑ 4. Hold the Fin next to the fuselage where shown and mark the pin locations on the center line of the fuselage.

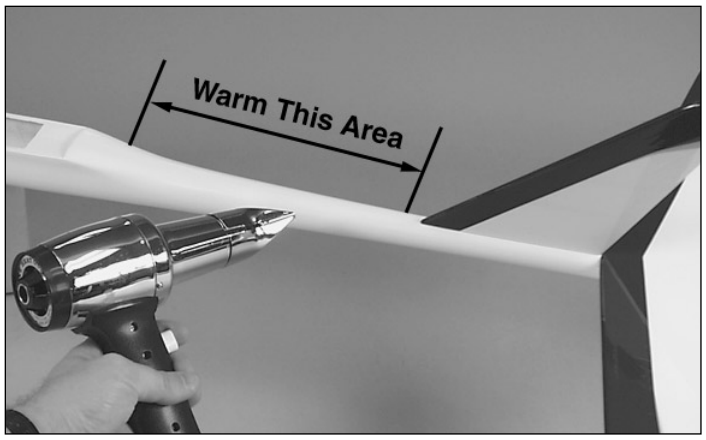
❑ 5. Drill 1/16" holes at the marks and trial fit the fin. Adjust the holes as needed to align the fin straight with the fuselage.

❑ 6. Glue the fin in place using epoxy. Use a triangle to make sure the fin is exactly perpendicular to the stab. Check and double check this until the epoxy is completely cured.

Align the Tail



❏ 1. Site the aircraft from behind. The stab should be parallel to the wing. If not, use a heat gun on the fuselage between the stab and wing to soften the fiberglass (see photo below). **IMPORTANT!! If you get the surface too hot, you will distort the fiberglass.**



❏ 2. Once the fuselage is hot, twist and hold it straight until it is completely cool.

❏ 3. Repeat this until the stab is parallel to the wing.

Install the Elevator and Rudder

❏ 1. Install four of the CA hinges (cut out earlier) into the Elevator and install the elevator onto the stab.

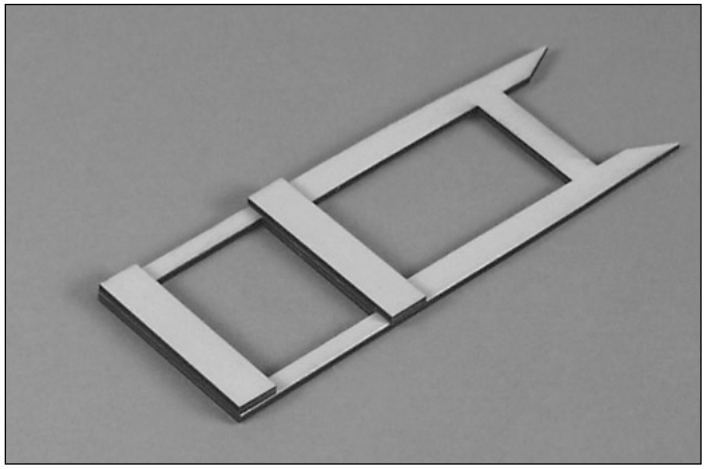
❏ 2. Deflect the elevator completely one direction and place three to four drops of thin CA onto each hinge (not too much or it will run down the hinge line).

❏ 3. Flip the stab over and glue the other side in the same manner.

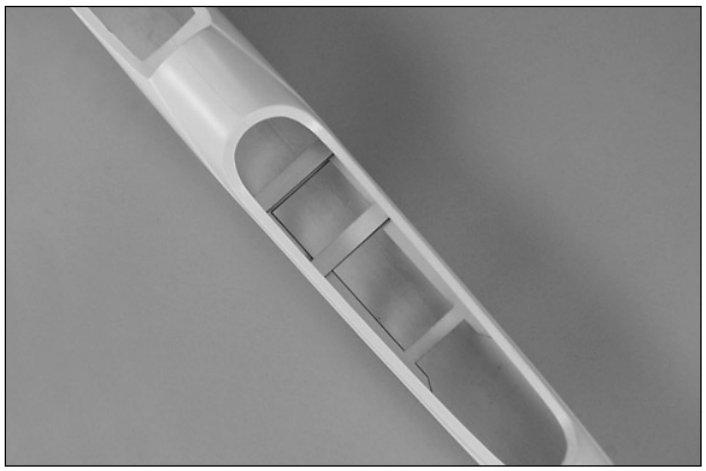
❏ 4. Install two of the CA hinges in the rudder and install onto the fin.

❏ 5. Glue the rudder hinges using the same technique as the elevators.

Install the Elevator and Rudder Servos

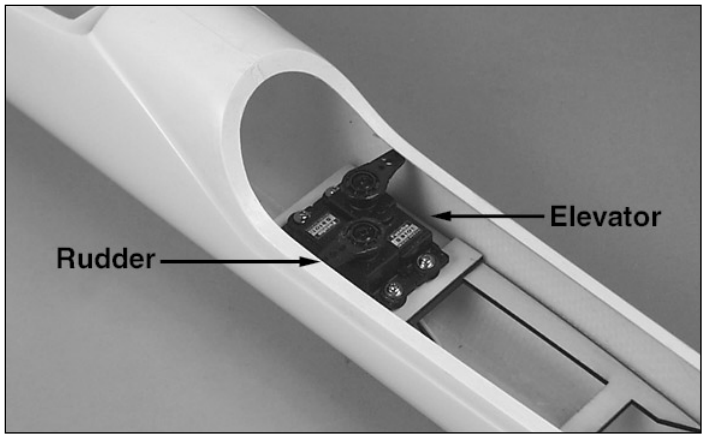


❏ 1. Glue the plywood servo tray doublers to the plywood servo tray using CA.



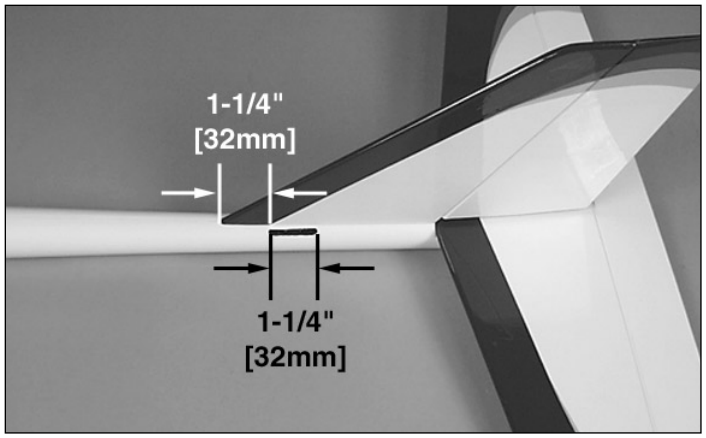
❏ 2. Trial fit the servo tray where shown. You may need to sand the edges slightly for the best fit. ***NOTE:*** *If you are using tall servos, you should install the servo tray with the doublers up to provide a little more clearance.*

❏ 3. Glue the tray in place using epoxy. **Note:** Rough up the fiberglass with sandpaper and clean with isopropyl alcohol for a good glue bond.



