

SYNCR0™



SPECIFICATIONS

GLIDER WING	Wingspan:	55.5 in [1410mm]
	Wing Area:	400 in ² [25.8 dm ²]
	Weight:	28 – 29.5 oz [795 – 835 g]
	Wing Loading:	10.1 – 10.6 oz/ft ² [31 – 32 g/dm ²]

SPORT WING	Wingspan:	31.5 in [800mm]
	Wing Area:	219 in ² [14.1 dm ²]
	Weight:	22.5 – 24.0 oz [640 – 680 g]
	Wing Loading:	14.8 – 15.8 oz/ft ² [45 – 48 g/dm ²]

INSTRUCTION MANUAL

Length:	34.5 in [875mm]
Radio:	4-Channel with 6 micro servos and standard receiver
Motor, ESC, Battery	24-33-4040 Ammo™, 25A ESC 11.1V 1800 – 2200mAh LiPo

WARRANTY

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

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

If the buyer is not prepared to accept the liability associated with the use of this product, the buyer is advised to return

this kit immediately in new and unused condition to the place of purchase.

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

Hobby Services

3002 N. Apollo Dr. Suite 1
Champaign IL 61822 USA

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

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



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

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INTRODUCTION

Thank you for purchasing the Syncro. The Syncro includes both a “glider” wing and a “sport” wing. With the glider wing, the Syncro is more stable and forgiving. This configuration is better suited to beginners and pilots with little flight experience, giving them more time to think and react. When you’re ready to graduate from the glider wing, the sport wing transforms the Syncro into a more nimble, faster “jet-like” craft perfect for boring holes in the sky!

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

AMA

Academy of Model Aeronautics: If you are not already a member of the AMA, please join! The AMA is the governing body of model aviation and membership provides liability insurance coverage, protects modelers’ rights and interests and is required to fly at most R/C sites.



Academy of Model Aeronautics

5151 East Memorial Drive
Muncie, IN 47302-9252
Tele. (800) 435-9262
Fax (765) 741-0057
modelaircraft.org

IMPORTANT!!!

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

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

1. Your Syncro should not be considered a toy, but rather a sophisticated, working model that functions very much like a full-size airplane. Because of its performance capabilities, the Syncro, 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. If you are not an experienced pilot or have not flown this type of model before, we recommend that you get the assistance of an experienced pilot in your R/C club for your first flights. If you’re not a member of a club, your local hobby shop has information about clubs in your area whose membership includes experienced pilots.
4. While this kit has been flight tested to exceed normal use, if the plane will be used for extremely high stress flying, such as racing, or if an engine larger than one in the recommended range is used, the modeler is responsible for taking steps to reinforce the high stress points and/or substituting hardware more suitable for the increased stress.

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

ADDITIONAL ITEMS REQUIRED

Adhesives

There are a couple of adhesives recommended for gluing the special type of foam from which the Syncro is made: One kind is either foam-safe or regular CA (cyanoacrylate or "super glue"). CA is best for modelers that already have experience with it because CA requires special handling. CA must be used with adequate ventilation and it can harden quickly, possibly causing some modelers to glue their fingers to the parts or to each other. Another kind is "canopy glue," a craft glue specially formulated for plastics. Canopy glue is recommended for most builders because it is water soluble, easy to clean up, emits no fumes and is easier to work with because it takes longer to dry:

CANOPY GLUES

- Zap Adhesives Ric 560 (PAAR3300), **OR**
- J&Z R/C-56 (JOZR5007)

If using canopy, glue Great Planes epoxy brushes (6) (GPMR8060) are also recommended for spreading the glue.

CA AND ACCESSORIES

- 1 oz. [30g] Medium Pro™ CA+ (GPMR6008)
- 2 oz. [57g] spray CA activator (GPMR6035)
- CA applicator tips (HCAR3780)
- CA debonder (GPMR6039)

Motor and ESC

The motor and ESC (electronic speed control) recommended for the Syncro are these:

- Great Planes 24-33-4040 Ammo Inrunner Brushless Motor (GPMG5165)
- Great Planes Silver Series SS-25 25A Brushless ESC (GPMM1820)

Note: The recommended 24-33-4040kV Ammo motor is rated for 18 Amps constant current and 28 Amps surge current. This means the motor can be run indefinitely as long as it is not drawing more than 18 Amps, but can be run for no longer than 30 seconds if drawing the maximum of 28 Amps before you have to back off the throttle and allow the motor to sufficiently cool. The closer to 18 Amps the motor operates the **longer** it can be run until it gets too hot. And the closer to 28 Amps the motor operates the **shorter** it may be run until it gets too hot (again, before reducing the throttle allowing the motor to cool). The motor must **never** be operated over 28 Amps. The ElectriFly batteries recommended in this manual will allow the motor to operate within the specified range: With the 1800mAh 11.1V (3S) 25C battery, the motor will draw about 21 Amps on the ground (static) at full-throttle. Although this is slightly over the constant current limit (of 18 Amps), it will drop to or below this limit when the plane is in the air, so the Syncro may be flown full-throttle for as

long as you desire. And the same applies to the 2200mAh "T-Rex" battery. With this battery the motor draws slightly more current @ 22 Amps, but will still fall to or below the maximum rated constant current when in the air. However, the motor should not be run on the ground with either battery at full power for more than 30 seconds. Otherwise, the motor may overheat causing damage.

If using batteries **other** than the ones recommended, keep in mind that batteries with higher capacity (mAh) and/or "C" rating could cause the motor to operate over its maximum current limit. The recommended 2200mAh 25C battery, is capable of providing 55 Amps (2.2 Amps x 25 C = 55A). So, if you were to switch to, say a larger, 2500mAh 25 C battery it will be capable of 62.5 Amps. This may be okay as long as the motor does not draw more than 28 Amps, but then the Syncro should probably not be flown full throttle for extended periods without lowering the throttle allowing the motor to cool.

If experimenting with batteries different than the ones recommended, the best way to know if you are operating the motor within its limits is to connect a Watt meter (REPL0100) in-line between the ESC and the battery. This will tell you how much current the motor is drawing with the battery you are using.

Batteries

There are a couple of batteries recommended for the Syncro. The ElectriFly 1800mAh 11.1V 25C LiPo (lithium-polymer) battery (GPMPO515) is smaller, lighter weight and less expensive, while the ElectriFly 2200mAh 11.1V 25C "T-Rex" LiPo (GPMG0520) is slightly larger for slightly longer flight time.

Radio Control System

The Syncro requires a 4-channel radio control system with Futaba S3107 micro servos (or similar). For beginners who may not already have a suitable radio control system, the Futaba 6EX 6-channel radio is recommended (FUTK6900). It features the latest 2.4GHz technology for reliability and eliminates the need for frequency sharing with other pilots who may be flying at the same time.

The 6EX does not come with servos, so six servos will also be required (two for each wing and two for the elevator and rudder controls in the fuselage). Futaba S3107 micro servos (FUTM0025) are recommended and illustrated in the manual, but any servo that is the same size (7/8" x 7/16" x 13/16" [22mm x 11mm x 20mm]) and torque rating could also be used. ElectriFly ES-50 Nano servos (GPMM1210) are also suitable.

A 6" [152mm] servo extension wire (HCAM2000 for Futaba) will also be required.

Charging System

The LiPo batteries recommended for your Syncro require a special charger capable of charging LiPos. LiPo batteries must also be “balance charged” so that each of the three individual cells making up the complete battery are charged evenly.

For pilots who wish to charge several batteries simultaneously (reducing down time and optimizing flight time), the Great Planes PolyCharge4™ DC-powered LiPo charger (GPMM3015) is recommended. The PolyCharge4 can charge up to four LiPo batteries at once. But the PolyCharge4 does not have an internal LiPo cell balancer, so for each LiPo battery you wish to charge simultaneously, one Great Planes Equinox™ LiPo Cell Balancer (GPMM3160) will also be required. Finally, the PolyCharge4 does not have AC capability, so if wall-charging from home is important, a separate A/C 12-Volt power source must be purchased separately. A suitable power supply for the PolyCharge4 is the Great Planes 12V 12A DC power supply (GPMP0901).

Another viable battery charging option is the Triton™ EQ (GPMM3155) featuring the required built-in LiPo cell balancing. The Triton EQ also features a built-in AC adapter and wall cord so it can charge batteries from either a wall outlet or a 12V source. The Triton EQ can charge only one battery at a time.

Tools and Accessories

Other than common hobby tools such as screwdrivers, needle-nose pliers, etc., here is the list of items illustrated in this instruction manual required to assemble the Syncro.

- Thread-locking cement (GPMR6060)
- Great Planes stick-on lead weight (GPMQ4485)
- Masking tape



A standard “L-bend” hex key is included with this kit for tightening the set screws in the fan rotor adapter (see page 13), but it’s really only a “one-time” use tool. For any future disassembly and reassembly, and even for this first-time assembly, a high-quality 1.5mm hex wrench such as the DuraTrax® 1.5mm Ultimate Hex Driver (DTXR0288) is suggested.

ORDERING REPLACEMENT PARTS

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

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

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

Mail parts orders and payments by personal check to:

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

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

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

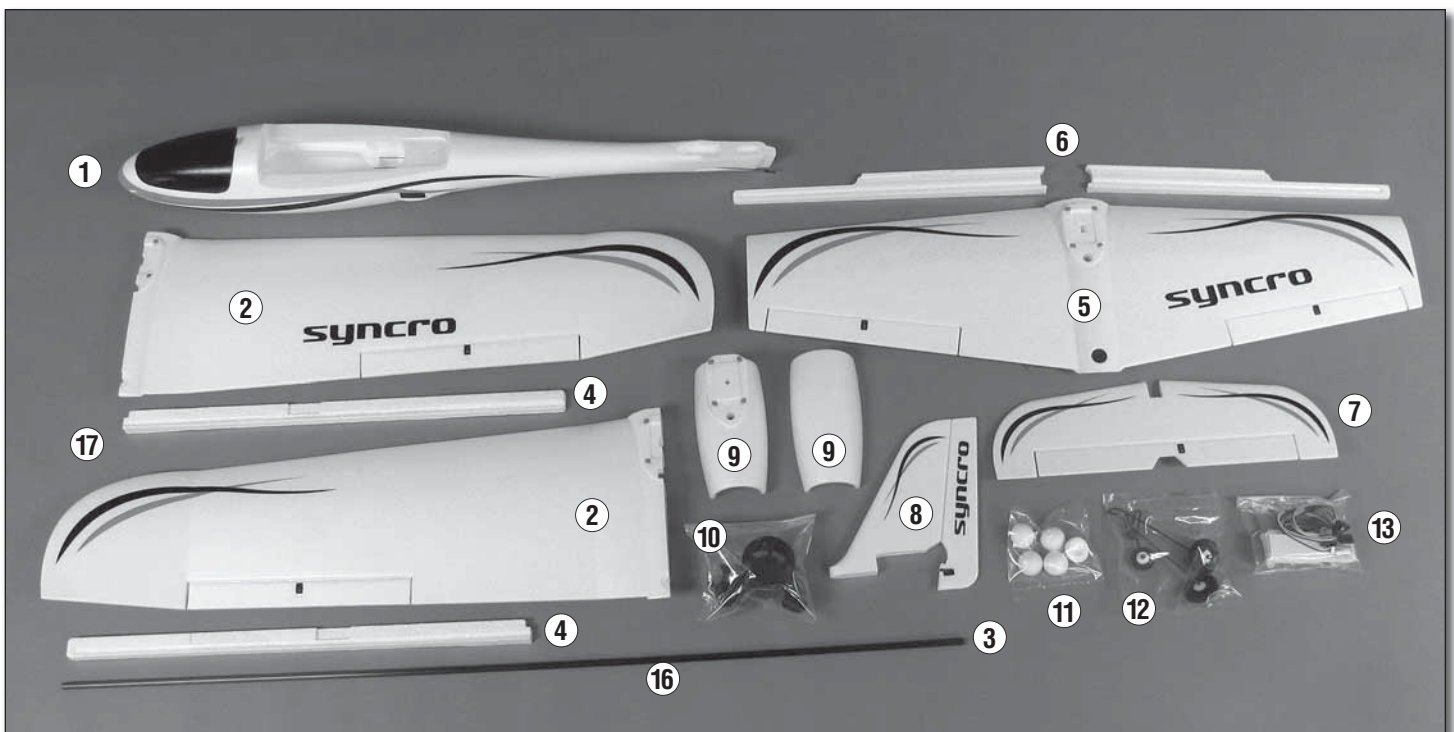
REPLACEMENT PARTS LIST	
Order No.	Description
GPMA4190	Fuselage Set
GPMA4191	Glider Wing Set
GPMA4192	Sport Wing Set
GPMA4193	Tail Set
GPMA4194	Foam Fan Duct
GPMA4195	Landing Gear Set
GPMA4196	Hardware Pack
GPMA4197	Canopy Hatch
GPMA4198	Ducted Fan Unit
GPMA4199	Ducted Fan Rotor
NOTE ▶	Full-size plans are not available. You can download a copy of this manual at www.greatplanes.com .

