Spirit™

Almost Ready-To-Fly 2-Meter Sailpane

INSTRUCTION MANUAL

Wing Span - 78.5 in
Wing Area - 676 sq in
Weight - 2 lbs
Wing Loading - 7 oz/sq ft
Fuse Length - 39 in

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.

While this kit has been flight tested to exceed normal use, if the plane will be used for extremely high stress flying, the modeler is responsible for taking steps to reinforce the high stress points.

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

P.O. Box 788 Urbana, IL 61803 (217) 398-8970

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GPMZ0225 for GPMA1045 V1.0

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PROTECT YOUR MODEL, YOURSELF & OTHERS...FOLLOW THIS IMPORTANT SAFETY PRECAUTION

Your Spirit ARF is not a toy, but rather a sophisticated, working model that functions very much like a full-size sailplane. Because of its realistic performance, the Spirit ARF, if not assembled and operated correctly, could possibly cause injury to yourself or spectators and damage property.

We recommend you get experienced, knowledgeable help from an instructor with assembly and during your first flights. You'll learn faster and avoid risking your model before you're ready to solo. Your local hobby shop has information about flying clubs in your area whose membership includes qualified instructors.

You can also contact the national Academy of Model Aeronautics (AMA), which has more than 2,500 chartered clubs across the country. Through any one of them, instructor training programs and insured newcomer training are available. 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*

INTRODUCTION

The **Spirit ARF** is a very stable and predictable aircraft, allowing pilots of differing skill levels to enjoy it.

The **Spirit ARF** is easy to build, flies great, and would be a great selection as your **first** R/C airplane.

PRECAUTIONS

1. 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 correct.

2. Take time to build straight, true and strong.

3. You must properly install the R/C radio system and other components so that the model operates properly on the ground and in the air.

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

Note: We, as the kit manufacturer, provide you with a top quality kit and great instructions, but ultimately the quality 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 directions to end up with a well-built model that is straight and true. Please inspect all parts carefully before starting to build!

YOU CAN CONTACT US...

If any parts are missing, broken or defective, or if you have any questions about building or flying this

airplane, please call us at (217) 398-8970. You can also check our web site at www.greatplanes.com for the latest Spirit ARF updates, or e-mail your questions to:

productsupport@greatplanes.com.

If you are calling for replacement parts, please reference the part numbers and the kit identification number (stamped on the end of the carton) and have them ready when calling.

PREPARATIONS

Required Accessories

Items in parentheses such as (GPMQ4243) are suggested part numbers recognized by distributors and hobby shops and are listed for your ordering convenience. **GPM** is the Great Planes brand, **TOP** is the Top Flite® brand, and **HCA** is the Hobbico® brand.

- ❏ Minimum Two-Channel Radio With Two Servos
- ❏ Square Receiver Battery Pack (500 mAh)

Building Supplies & Tools

These are the building tools that are required. We recommend ***Great Planes Pro***™ *CA and Epoxy glue.*

- ❏ 2 oz. Pro CA (Thin, GPMR6003)
- ❏ 2 oz. Pro CA+ (Medium, GPMR6009)
- ❏ 6-Minute Pro Epoxy (GPMR6045)
- ❏ Epoxy Brushes (GPMR8060)
- ❏ Pro Thread Locking Compound (GPMR6060)
- ❏ Plastic Wrap or Waxed Paper
- ❏ Isopropyl Alcohol (70%)
- ❏ Mixing Sticks (GPMR8055)
- ❏ Round Toothpicks
- ❏ Hobby Knife, #11 Blades
- ❏ Small Hobby Clamps
- ❏ Clothes Pins
- ❏ String
- ❏ Builders Triangle Set (HCAR0480)
- ❏ Masking Tape (TOPR8018)
- ❏ 1/2" [13mm] Latex Foam Rubber Padding (HCAQ1050)
- ❏ Paper Towels
- ❏ Felt-Tip Marker
- ❏ Wire Cutter
- ❏ Drill Bits: 5/64" [2mm], 3/32" [2.5mm]

Optional Supplies & Tools

- ❏ CA Applicator Tips (HCAR3780)
- ❏ CA Debonder (GPMR6039)
- ❏ Sealing Iron (TOPR2100)
- ❏ Single-Edge Razor Blades (HCAR0312)
- ❏ Curved Tip Canopy Scissors For Trimming Plastic Parts (HCAR0667)

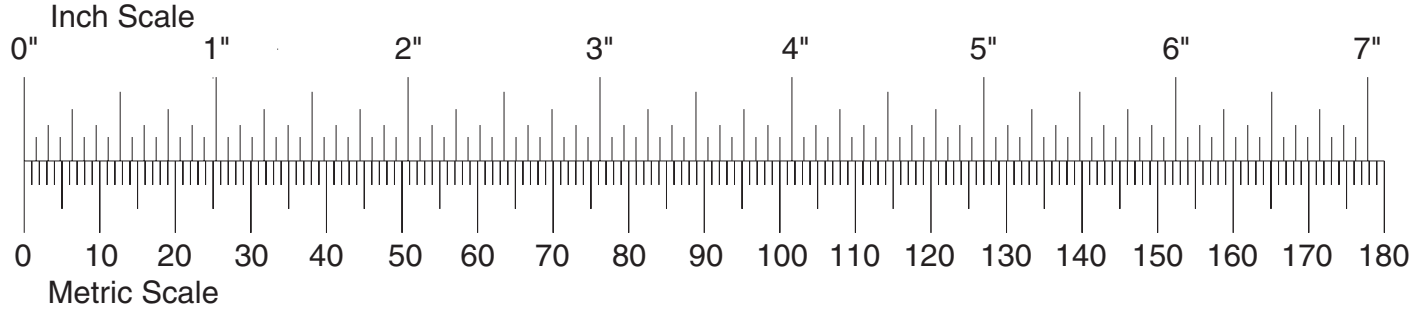
General Inspection

Remove the fuselage, wing panels, rudder assembly and stabilizer assembly from their bags. Inspect all items closely to check for any damage. If any damage is found, contact the place where your Spirit ARF was purchased, or Hobby Services, to obtain a replacement for your damaged items. If any of the control surfaces are attached, simply pull them apart and store the hinges in a safe place until it is time to re-attach them.

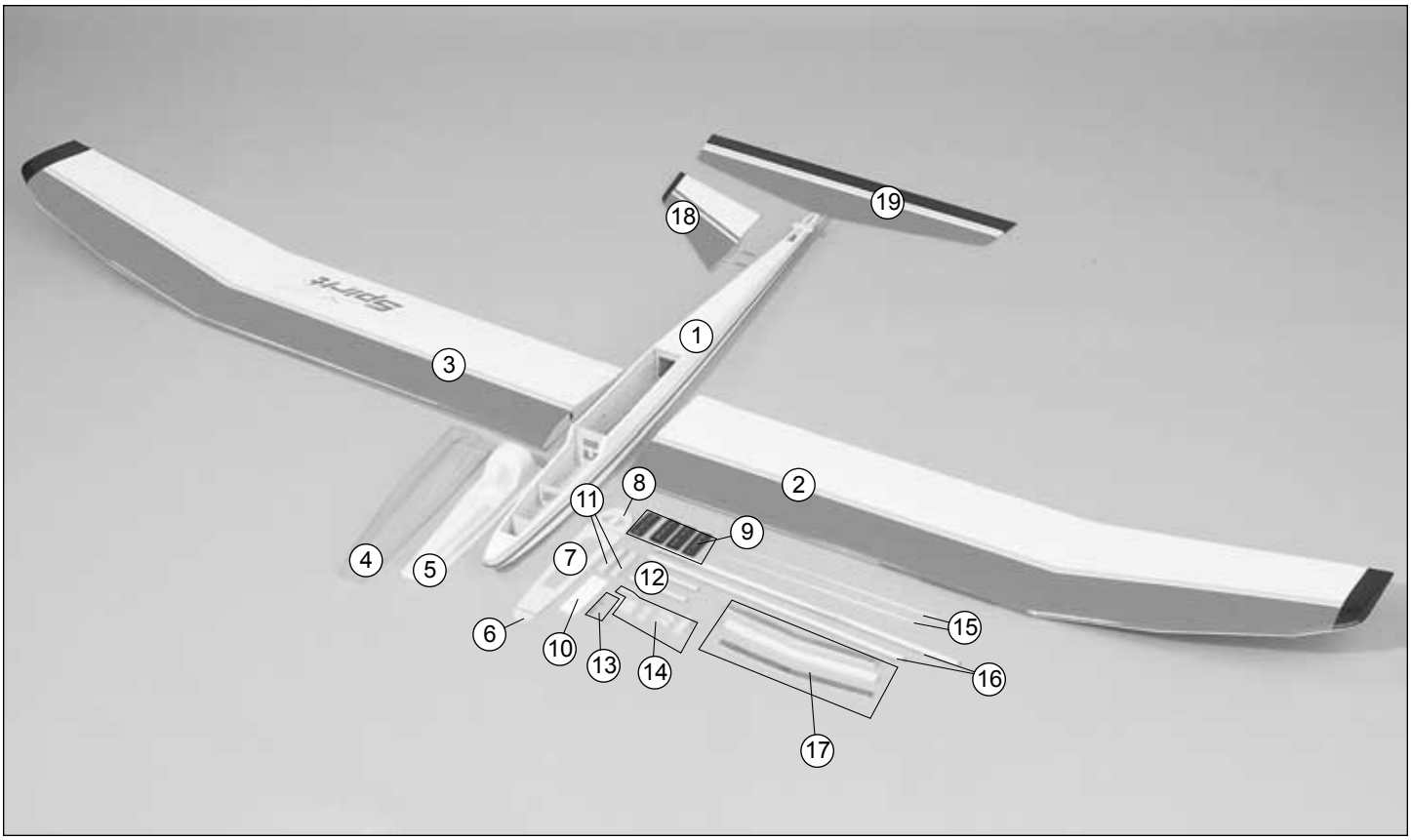
Your Spirit ARF is covered using Top Flite MonoKote® covering. Eliminate any wrinkles you find in the covering by shrinking them away with a heat gun. Then, apply pressure to the area with a covering iron and a hot sock. This will securely bond the covering to the wood so the wrinkles will be less likely to reappear in the future.