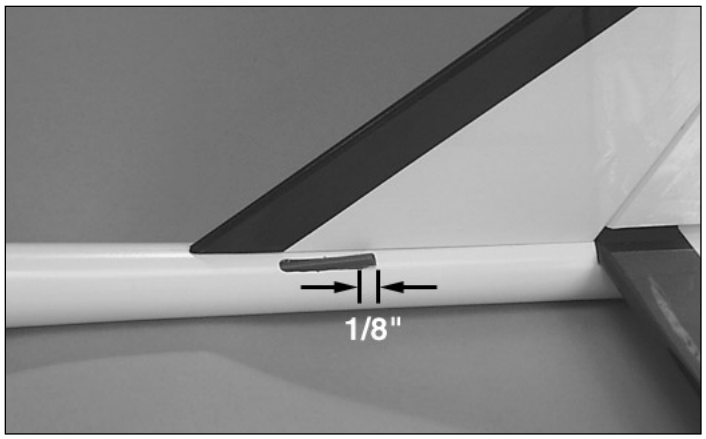
❑ 4. Install the elevator and rudder servos. Make sure they are oriented as shown. Route the servo leads to the front of the plane.

Install the Elevator and Rudder Pushrods



❑ 1. Carefully cut a slot on the left hand side of the fin. This is for the rudder pushrod. A rotary tool is perfect for this job. If you don't have one, drill several small holes and use your hobby knife to finish the shape.

❑ 2. Cut the pushrod guide tubes so one is 22" [559mm] and the other 28" [711mm].

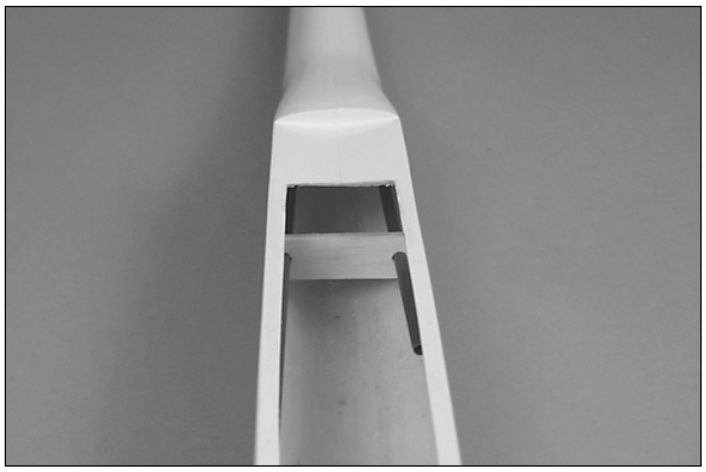


❑ 3. Route the shorter guide tube through the fuselage starting from the slot you cut next to the fin. Position the tube so it only protrudes 1/8" [3mm] past the slot.

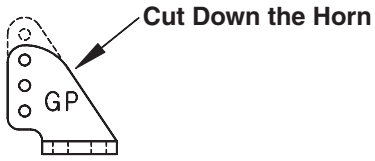
❑ 4. Roughen the end of the tube an inch or so [25mm] with sandpaper. (This will provide a better gluing surface).

❑ 5. Use epoxy to glue the tube to the fuselage at the slot.

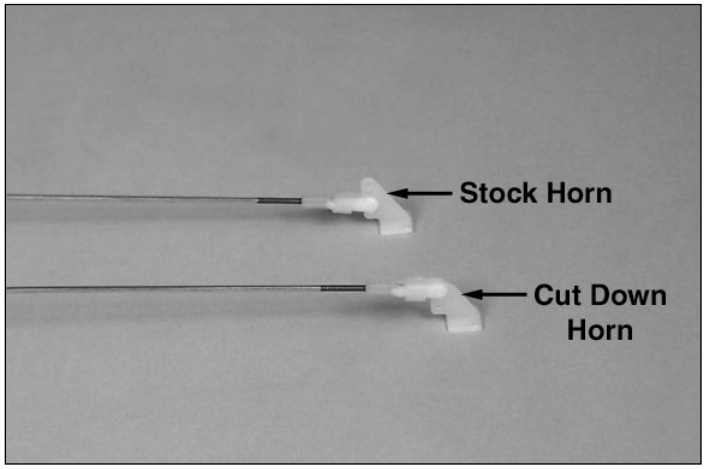
❑ 6. Route the 28" elevator pushrod guide tube into the fuselage.



❑ 7. Slide the plywood support over the guide tubes and position it where shown. Do not glue this yet.

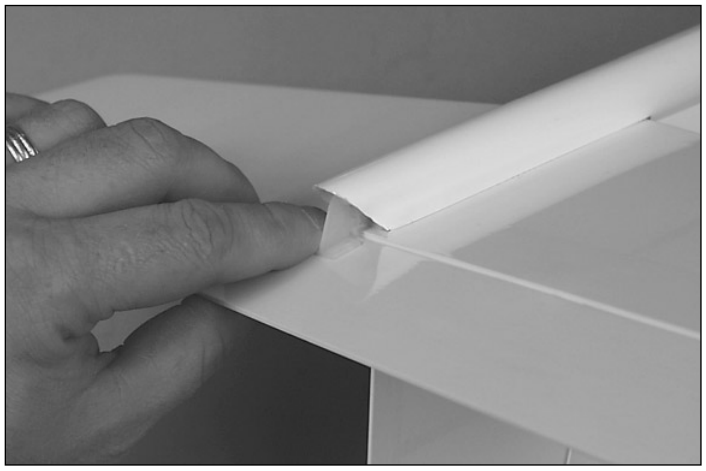


❑ 8. Modify one of the control horns for the elevator as shown. It will need to be short enough so that it can go inside the tail of the fuselage.