KIT INSPECTION

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

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

KIT CONTENTS



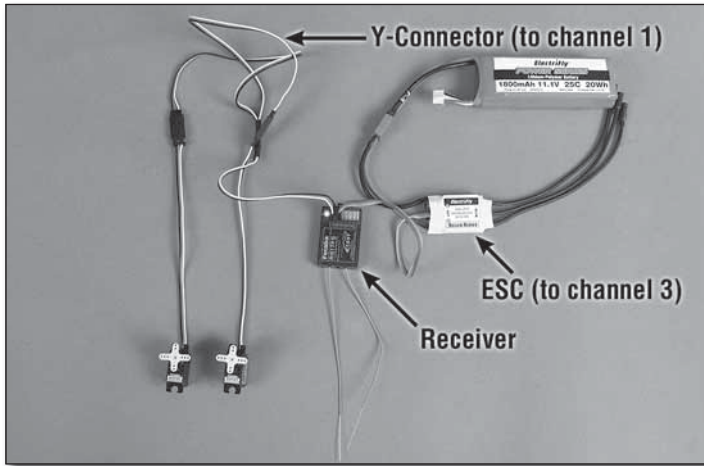
1. Fuselage/canopy hatch
2. Glider wing halves (R&L)
3. Glider wing spar
4. Glider wing spar covers
5. Jet wing
6. Jet wing spar covers
7. Horizontal stabilizer with elevators
8. Vertical stabilizer with rudder
9. Fan duct (top, bottom)
10. Fan assembly (fan housing, rotor, tail cone)
11. Foam fan cones (5)
12. Landing gear (R&L main landing gear, 40mm wheels, nose gear, 25mm nose wheel)
13. Hardware (Glider wing dowel plate, adhesive-back hook & loop (2), long (450mm) Y-harness, short (240mm) Y-harness, motor wire extensions, aileron pushrods, Fan duct mounting bolt, wing bolt collar, Phillips wing screw, pinned hinge, 10mm wood screws (2), 3mm flat washer (for wing screw), micro screw-locks (4), Faslinks (6), retainers for screw-locks (6), screws for screw-locks (8), 2mm fan rotor adapter w/set screws, 5mm hex nut, 3x4mm flat-head motor mount screws (2))

ASSEMBLE THE WINGS

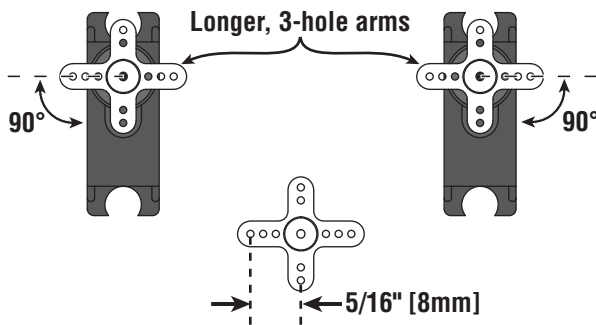
After the spar covers are permanently glued into place, the ends of the Y-connector for the aileron servos will no longer be accessible. The servos may still be removed by pulling the wires out of the wing, but the wing will no longer be functional *because it will not be possible to re-connect new servos*. So make sure your servos are working properly before permanently gluing in the spar covers because there's no going back.

Install the Servos

Refer to this photo for the next two steps.

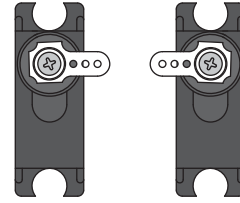


❑ 1. If assembling the **glider** wing, connect the two servos you will be using for the ailerons to the **longer** Y-connector. If assembling the **sport** wing, connect the aileron servos to the **shorter** Y-connector. Connect the ESC to the throttle channel in the receiver (channel 3 for Futaba) and the Y-connector to the aileron channel (channel 1). (If using the ElectriFly SS-25 ESC, note that the brown wire is the negative lead.)

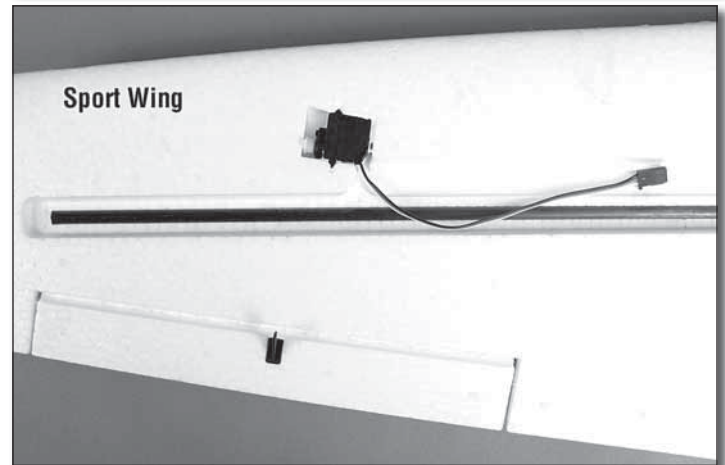
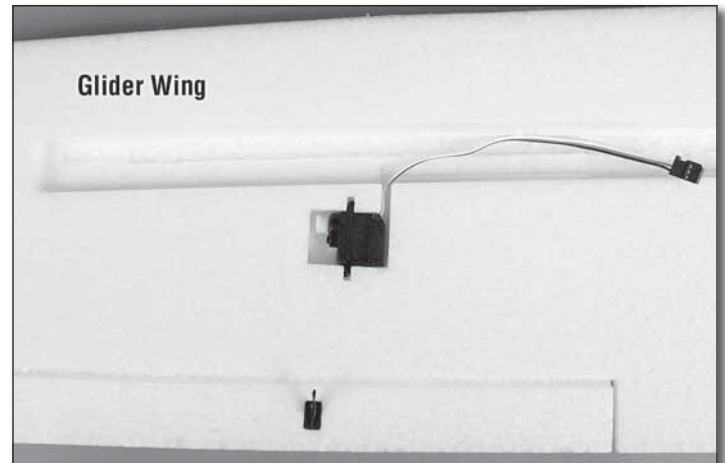


❑ 2. Turn on your transmitter and center the trims. Connect the motor battery to the ESC to power the servos. Use servo arms with holes that are approximately 5/16" [8mm] from center (which are the arms included and shown for the Futaba servos recommended). Position the arms on the servos so they will be 90°, or as close to 90° as possible to the sides of the servo.

Cut off the unused arms

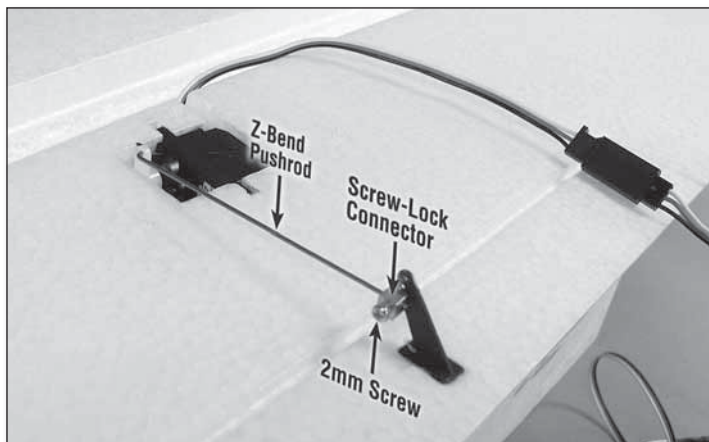


❑ 3. Use small wire cutters to cut off the unused arms so you have two, opposing servo arms. Fasten the arms to the servos with the servo arm screws that came with your servos.



❑ 4. Disconnect the servos from the Y-connectors. Test-fit, then glue the servos into the wings as illustrated for the wing you are working on: It is recommended to use canopy glue because the servos will be easier to remove later if ever necessary (for transferring to another model). **Hint:** You can skip ahead to step 1 on page 12 and glue in the elevator and rudder servos too. Then, you won't have to wait for the glue to dry when you get to that part of assembly.

Hook up the Ailerons



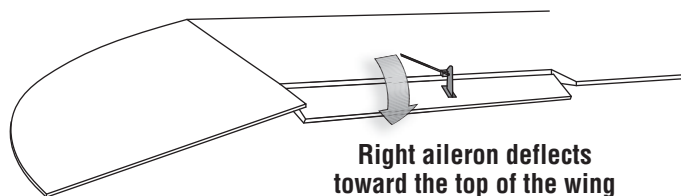
❑ 1. If working on the **glider** wing (pictured), connect one of the **shorter** Z-bend pushrods to the **outer** hole of the servo arm on the servo in the **right** wing panel. Insert a screw-lock connector into the **bottom** hole in the aileron control horn and fit the pushrod into the connector.

If working on the **sport** wing, connect one of the **longer** Z-bend pushrods into the **outer** hole of the servo arm on the servo in the **right** side of the wing. Insert a screw-lock connector into the **outer** hole in the aileron control horn and fit the pushrod into the connector.

❑ 2. Same as when you were fitting the servo arms to the servos, temporarily connect the aileron servo to the receiver and power up the system so you can move the servo with the transmitter. Holding the aileron centered, temporarily lock the pushrod to the screw-lock connector with a 2mm screw.

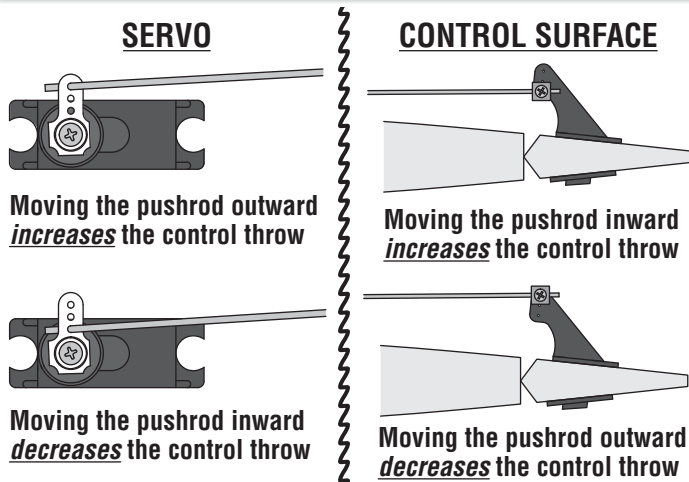
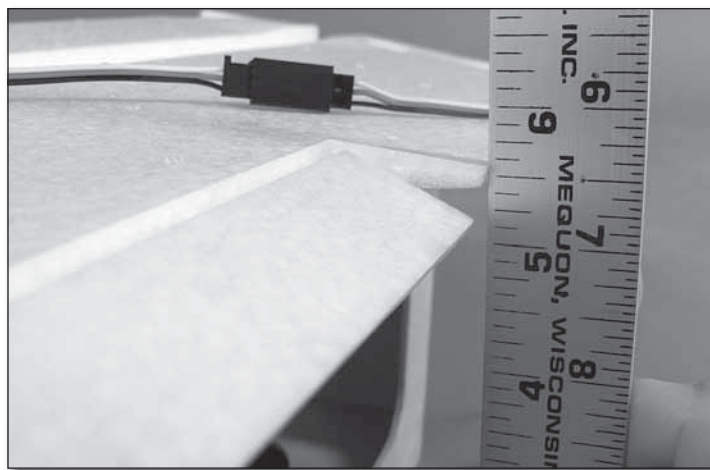


Move the aileron control stick to the right

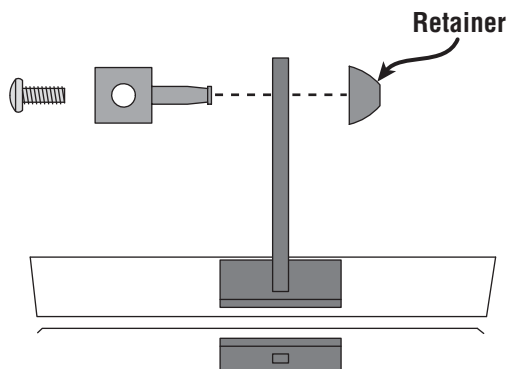


❑ 3. Use the control stick on the transmitter to move the aileron servo. Make sure the servo is moving in the correct direction; when you move the stick to the right the aileron should deflect toward the **top** of the wing (downward, since we are working on the wing upside-down). If the aileron does not respond in the correct direction, reverse the servo direction in the transmitter.

❑ 4. Once we've confirmed that the servo direction is correct, check the control throw as follows to make sure the model responds correctly in the air—if the throw is too much you will end up over-controlling it—if the throw is not enough the model will respond too slowly.



Move the aileron stick all the way to the right. Measure how far from center the trailing edge of the aileron moved. For the **glider** wing, the aileron should move $3/8$ " [10mm] up and $3/8$ " [10mm] down. For the sport wing, the aileron should move $5/16$ " [8mm] up and $5/16$ " [8mm] down. If the aileron does not move the specified distance, move the pushrod to another hole in the servo arm or to another hole in the aileron horn to increase or decrease the throw until you can get it as close as possible ($\pm 1/16$ " [1.5mm] is acceptable).



❑ 5. Once you have the pushrods where you want them and the control throw set, press a nylon retainer onto the screw-lock connector securely holding it to the control horn—be certain the retainer fits tightly and goes all the way on. If you feel the retainer slipped on too easily, discard that retainer and replace it with another—a couple of spare retainers are included with this kit.