Building Notes

Several times during construction we refer to the “top” or “bottom” of the model or a part of the model. It is understood that the “top” or “bottom” of the model is as it would be when the airplane is right side up and will be referred to as the “top” even if the model is being worked on upside-down.



Parts List



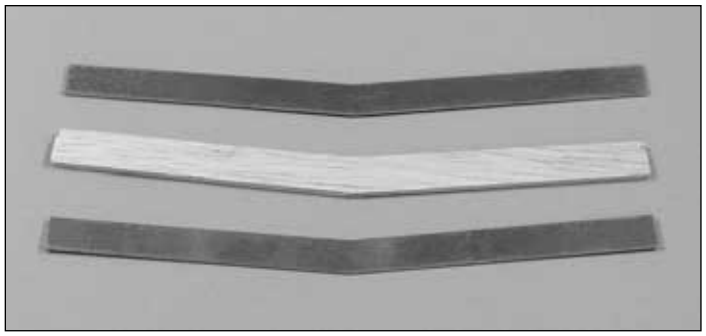
Key#	Description	Qty
1	Fuselage	1
2	Left Wing Panel	1
3	Right Wing Panel	1
4	Canopy	1
5	Cockpit	1
6	Front Canopy Brace	1
7	Bottom Canopy Brace	1
8	Rear Canopy Brace	1
9	Heat Shrink Tubing	4
10	Trailing Edge Brace	1
11	Servo Rails	2
12	Wing Dowels	2
13	Metal Hardware	1 Bag
14	Nylon Hardware	1 Bag
15	Pushrod Wires	2
16	Hardwood Pushrod Dowels	2
17	Wing Joiners	3
18	Fin	1
19	Stabilizer	1

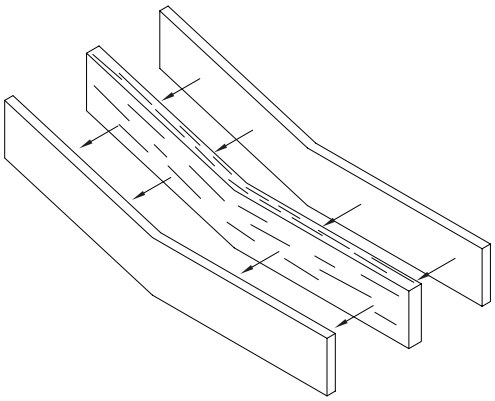
Replacement Parts

If needed, replacement parts for your Spirit ARF are available through your hobby supplier.

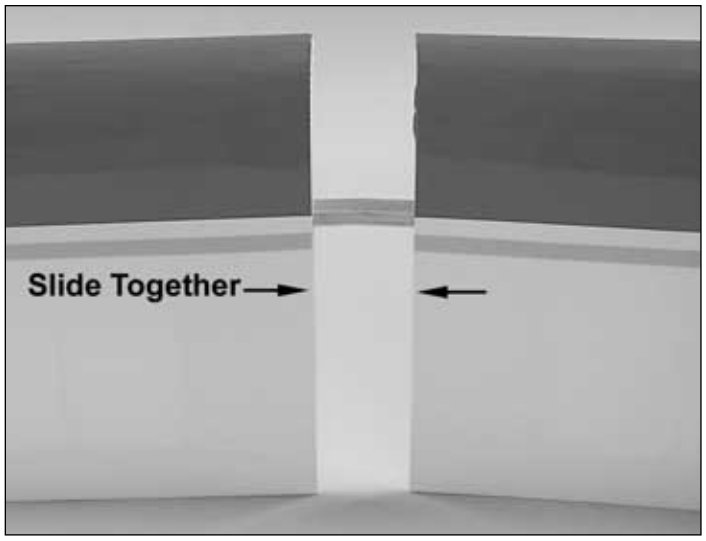
Wing Kit.....GPMA2176
Fuselage Kit GPMA2177
Tail Set.....GPMA2178
Canopy Set.....GPMA2179

WING ASSEMBLY

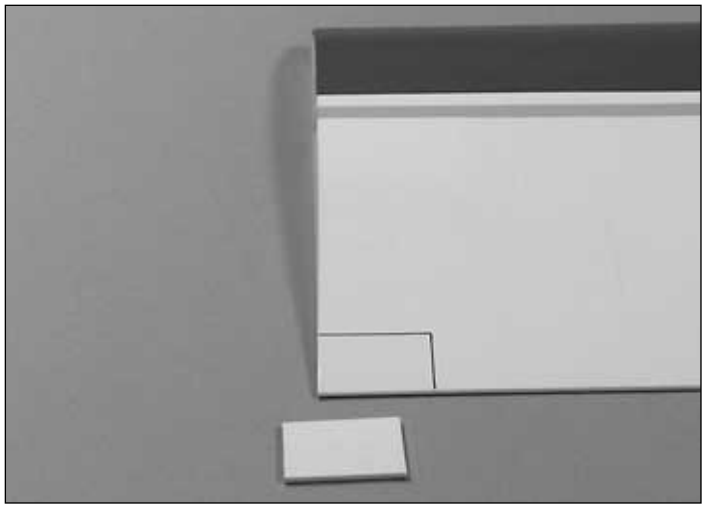




❑ 1. Use either epoxy or thick CA to glue one of the 1/16" [1.5mm] **aluminum joiners** to the 1/8" [3mm] **balsa joiner.** Apply as much pressure (clamps, clothes pins, weights, etc.) as possible while the glue is curing and be sure to line up the two pieces accurately. Glue the other 1/16" [1.5mm] aluminum joiner to the other side of the 1/8" [3mm] balsa joiner using the same procedure.

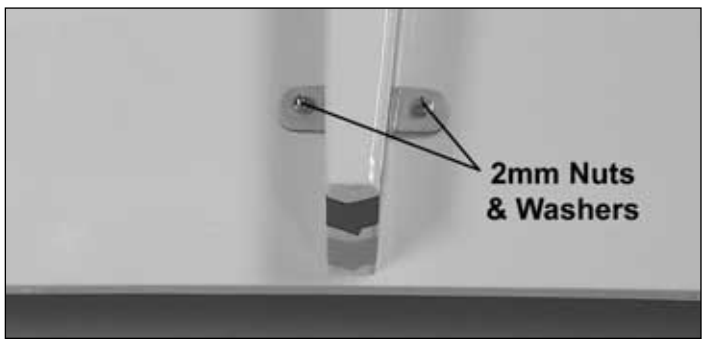


❑ 2. Check the fit of the wing joiner in the **wing panels.** Remove any excess material from the joiner to allow the panels to fit together. The joiner does not have to be glued into the wing. This will allow the wing panels to be separated for easier transportation.