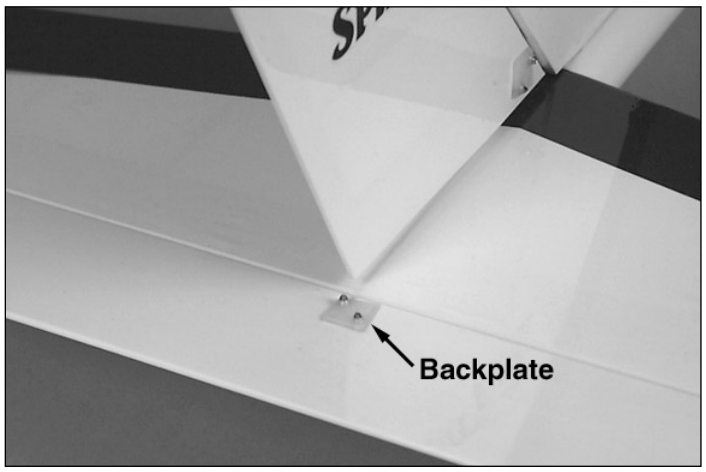


❑ 9. Attach a clevis with retainer onto each of the wire pushrods. Connect one to the modified control horn and the other to a stock control horn as shown.

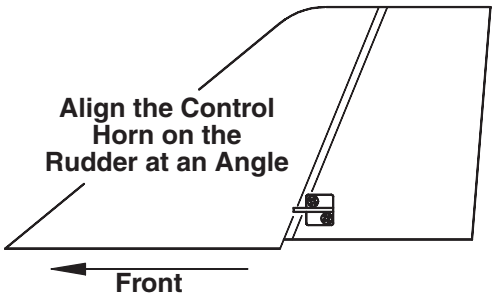
❏ 10. Insert the elevator pushrod (the one with the modified horn) through the back of the fuselage, into the guide tube and to the elevator servo.



❏ 11. Position the control horn so the clevis holes are centered over the hinge line. Mark the two mounting holes onto the elevator. Drill two 1/16" [1.5mm] holes at the marks. Hint: To strengthen the holes, place one small drop of CA into each hole and redrill.

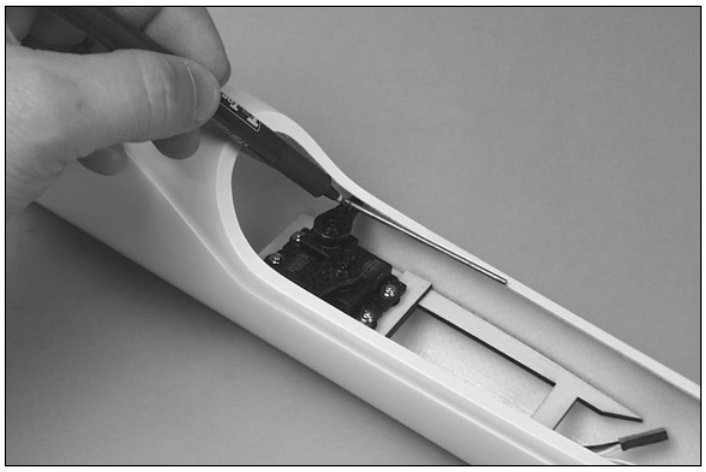


❏ 12. Attach the control horn to the elevator and rudder using two 2-56 x 3/8" [9mm] screws along with the backplate.

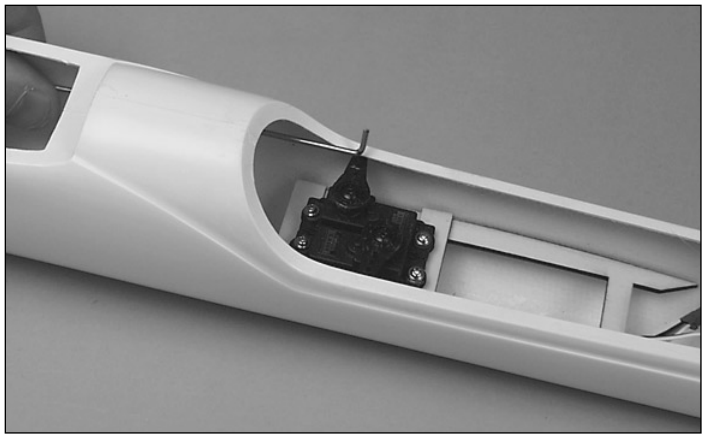


❏ 13. Install the rudder pushrod.

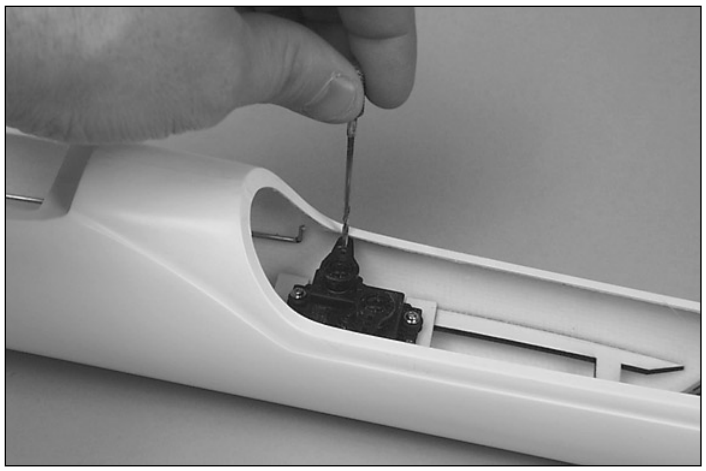
❏ 14. Temporarily, plug the elevator and rudder servos into the receiver and turn on the transmitter and receiver. Center the sticks and the trims.



❏ 15. With the elevator held at center, mark the pushrod where it crosses the servo arm.



❑ 16. Bend the pushrod up 90° at the mark. Cut off the excess pushrod 1/4" [6mm] from the bend.



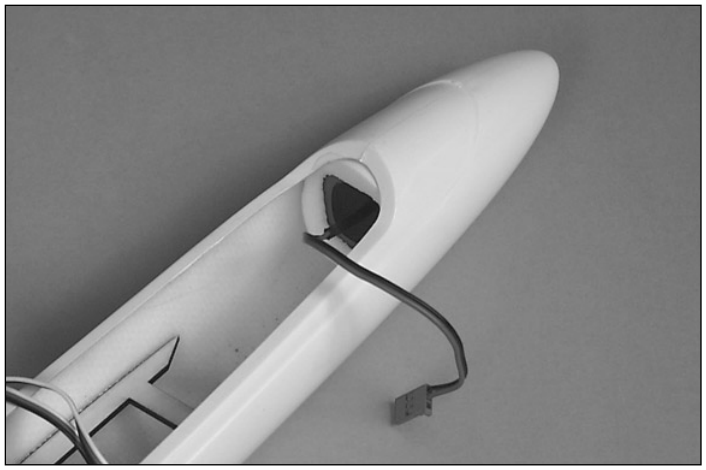
❑ 17. Enlarge the holes in the servo arm with a 5/64" [2mm] (or a #48 drill bit).

