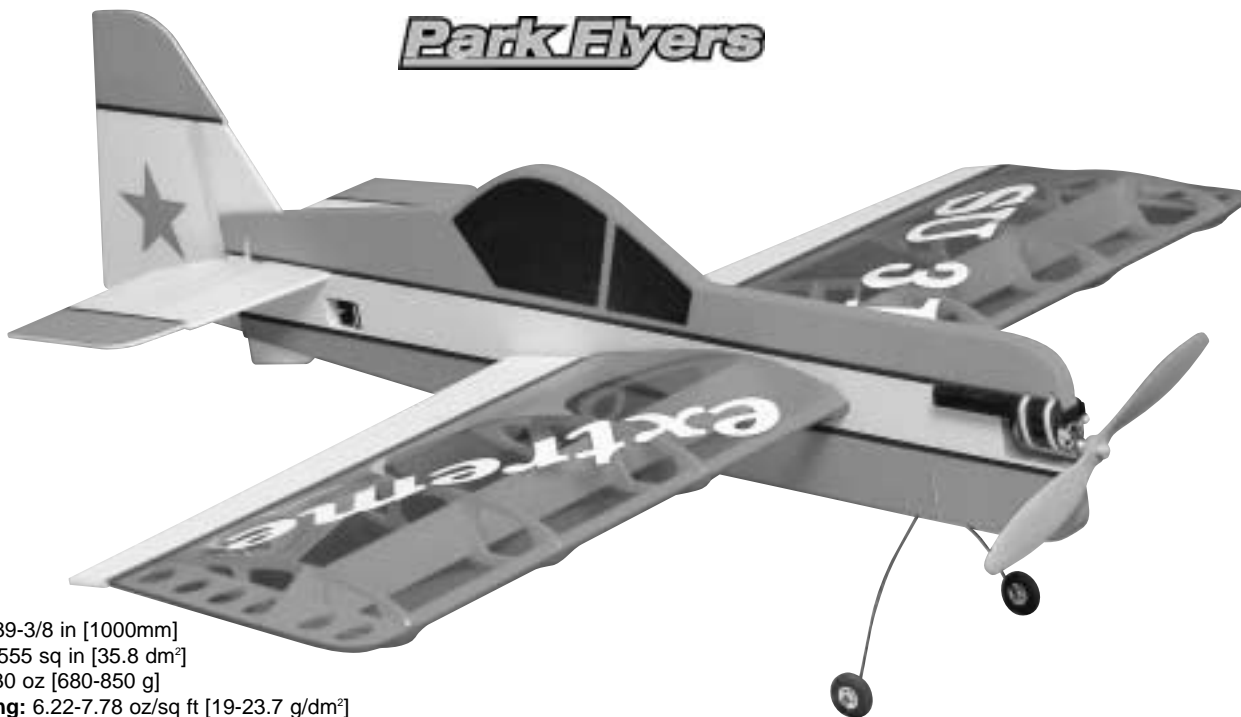


Sukhoi SU-31

INSTRUCTION MANUAL

ARF



Wingspan: 39-3/8 in [1000mm]
Wing Area: 555 sq in [35.8 dm²]
Weight: 24-30 oz [680-850 g]
Wing Loading: 6.22-7.78 oz/sq ft [19-23.7 g/dm²]
Length: 46-3/4 in [1188mm]
Radio: 4-channel with four micro servos
Recommended Motor: Kontronik Fun 400-36 with 4.2:1 gear box
Recommended Prop: APC 11x4.7SF

WARRANTY

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

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

If the buyer is not prepared to accept the liability associated with the use of this product, the buyer is advised to return this kit immediately in new and unused condition to the place of purchase.

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

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

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

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



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

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INTRODUCTION

Thank you for purchasing the Great Planes Sukhoi SU-31 3D Park Flyer ARF. The Sukhoi SU-31 is a profile model loosely based on the full size Sukhoi SU-31, well known for its aerobatic capabilities.

The Sukhoi SU-31 ARF is a slow flying, highly maneuverable model that can be flown in a surprisingly small area. Once you are thoroughly familiar with the model, it could even be flown indoors in a large gymnasium. This is one model with a very high fun:cost ratio.

For the latest technical updates or manual corrections to the Great Planes Sukhoi SU-31 3D ARF visit the Great Planes web site at www.greatplanes.com. Open the "Airplanes" link, then select the Sukhoi SU-31 3D Park Flyer ARF. If there is new technical information or changes to this model, a "tech notice" box will appear in the upper left corner of the page.

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



Attention: The product you have purchased is powered by a rechargeable battery. At the end of its useful life, under various state and local laws, it may be illegal to dispose of this battery into the municipal waste system. Check with your local solid waste officials for details in your area for recycling options or proper disposal. **The battery may contain a chemical known to the state of California to cause cancer and birth defects or other reproductive harm.**

1. Your Sukhoi SU-31 ARF should not be considered a toy, but rather a sophisticated, working model that functions very much like a full-size airplane. Because of its performance capabilities, the Sukhoi SU-31 ARF, if not assembled and operated correctly, could possibly cause injury to yourself or spectators and damage to property.
2. You must assemble the model **according to the instructions**. Do not alter or modify the model, as doing so may result in an unsafe or unflyable model. In a few cases the instructions may differ slightly from the photos. In those instances the written instructions should be considered as correct.
3. You must take time to **build straight, true and strong**.
4. You must use an R/C radio system that is in first-class condition. This model requires a micro receiver and micro servos.
5. You must correctly install all R/C and other components so that the model operates correctly on the ground and in the air.
6. You must check the operation of the model before every flight to insure that all equipment is operating and that the model has remained structurally sound. Be sure to check clevises or other connectors often and replace them if they show any signs of wear or fatigue.
7. If you are not already an experienced R/C pilot, you should fly the model only with the help of a competent, experienced R/C pilot.

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

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

If you're an inexperienced modeler, we recommend that you get assistance from an experienced, knowledgeable modeler to help you with assembly and your first flights. You'll learn faster and avoid risking your model before you're truly 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>

Please inspect all parts carefully before starting to build. If any parts are missing, broken or defective, or if you have any questions about building or flying this airplane, please give us a call at (217) 398-8970 or e-mail us at productsupport@greatplanes.com and we'll be glad to help. If you are calling for replacement parts, please reference the part numbers and have them ready when calling.