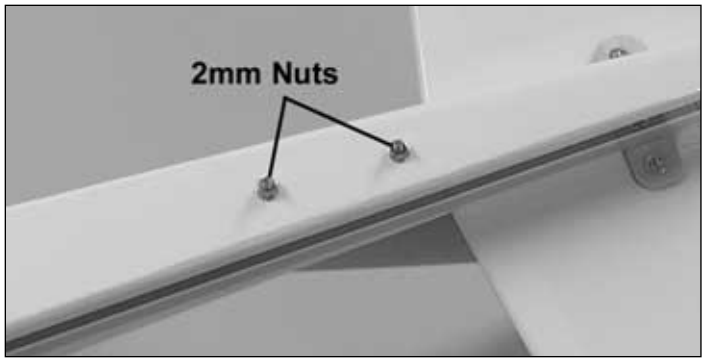


❑ 3. Mark and remove a small area of the covering on both wings for the 1/8" x 1" x 1-5/8" [3mm x 25mm x 41mm] plywood **trailing edge plates.** Glue the plates onto the wing with thick CA.

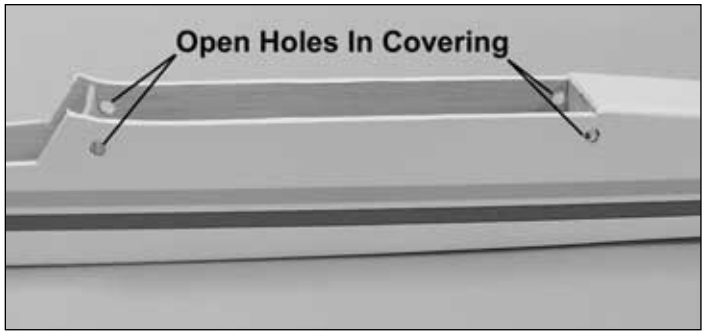
TAIL ASSEMBLY

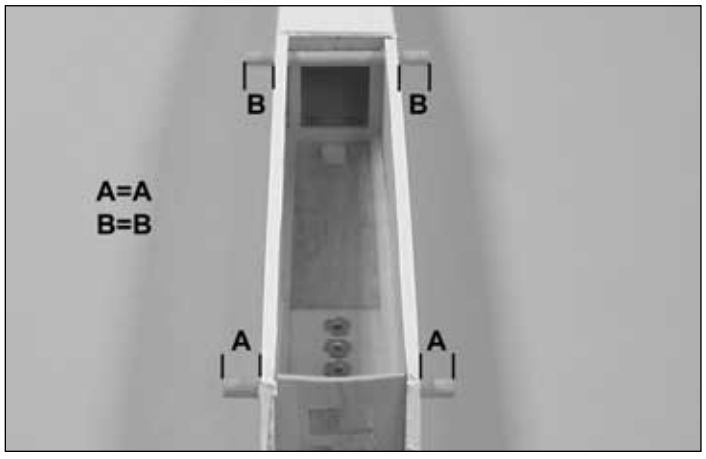


❑ 1. Find and open the holes in the **stabilizer** covering for the attachment screws. Attach the stabilizer to the **fuselage** using two **2mm x 15mm screws,** two **2mm nuts** and four **2mm washers.** Use thread lock on the nuts to prevent loosening.

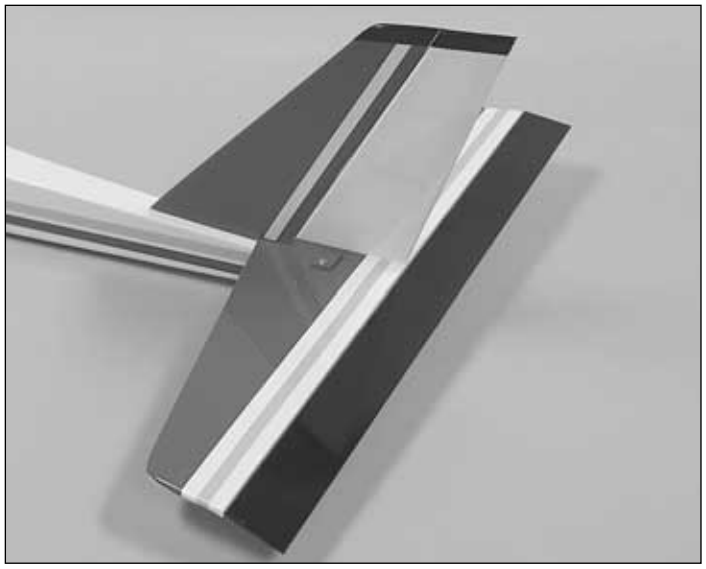


❑ 2. Open the holes on the top and bottom of the fuselage covering for the **fin** attachment. Attach the fin using two 2mm washers and two 2mm nuts. Use thread lock on the nuts to prevent loosening.

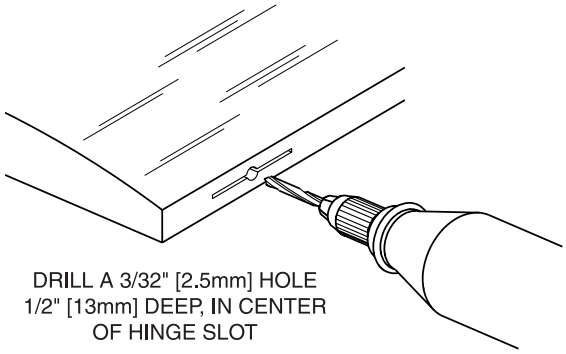




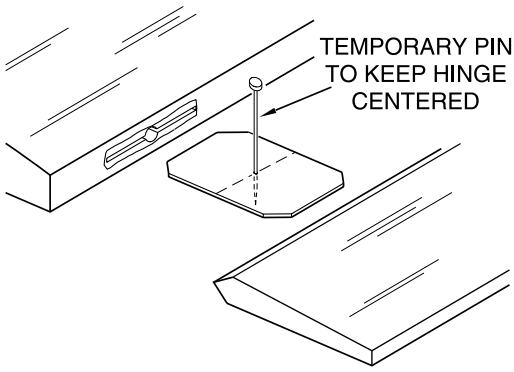
❑ 3. Install the **wing dowels** using medium or thick CA. Center the dowels in the fuselage before gluing.



❑ 4. Join the **rudder** to the fin using the following procedure:

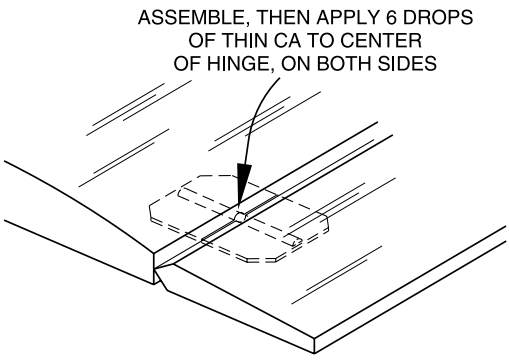


❑ ❑ A. Drill a 3/32" [2.5mm] hole, 1/2" [13mm] deep, in the center of the hinge slot. If you use a Dremel® MultiPro™ for this task, it will result in a cleaner hole than if you use a slower speed drill. Drilling the hole will twist some of the wood fibers into the slot, making it difficult to insert the hinge, so you should reinsert the knife blade, working it back and forth a few times to clean out the slot.



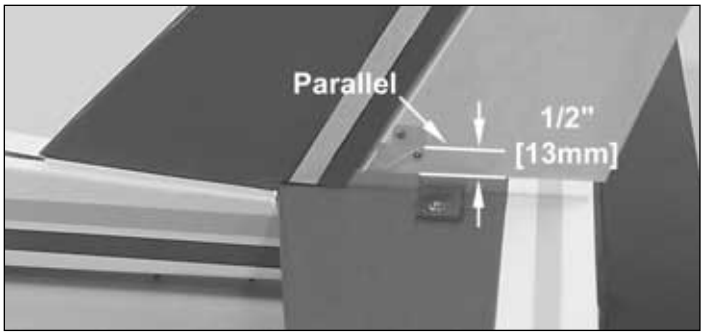
❑ ❑ B. If the hinges don't remain centered, remove the rudder and insert a pin in the center of the hinges.

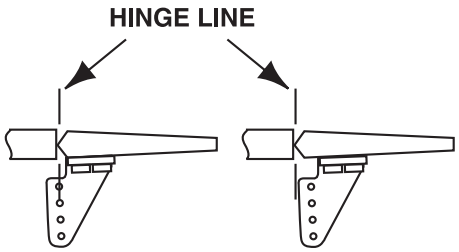
❑ ❑ C. Attach the rudder to the fin using three hinges. Make sure there is approximately a 1/64" [.04mm] gap between the rudder and the fin.