❑ 18. Attach the pushrod to the servo using a Faslink connector.

❑ 19. Repeat this procedure for connecting the rudder pushrod.

❑ 20. Adjust the location of the plywood pushrod tube support so the pushrods are as straight as possible. Also, position the elevator guide tube so it is approximately 1" [25mm] from the back of the fuselage. Glue the guide tubes to the support and the support to the fuselage using epoxy. ***Hint:*** *Roughen the guide tubes and fuse sides to help the glue stick better.*

Install the Receiver and Battery



❑ 1. Wrap the receiver battery with 1/4" foam rubber and install it as far forward in the nose as possible.

❑ 2. Extend the antenna and route through the inside of the fuselage towards the tail. Try to keep it as straight as possible.

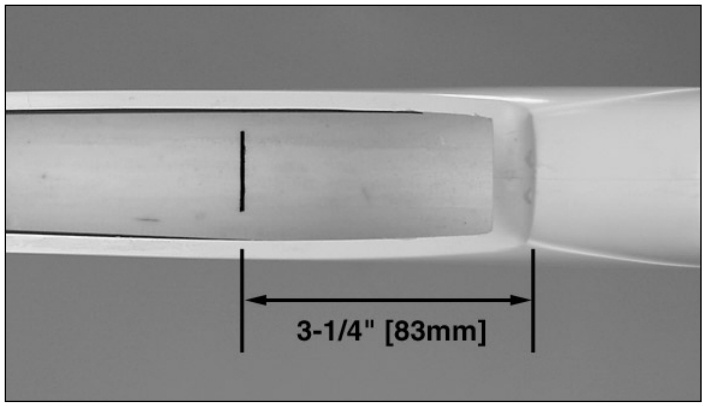
❑ 3. Wrap the receiver in 1/4" foam rubber and position behind the battery. Route the servo extension wires under the servos to the wing saddle area.

❑ 4. Install the switch in front of the servos on the tray. Use a scrap piece of light ply to make a mount that fits your particular switch.

❑ 5. Hook up all the servos to your receiver. Connect a "Y" harness for the flaps and two 12" [305mm] extensions for the ailerons to the receiver. ***NOTE:*** *Consult your radio's instruction manual for proper connection.*

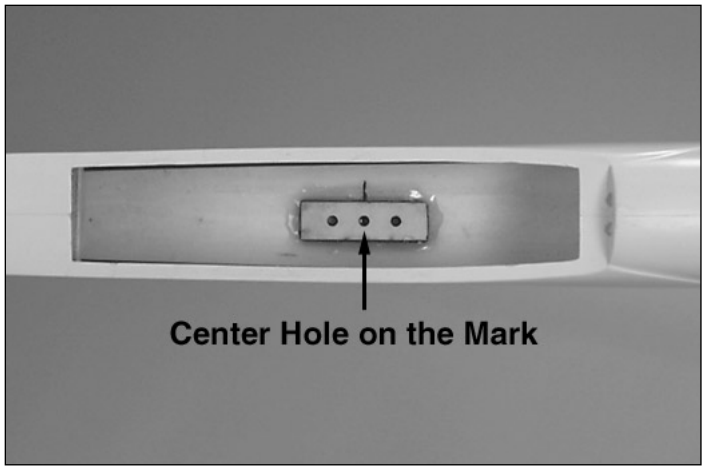
FINAL ASSEMBLY

Install the Tow Hook



❑ 1. The tow hook has three different mounting locations. Mark the inside of the fuselage 3-1/4" [83mm] back from the leading edge of the wing saddle.

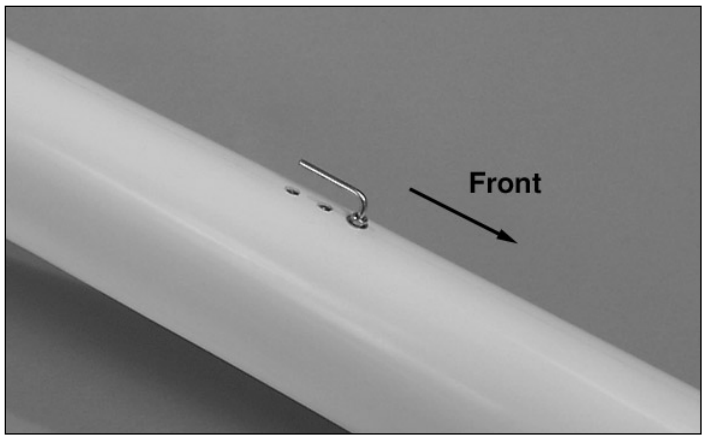
❑ 2. Epoxy the two plywood tow hook plates together.



❏ 3. Epoxy the plywood tow hook plates into the fuselage so the middle hole of the plate lines up with the mark you made. Use plenty of epoxy here due to the high stress induced by a Hi-start or winch.

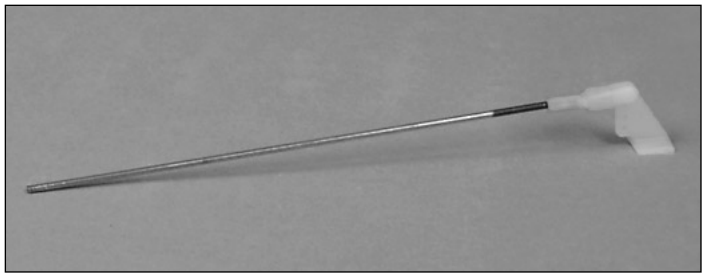
❏ 4. Drill out the three holes using a 5/32" [4mm] drill bit. Drill completely through the bottom of the fuselage. Be careful not to drill into your table.

❏ 5. Gently tap the three 4-40 blind nuts into the holes. Place a couple of drops of CA around the blind nut flanges to hold them in place. Do not get glue on the threads.



❏ 6. Install the 4-40 hex nut onto the tow hook followed by the #4 flat washer. Install the tow hook into the front hole and tighten. This is the preferred location for your initial flights.

Hook Up the Wing Servos

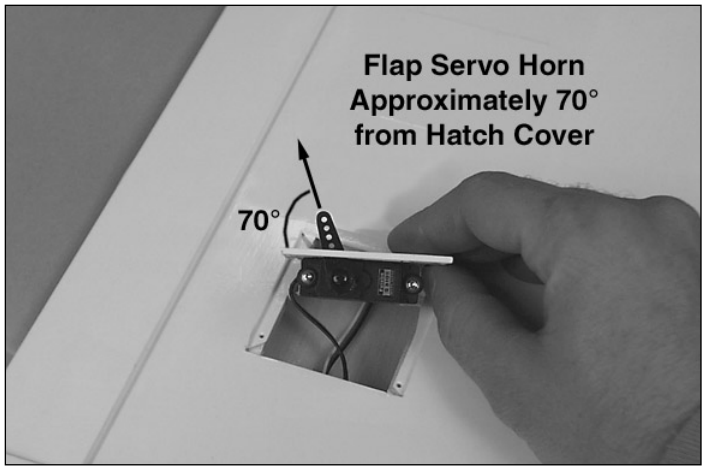


❏ 1. Attach four clevises with retainers onto the 4 short wire pushrods. Attach them to the four remaining control horns as shown.