DECISIONS YOU MUST MAKE

This is a partial list of items required to finish the Sukhoi SU-31 ARF that must be purchased separately. For some of these items there is more than one option which will require a bit of decision making ahead of time. Order numbers (in parentheses) are provided for your convenience.

Radio Equipment

The Sukhoi SU-31 ARF requires a four channel radio. If you have a computer radio with mixing capability, and would like to use the "flaperon" mix for the ailerons, you will need a five

(or more) channel radio. Four micro or mini servos are required having a minimum of 15 oz-in torque.

The following are also required:

- (2) 12" [305mm] Servo extensions (rudder, elevator)
- (3) 6" [153mm] Servo extensions (ailerons, speed control)
- (1) "Y" connector
- (1) Screw-lock connector (GPMQ3870)

Suggested servos:

- (HCAM0090) Hobbico® CS-5, 16.7 oz-in torque
- (HCAM0100) Hobbico CS-15, 15 oz-in torque
- (FUTM0037) Futaba® S3103, 16.6 oz-in torque
- (FUTM0025) Futaba S3107, 16.6 oz-in torque
- (HRCM0981) HiTec® HS-55J, 15 oz-in torque

Suggested receivers:

- (GPML0044) Great Planes 4-channel FM, low band
 - (GPML0045) Great Planes 4-channel FM, high band
 - (FUTL0442) Futaba 4-channel FM, low band
 - (FUTL0443) Futaba 4-channel FM, high band
- Low band - channels 11-35
High band - channels 36-60

Receiver crystal:

- (FUTL62**) for GPM low band
 - (FUTL63**) for GPM high band
 - (FUTL62**) for FUT low band
 - (FUTL63**) for FUT high band
- ** desired channel

Speed Control

Select a speed control suitable for the motor you will use. On the prototypes we used the Kontronik Smile 30-6-12 (KONM3000) with the Kontronik motor. With the Mega motor we used a Hacker F25-3ph.

Motor

There are several motor/gearbox/prop/battery combinations that give good performance with the Sukhoi SU-31 ARF. Many modelers do not realize that each component in this combination is important. You can have a good motor/gearbox/prop combination, but without the proper battery, performance could be disappointing.

The Sukhoi SU-31 ARF will fly well on a variety of motors, but for the best performance you should use a brushless motor. While more expensive than normal ferrite motors, the power, efficiency and light weight of brushless motors are well worth the cost.

The motor we used extensively in testing the Sukhoi SU-31 ARF is the Kontronik Fun 400-36 with 4.2:1 gear box (KONG2440) with an APC 11x4.7SF prop.

Battery

An 8-cell (9.6 volt) 2000 mAh NiMH battery pack is recommended (GPMP0352). This battery gives great performance and fits well in the battery compartment.

Charger

The best type of charger for NiMH and NiCd batteries is a *peak* charger, because it charges the batteries until they are fully charged, then automatically switches to trickle charge mode. The Great Planes ElectriFly™ Peak Charger (GPMM3000) is suitable for NiMH and NiCd batteries as well as transmitter battery packs. The Great Planes Triton™ charger (GPMM3150) is also suitable.

ADDITIONAL ITEMS REQUIRED

Adhesives and Building Supplies

In addition to common household tools and hobby tools, this is the “short list” of the most important items required to build the Sukhoi SU-31 ARF. **Great Planes Pro™ CA and Epoxy glue are recommended.**

- Pro 6-minute epoxy (GPMR6045)
- Pro 30-minute epoxy (GPMR6047)
- Hobby knife (HCAR0105)
- #11 blades (HCAR0211)
- Small T-pins (HCAR5100)
- Builder's triangle (HCAR0480)
- Small Phillips and flat blade screwdrivers
- Pliers with wire cutter (HCAR0630)
- Great Planes Plan Protector (GPMR6167) or wax paper
- Sealing Iron (TOPR2100)
- Razor Saw

Optional Items

Here is a list of optional tools mentioned in the manual that will help you build the Sukhoi SU-31 ARF.

- Great Planes CG Machine™ (GPMR2400)
- Top Flite Precision Magnetic Prop Balancer™ (TOPQ5700)
- Top Flite Hot Sock™ iron cover (TOPR2175)
- Straightedge with scale (HCAR0475)
- Masking Tape (TOPR8018)

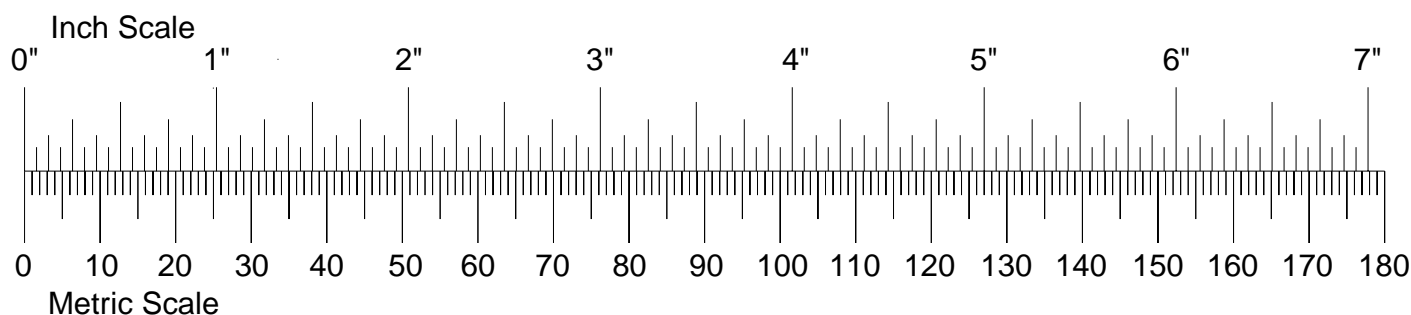
IMPORTANT BUILDING NOTES

The fuselage and tail section of this model are built from foam. Most CA glues will melt foam and should not be used.

Caution: During construction you will need to use paper towels and alcohol to clean up any excess epoxy, but be very careful doing so. The alcohol can dissolve the paint on the fuselage and tail section, causing it to streak.