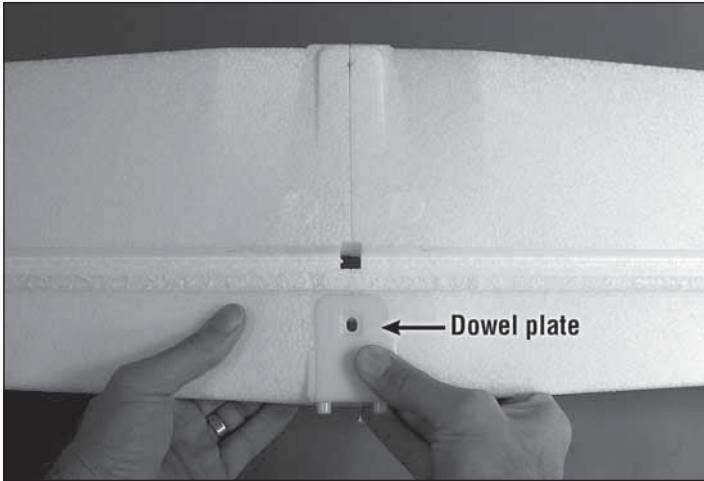
❑ 6. Still with the radio on, remove the screw in the screw-lock connector, wet the threads with threadlocker, reinstall the screw and tighten it securely making sure the aileron remains centered.

❑ 7. Connect the other pushrod to the other aileron and servo the same way.

Finish the Wing

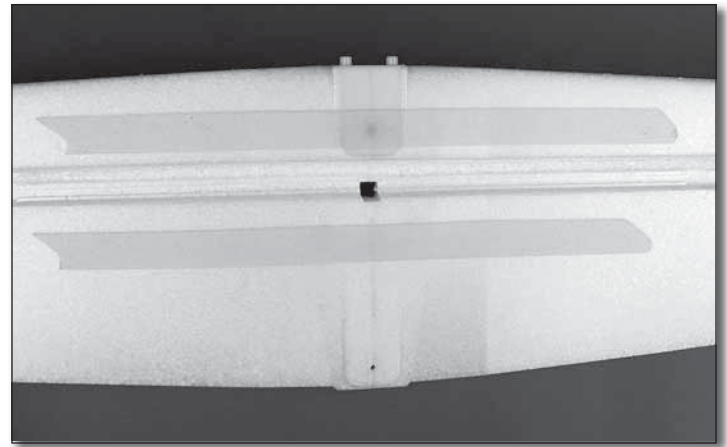
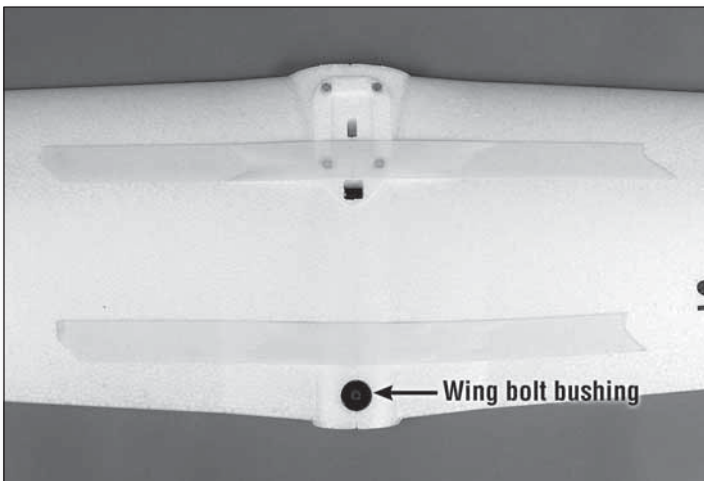
GLIDER WING:

❑ 1. Keep a couple of paper towels handy for wiping glue from your fingers and the wing—remember, canopy glue is preferred because it will be easier to clean up. You'll also need some masking tape for holding the halves together until the glue dries. If using canopy glue, lightly wet the paper towels with water or window cleaner to make it easier to wipe up glue.

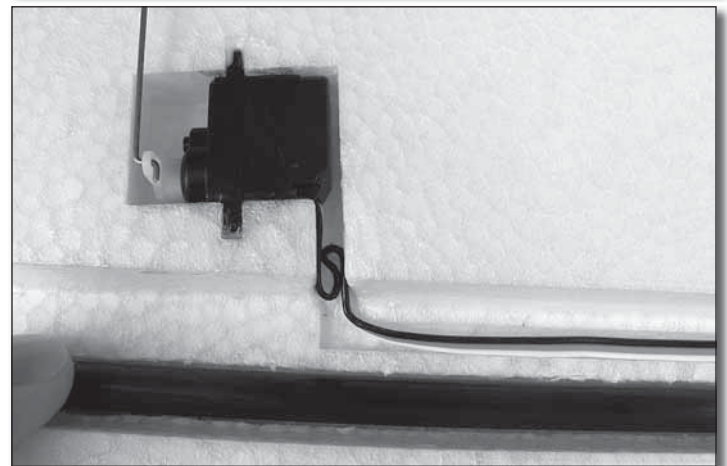
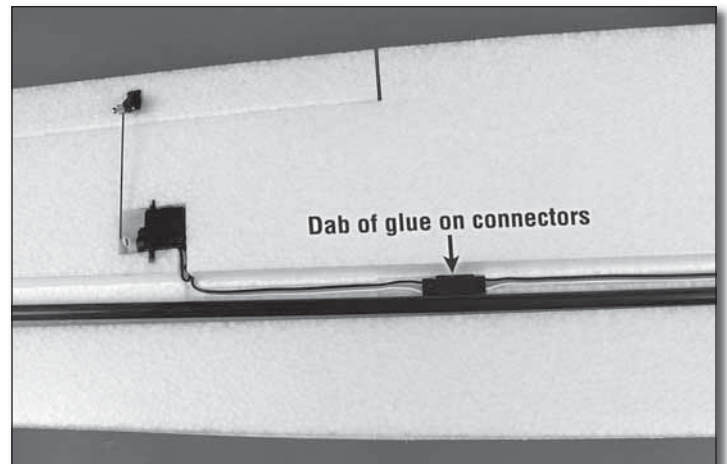


❑ 2. Test-fit the wing halves using the **dowel plate** to help assure alignment.

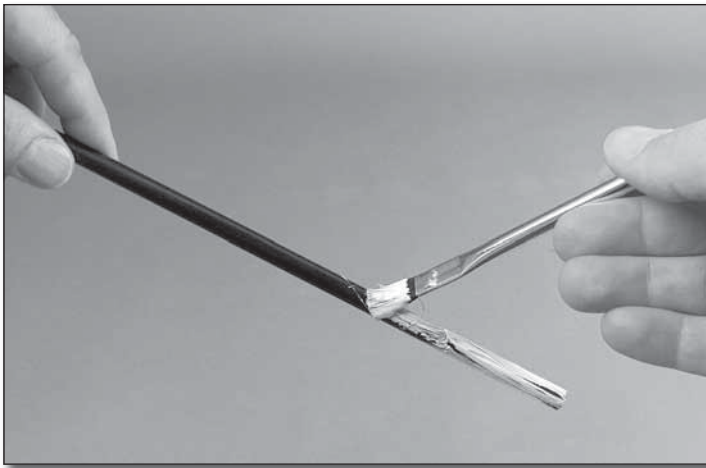
❑ 3. Get ready to glue the wings together. Apply glue to all joining surfaces of both wing halves—you don't need much—just a film, but all surfaces that touch should have glue.



❑ 4. Mate the halves and install the dowel plate. Use strips of masking tape on the top and bottom of the wing to pull the halves together. Make certain the dowel plate remains in position helping to keep the wings aligned. Also install the **wing bolt bushing** to align the trailing edges. Use your paper towels to wipe excess glue from the wing and from your fingers as necessary. Do not disturb the wing until the glue has set (overnight if using canopy glue).



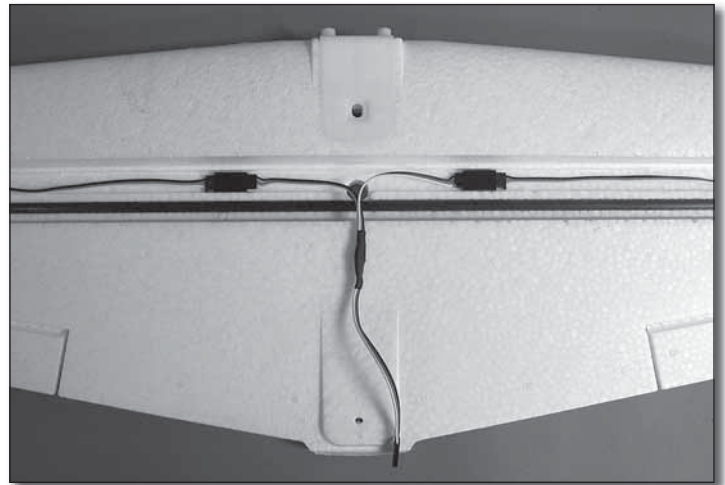
❑ 5. After the glue from joining the wing halves has dried, remove the masking tape and get ready to glue in the spar and the spar covers. Test-fit, but do not glue in the spar. Also connect the Y-connector to the servos. Use a dab of glue to hold the connectors in the channel so they won't move around and interfere with the fit of the spar covers. If the servo wires are too long you can double them back into the servo cavity.



❑ 6. Test-fit, but do not glue in the spar covers. Once you see that the spar and spar covers fit well, remove and apply glue all the way around the spar—an epoxy brush is great for spreading the glue. Place the spar in the wing. Coat the channel and the spar covers with glue, then fit them into the wing.

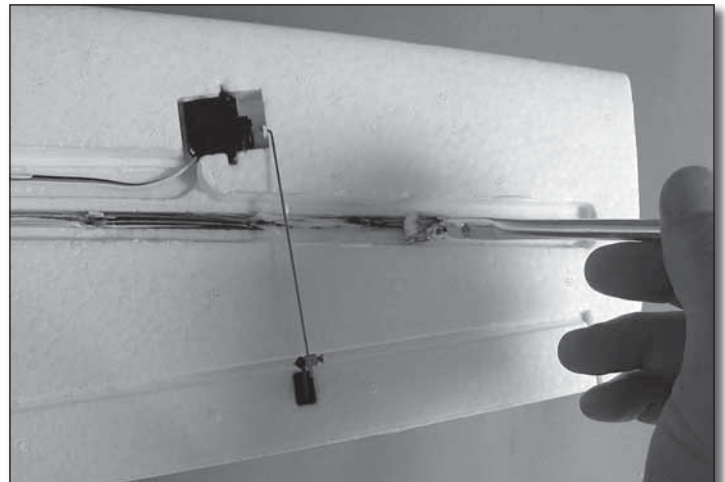
❑ 7. Wipe away excess glue with paper towels and make certain the spar covers remain in position until the glue dries—they shouldn't require clamps or tape, but just monitor the spar covers for a few minutes pressing them back down into the wing if necessary. After a few minutes the glue should set well enough to hold them into position until you can handle the wing after the glue has completely dried.

SPORT WING:



❑ 1. Connect the short Y-connector to the aileron servo wires. Use a drop of glue to hold the connectors in the channel so they won't move around and interfere with the fit of the spar covers when gluing them in.

❑ 2. Test fit the spar covers—they should fit all the way down until they are flush and even with the bottom of the wing.

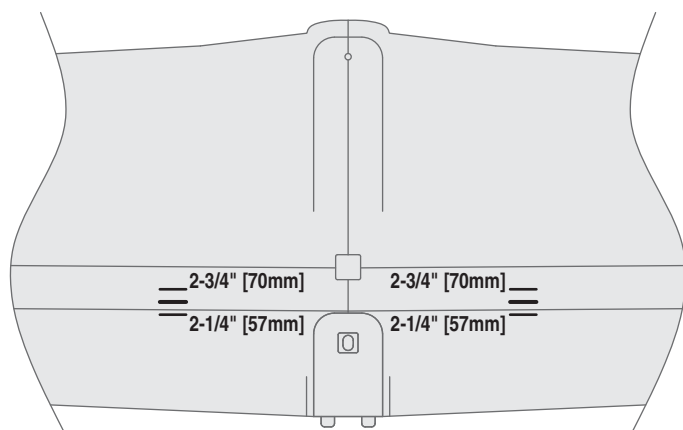
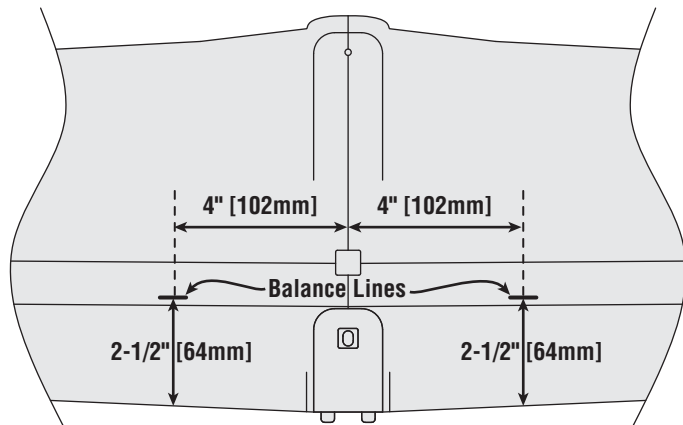


❑ 3. Remove the spar covers. Apply glue to one of the spar covers and in the corresponding channel in the wing—make especially sure that you get glue on the spar and in the groove in the spar cover for the spar. **Hint:** An epoxy brush will make it easier to evenly distribute the glue.