❏ 2. Plug the ailerons into the extensions and the flaps into the “Y” harness.

❏ 3. Remove the wing servo hatch covers and remove the servo arms from the four servos.

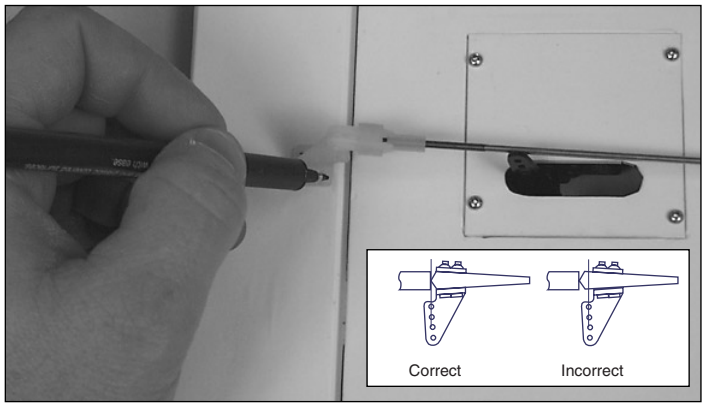
❏ 4. Turn on your radio system and center the servos. Make sure the trims are centered as well. The flaps should be connected to your throttle channel. With the stick full up, the flaps should be even with the bottom of the wing.



❏ 5. Attach a servo arm to the four servos as shown. **NOTE:** The flap servo arm will be offset differently than the ailerons. Be sure to install the servo arm screws.

❏ 6. Enlarge the holes in the servo arm with a 5/64" [2mm] (or a #48) drill bit.

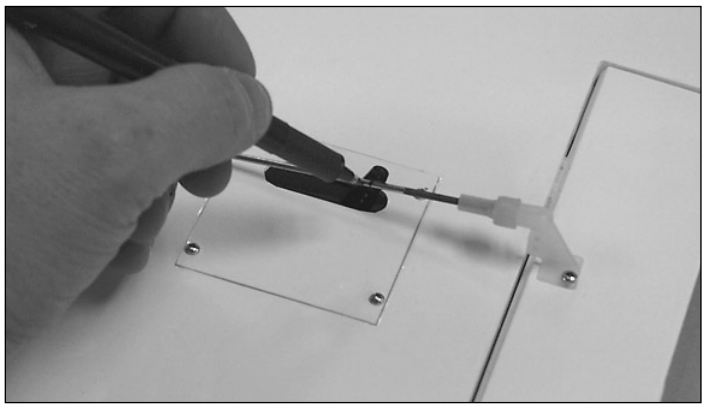
❏ 7. Attach the hatch covers using four #2 x 3/8" [6mm] screws.



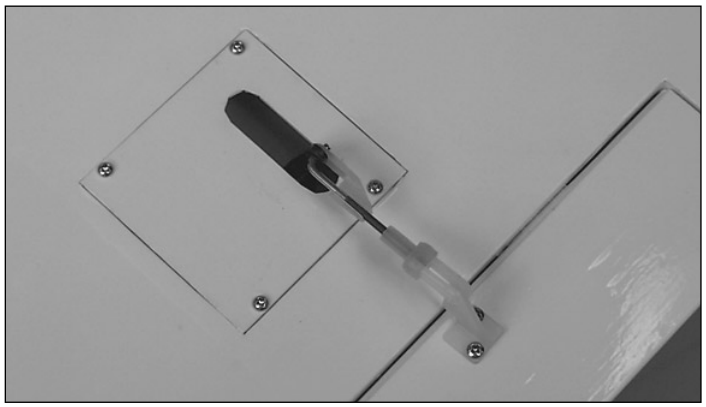
❏ 8. Position the control horns on each surface so the clevis holes are lined up over the hinge line.

❏ 9. Mark the control horn mounting holes and drill 1/16" [1.5mm] holes. Place one **small** drop of thin CA into each hole to add strength. Redrill if needed.

❏ 10. Connect the control horns to the surfaces using 2-56 x 5/8" [16mm] screws with the backplates.

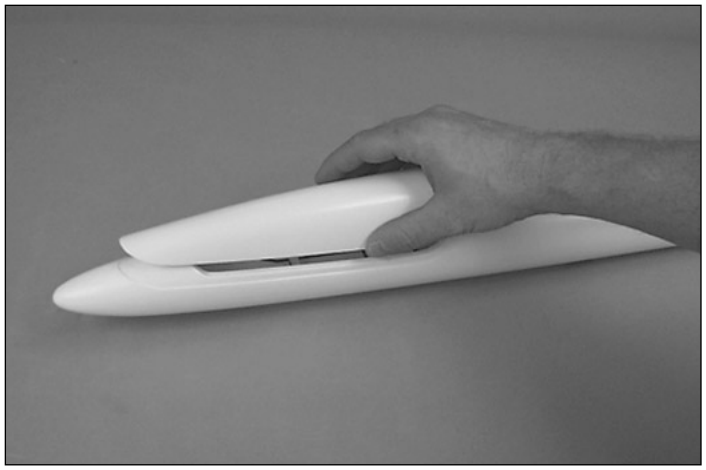


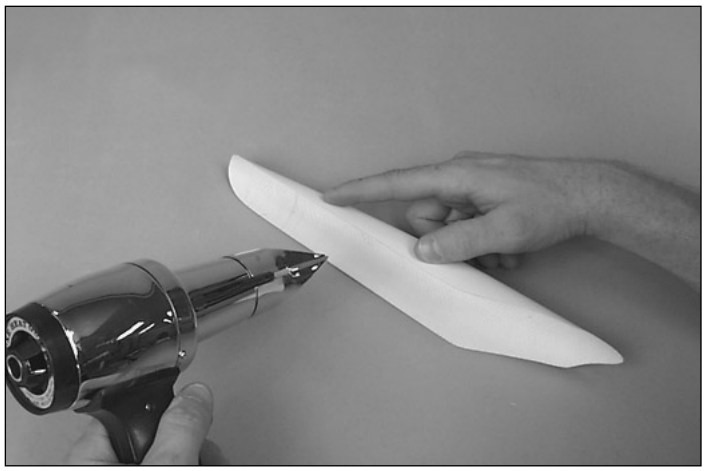
❏ 11. While holding the surfaces at neutral, mark the pushrod wire where it intersects the servo arm.