- When you see the term **test fit** in the instructions, it means that you should first position the part on the assembly **without using any glue**, then slightly modify or *custom fit* the part as necessary for the best fit.
- Whenever the term **glue** is written you should rely upon your experience to decide what type of glue to use. When a specific type of adhesive works best for that step, the instructions will make a recommendation.
- Whenever just **epoxy** is specified you may use **either** 30-minute (or 45-minute) epoxy **or** 6-minute epoxy. When 30-minute epoxy is specified it is **highly** recommended that you use only 30-minute (or 45-minute) epoxy, because you will need the working time and/or the additional strength.
- **Photos** and **sketches** are placed **before** the step they refer to. Frequently you can study photos in following steps to get another view of the same parts.

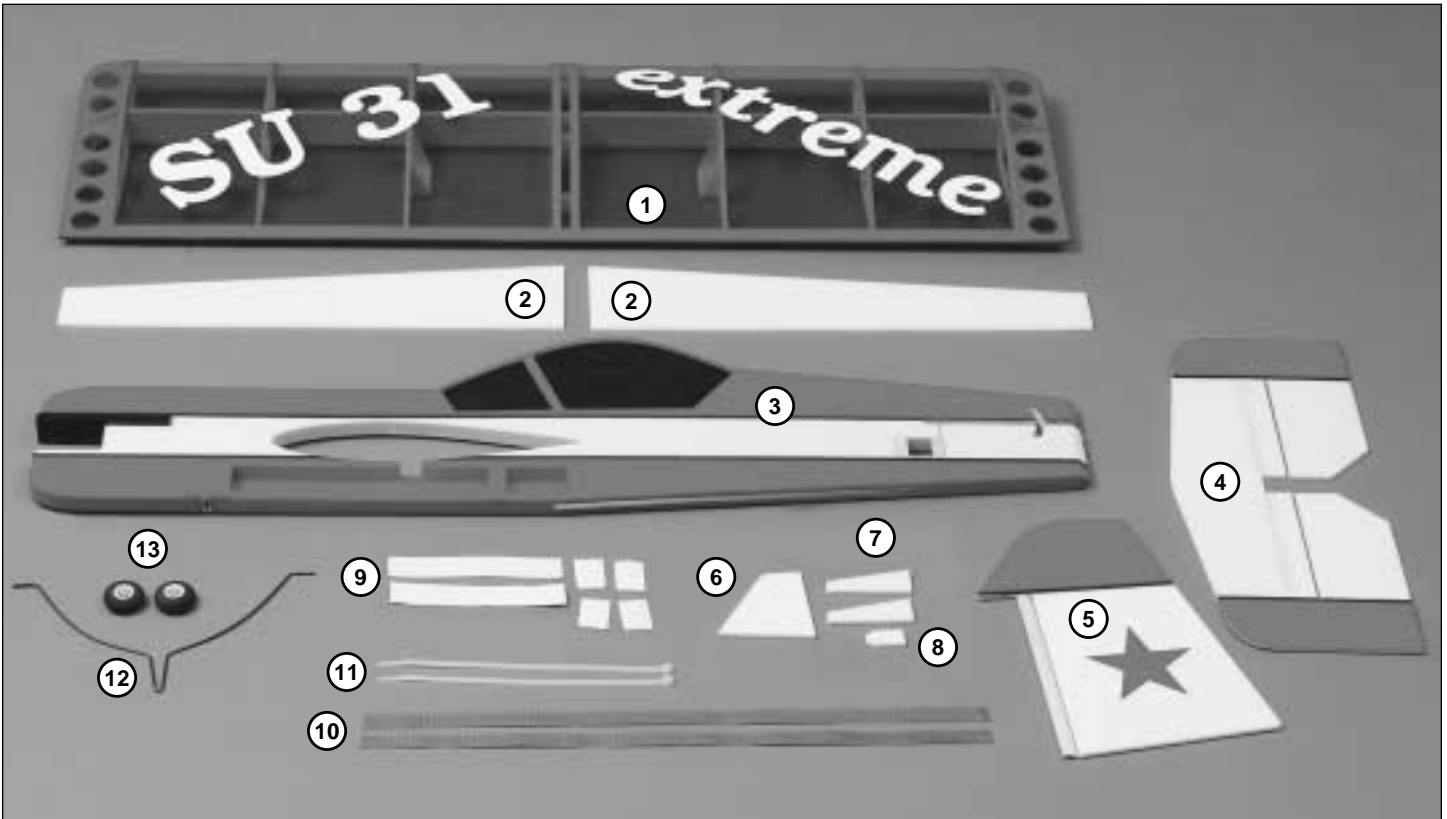
To convert inches to millimeters, multiply inches by 25.4



KIT CONTENTS

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

3002 N. Apollo Drive, Suite 1, Champaign, IL 61822
Telephone: (217) 398-8970, Fax: (217) 398-7721
E-mail: airsupport@greatplanes.com



Kit Contents (Photographed)

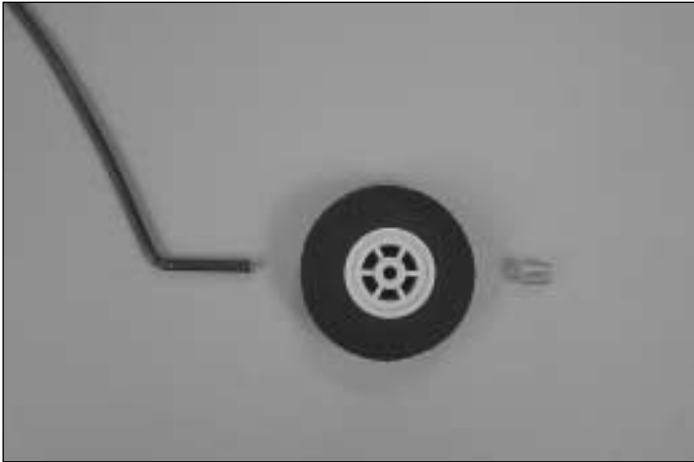
- | | |
|---|---|
| <ul style="list-style-type: none"> 1 Wing 2 Ailerons (2) 3 Fuselage 4 Stab w/elevators 5 Rudder w/wood post 6 Vertical fin 7 Stab braces | <ul style="list-style-type: none"> 8 Stab slot filler 9 Hook & loop mounting strips 10 Aileron hinge strips 11 Plastic tie-wraps 12 Landing gear wire 13 Wheels |
|---|---|

Kit Contents (Not Photographed)