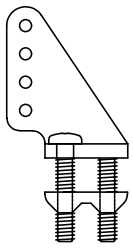


❑ ❑ D. Add six drops of thin CA to the center of the hinges on both sides. Use a paper towel to absorb excess CA from the hinge gap before it cures. Do not use CA accelerator; allow the CA to cure slowly.

❑ 5. Use the same hinging method to join the **elevators** to the **stab.**



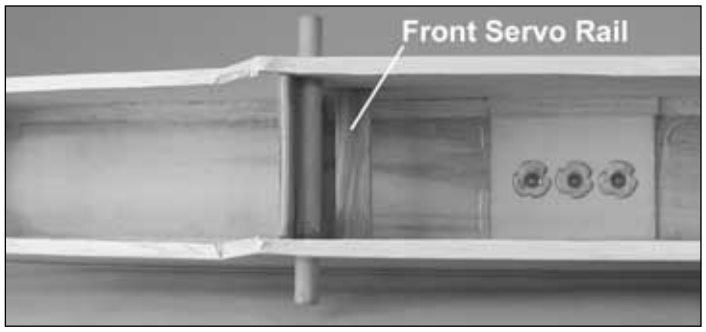




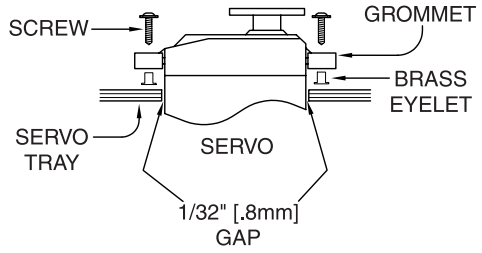
❑ 6. Position one of the **nylon control horns** up 1/2" [13mm] up from the bottom of the rudder. Align the horn parallel to the bottom of the rudder. Drill two 3/32" [2.5mm] holes through the rudder using the horn as a guide. Harden the holes using two or three drops of thin CA. Attach the nylon control horn to the rudder using two 2mm x 15mm screws.

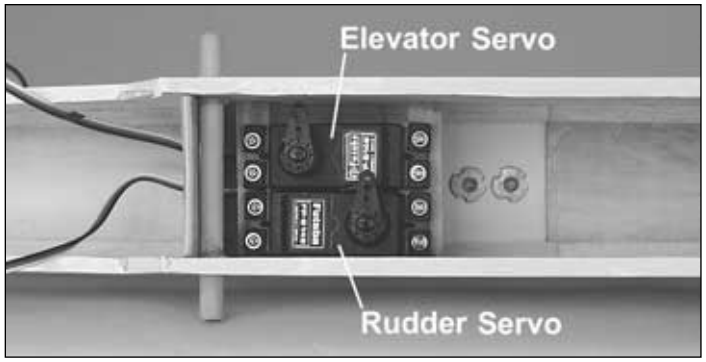
❑ 7. Position the remaining control horn in line with the center of the fuselage on the bottom of the elevator. Attach the control horn to the elevator using two 2mm x 15mm screws.

RADIO INSTALLATION

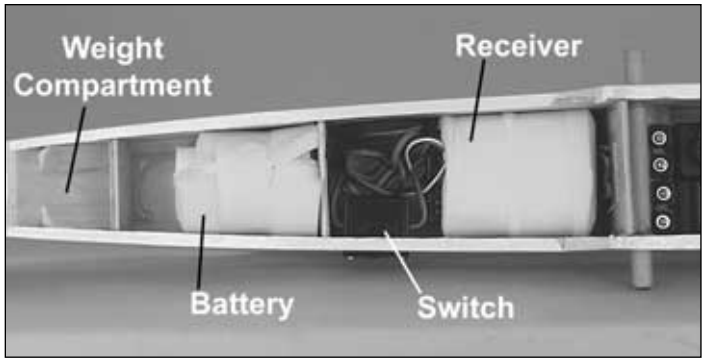


❑ 1. Slide one hardwood 3/8" x 1/4" x 2" [9.5mm x 6mm x 50mm] **servo rail** into its slot in the fuselage doubler. Slide it all the way forward and glue it in place with thick CA. Slide the other servo rail into place and then slide it all the way aft. **Do not glue it yet!** Position one of your servos in place and use it to position the rear servo rail. **Do not** push the rear servo rail tight against the servo, but rather leave about a **3/32" [2.5mm] gap** between the servo "body" and the aft servo rail. This will provide enough room to install and remove the servos without removing the rails. Glue the rear servo rail in place.

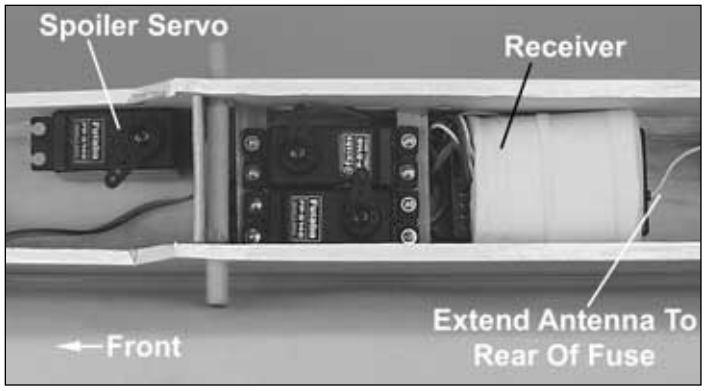




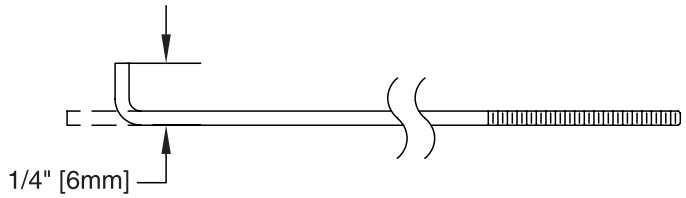
❑ 2. Install the servos using the hardware included with your radio system.



❑ 3. Install the receiver, battery and switch. Use foam to cushion the receiver and battery. Extend the antenna to the rear of the fuse.

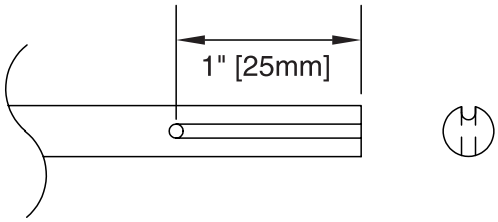


Note: If you are installing spoilers, mount the spoiler servo where the receiver is shown in the photo. It can be mounted on servo rails, or with servo tape. The receiver is then placed behind the servos used for the rudder and elevator. Cut three arms off an X-type servo horn and mount a small screw in the outer hole. Adjust the servo and your transmitter so the horn is almost pointing toward the rear of the plane when your transmitter stick is in the "spoilers closed" position. The horn should rotate toward the front of the plane when the transmitter stick is moved to the "spoilers open" position. (**Note:** The spoiler servo arm is shown in the "up" position.)

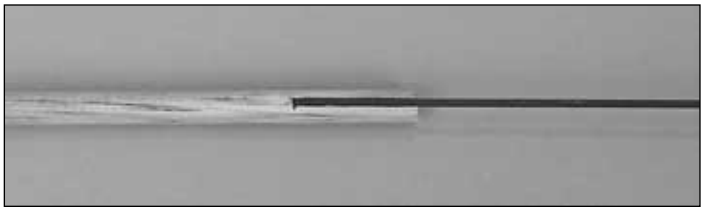


❑ 4. Make a 90º bend 1/4" [6mm] from the non-threaded end in each of the **pushrod wires** as shown in the sketch. Wipe off each wire using a paper towel dampened with rubbing alcohol to remove any oil. Make the same 90º bend in all four of the threaded and non-threaded pushrods.

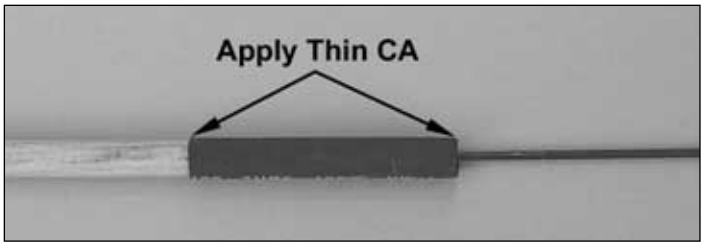
❑ 5. Cut the pushrods from the **hardwood dowels.** The elevator pushrod dowel should be 13" [330mm] long and the rudder pushrod dowel should be 11" [280mm] long.