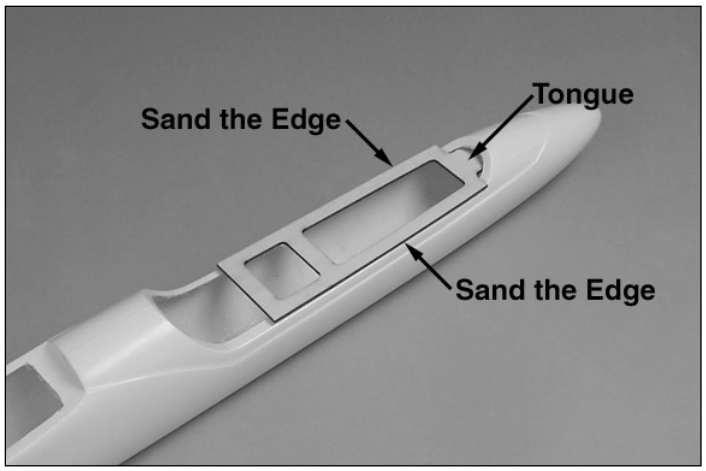
❏ 12. Make a 90° bend at the mark and insert into the arm. Cut off the excess wire, leaving only 1/4" [6mm] after the bend. Secure with a Faslink connector.

Attach the Canopy





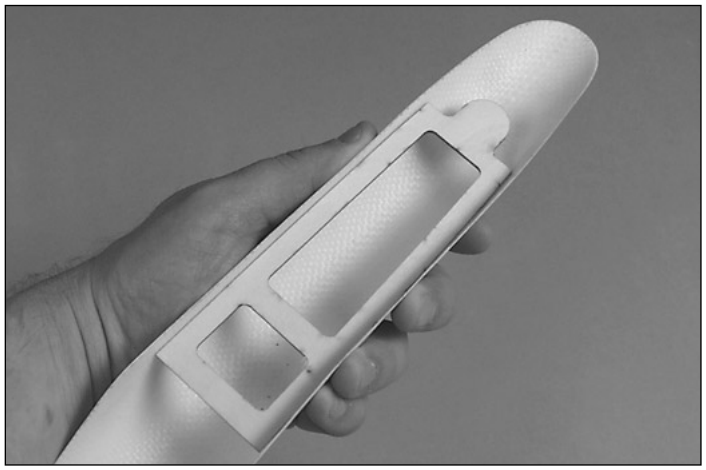
❏ 1. Trial fit the canopy onto the fuselage. If the canopy does not fit snugly, use a heat gun to warm it up slightly and squeeze the sides closer together. Hold until completely cool. Repeat until the canopy fits perfectly. You may need to sand the edges slightly so it aligns perfectly with the canopy outlines on the fuselage.



❏ 2. Position the plywood canopy frame on the fuselage. If needed, carefully sand the “tongue” portion of the frame for a snug fit under the front edge of the canopy. Also, sand the edges of the canopy frame so the canopy will sit in place without getting pushed out of shape. Be patient here to get a nice fit.

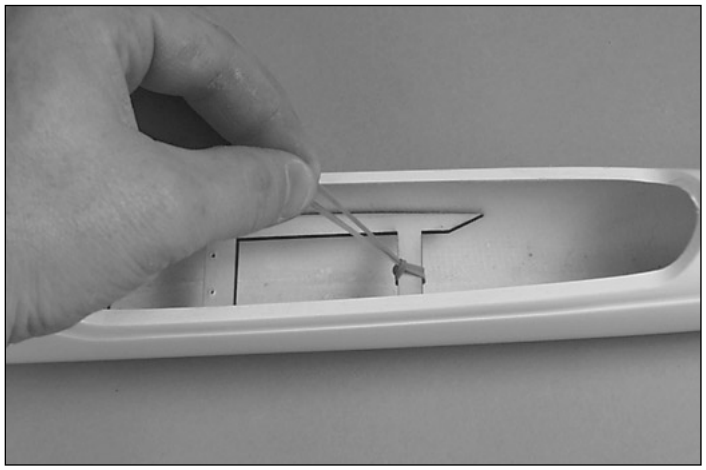
❏ 3. Using sandpaper, rough up the inside of the canopy where the canopy frame will be glued. Clean with isopropyl alcohol.

❏ 4. Place the canopy in position on the fuselage. Carefully grip the sides and remove the canopy WITH the plywood frame. Practice this several times until you are confident you can pick up the assembly without it moving.

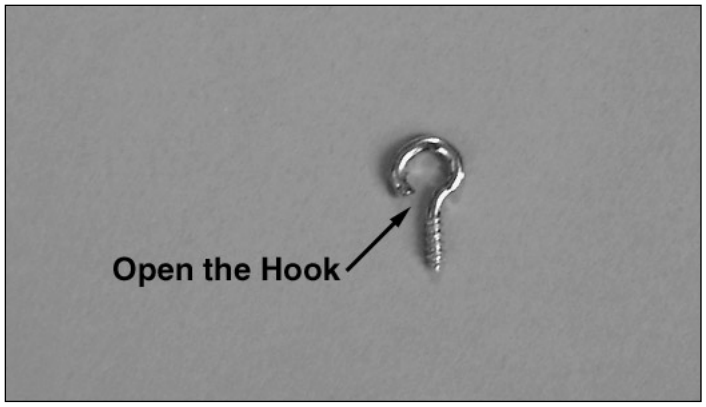


❏ 5. Being careful not to move the canopy frame, tack glue the frame to the canopy with thin or medium CA. Recheck the fit onto the fuselage. Adjust its position as needed for a good fit.

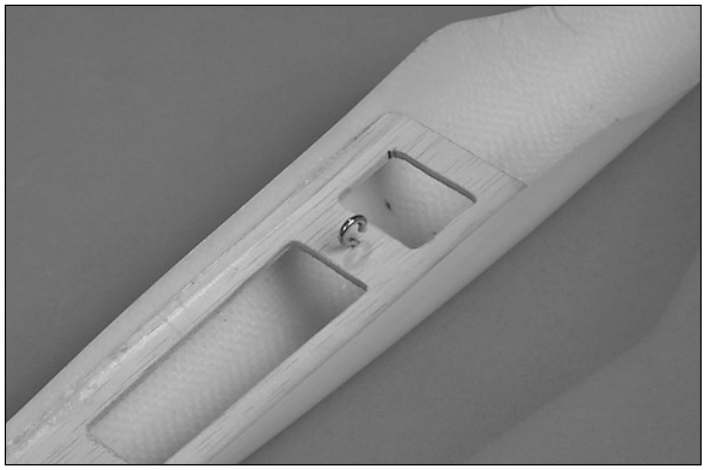
❏ 6. Once satisfied with the fit, use epoxy to glue the frame to the canopy.