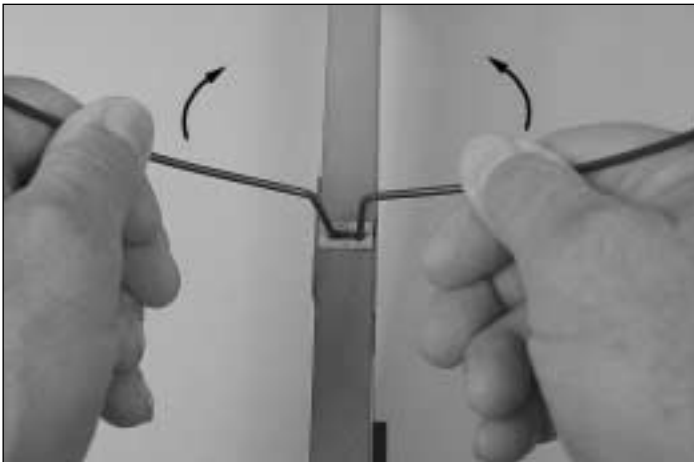
- | | |
|--|---|
| <ul style="list-style-type: none"> (2) Aileron pushrod (2) Plastic wheel collars Elevator pushrod (4) Control horn | <ul style="list-style-type: none"> Rudder pushrod Wire tail-skid (4) Screw-lock connector, screw, retainer |
|--|---|

BUILDING INSTRUCTIONS

Install the Landing Gear



1. Mount the **wheels** to the **landing gear wire**, holding them on with the short **plastic tubes**.

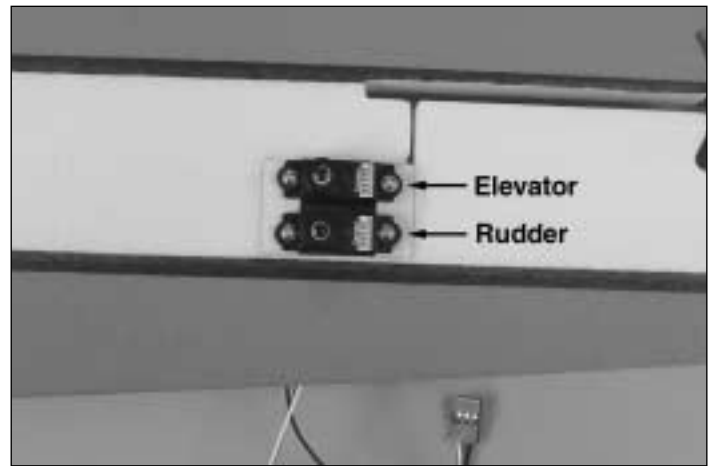


2. Insert the landing gear wire into the slot in the bottom of the **fuselage**. This is easier to do if you squeeze the sides of the wire together as you insert the wire into the fuselage. **Note:** The landing gear is securely held in the slot by spring tension, making it easy to remove if required. For a permanent installation, put some epoxy into the slot.

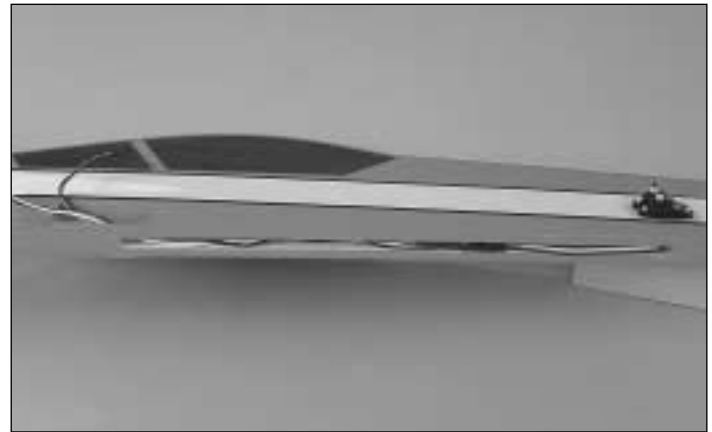


3. Glue the **tail skid wire** to the bottom rear of the fuselage.

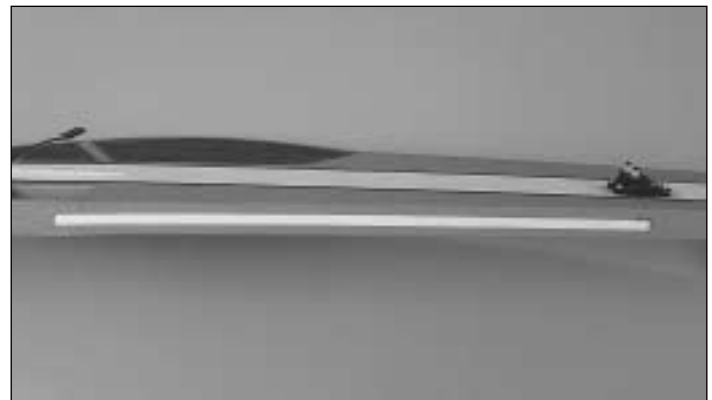
Install the Fuselage Servos



1. Install the rudder and elevator **servos** into the fuselage mount using the grommets, eyelets and screws provided with your servos. Enlarge the mounting area as needed to fit your servos. **Note:** Be sure to route the servo wires through the hole in the fuselage and out the bottom.

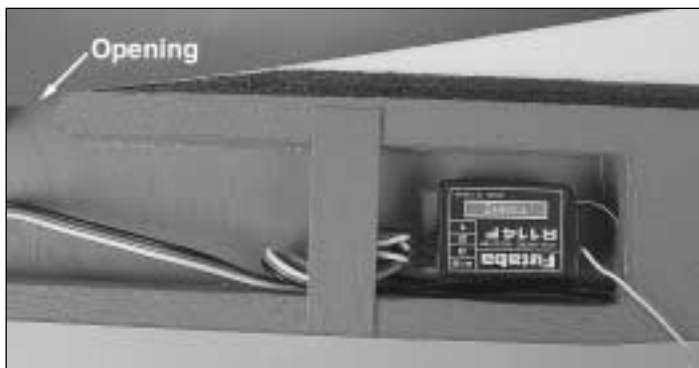


2. Connect a 12" [305mm] **servo extension** wire to the rudder and elevator servos. Use tape or shrink tubing to hold the connections securely together. Route these wires in the channel already cut in the bottom of the fuselage. This must be done neatly so that the filler strip can be installed in the next step.