❑ 6. Drill a 5/64" [2mm] hole 1" [25mm] in from both ends of each pushrod. Cut a groove in the dowel from the hole to the end of the dowel.

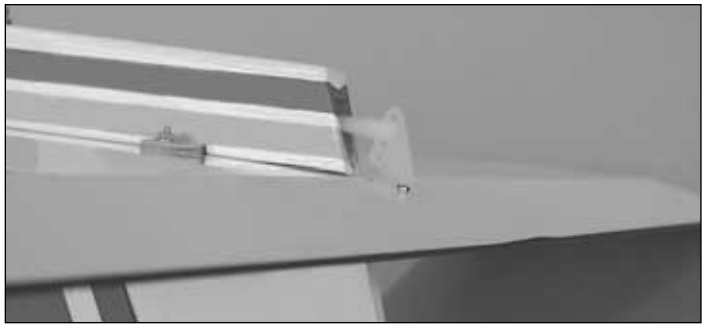


❑ ❑ 7. Insert one threaded piece of wire into each pushrod. Insert the remaining pieces of wire into the other end of each pushrod. Tack glue the wires in place with a couple drops of CA. Repeat the procedure to attach the non-threaded pushrod wires to the opposite end of the pushrod dowels.

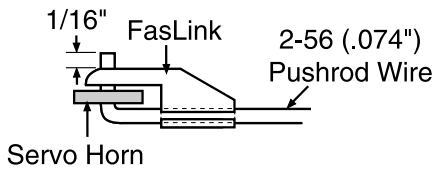


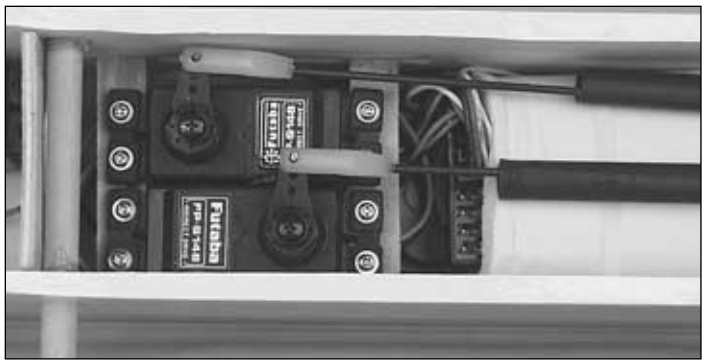
❑ 8. Use the **heat shrink tubing** at the end of the pushrod to hold everything in place as shown in the photo. Apply a few drops of thin CA to each end of the heat shrink tubing to secure it.

❏ 9. Install the rudder pushrod. Thread a **clevis** 14-turns onto the pushrod. Attach the clevis to the control horn. Bend the pushrod as necessary to allow for free movement.



❏ 10. Install the elevator pushrod. Thread the clevis onto the pushrod. Attach the clevis to the control horn. Trim the opening at the rear of the fuselage as necessary to allow the pushrod to move freely.

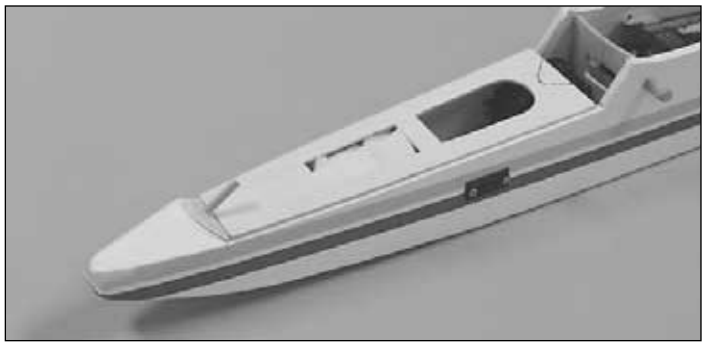


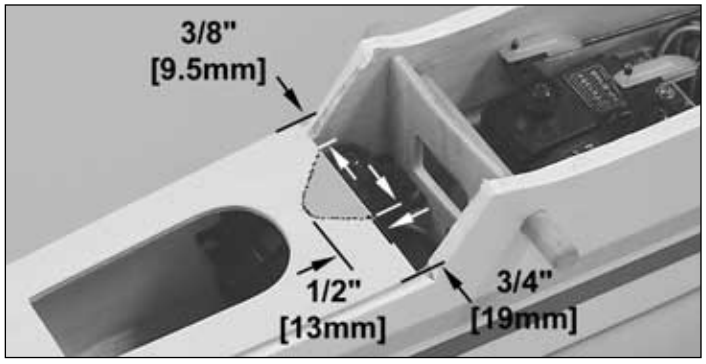


❏ ❏ 11. Center the rudder and servo arm. Mark the pushrod wire at the servo arm. Bend the wire up at the mark. Cut the wire 5/16" [8mm] below the bend. Secure the pushrod to the servo arm with a nylon FasLink. Make sure the wire will not bind against the servo case. Repeat the process for the elevator pushrod.

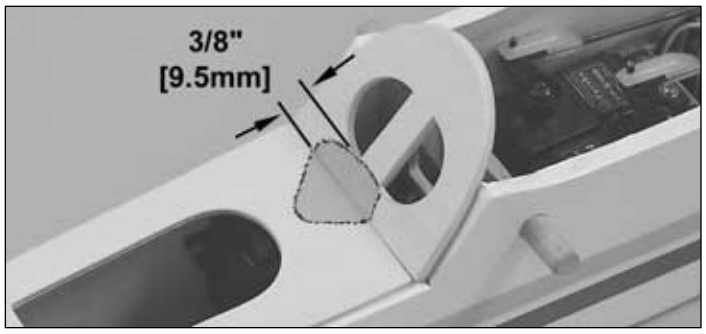
CANOPY INSTALLATION

❏ 1. Place the small **hardwood dowel** into the **front canopy brace.** Remove the covering for the dowel in the front of the fuselage. Install the dowel into the hole.

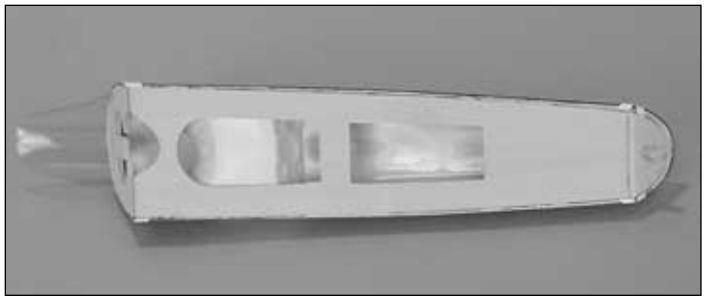




❏ 2. Place a piece of wax paper between the **bottom canopy brace** and fuselage. Glue the bottom canopy brace to the front canopy brace with CA. The wax paper will prevent the braces from accidentally being glued to the fuselage. **Note:** If you are planning on using the optional spoilers, you must remove the shaded area to allow for servo movement.



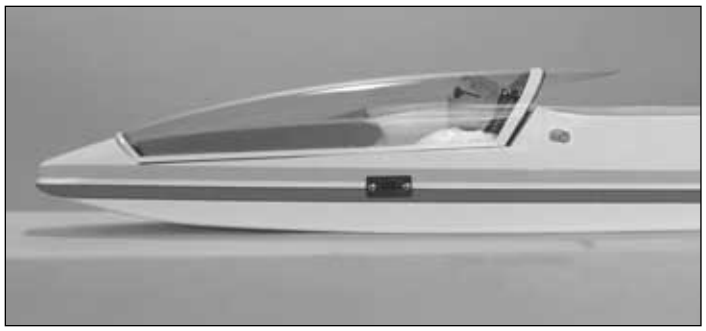
❏ 3. With the wax paper still in place, glue the **rear canopy brace** to the bottom canopy brace with CA. **Note:** If you are planning on using the optional spoilers, you must remove the shaded area to allow for servo movement.



❑ 4. Trim the **cockpit.** Use CA to glue the cockpit to the canopy braces. Glue the dowel to the front canopy brace, allowing it to protrude 3/8" [9.5mm] out front.