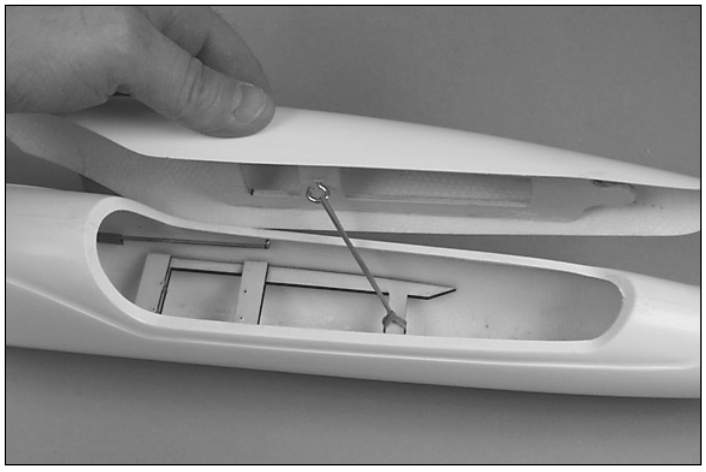
❏ 7. Attach a small rubber band around the servo tray frame as shown.



❏ 8. Use pliers to bend the eyelet as shown.



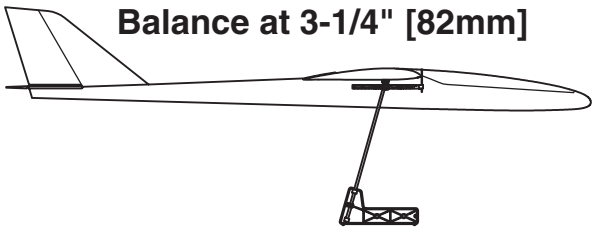
❏ 9. Attach the eyelet to the canopy frame. Make sure the opening of the eyelet faces the back. Use a drop or two of thin CA to secure the threads.



❏ 10. Connect the rubber band to the eyelet. This will hold the canopy in place. Use a second rubber band if you need the canopy held on tighter.

Congratulations!!! Your plane is built. Now proceed through the next VERY IMPORTANT section about balancing and setting up your radio.

BALANCE THE MODEL



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

❑ 1. The balance point **(Center of Gravity)** is **3-1/4" [82mm]** from the leading edge of the wing. This is the balance point at which your model should balance for your first flights. Later, you may wish to shift the balance up to **1/2" [13mm] behind** this point to change the flying characteristics. Moving the CG forward will add stability but it will **decrease** the overall performance of the sailplane. Moving the balance back makes the model more agile with a lighter and snappier "feel" and **improves** the sailplane's response to air currents. However, it will also make the model **less stable** and can cause the sailplane to "tuck under" or dive when its flying speed increases.

❑ 2. With the wing attached to the fuse and all parts of the model installed (ready to fly), lift the model by picking it up with your fingertips at the C.G. If the tail drops when you lift, the model is "tail heavy" and you must add weight to the nose to balance. If the nose drops, it is "nose heavy" and you must add weight to the tail to balance. The model should hang with a slight nose down attitude. Add BB's or lead to the nose.

BALANCE THE MODEL LATERALLY

❑ 1. With the wing level, have an assistant help you lift the model by the nose and the bottom of the fuse at the tail. 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.**

CONTROL SURFACE THROWS

These are the recommend control surface throws:

ELEVATOR:	1/2" [13mm] up 1/2" [13mm] down
RUDDER:	2" [50mm] right 2" [50mm] left
AILERONS:	3/4" [19mm] up 3/8" [9.5mm] down
FLAPS:	1-3/8" [35mm] down

TOW HOOK LOCATION

The tow hook should be in the front hole for the first flights. After the first flights the tow hook can be moved back to the middle hole for most flying conditions. For contest flying you may want to try the rear hole as it can help achieve a higher launch. But be careful as the sailplane will be less stable and more apt to "pop off" the line.

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.

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.

NOTE: Checking the condition of your receiver battery pack is **highly recommended**. All battery packs, whether it's a trusty pack you've just taken out of another model, or a new battery pack you just purchased, should be cycled, noting the discharge capacity. Oftentimes, a weak battery pack can be identified (and a valuable model saved!) by comparing its actual capacity to its rated capacity. Refer to the instructions and recommendations that come with your cycler. If you don't own a battery cycler, perhaps you can have a friend cycle your pack and note the capacity for you.

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 (consult your radio's instructions for the exact distance required) from the model and still have control. 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 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 (EXCERPT)

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

General

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

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

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

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

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

Radio Control

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

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

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

CHECKLIST

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 checklist 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 as off they are completed (that's why it's called a *check list!*).

❏ 1. Check the C.G. according to the measurements provided in this manual.

❏ 2. Be certain the battery and receiver are securely mounted in the fuse.

❏ 3. Extend your receiver antenna inside the fuselage.

❏ 4. Balance your model *laterally* as explained in the instructions.

❏ 5. Make sure all hinges are **securely** glued in place.

❏ 6. Reinforce holes for wood screws with thin CA where appropriate (servo mounting screws, control horns, etc.).

❏ 7. Confirm that all controls operate in the correct direction and the throws are set up according to the manual.

❏ 8. Make sure there are silicone retainers on all the clevises and 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. Make sure all servo extensions you may have used do not interfere with other systems (servo arms, pushrods, etc.).

❏ 11. Use an incidence meter to check the wing for twists and attempt to correct before flying.

❏ 12. Place your name, address, AMA number and telephone number on or inside your model.

❏ 13. Cycle your receiver battery pack (if necessary) and make sure it is fully charged.

❏ 14. If you wish to photograph your model, do so before your first flight.

❏ 15. 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.