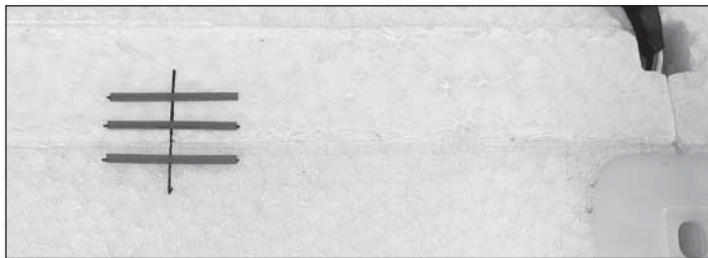
4. Insert the spar cover and wipe away excess glue with paper towels. Glue in the other spar cover the same way. Wipe away excess glue with paper towels and make certain the spar covers remain in position until the glue dries—they shouldn't require clamps or tape, but just monitor the spar covers for a few minutes pressing them back down into the wing if necessary. After a few minutes the glue should set well enough to hold them into position until you can handle the wing after the glue has completely dried.

Mark the C.G. (Balance Point)

GLIDER WING:

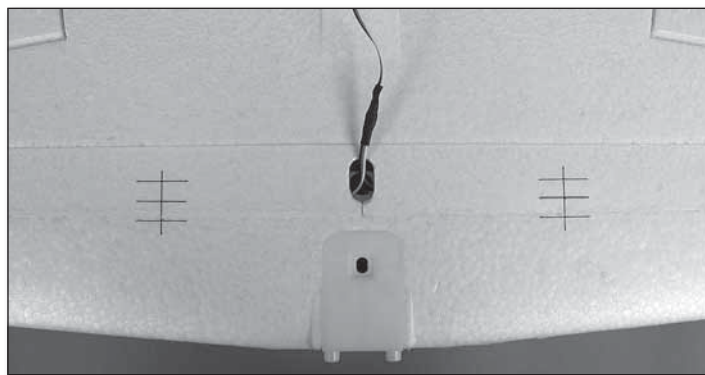
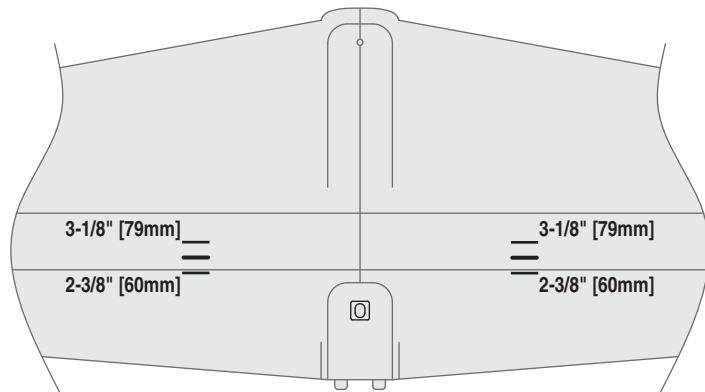
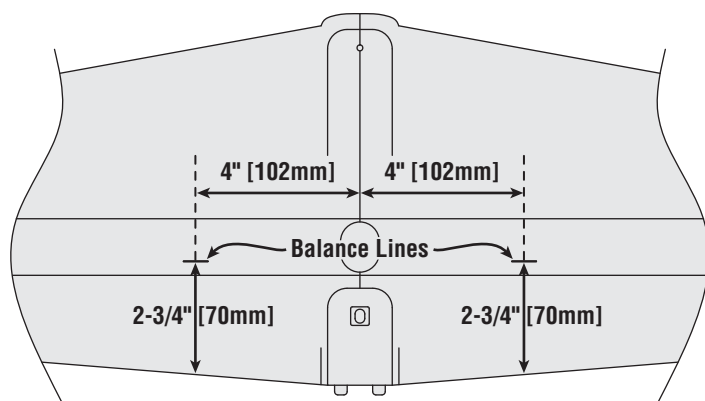


1. Use a fine-point felt-tip pen to mark the **balance lines** on the bottom of the wing 4" [102mm] out from the middle of the wing and 2-1/2" [64mm] back from the leading edge where shown. Mark two more lines 1/4" [6.4mm] ahead and 1/4" [6.4mm] behind the lines you marked.

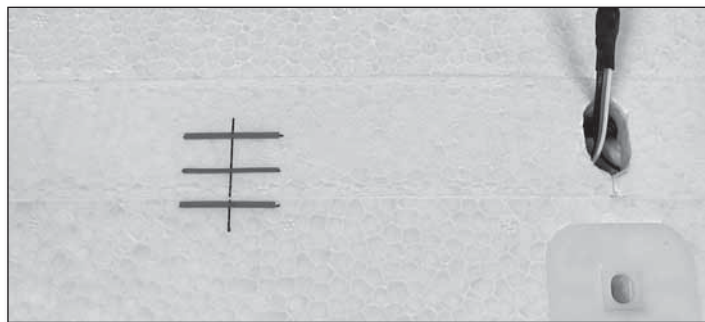


2. Apply narrow strips of tape approximately 1/16" [1.5mm] wide over the lines so you will be able to feel them with your fingers when balancing the plane later. If you don't have any narrow tape you could simply cut whatever tape you do have into strips.

SPORT WING:



1. Use a fine-point felt-tip pen to mark the **balance lines** on the bottom of the wing 4" [102mm] out from the middle of the wing and 2-3/4" [70mm] back from the leading edge where shown. Mark two more lines 3/8" [10mm] ahead and 3/8" [10mm] behind the lines you marked.

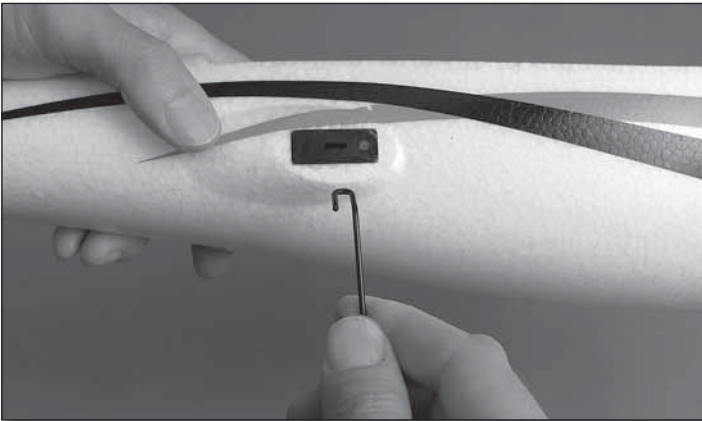


2. Apply narrow strips of tape approximately 1/16" [1.5mm] wide over the lines so you will be able to feel them with your fingers when balancing the plane later. If you don't have any narrow tape you could simply cut whatever tape you do have into strips.

ASSEMBLE THE FUSELAGE

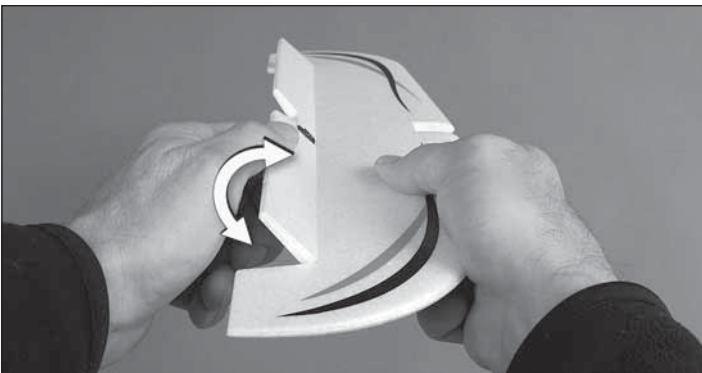
Install the Landing Gear (Optional)

The landing gear for the Syncro is optional. If you prefer the streamlined appearance of a glider (with the glider wing) or the jet-like appearance with the landing gear retracted (with the sport wing) you may simply leave the landing gear off. Of course your Syncro will then have to be hand-launched and landed on soft terrain so as not to damage the bottom of the fuselage.

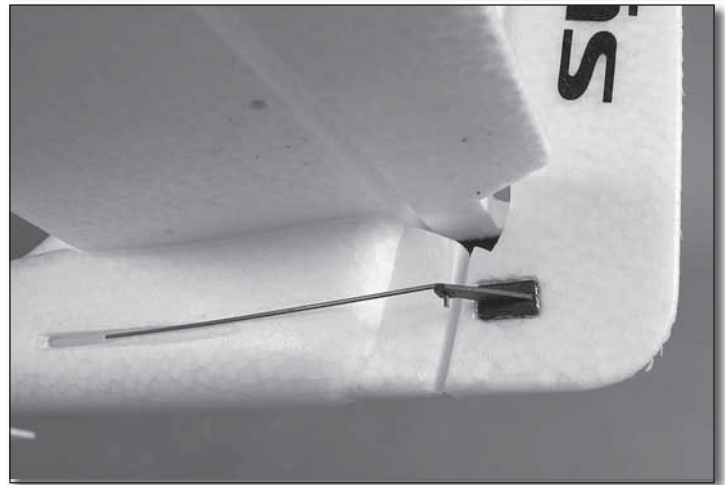
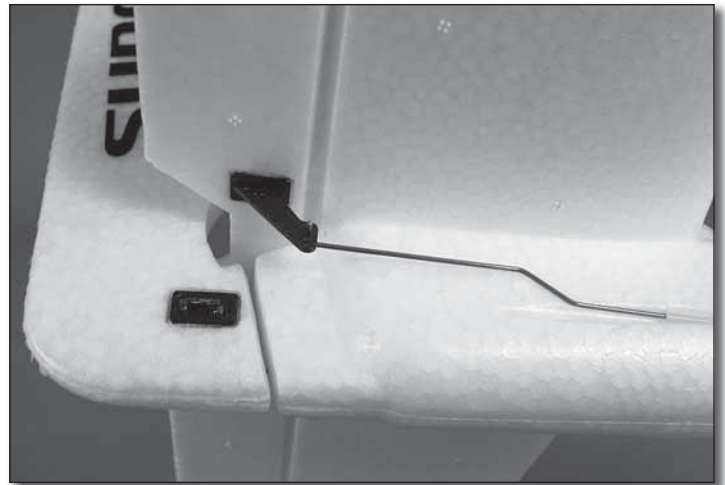


❑ Press-fit the main and nose landing gear into the molded-in landing gear mounts. It doesn't matter which way the main gear goes in (there isn't a right or a left), but the nose gear should be installed with the wire "bending" back as illustrated.

Attach the Horizontal and Vertical Stabilizers

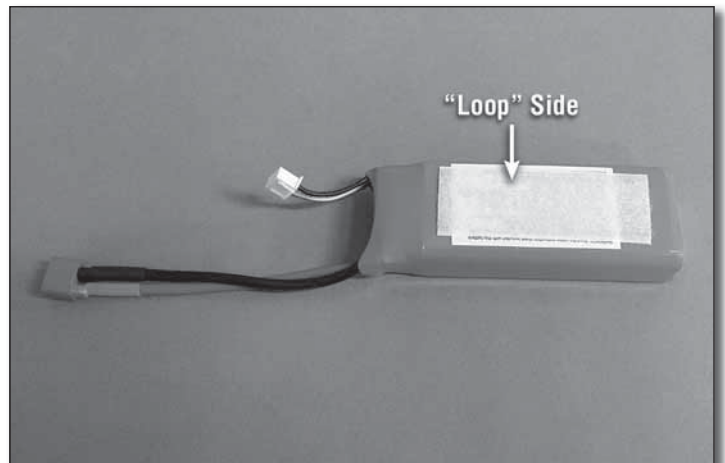


❑ 1. Bend the elevator up and down several times to free up the hinge. Do the same with the rudder.

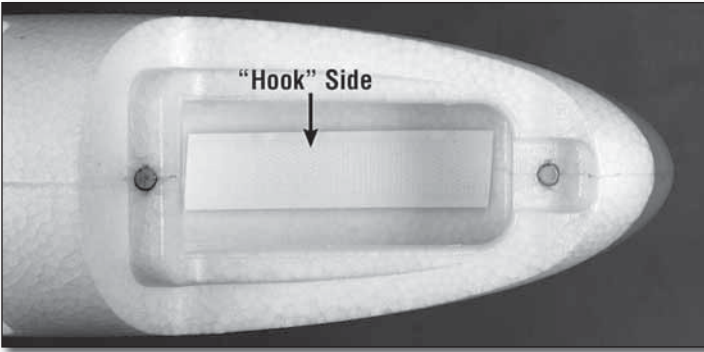


❑ 2. Temporarily fit the vertical stabilizer (fin) to the horizontal stabilizer (stab) and fit the assembly to the fuselage. Also temporarily fit the pushrods into the middle holes of each control horn. If necessary, carefully use a sharp hobby knife to enlarge the holes in the horns so the pushrods will fit.

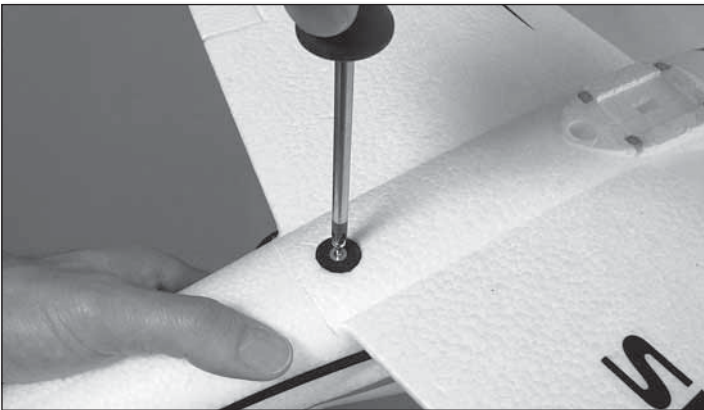
❑ 3. Remove the pushrods from the horns and separate the fin and stab from the fuselage and from each other.