3. Using foam safe CA, install the 3/16" x 1/4" x 12-3/4" [4.8 x 6.4 x 324mm] **foam filler strip** in the channel to cover the servo wires and hold them in place.

Install the Receiver and Battery



❑ 1. Plug the elevator and rudder servos into the receiver. You will also probably need a 6" [152mm] servo extension wire for the speed control. Install the **receiver** in the receiver compartment with a short piece of the supplied hook and loop mounting tape. The photo shows a Futaba R114F four channel receiver. Note in the photo how the wires are routed. When the wing is installed, the aileron servo wire will come down the opening in the fuselage at the upper left of the photo.

❑ 2. Extend the receiver antenna to its full length and route it to the tail skid. Use clear tape to hold it to the side of the fuselage.

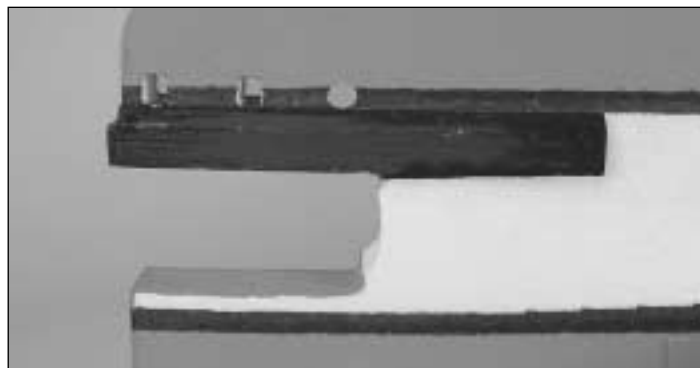
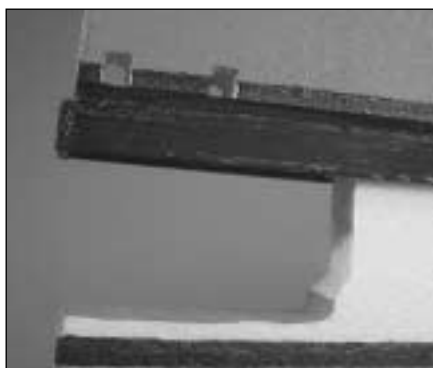


❑ 3. Install the hook and loop **mounting tape** for the battery in the battery compartment. We used four short pieces of hook material. On the battery, we mounted one long piece of loop material. This allows the battery to be moved within the battery compartment to help balance the model.

Install the Motor

INSTALLING A KONTRONIK MOTOR

❑ 1. Trim the foam fuselage as needed to accommodate the motor and wires from the motor.

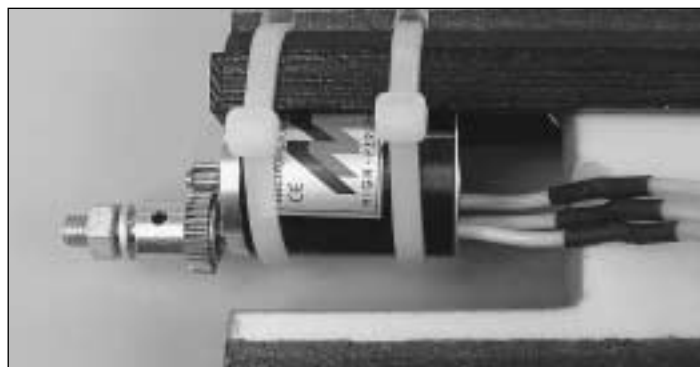


❑ 2. Drill a 3rd hold to for a zip tie.



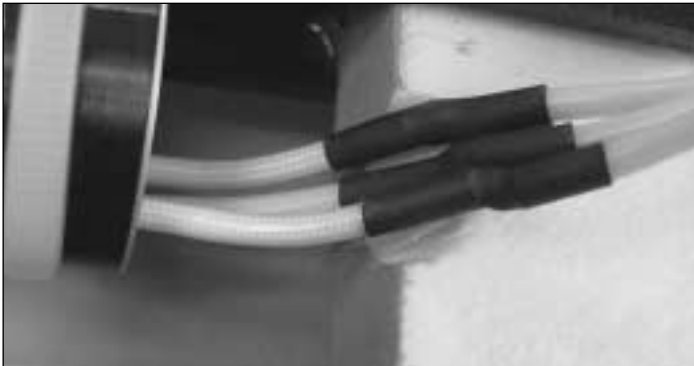
❑ 3. Install the motor using the supplied nylon tie straps. Note: The tie straps may not hold the motor tight enough to prevent it from twisting slightly at full power with the prop installed. If this happens, put a small drop of CA on the rear of the motor where it touches the fuselage.

INSTALLING A MEGA CAN 16/15/3 BRUSHLESS MOTOR



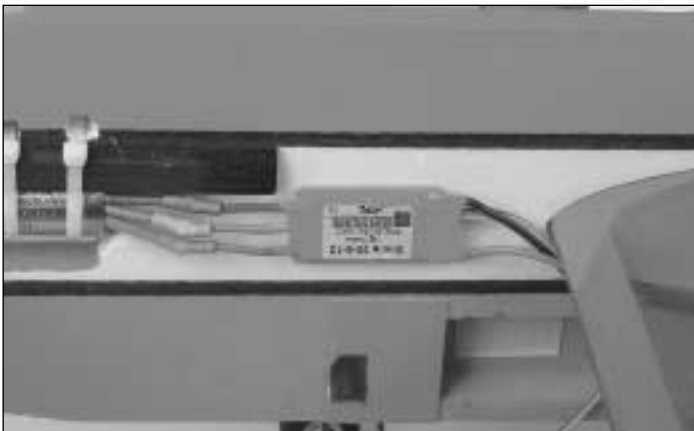
❑ 1. Install your motor on the model with the included nylon tie-wraps. The motor should be positioned just behind the

hardwood strip at the front of the fuselage. The motor shown is a MEGA Can 16/15/3 brushless. **Note:** The tie-wraps may not hold the motor tightly enough to prevent it from twisting slightly at full power with the prop installed. If this happens, put a small drop of CA on the rear of the motor where it touches the fuselage.