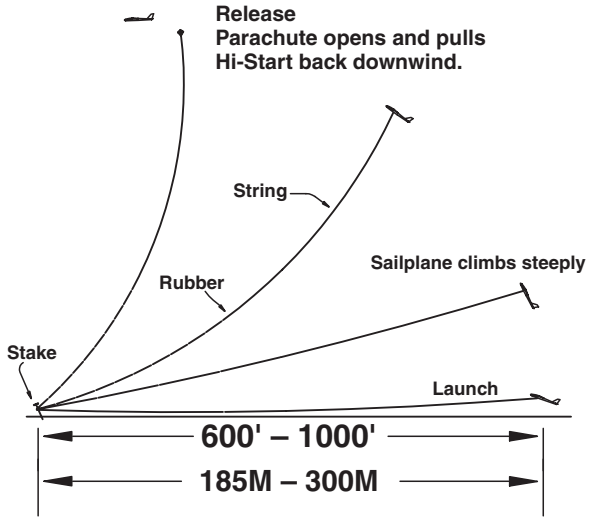
Hold the SPIRIT ELITE ARF under the wing with the nose pointed slightly down and directly into the wind. Launch the model with the wings level and the nose pointing at a spot on the ground about 50 feet in front of you. If the sailplane is launched with the nose up or launched too hard it will climb 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 ELITE 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.

TYPICAL HI-START LAUNCH



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 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.

First Flights

Use these flights to get the "feel" of the controls and the SPIRIT ELITE 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 ELITE 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 Elite 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.

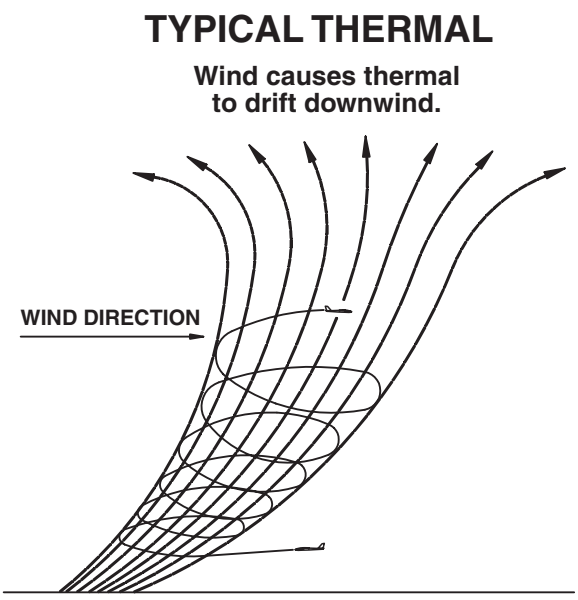
Aileron/Rudder Coupling - This is used to allow the sailplane to make efficient, non-slipping, non-skidding turns. You will need to experiment to find the proper amount of throw required to do this but 1" [25mm] of rudder throw at full aileron is probably a good place to start.

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!!

BUILDING NOTES

Kit Purchased Date: _____

Where Purchased:_____

Date Construction Started: _____

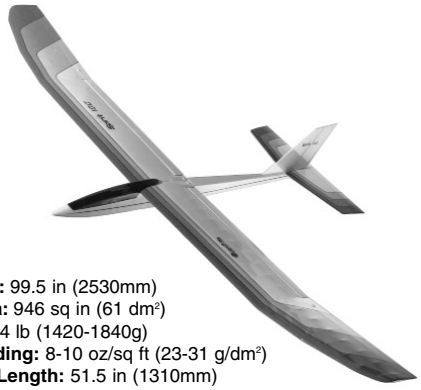
Date Construction Finished: _____

Finished Weight: _____

Date of First Flight: _____

FLIGHT LOG

OTHER ITEMS AVAILABLE FROM GREAT PLANES



Wingspan: 99.5 in (2530mm)
Wing Area: 946 sq in (61 dm²)
Weight: 3-4 lb (1420-1840g)
Wing Loading: 8-10 oz/sq ft (23-31 g/dm²)
Fuselage Length: 51.5 in (1310mm)
Requires: 2-4 channel radio with 2-5 servos (advanced wing option requires micro servos) & 2+ rolls MonoKote

Great Planes® Spirit 100™ (GPMA0550)

• Huge, 100” wingspan for extra-smooth flight!

Build the Spirit 100 kit with either of TWO wings: a sport wing with the same S-3010 airfoil as the original Spirit...or a larger wing (with highly efficient Selig 7037 airfoil, plus ailerons and flaps) that can use crow type mixing for pinpoint landings and offers complete camber-changing capability for outstanding thermal performance. Interlocking construction and step-by-step, photo-illustrated instructions make it beginner easy to build.

Futaba® 9C 9-Channel Radio Systems

The 9C radios include such popular Futaba system features as governor mixing (a Futaba exclusive), switch assignability, factory programming for airplanes, helis and sailplanes, Mode 1-4 selection and expandable CAMPac model memory...PLUS 8-character model naming, improved graphics displays, 2 slider switches, a larger LCD – and Futaba's most user-friendly programming ever! The top left button pulls up the home page, basic and expanded menus; the bottom button finalizes settings. Right buttons move the cursor up and down to the values you want...and the dial does the rest. Rotate the dial to find functions; press to select. Your choices appear on the LCD. 600mAh Tx and Rx NiCds add value. 1-year warranty.

Stock #:	**FUTJ85****	**FUTJ87****
Tx:	9C	9C
Rx:	R148DF	R149DP
Servos:	(4) S3004	(4) S3001
Tx NiCd:	600mAh	600mAh
Rx NiCd:	600mAh	600mAh
Band:	50, 72	50, 72
Modulation:	FM	PCM

Hobbico® Accu-Cycle™ Plus (HCAP0270) Pro Series™ Charger - Conditioner - Analyzer for Radio Batteries

Accu-Cycle Plus fast-peaks NiCds in 45 minutes or less. Rx and Tx packs can be discharged and peaked at separate rates (250/750 mA discharge; 500/1000 mA peak charge). LCDs show mAh capacity, discharge or peak-charge time, or pack voltage. Accu-Cycle Plus can also put packs through 3 deep conditioning cycles automatically, just by touching a button. Handles 1-, 4-, and 5-cell Rx and 6-, 7- and 8 cell Tx packs. Other conveniences include: easy switch setup; push-button start, status LEDs, color coded jacks, automatic trickle charge and a 2-year warranty.

***NOTE:** Most modern transmitters feature diode protection, which prevents NiCds from being discharged through radio circuitry. To be discharged, NiCds must be connected directly to Accu-Cycle.

DynaFlite™ Heavy-Duty Hi-Start DYFP8302

• Compact power for high-altitude launches.
• Complete system unlimited class sailplanes.

A Dynaflite Hi-Start and 800' of clear launch area are all you need to send your sailplane rocketing up to 500' in the air! Easy to lay out and retrieve, Hi-Starts include everything required for sailplane launches: 100' of UV-stabilized surgical tubing, injection-molded reel, parachute, steel stake and tow ring, and nylon tow line. Heavy-Duty Hi-Start with 3/16” diameter tubing provides the launch power needed for sailplanes spanning 100" or more.