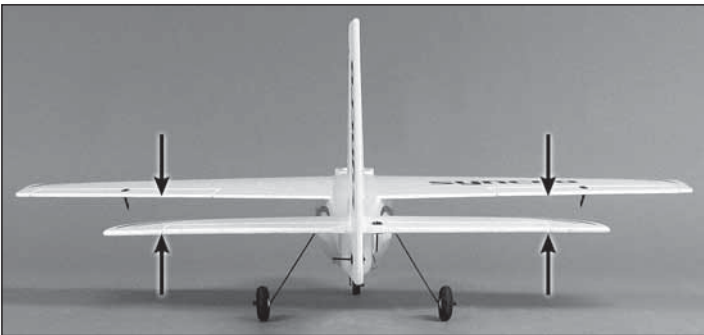
❑ 4. The fuselage will be easier to work on if the battery is in position to hold the nose down, so apply the softer, "loop" side of the included hook-and-loop material to your battery.



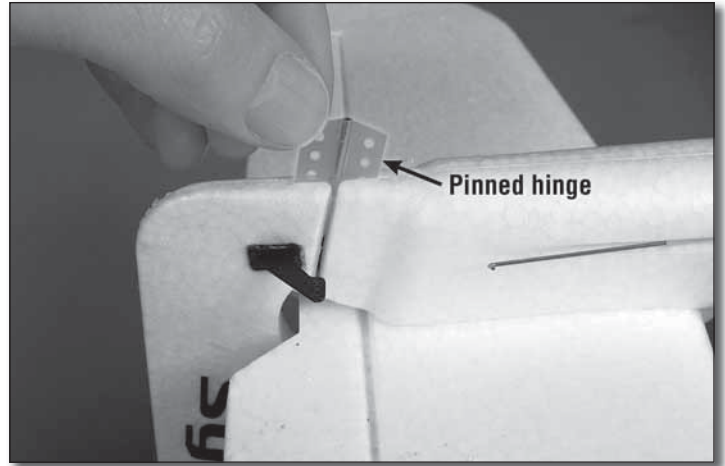
❑ 5. Apply the rougher, “hook” side to the bottom of the battery compartment inside the fuselage. (If more Velcro is ever required for more batteries, you can purchase Great Planes adhesive-back Velcro separately (GPMQ4480)—or, you could cut the included strip in half and have enough for at least two batteries.)



❑ 6. For alignment purposes, temporarily mount one of the wings to the fuselage with the 1-3/8" [35mm] Phillips sheet metal screw and washer.

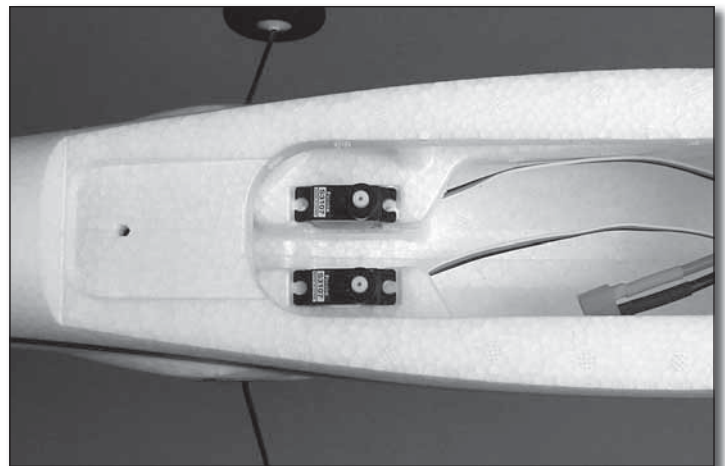


❑ 7. Apply glue to all joining surfaces and fit the fin and stab into position. (Again, using canopy glue will make clean up easier with damp paper towels.) Working quickly, see if the stab is parallel with the wing. If necessary, align the stab with the wing and do not disturb the assembly until the glue dries.

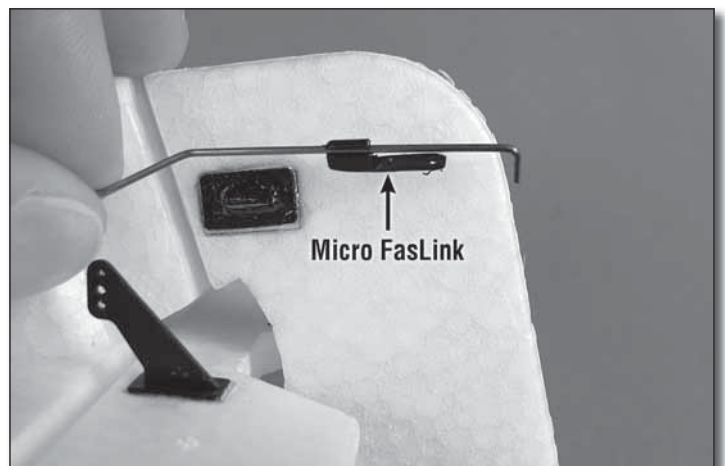


❑ 8. Remove the wing. Test-fit, then glue the pinned hinge into the bottom of the rudder and the fuselage—use care not to get any glue into the hinge pin. As a precaution, you could add a dab of petroleum jelly or plastic-compatible oil to the hinge joint. **Note:** if the rudder control horn down inside the rudder interferes with the fit of the hinge keeping it from going all the way in, it's okay to nip a little corner off the hinge to clear the horn.

Install the Servos



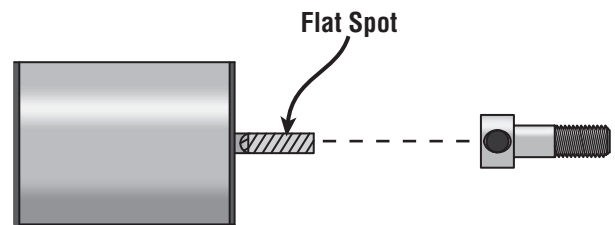
❑ 1. The same as was done with the aileron servos, glue the elevator and rudder servos into position.



Assemble the Ducted Fan



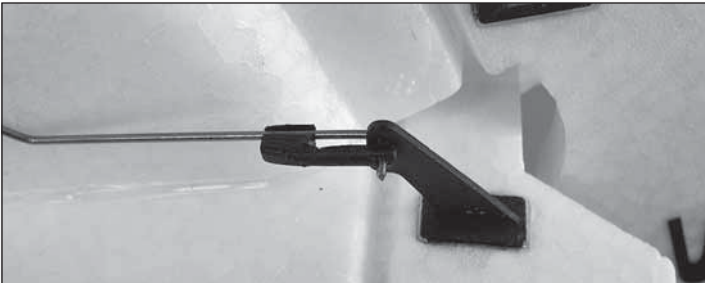
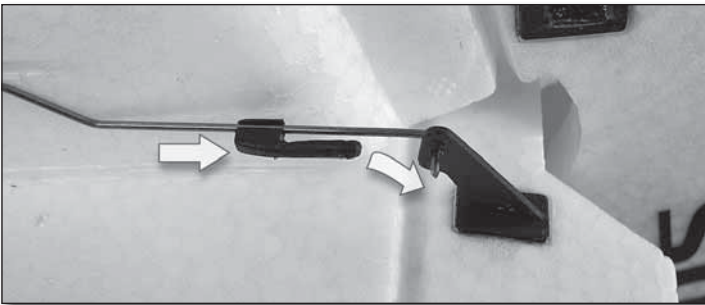
- ❑ 1. Remove the female “bullet” connectors from the ducted fan motor (not included). These will not be used because the recommended SS-25 ESC already has connectors on the wires.



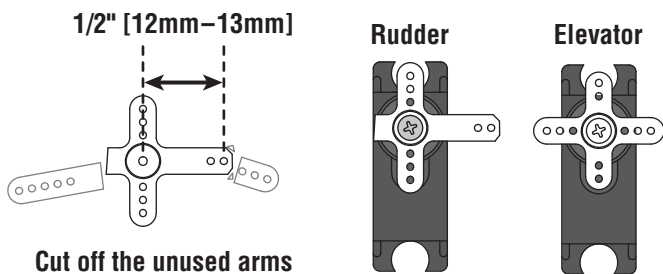
- ❑ 2. Fit the brass fan adapter shaft over the motor shaft—be certain one of the two holes in the adapter for the set screws is aligned over the flat spot on the motor shaft. Also be certain the adapter is pressed all the way onto the motor shaft.



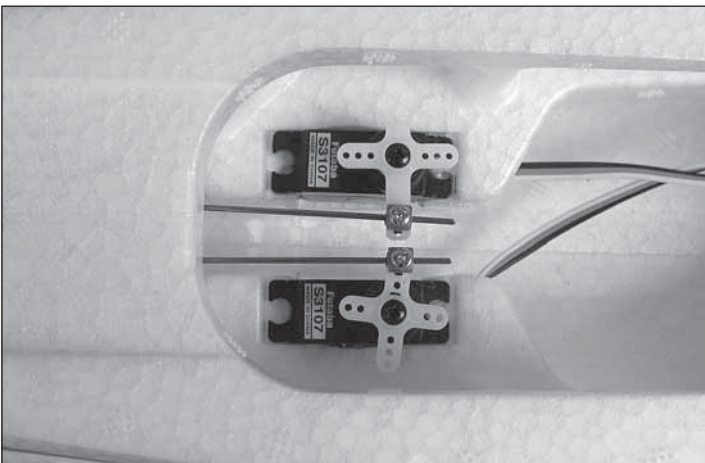
- ❑ 3. Barely wet the threads of both 3mm set screws with threadlocker and thread them into the adapter. Making sure the longer of the two set screws goes over the flat spot on the motor shaft, use the included 1.5mm hex key wrench (or a high-quality hex key wrench as recommended in the front of the manual) to tighten the screws.



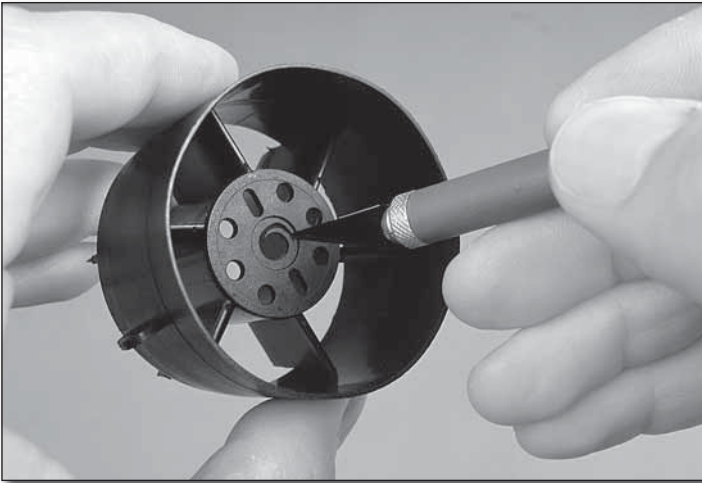
- ❑ 2. Fit the pushrods into the **middle** hole in the elevator control horn and into the **lowest** hole—the one closest to the surface of the rudder—in the rudder control horn. Secure the pushrods with micro Faslinks—sometimes it’s easiest first to slide the Faslinks over the pushrods, then to insert the pushrod in the control horn. Then, holding the Faslink on the pushrod, slide the Faslink forward and fit it over the L-bend in the pushrod.



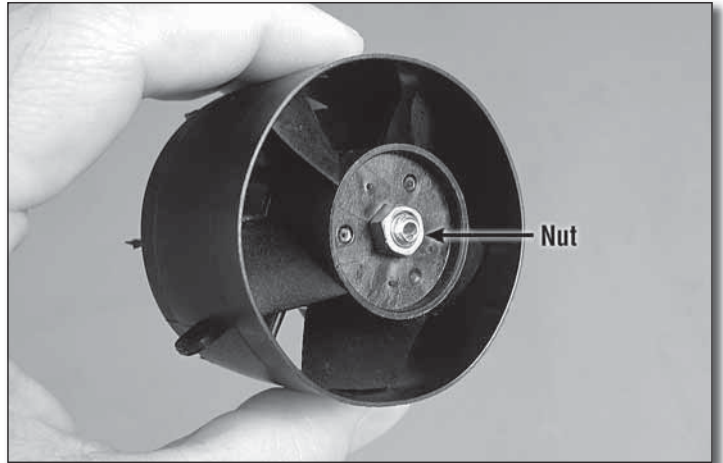
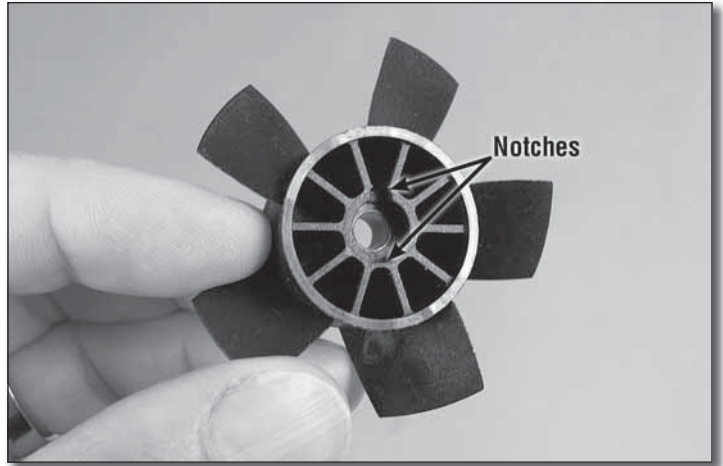
- ❑ 3. Prepare the servo arms for the elevator and rudder servos—this time, make a 1/2" [12mm – 13mm] servo arm for the **rudder** so you can get the correct control throw.