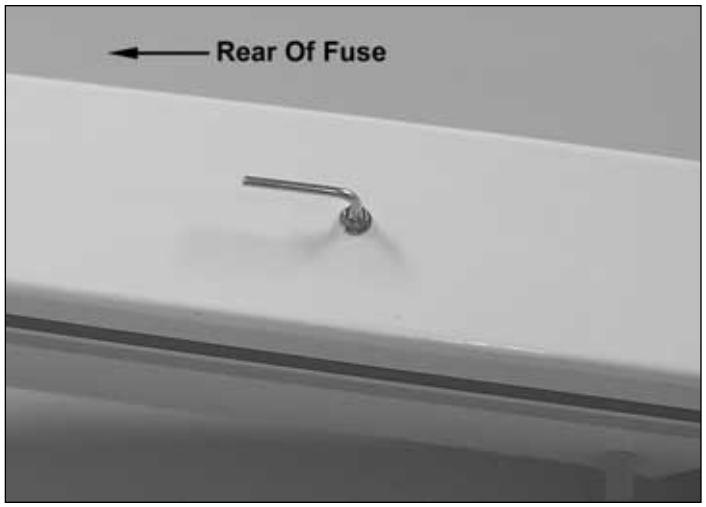
❑ 5. Paint the cockpit with the color scheme of your choice. Test the paint you are going to use on a piece of the plastic you cut off to make sure it will not affect the plastic. Regular plastic model paints usually work well for this. Do not paint the edges of the cockpit where the canopy will attach or the glue will not hold as well. Striping tape can be used to cover that seam. Lightly sand the edges to help the canopy adhere.

❑ 6. Set the cockpit inside the **canopy** and line the cockpit up with the scribe lines in the canopy. The scribe lines are only for reference while positioning the cockpit. Do not try to get the cockpit to fit the scribe lines. Glue the canopy to the cockpit using medium CA. Use the glue very sparingly. Hold the cockpit in place inside the canopy and apply glue a drop at a time to the seam. The glue will seep in along the seam and provide a nice, clean glue joint. Work your way around the canopy and don't get in a hurry or you may get too much glue in there and it will run down the canopy. Be careful not to twist or move the cockpit once you start gluing it in place.



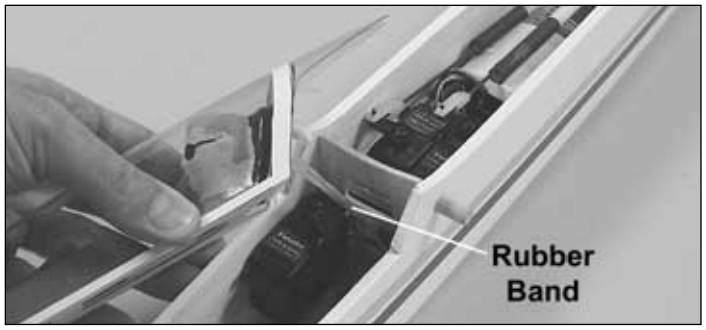
❑ 7. Test fit the canopy onto the fuselage. Trim the canopy flush with the base and the front but **do not trim the back yet!** Curved tip scissors works well for trimming the canopy. Temporarily mount the wing in place on the fuselage. **VERY CAREFULLY** trim the back of the canopy, **A LITTLE AT A TIME,** to fit over the wing. Take your time and use the outlines and the wing for guides.

FINAL HOOKUPS & CHECKS



❑ 1. Attach the **threaded tow hook** to the bottom of the fuselage by threading a **3mm nut** and a **3mm washer** all the way onto the tow hook. Tighten the tow hook into the front blind nut for the first flights. With the tow hook threaded almost all the way into the blind nut, make sure the tow hook is facing straight back and tighten the 3mm nut to secure it. After the first flights the tow hook can be moved back to the center 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 more apt to "Pop-Off" the line.

Note: A piece of self-adhesive foam rubber weather stripping can be applied to the front of the fuselage bottom to help protect it from getting nicked up during landings.

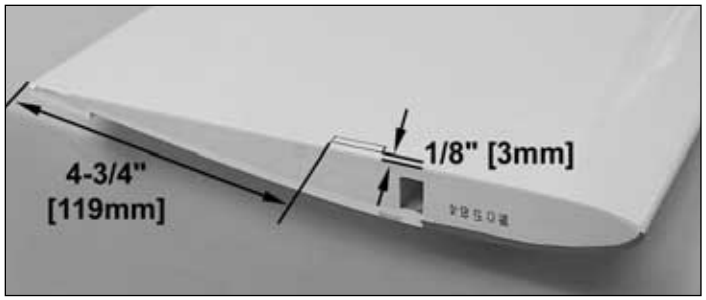


❑ 2. The canopy is held in place with a rubber band. Loop a medium size rubber band through the cut-out in the canopy back. Thread the rubber band through itself and then hook it on the little extension on the former. To remove the canopy, pick up on the back until the dowel is clear of the fuselage. To re-install the canopy just do the opposite.

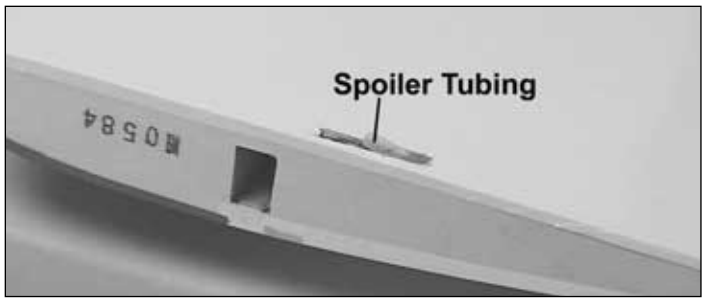
Note: If you are planning on installing the optional spoilers, a brace may be necessary to attach the rubber band to the canopy.

Optional Spoilers

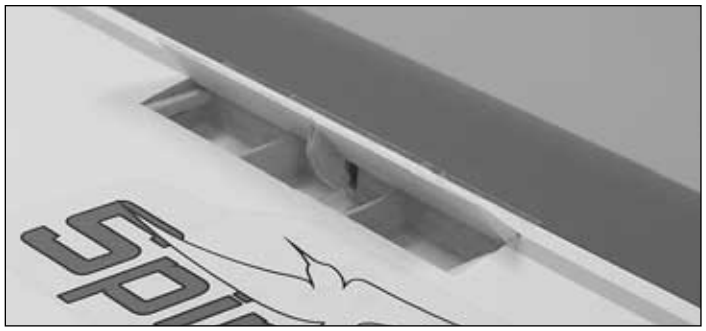
Note: Since the spoiler installation is optional, none of the hardware has been included.



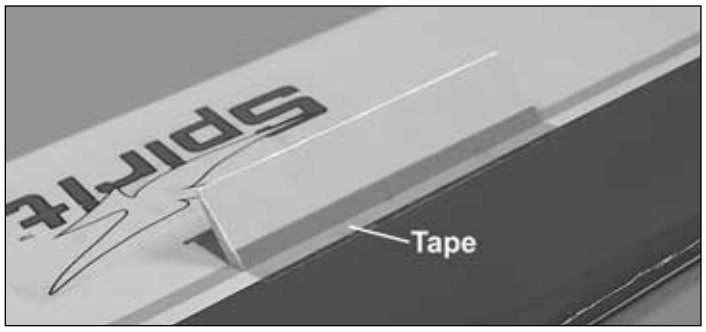
❑ ❑ 1. Use a hobby knife to cut a hole in the bottom of the wing sheeting for the **spoiler tubing** to exit the wing as shown.



❑ ❑ 2. Pull the end of the spoiler tubing out of the wing just far enough to glue it in place using thick CA.

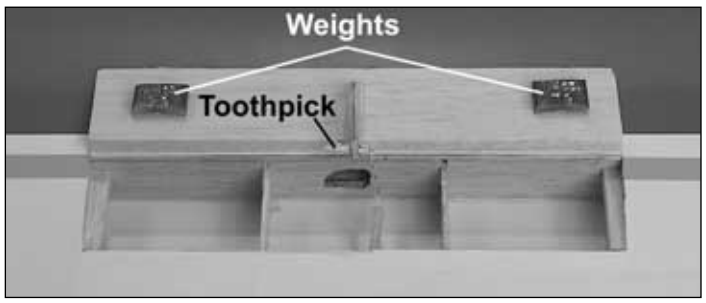


❑ ❑ 3. Cut the covering all around the edge of the **spoiler** and remove it from the wing panel.