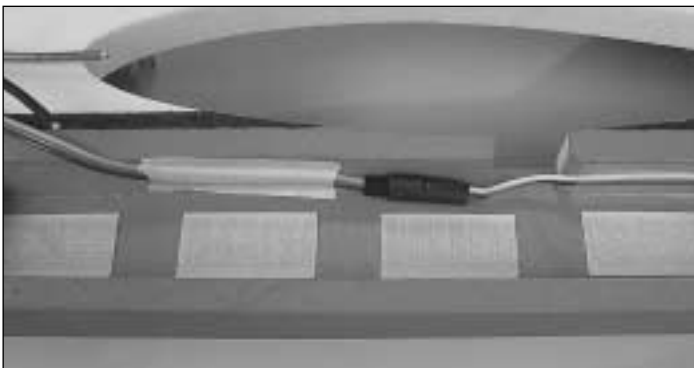


- ❑ 2. Trim the foam fuselage as needed for wires from the motor

Install the ESC

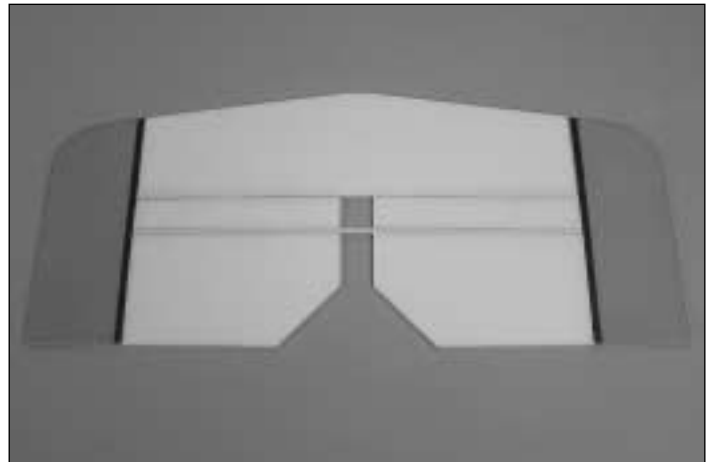
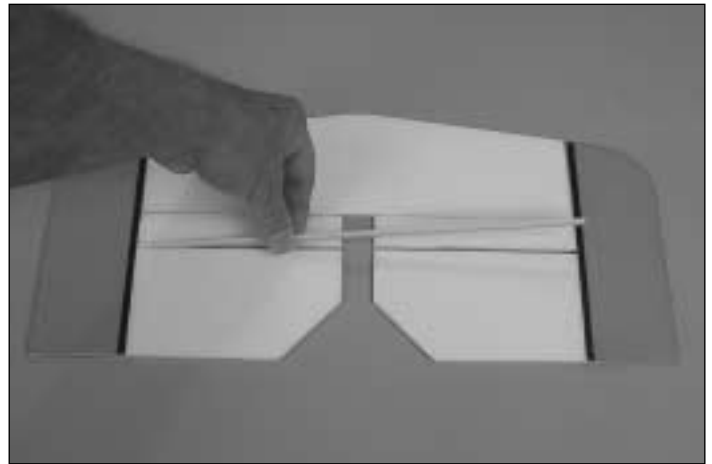


- ❑ 1. The Electronic Speed Control (ESC) can be held to the fuselage with a short piece of the included hook and loop tape. The speed control shown is a Kontronik Smile 30-6-12.
- ❑ 2. Mount the ESC switch to the side of the fuselage with 6-minute epoxy. Do not use CA as it could get into the switch.

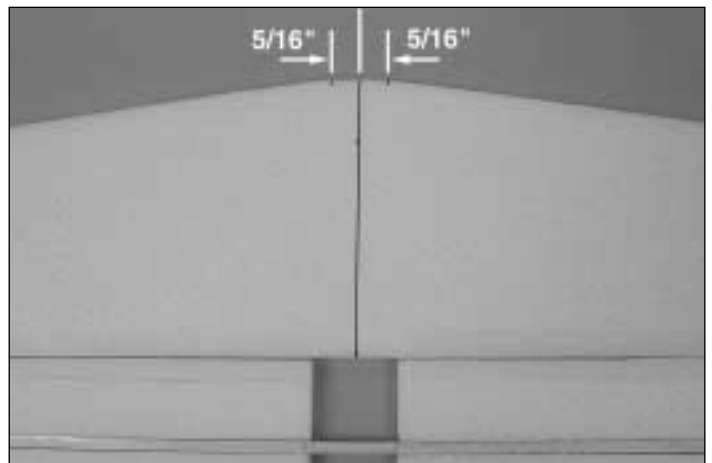


- ❑ 3. Route the receiver connector wire from the ESC into the battery compartment and then to the extension wire from the receiver. Fasten the wire to the top of the battery compartment with some tape.

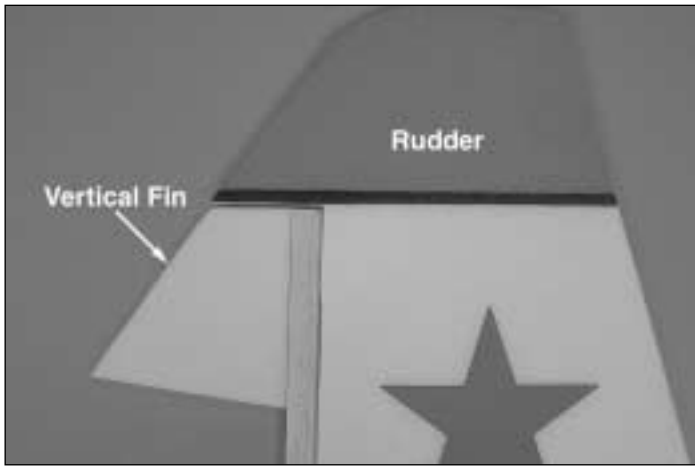
Install the Tail Surfaces



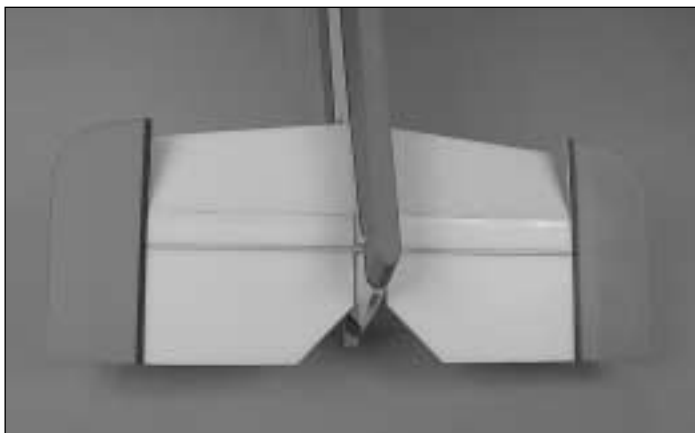
- ❑ 1. On a flat surface, glue the 1/8" x 3/16" x 11-7/8" [3.2 x 4.8 x 302mm] hardwood **elevator joiner** in place with 6-minute epoxy. Make sure the elevators are aligned with each other. **Note:** Use some plan protector or wax paper on your building surface.