- ❑ 4. Fasten the screw-lock connectors to the servo arms where shown with the retainers and temporarily lock the pushrods to the retainers with the small screws.

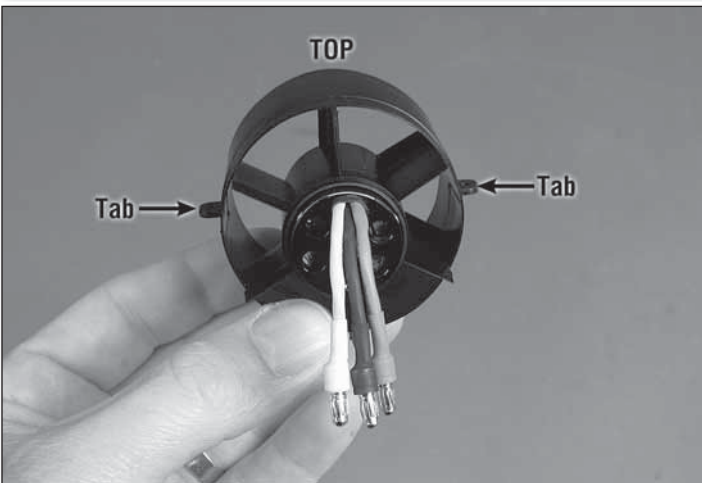
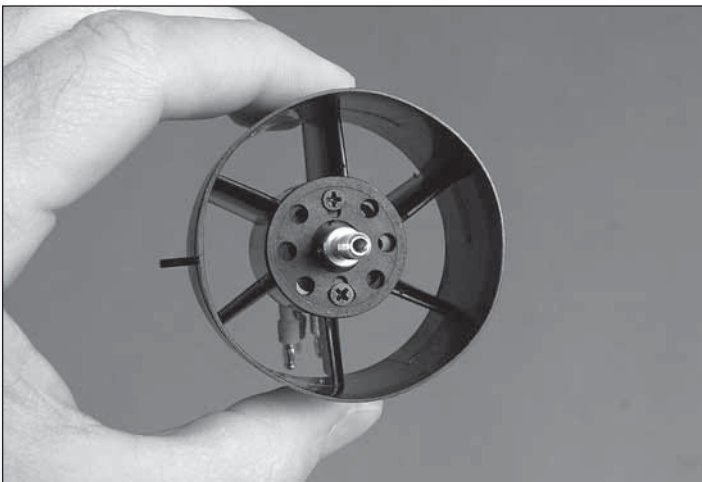


❑ 4. Use a hobby knife to enlarge the hole in the fan housing to accommodate the adapter shaft on the motor.

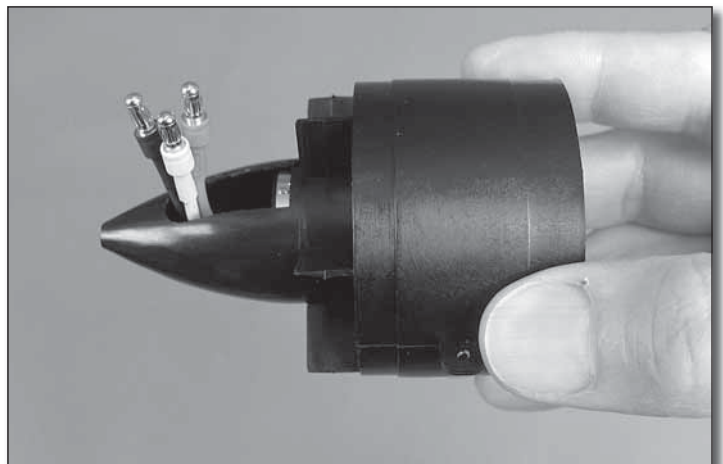


❑ 6. Fit the fan onto the adapter shaft keying the notches in the back of the fan over the set screws protruding from the shaft. Make certain the fan is all the way down onto the shaft—if you can thread the nut over the shaft with a little of the shaft protruding from the nut, then the fan is all the way on.

❑ 7. Remove the nut, add a drop of threadlocker to the threads, then install and tighten the nut with an 8mm or 5/16" wrench or pliers.

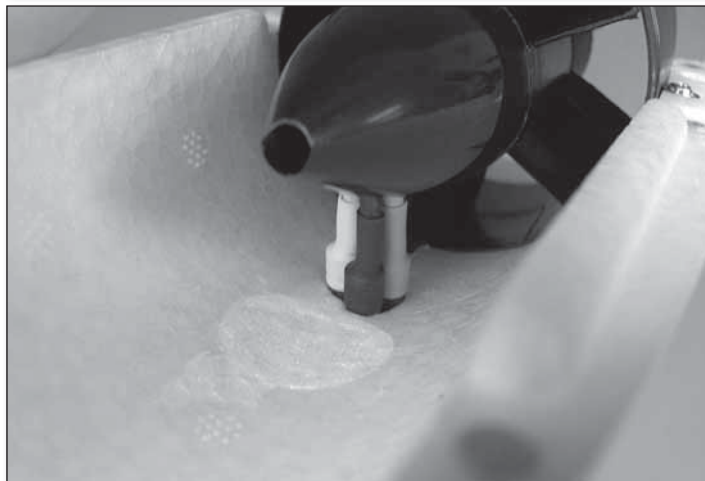
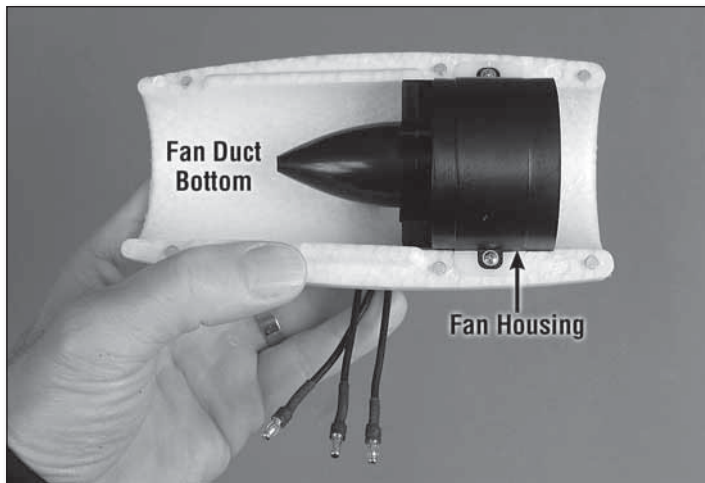


❑ 5. Use threadlocker to wet the threads of both 3mm flat-head Phillips screws and mount the motor in the fan housing with the screws through the slotted holes. Note that the wires coming out of the back of the motor should be perpendicular to the mounting tabs on the housing. The side with the wires will be the "top" of the unit.



❑ 8. **OPTIONAL:** The optional **tail cone** may provide a few additional miles-per-hour, but it won't be anything monumental. If you prefer not to take the time to install the tail cone simply skip this step. To install the cone, cut a slot in the cone to accommodate the motor wires, then tack-glue

it into position with four to six drops of medium CA. Note that, if ever the motor requires removal, the tail cone will have to be broken free from the fan housing. This should not prove to be difficult as long as it was just tack-glued into place.

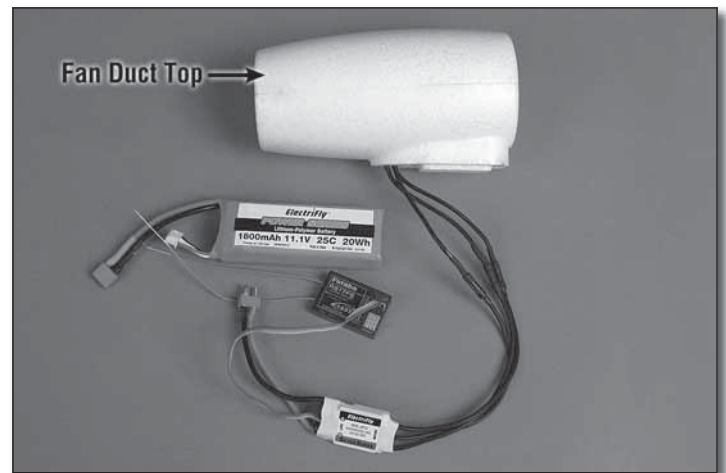


❑ 9. Connect the three motor extension wires to the motor wires coming from the motor and guide them down through the hole in the bottom half of the **fan duct** while simultaneously keying the fan housing into position. Secure the housing to the duct with the two small Phillips-head screws.

Test Run the Motor

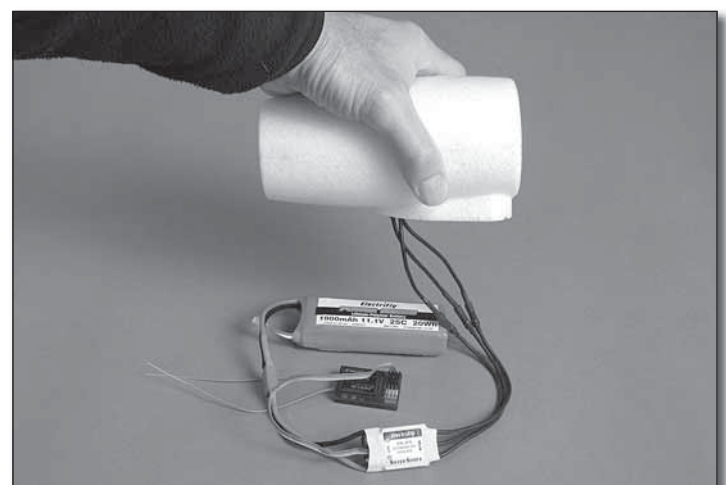
Before mounting the fan cone and proceeding with the rest of assembly, test-run the motor to make sure everything is working properly. You'll need your transmitter, receiver, ESC and battery again.

❑ 1. If you haven't yet done so, charge your motor battery following the instructions, warnings and cautions included with the battery and charger.



❑ 2. Temporarily connect the three motor wires coming from the ESC to the three motor extension wires coming from the motor. Connect the ESC to the throttle channel in the receiver (channel 3 for Futaba).

❑ 3. Turn on your transmitter. If using the ElectriFly SS-25 ESC set the throttle servo direction in your transmitter to "reverse" (this is channel 3 for Futaba).



❑ 4. Be certain the throttle stick on your transmitter is all the way down. Connect the battery to the ESC. With the top of the fan duct in position, hold the unit in one hand and advance the throttle stick **just enough to get the motor to turn**. Make certain the motor is turning in the correct direction by checking to see that air is blowing out the back of the fan. If the fan is turning the wrong way, disconnect the battery and swap any two of the three motor wires with each other. With the throttle stick all the way down, re connect the battery and operate the motor to confirm that it is turning in the correct direction.

CAUTION: In the next step we will be running the fan to full power, so proceed with great care and wear hearing protection and eye protection.

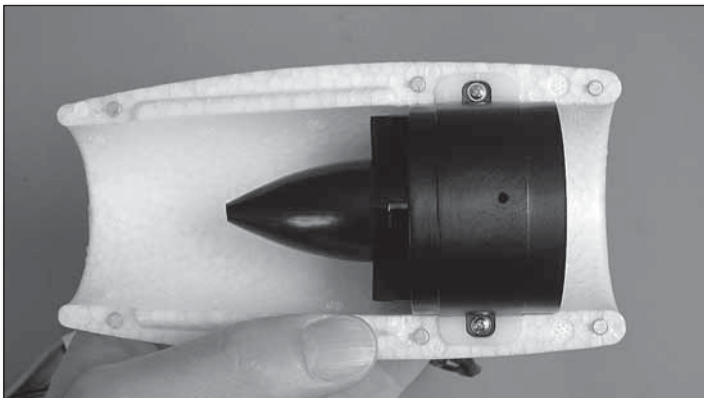
❑ 5. Once you have confirmed that the motor is running in the correct direction, put on your hearing protection and safety glasses. Advise anybody else in the area to do the same (or ask them to leave the area).

❑ 6. Firmly holding the fan duct in your hand, point the intake away from anything that could get sucked into it and point the exhaust in an area where nothing will get blown off the workbench or blown around the room. Checking your surroundings, advance the throttle to about 1/3 stick. If the motor and fan run smoothly hold the throttle in this position for one minute. Continue the test-running procedure as described step 10. If you detect any unusual noise or vibration cut the throttle, disconnect the battery and turn off the transmitter.



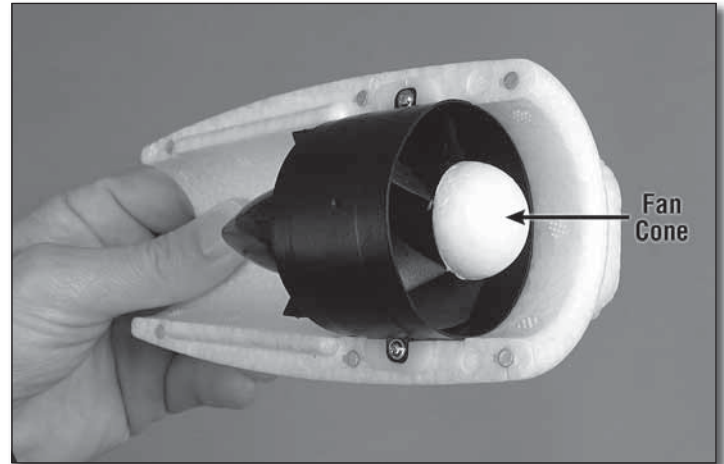
❑ 7. With the power disconnected, remove the top of the fan duct and inspect the fan and housing for any signs of rubbing or wear. If necessary, remove the fan and use a hobby knife to remove any plastic that may have been deposited on the fan blades or in the housing. If you can't pull the fan off with your fingers, you can make a "fan puller" from 1/16" [1.6mm] pushrod wire as shown.