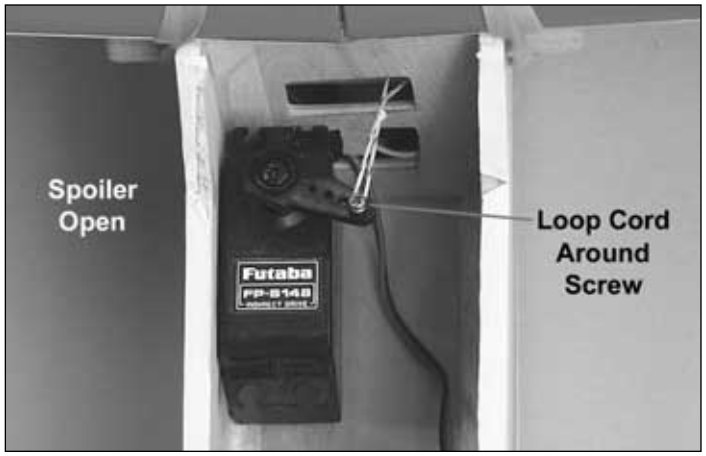
❑ ❑ 4. Tape the spoiler in position in the wing using a strip of cellophane or vinyl tape or a strip of covering. The tape should be flexible enough to allow the spoiler to close on its own. The tape should also be replaced occasionally as it will eventually rip.

❑ ❑ 5. Thread a 42" [1070mm] length of braided fishing line (not included) through the spoiler tubing in the wing.



❑ ❑ 6. Thread one end of the line through the small hole in the spoiler horn and use a piece of a round toothpick to hold the line in the horn. Allow about 1/2" [13mm] to hang out the other side of the horn for fine adjustments. It may be necessary to drill out the spoiler control horn using a 3/32" [2.5mm] drill bit. Trim the shear web to allow the toothpick to pass through without interference.

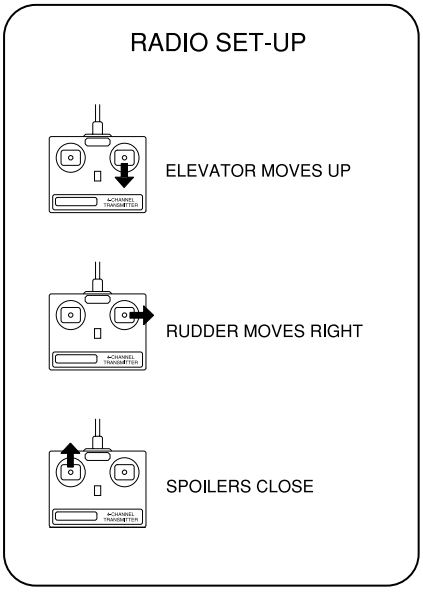
❑ ❑ 7. Glue a small lead weight on the bottom side of the spoiler to help it close. 1/4 – 1/2 oz. is usually enough since the airflow will keep the spoilers closed when the plane is flying. Repeat steps 1 through 7 for the opposite spoiler.



❑ 8. Mount the wing onto the fuselage and pull the ends of the spoiler strings up to the spoiler servo. Position the spoiler servo horn at the rearward end of its swing and wrap one spoiler string around the screw in the horn. With the spoilers held closed, apply a drop of CA to glue the string to itself, forming a small loop. Remove that string and do the same steps to the other string. The two strings should be the same

length (be careful not to glue the two strings together) and the spoilers should open and close together. Adjustments can be made at the toothpick end if needed.

RADIO SETTINGS



Use the sketch to make sure the control surfaces are moving the correct directions.

The control throws are as follows:

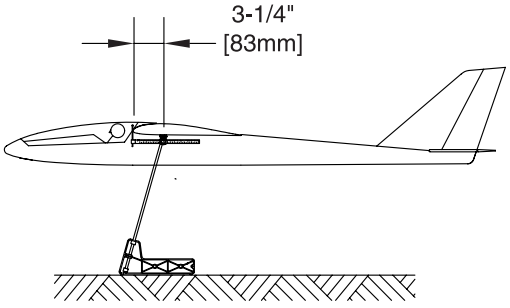
Elevator 1/2" [13mm] up
1/2" [13mm] down

Rudder 1-1/2" [38mm] left
1-1/2" [38mm] right

Spoilers 90º to the upper surface of the wing

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.



Accurately mark the balance point on the bottom of the wing on both sides of the fuselage. The balance point is located 3-1/4" [83mm] back from the leading edge. This is the balance point at which your model should balance for your first flights. Later, you may wish to experiment by shifting the balance up to 5/16" [8mm] forward or back to change the flying characteristics. Moving the CG forward of the spar will add some stability but it will decrease the overall performance of the sailplane. Moving the balance behind the spar makes the model more agile with a lighter and snappier “feel” and improves the sailplane’s response to air currents. In any case, please start at the location we recommend and do not at any time balance your model outside the recommended range.

With the wing attached to the fuselage, and all parts of the model installed (ready to fly), lift the model by picking it up with a finger on each bottom inner spar. 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 weight compartment at the front of the fuselage to correct a tail heavy model. In the unusual circumstance that you would have a nose heavy model, you can switch the receiver and battery or even move the receiver behind the servos. Getting the weight farther back helps correct the “nose heaviness.”

CHECKING FOR WARPS

This is a very important step and should be done occasionally throughout the flying season. A sailplane’s wing is most efficient when it is not twisted or warped at all. “Washout” (wing trailing edges twisted up at the tip) helps make a poor wing design fly better by adding some stability (preventing stalls) at slow speeds but it cuts down on the wing efficiency at normal speeds. The SPIRIT ARF’s wing is designed to fly well at slow speeds without any washout, and therefore we recommend you check to make sure the wings are “flat” using the following procedure:

Set the wing so an inner panel is resting on a flat surface. Any warp (twist) will show up by causing a corner of the panel to rise off the work surface.

To remove the warp, gently twist the wing in the opposite direction while a helper glides an iron or heat gun over the covering on both the top and the bottom of the panel to re-shrink the covering. Hold the twist until the covering cools and then recheck for warps. It may take several tries to get a warp out but it is worth it as you will end up with a sailplane that flies straight and true and responds to air currents like a high performance sailplane should.

Follow the same procedure to check all four wing panels and then go back and double check them. Sometimes you put a warp in one panel while trying to fix another. You should also look at the tail surfaces as they too can warp.

PREFLIGHT

Charge the Batteries

Follow the battery charging procedures in your radio instruction manual. You should charge your transmitter and receiver batteries the night before you go flying, and at other times as recommended by the radio manufacturer.

Find a Safe Place to Fly

The best place to fly your R/C model is an AMA (Academy of Model Aeronautics) chartered club field. Ask your hobby shop dealer if there is such a club in your area and join. Club fields are set up for R/C flying which makes your outing safer and more enjoyable. The AMA can also tell you the name of a club in your area. We recommend that you join AMA and a local club so you can have a safe place to fly and also have insurance to cover you in case of a flying accident. (The AMA address is listed on page 2 of this instruction book).

If a club and its flying site are not available, you need to find a large, grassy area at least 6 miles away from any other R/C radio operation and away from houses, buildings and streets. A schoolyard may look inviting but it is usually too close to people, power lines and possible radio interference.

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

Range Check Your Radio

Wherever you do fly, you need to check the operation of the radio before every time you fly. This means 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 someone help you. Have them stand by your model and, while you work the controls, tell you what the various control surfaces are doing.

AMA SAFETY CODE (excerpt)

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

General

1. I will not fly my model aircraft in competition or in the presence of spectators 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 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.

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 flyer, unless assisted by an experienced helper.

3. I will perform my initial turn after takeoff away from the pit, spectator and parking areas, and I will not thereafter perform maneuvers, flights of any sort or landing approaches over a pit, spectator or parking area.

FLYING

First of all, if you are flying with other flyers check to make sure they are not flying or testing on the same frequency as your model.

Try to find an experienced pilot to help you with your first flights. Although the SPIRIT is very easy to fly, an experienced pilot can save you a lot of time and possible aggravation by helping you get your model in the air smoothly.

Trim 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. The model will survive a hard landing from 5 feet much better than it will one from several hundred feet. The first few trim flights should be done over a grass field. The longer the grass the better (more cushion).