- ❑ 2. Using a fine tip marking pen, measure and mark the centerline on the top of the horizontal stab. At the leading edge, put a mark 5/16" [8mm] on each side of the centerline. **Note:** The top of the horizontal stab has the clear cellophane tape hinge applied to it.



3. On a flat surface, use 6-minute epoxy to glue the **vertical fin** to the balsa post already taped to the rudder.

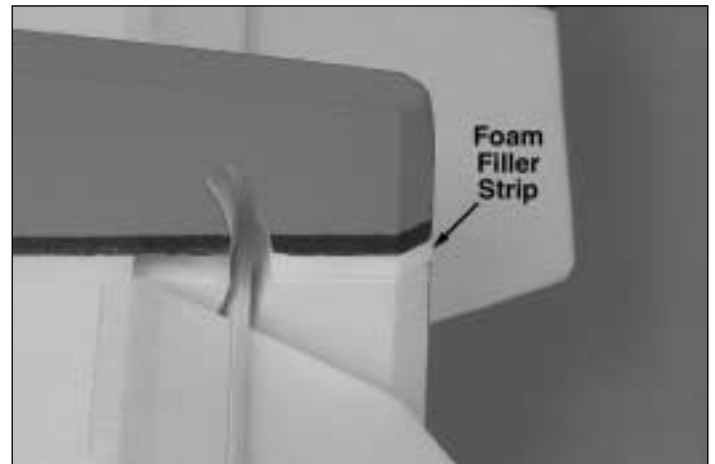


4. Temporarily insert the wing into place in the fuselage, aligning the two center ribs with the fuselage sides. Insert the horizontal stab into the slot in the rear of the fuselage and align it with the sides of the fuselage. Check the alignment of the stab with the wing, making sure it is parallel with the wing. Also check that the stab and wing are perpendicular to the fuselage side. Make any needed adjustments to the slots in the fuselage for the stab and wing. **Note:** If the wing and stab are not parallel, it is easier to adjust the wing by twisting it slightly in its slot.

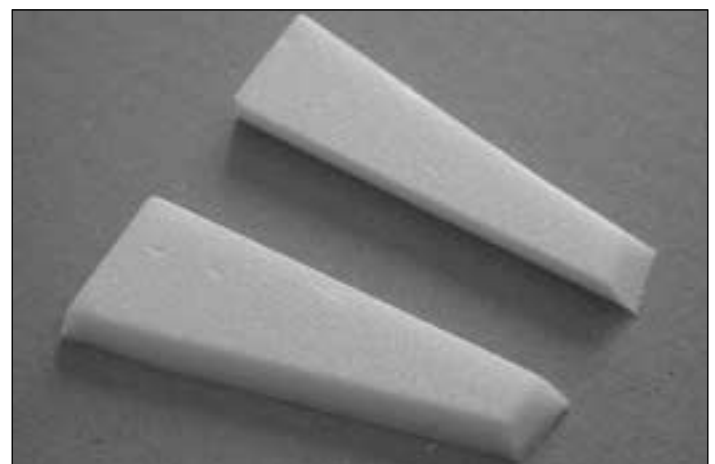
Caution: Be careful that the elevator joiner does not catch on the rear of the fuselage when you insert the horizontal stab.

5. Glue the stab into place with 6-minute epoxy, using as little epoxy as possible.

Caution: Do not use alcohol to clean up any excess epoxy as it could remove and/or streak the paint on the fuselage. Wipe up any excess epoxy only with paper towels.



6. Remove the wing. Glue in the small **foam filler strip** in the rear of the fuselage behind the stab.



7. Prepare the reinforcing **foam braces** for the stab bottom. Referring to the above three photos and the photo for the next step, trim the short end and long side at an angle. Note that the angle on the second brace is trimmed the opposite way, making the braces a mirror of each other.



- 8. Glue a brace to the bottom of the stab, one on each side of the fuselage. The narrow end faces the front of the model.



- 9. Glue the vertical fin and balsa rudder post to the model with 6-minute epoxy. Be sure the vertical fin is perpendicular to the stab.

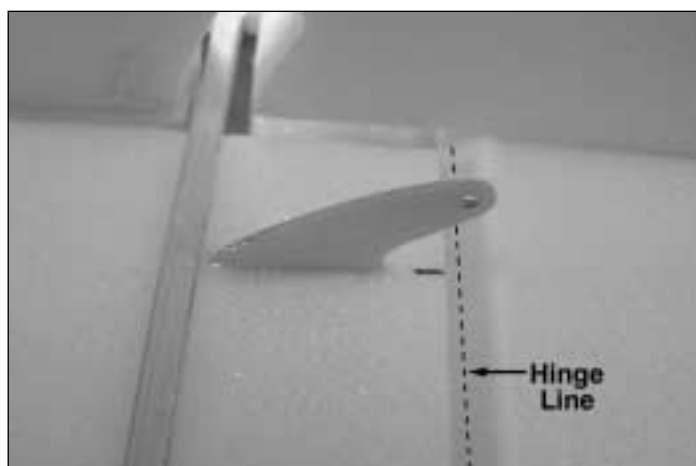
Connect the Control Linkages

The smaller micro and mini servos this model requires usually do not include the long servo arms needed for high rate throws on this model. Depending on the servo you are mounting the extended servo arm on it may be necessary to sand the face of the servo arm flat to make a good gluing surface.