❑ 8. Remount the fan 180° from the way it was, then reinstall the nut with threadlocker. Run the motor as described in step 6 to see if the problem has been solved. If there is **still** vibration or rubbing, remove the fan again. This time also remove the adapter shaft from the motor—this will also require removal of the motor from the fan housing. (Or you could drill a 3/32" [2.4mm] hole through the housing 5/8" [16mm] back from the front edge. Then, you can insert your hex key wrench down through the hole instead of removing the motor.)

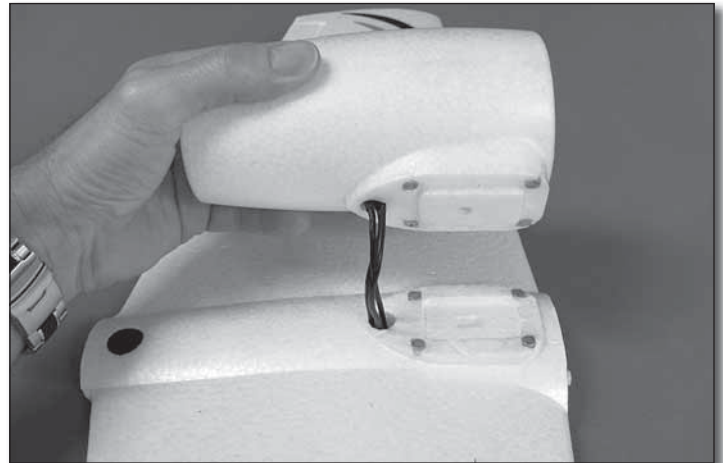


❑ 9. Reinstall the adapter shaft onto the motor 180-degrees from the original position and remount the fan with the nut. Once more run up the motor to 1/3-throttle.

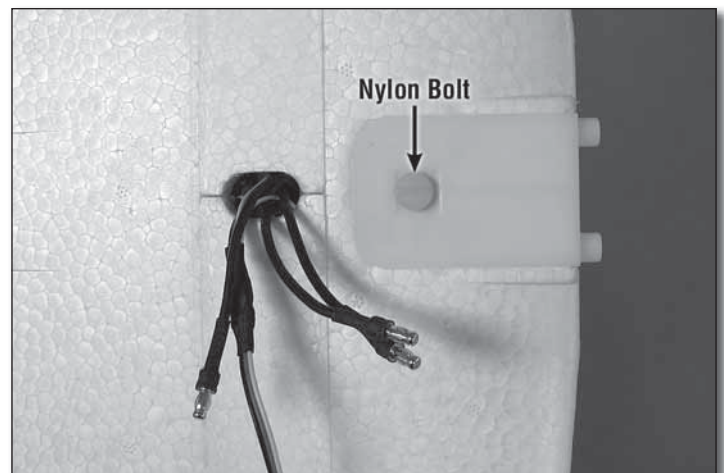
❑ 10. Once you can get the motor and fan to run smoothly at 1/3-throttle for one full minute, advance the throttle to 2/3 stick and run for another minute, then finally to full power for 30 seconds.



❑ 11. After you have confirmed smooth operation of the motor and fan unit all the way to full-throttle, disconnect the battery, ESC and receiver. Use a few drops of CA or canopy glue to tack glue one of the foam fan cones to the fan.



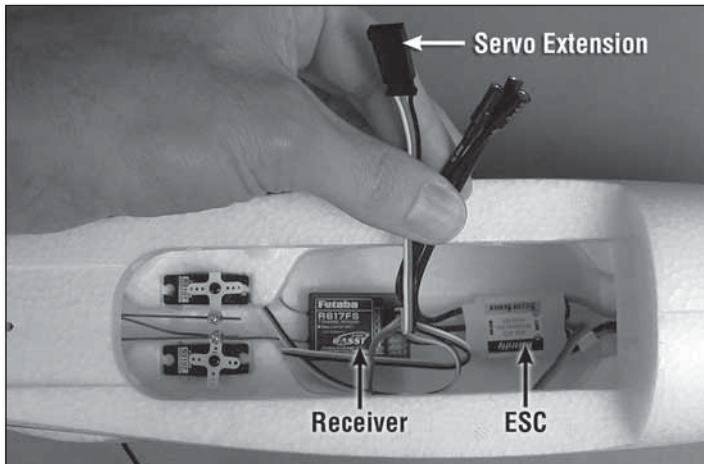
❑ 12. Guide the motor wires down through the hole in the wing and attach the fan duct to the top of the wing with the magnets.



❑ 13. Secure the fan duct to the wing with the nylon bolt.

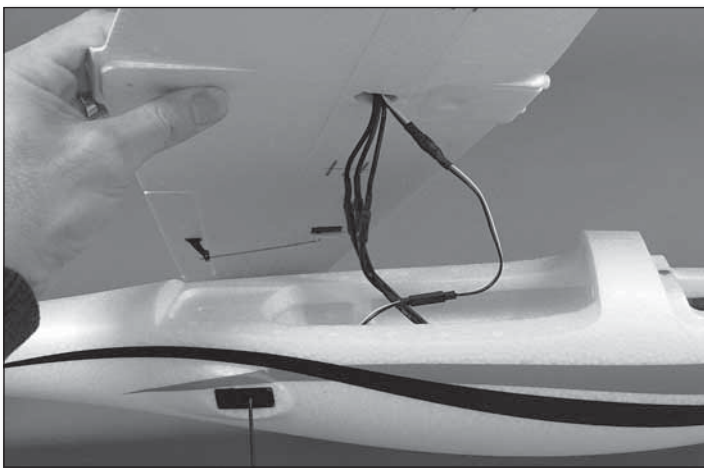
FINAL PREPARATIONS

Mount the Receiver and ESC



❑ 1. Apply the remaining “hook” side of the included hook-and-loop strip to the bottom of the fuselage in the radio compartment in front of the servos. Connect a 6” [150mm] servo extension in the aileron channel in your receiver (so it will be easier to connect and disconnect the aileron servo wire when installing/removing the wing). Connect the rest of the servos and the ESC to the receiver and mount the receiver and ESC in the bottom of the fuselage with the other side of the hook-and-loop.

❑ 2. Turn on the transmitter and receiver. Add a drop of threadlocker to the 2mm screws in the screw-lock connectors on the elevator and rudder servos and lock the pushrods down making sure the elevator and rudder are centered.



❑ 3. Connect the three motor wires coming out of the wing to the three wires coming from the ESC and connect the Y-connector for the ailerons coming from the wing to the servo extension in the aileron channel in the receiver. Before mounting the wing to the fuselage, turn on the transmitter and connect the battery to the ESC. Run the motor briefly to make sure it is running in the correct direction—it should be blowing air out the back. If the motor is turning the wrong way, same as before when conducting initial test runs, swap any two of the motor wires to get the motor running the right way.

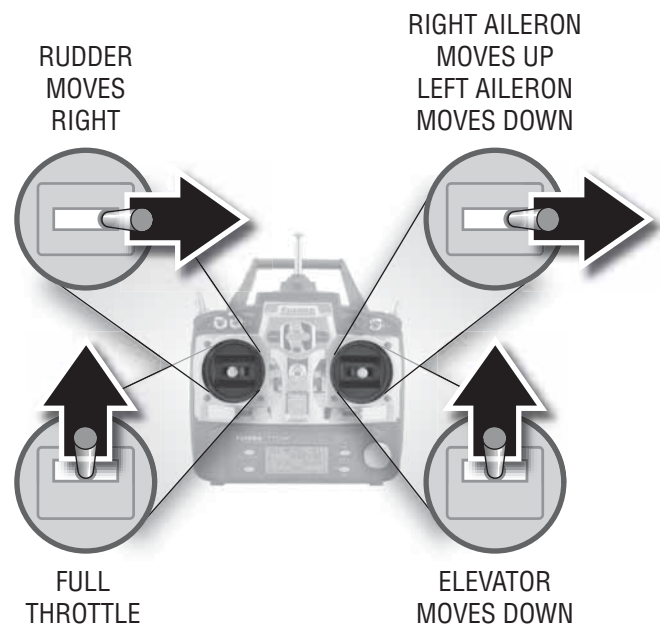


❑ 4. Place the wing on the fuselage making sure none of the wires are pinched between the bottom of the wing and the fuselage. Bolt the wing to the fuselage with the 35mm Phillips sheet metal screw and the 3mm washer—do not over-tighten the screw—just about 1 to 1-1/2 turns after the bolt is seated on the collar.

Check the Control Directions

The instructions already guided you how to set up the controls, but it is always a good idea to double-check that the controls are responding in the correct direction once the model is all together. With the wing mounted to the fuselage turn on the transmitter, then connect the battery.

4-CHANNEL RADIO SET UP (STANDARD MODE 2)



Confirm that the controls are responding in the correct direction as illustrated.

Check the Control Throws

You were also already guided how to connect the pushrods to get the recommended throws, but because the control throw has such a great effect on how a model flies the throws should be checked again. You should also program the low-rate throws so you can switch between rates in-flight to suit your taste and the conditions.

It is best to get the throws as close as possible to the recommended measurements specified below first by relocating the pushrods on the servo arms and/or on the control horns on the control surfaces. Once the throws are close, **then** you can adjust the end points or ATV's in your transmitter as necessary. Moving the pushrods inward on the servos or outward on the control surfaces will provide less throw. Moving the pushrods outward on the servos or inward on the control surfaces will provide more throw.

These are the recommended control surface throws:				
	HIGH RATE		LOW RATE	
	Up	Down	Up	Down
ELEVATOR	3/8"	3/8"	1/4"	1/4"
	[10mm]	[10mm]	[6.5mm]	[6.5mm]
	17°	17°	11°	11°
RUDDER	Right	Left	Right	Left
	5/8"	5/8"	3/8"	3/8"
	[16mm]	[16mm]	[10mm]	[10mm]
AILERONS (Glider Wing)	Up	Down	Up	Down
	3/8"	3/8"	1/4"	1/4"
	[10mm]	[10mm]	[6.5mm]	[6.5mm]
AILERONS (Sport Wing)	Up	Down	Up	Down
	5/16"	5/16"	3/16"	3/16"
	[8mm]	[8mm]	[5mm]	[5mm]

Note that the **aileron** throws for the glider wing and the sport wing are different, but all the rest of the throws are the same for both models.

Balance the Model (C.G.)

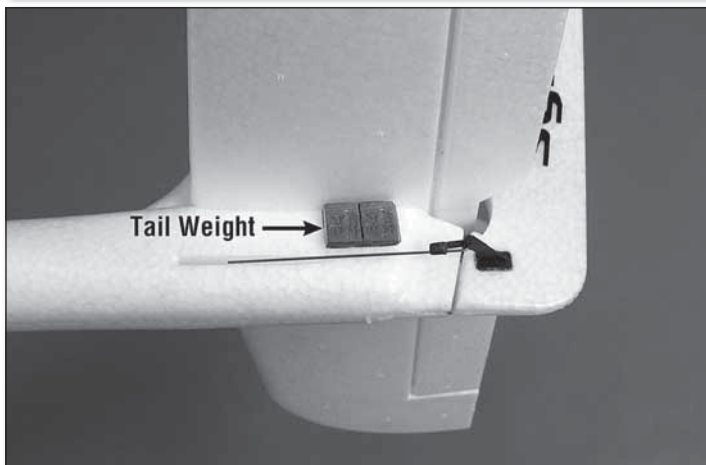
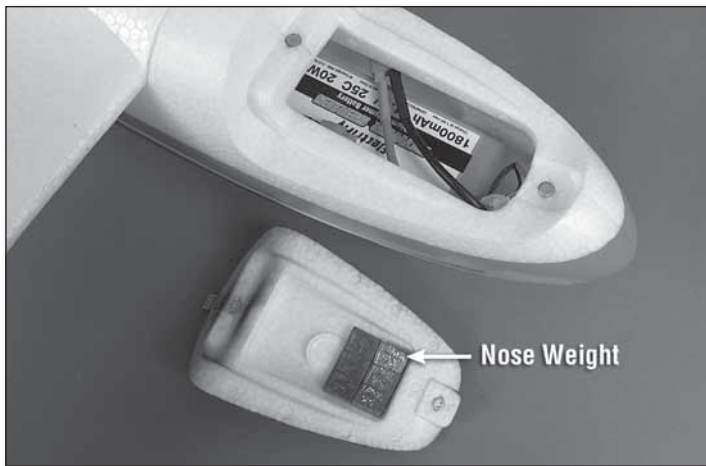
The C.G. (Center of Gravity) is the location on the wing where the model balances. Same as the control throws, the C.G. has a profound effect on the way the model flies. If the C.G. is too far aft (tail heavy), the model will be too responsive. If the C.G. is too far forward (nose-heavy), the model will not be responsive enough. Follow the balance procedure to make sure the model is properly balanced and the C.G. is in the correct location.