Turn on the transmitter first and then the receiver. Hold the SPIRIT ARF under the wing with the nose pointed slightly

down and directly into the wind as shown in the photo. It is very important that you launch the model with the wings level and the nose pointing at a spot on the ground about 50 feet in front of you. Have a friend stand off to the side of you and tell you whether the nose is pointing up or down. Show your friend the picture above so he will know what to look for. 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. The plane should be launched with a gentle push forward. With a little practice you will be able to launch it at just the right speed so it soars straight ahead in a long and impressive glide path. Adjust the trims on your transmitter to get the plane to fly straight ahead in a smooth glide path.

Once you get the hang of launching it you can try turning the plane during the trim flights by gently applying a "touch" of right or left rudder. You can also try "flaring" the landings by slowly applying a touch of up elevator (pull the stick back) as the plane nears the ground. The SPIRIT ARF will continue to fly just a few inches off the ground for a surprisingly long distance. It is important you don't "over-control" the model. Make any control inputs slowly and smoothly rather than moving the transmitter sticks abruptly.

Your First Hi-Start Launch

A hi-start is the most popular way to launch your SPIRIT ARF. It consists of 25' – 100' of rubber tubing and 200' – 400' of string with a parachute or streamer at the end. One end of the rubber is staked down directly upwind of the launch point. One end of the string is attached to the other end of the rubber and the end of the string with the parachute has a loop or ring and is attached to the tow hook on the sailplane.

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.

Turn on your transmitter and then your receiver and hook the parachute onto your plane's tow hook. Pull the plane back approximately twice as far as the rubber is long (i.e., 100' of rubber = pull back 200') or whatever the hi-start instructions state. A "fish scale" is handy for determining the correct amount of pull. For your first flights pull the plane back until there is approximately 8 lbs. of tension. More tension can be used after you get acquainted with the launching procedure.

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 healthy 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 but use the rudder stick to keep it going straight up. As the rubber relaxes the plane will fly off the hi-start and the parachute will bring the end of the string back towards you.

First Flights

Find a BIG, OPEN field for your first flights. The bigger the better as you won't have to worry about where you need to land. Ground based objects (trees, poles, buildings, etc.) seem to attract model airplanes like a magnet. **Again, we would like to recommend that you find an experienced pilot to help you with these first flights.**

Note: You need to remember that your radio control responds as if you were sitting in the cockpit. When you push the transmitter stick to the right, the rudder moves to the plane's right! This means that when the plane is flying towards you it may seem like the rudder controls are reversed (when you give "right" rudder the plane turns to your left–which is the plane's "right"). It is sometimes easier to learn to fly the plane if you always face your body in the direction the plane is flying and look over your shoulder to watch the model.

Don't worry about accomplishing very much on your first flights. Use these flights to get the "feel" of the controls and the SPIRIT ARF's flying characteristics. Try to keep the plane upwind and just perform some gentle "S-turns" (always turning into the wind) until it is time to set up for landing. Have a helper 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. It can be very hard for a beginner to fly a plane straight towards him as he would have to do if the plane were downwind and every mistake takes the plane a little farther downwind. When it is time to land, just continue performing the gentle "S-turns" upwind and let the plane glide onto the ground. Don't worry about where the plane lands–just miss any trees, etc.

Practice flying directly into the wind (upwind of yourself) without letting the plane get off course, and then turn and come downwind until the plane is even with you and try it again. When you are comfortable with flying directly into the wind, start letting the plane go behind you (downwind) a little before you start back upwind. Continue this until you can fly directly towards you from downwind without getting disoriented. At this point you can start to establish a "landing pattern" and bring the sailplane in for a landing from downwind. This enables the plane to be flown as slowly (ground speed) as possible for accurate landings.

Thermal Flying

Thermal soaring is one of the most intriguing of all aspects of flying and the SPIRIT ARF was designed to excel at thermal soaring even in the hands of a novice. It can be hard for the average person to understand how a plane can fly for hours and gain altitude **without a motor!**

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 some dust), you have seen a thermal in action. Their swirling action is very similar to that of a tornado but of course much gentler. Most thermals have updrafts rising in the 200 – 700 feet per minute range but they have been known to produce updrafts of over 5,000 feet per minute (that's over 50 miles/hour straight up!) 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

It takes a lot of concentration to thermal soar effectively. A sailplane can fly along the edge of a thermal and unless the pilot is carefully watching the model he may not realize the opportunity to gain some altitude. Because most thermals are relatively small (a couple hundred feet in diameter or less at 400' altitude) compared to the rest of the sky, the sailplanes will rarely fly directly into the thermal and start rising. Generally, the sailplane will fly into the edge or near a thermal and the effects the thermal has on the plane may be **almost** unnoticeable. As the sailplane 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.

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 (especially in a contest where every second counts). Fly straight ahead until you feel like you are in the strongest lift, **fly a couple of seconds farther** (so your circle will be centered in the strongest lift) and then start circling in a fairly tight but smooth turn. When the sailplane is low the turns have to be tighter to stay in the strongest lift. As the plane gains altitude, the turns can be larger and flatter. The flatter the turn, the more efficient the plane is flying, but don't be afraid to really "crank" it into a steep bank when you are low. If you see the plane falling off on one side of the turn, move your circle over into the stronger lift. Thermals move along with the wind so as you circle you will be swept along with it. Be careful when thermaling, that you don't get so far downwind you can't make it back to the field to land.

If the sailplane is flying along straight and all of a sudden turns, let the plane continue to bank (you may have to give it some rudder to keep it banking) until it has turned 270-degrees (3/4 of a full circle). Straighten out the bank and fly into whatever turned the plane. If you encounter lift, and you won't every time, start circling just as you did when flying directly into a thermal.

Thermals are generated all day long, but the strongest thermals are produced when the sun is directly overhead. 10:00 am – 2:00 pm seems to be the best time to get those "killer" thermals. Some of these thermals can be very large and you may find it hard to get out of them. 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. The twirling action will give the sun a better chance of flashing off of the wing and catching your attention. When you are high enough and want to leave the thermal, add a little down trim to pick up some speed and fly 90 degrees to the direction of the wind. If you are not real high and want to find another thermal, you may want to look upwind of the last thermal. The same source that generated this thermal is probably producing another. Just watch out for "sink" which is often found behind and between thermals.

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 it can be very strong. Down drafts of many hundreds of feet per minute are common on a good soaring day. These down drafts can make a sailplane look like it is falling out of the air. Because of this, it is important that you do not let the sailplane get too far downwind.

When encountering sink, immediately turn and fly 90 degrees to the direction of the wind (towards you if possible). Apply a little "down elevator" and pick up some speed to get out of the sink as fast as possible. Every second you stay in the sink is precious altitude lost.

POINTERS FOR CONTEST FLYING

Pay Attention! – Pay close attention to the sailplanes flying before you, watch them and try to establish where and when the thermals are being formed. Thermals are often formed in cycles and can be fairly regular, so if you keep track of the time intervals you will have a pretty good idea of when and where a thermal may be generated.

Watch The Birds! – Thermals suck up small insects that 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. Spoilers 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. Opening the spoilers 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 toward 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.

Concentrate – Keep your eye on your sailplane during your contest flights. Have a helper or your counter watch the other sailplanes in the air. Sometimes your sailplane will wiggle so quickly or gently that you may miss it if you are not paying close attention. If you find a productive thermal, don’t leave it because your helper tells you that someone else has found a different one.

Know Your Sailplane! – Learn what your sailplane will and won’t do and fly within this envelope. This will allow you to ride thermals downwind while knowing when you have to head back to make your landing safely.

Learn From The Wind! – Keep track of which way the wind is blowing. If the wind suddenly shifts, there is some thermal action fairly close to you. The air is probably being either sucked up into a thermal or falling out of some sink. In either case it is often a good idea to fly in the direction the wind is blowing if your sailplane is in the general area. This will take you towards a thermal if there is one or away from the sink, both of which are desirable.

SLOPE SOARING

Flying

Slope soaring is a type of flying that is very popular in hilly regions and along the coasts. This type of soaring is possible when the wind is blowing directly up a hill or cliff. As the wind hits the slope it is forced up, producing lift which can be utilized by real sailplanes, hang gliders, birds and even model sailplanes.

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 along hits 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 behind the slope. If you don’t have enough altitude you may want to land a good distance behind the slope if possible to avoid this turbulent air.

Slope Landings

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 launching your plane.

Ballasting

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.

Add the weight as near as possible to the C.G. of the plane. Adding 6 – 8 oz. will make a noticeable difference in the sailplane’s flying speed and more can be added later, if needed. Make sure to recheck the C.G. of the plane after adding ballast–it should remain where it was.

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

GOOD LUCK AND GREAT FLYING!

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