IMPORTANT! If balancing your Syncro with the Sport wing, it will have to be re balanced again if you install the Glider wing. And the same is true for the opposite—be certain to re balance your Syncro after switching wings.

1. On page 10 you were already instructed to mark the balance lines on the bottom of the wings. Mount the wing and install the motor battery. All the rest of the parts of the model should be installed including the fan duct with the motor, landing gear, battery hatch and all the servos and radio components.



2. Place your fingers on the **middle** balance lines and lift the model. If the fuselage remains level (balances), your Syncro is perfectly balanced—it may be helpful to have an assistant view the model from the side if you can't tell for sure. If the fuselage does not rest level try moving your fingers under the wing, **making certain to keep them between the forward and aft lines**. If you can get the fuselage to rest level with your fingers between the forward and aft balance lines, it is within the recommended balance range and could be flown, but it's really best to get the model to balance directly on the **middle** lines as recommended. This is where the Syncro will fly best. Balance the model as instructed in the following steps.



❑ 3. If the tail sits low the plane is tail-heavy and ballast will be required in the nose. If the nose is low the plane is nose-heavy and ballast will be required on the tail. If using a smaller battery it is likely that nose weight will be required and this is not at all unusual. Determine how much weight will be required by temporarily placing segments of Great Planes stick-on lead (GPMQ4485) in the nose or on the tail and lifting the wing on the middle balance lines until you can get the model to balance. Once you have determined how much weight is required peel off the backing and securely attach it to the model. Nose weight can be conveniently attached to the inside of the canopy hatch. Tail weight can be stuck to the side of the fuselage or bottom of the horizontal stabilizer next to the fuselage—just make sure it doesn't interfere with any of the controls.

❑ 4. Recheck the C.G. to make certain the model still balances where required. Once finished, remove the battery.

❑ 5. Later, once you become an expert at flying your Syncro, you can change the flying characteristics by changing the balance point—but do not go beyond the marks you made on the bottom of the wing. Moving the C.G. forward (adding nose weight or removing tail weight) will make the model more stable which may be better for windier days, but this will also make it less maneuverable. Moving the C.G. back (adding tail weight or removing nose weight) will make the Syncro more maneuverable which is good for experienced pilots who wish to perform aerobatics. In any regard, start at the recommended balance point and never fly the model with the C.G. outside of the recommended range.

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 flying events and simply is a good idea no matter where you are flying. Write the information directly on the model or on a strip of tape and place it on or in the model.

Charge the Battery

Be certain to refer to the instructions that accompany the charger and battery to properly and safely charge the battery.

FLYING THE SYNCRO

Following are some **basic** flying guidelines intended for beginners who already have at least a little flight experience. These guidelines **are not** a substitute for having an R/C flight instructor, which is essential to learning to fly safely and properly without destroying your Syncro.

Pilots with little experience should initially fly their Syncro with the glider wing. The glider wing will enable the Syncro to fly slowly and be more “forgiving.” After you have mastered flying the Syncro with the glider wing you can switch to the sport wing which will fly faster and be more responsive. Whichever wing you use, **don't forget to re-check the balance (C.G.) before flying your Syncro with the other wing.**

Find a Suitable Flying Site

Find a flying site clear of buildings, trees, busy streets, power lines and other obstructions. Until you have mastered flying your Syncro and know how much area will be required, a site at least the size of two or three football fields should be used—a flying field specifically intended for R/C planes is by far the best. Never fly your Syncro near or over people—especially around children who can wander unpredictably.

Ground Range Check

Follow the manufacturer's instructions that came with your radio control system to perform a ground range test to check the operational control range of your radio. If your radio control system does not pass a ground range test you could lose control in the air.

Set a Flight Timer

Use a stopwatch, the timer or alarm in your wrist watch or the timer in your transmitter (if your transmitter has one) to tell you when it's time to land before the battery gets too low causing the motor to quit. When the batteries get too low the ESC will automatically cut power to the motor, but there will still be power to control your radio so you can operate the controls to land. Still, if the motor quits unexpectedly you could end up landing your Syncro far away or you may even possibly crash.

Before you have flown your Syncro a few times you can not know for certain how long it will fly, so you'll have to take an educated guess based on our recommendation. There are too many variables that can determine the flight time such as the size, condition and brand of your batteries, how much throttle you use and even how windy it is (more throttle is usually used on windy days). Since it's impossible to precisely predict, you should err on the side of caution. Most of the batteries suitable for your Syncro should provide 5 – 8 minutes of flight time. Initially then, set your timer to four minutes. Until you get pretty good at flying your Syncro you should land when the timer goes off. There are a few ways to find out the maximum flight time. For one, you can simply continue to fly around until the motor finally quits. With planning, altitude and a little skill you should have no trouble making a "dead-stick" landing, but you get only one chance, so dead-stick landings are for experienced pilots only. Another way is to fly around until you notice a significant drop in motor performance. Then, the batteries are getting low and will probably quit soon, so go ahead and land at this time. In either case note the flight time and subtract a minute to tell you your overall maximum flight time (giving you approximately an extra minute until the motor quits).

If your LiPo charger permits, note how much capacity it takes to fully recharge the battery. It should not be any more than 75% to 80% of the total capacity. Otherwise, you are flying too long and draining your batteries too much. Then, you should shorten your flight time even more.

Take Off

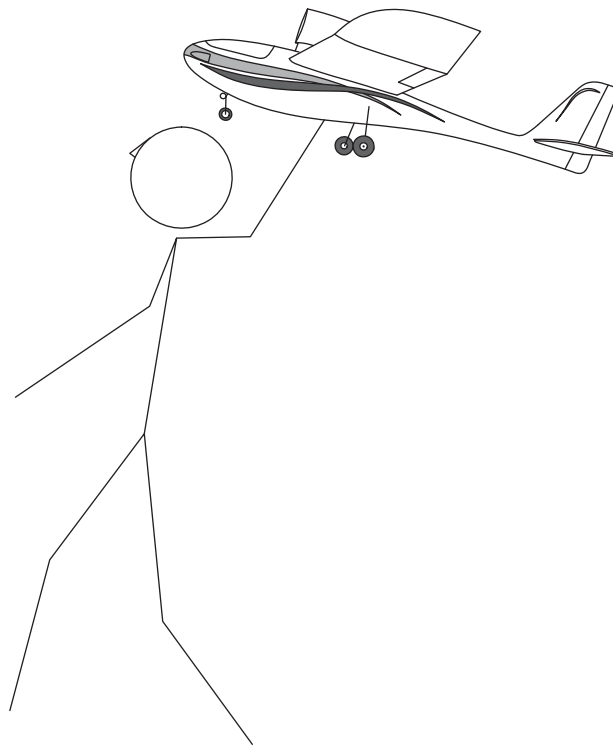
Until you are confident flying your Syncro, do not fly if the wind speed is greater than 10 mph [16 kph].

One final check before takeoff; **check the control response to your transmitter inputs—this should be done before every flight!** Be certain the ailerons, elevator, rudder and throttle respond correctly and that none of the controls have inadvertently become reversed.

Your Syncro may takeoff from short grass or pavement. For beginners, short grass is usually best because it stabilizes the wheels making it easier to keep the plane rolling straight ahead. But if the grass is too tall or there is no suitable runway, the Syncro may also be hand-launched. Hand-launching is easiest with the glider wing because it requires less air speed to fly.

Hand Launch

It's easy to hand-launch your Syncro, but it's **even easier** to have an assistant launch it—especially for the first time.

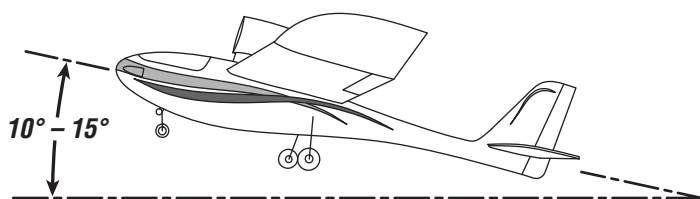


Ducted fans don't develop thrust as quickly as propellers, so the Syncro will require a pretty good toss to give it enough velocity to remain airborne. But usually, the harder one throws a model, the less control they have—possibly resulting in a poor launch with the wings banked or the nose too high or too low. So ask your assistant to concentrate on keeping the wings level and make sure he throws it directly into the wind. Have your assistant hold the fuselage under the wing. Let him know when you're ready and make sure he acknowledges, then advance the throttle to full power before he throws it. The Syncro will initially ascend, then climb once it gains enough flying speed. Hold just enough "up" elevator to start climbing and use the ailerons to keep the wings level.

Rise Off Ground (ROG)



OKAY!



**Good climb angle
(no more than 15°)**

Place the Syncro on the ground with the nose pointing directly into the wind—taking off into the wind reduces the ground speed required for takeoff and helps stabilize the plane keeping it moving straight ahead. Smoothly but rapidly advance the throttle. Use the left control stick (rudder) to keep the Syncro going straight and use the right control stick (ailerons) to keep the wings level. Once the plane becomes “light” smoothly apply just enough “up” elevator to allow the model to rise into the air—all this will happen in a few seconds. Do not “yank” up on the elevator stick—rather, be smooth and allow the plane to establish a gentle climb as illustrated.

Flying

Once the Syncro has become airborne continue a gentle climb and keep the wings level until it has reached an altitude of approximately 100' [30m] when you can make your first turn away from yourself.

If you already have some flight experience and are relatively comfortable flying your Syncro, the first thing you should do is adjust the trims so the plane will fly straight-and-level when the control sticks are centered.

If you find yourself in a little over your head and are having difficulty controlling the Syncro, your first priority will be simply to keep it airborne. Concentrate on making smooth

turns by using the ailerons to bank the wings and the elevator to control pitch. It may also be a good idea to throttle back to slow the Syncro, giving you a little more time to think.

One thing for beginner pilots to keep in mind is that when the plane is flying away from you, moving the aileron stick to the right will make the plane bank to your right. However, when the model is flying toward you, moving the aileron stick to the right will make the plane move to your **left**. Of course, the plane is still responding the same way, it's just that your orientation is reversed. Keep this in mind while learning to fly (this is another great reason to take flight lessons from an experienced pilot!).

To establish a turn, “up” elevator (pulling back on the stick) is usually required along with aileron input to get the model into a bank. To stop the turn, apply a small amount of opposite aileron.

Remember to keep the model high enough to give your self time to make corrections, but don't let it get too far away or else it will be too difficult to see what it is doing. Continue to fly your Syncro, getting used to how it responds before finally coming in to land.

One final check before landing; see how the model will react when you cut the power. While at altitude, cut the motor power. The model should establish a gentle, downward glide path. This is how it will react when it's actually time to land. Add power and climb back to your original altitude. Practice a few of these “climb and glides” to judge how the Syncro will respond.

Landing

To land, fly down-wind past the landing area. Gently turn into the wind and reduce the throttle so that the airplane initiates an ascending glide path. If necessary, add power to extend the glide path to reach the runway. As the model approaches and loses altitude, gradually and proportionally, add “up” elevator to control the glide path and altitude. Continue to apply elevator until the model touches down at which time you should be holding full, or nearly full up elevator. This will cause the airplane to slow and settle to the ground.

After Flight

Disconnect the battery and remove it from the airplane, then turn off the transmitter. Inspect the airplane to make sure nothing has become loose or damaged—inspect all the connectors on the pushrods. Allow the battery to cool before recharging, or allow the motor to cool for a few minutes before installing another charged battery and flying again.

Always inspect the model after every flight to make sure it is airworthy and ready for the next flight.

OTHER ITEMS AVAILABLE FROM GREAT PLANES

ElectriFly™ by Great Planes Ammo™ 24-33-4040kV Brushless Inrunner Motor



Brushless, slotless Ammo In-runner motors offer almost twice the efficiency of brushed motors, more value than other In-runners and the advantage of a 2-year Satisfaction Guarantee. Ideal for both direct- or gear-drive use, Ammo motors offer an incredible power-to-weight advantage for everything from indoor flyers to giant scale stars. Powered by rare-earth Neodymium magnets for premium performance and unmatched heat resistance, they're highly efficient and virtually maintenance-free. Bearings are double-shielded and there are no brushes to burn out. Installed, gold-plated bullet connectors are compatible with brushless ElectriFly ESCs. (GPMG5165)

ElectriFly™ ElectriFly by Great Planes Silver Series SS-25 Brushless Electronic Speed Control



Input Voltage: 7.2-14.8V
Max. Continuous Current: 25A
BEC: 5V/2.0A
Dimensions: 1.58 x 0.31 x 1.02 in (40 x 8 x 26 mm)
Weight: 0.92 oz (26g)
Battery Connector: Deans® Ultra Plug®

Silver Series ESCs are compatible with NiCd, NiMH, and LiPo batteries, with automatic low-voltage cut-off for all. The SS25 features fully proportional forward and smooth throttle response with on/off brake. Connectors are installed and a 180-day warranty is included. (GPMM1820)

Futaba® S3107 Micro Servo



Dimensions: 0.8 x 0.4 x 0.8 in (20 x 10 x 20mm)
Weight: 3.0 oz (85g)
Speed @ 4.8V: 0.12 sec/60°
Torque @ 4.8V: 16.7 oz/in (1.2kg/cm)

No matter what the application, there's a quality Futaba servo with the right size, strength and speed to master it. For small aircraft, the S3107 micro servo is a new favorite, designed to fit easily inside small spaces. It weighs only 9 grams, yet delivers excellent torque and speed! (FUTM0025)