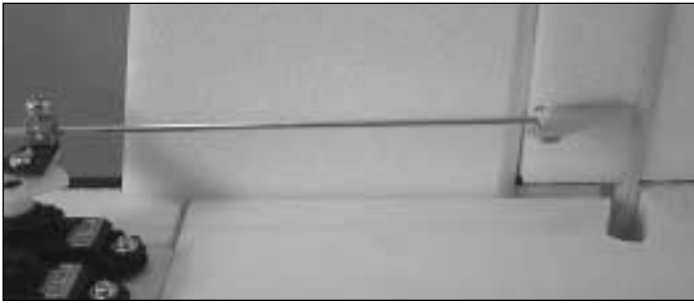


- 1. Attach the servo arm extender to the servo arm with the servo screw. With the radio on position the servo arm extender in the correct position. Glue the extender to the servo arm with thin CA.

Caution: In the following steps you will be using screw-lock connectors to connect the pushrods from the control horns to the servo arms. Before installing the Push-On Retainer Ring on the screw-lock connector, you should first turn on your radio system and check which hole the screw-lock connector should be installed in to get the desired control throw. Once the push-on retainer ring has been installed, it can't be removed without damaging it.



- 2. Temporarily install the servo arm and screw-lock connector on the elevator servo. **Do not** install a push-on retainer ring on the screw-lock connector. Insert the short elevator pushrod in the hole in the screw-lock connector and sight down the pushrod to determine where the **elevator control horn** should be mounted. Cut a slot in the elevator for the control horn and glue it into place with 6-minute epoxy.



❑ 3. Remove the servo arm from the servo. Insert the **elevator pushrod** into the elevator control horn. Re-install the servo arm and screw-lock connector on the servo. **Do not** install a push-on retainer ring on the screw-lock connector. Use your radio system and determine which hole in the servo arm will give the desired control throw.

❑ 4. Install the **push-on retainer ring** onto the screw-lock connector. Secure the pushrod to the screw-lock connector with the 2mm x 5mm screw. Cut off the excess pushrod, leaving about 5mm protruding.



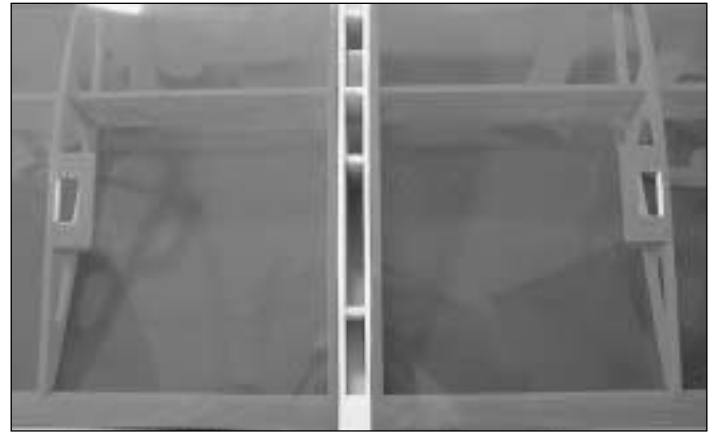
❑ 5. In the same manner, install the long **rudder pushrod**.

Install the Wing

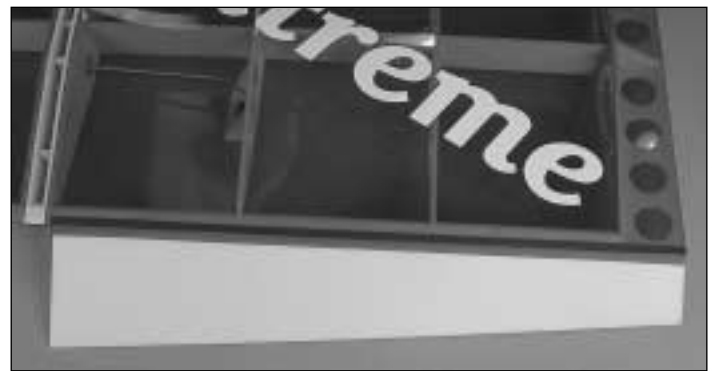
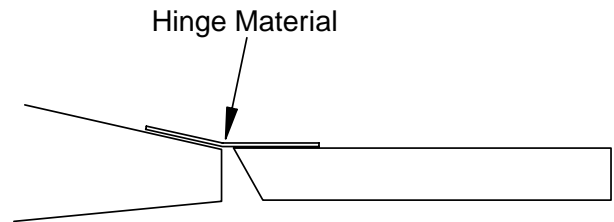
Before proceeding, iron the covering on the wing so that it is firmly glued to the center ribs and the servo openings.



❑ 1. Cut a 9/16" [14mm] wide strip of covering material from the center of the top and bottom of the wing. Use the two center ribs as a guide to mark the wing prior to cutting the covering. Be careful not to cut into the wood under the covering.



❑ 2. Cut the covering from over the servo bays on the wing.

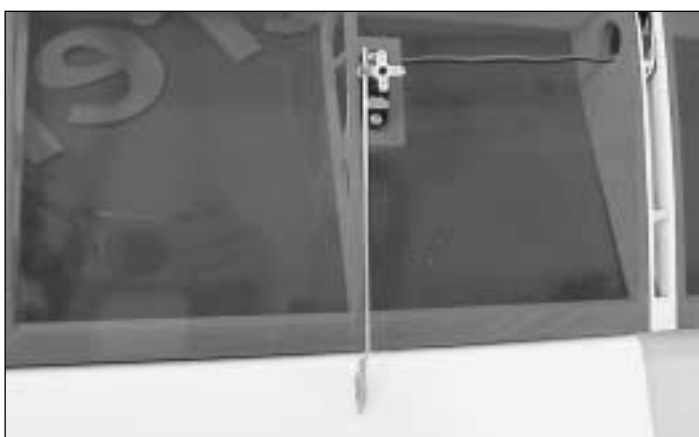


❑ 3. Hinge the **right** aileron to the wing with the included 9/16" x 20-1/2" [14mm x 520mm] hinge material. Attach the hinge material to the trailing edge of the wing first, then carefully place the aileron in position. Try to leave a slight gap of about 1/32" [0.8mm] between the wing and aileron. Once the aileron is in the proper position, press the hinge material firmly onto the wing and aileron. **Note:** It is fairly easy to reposition the aileron if the hinge material has not been firmly pressed into place.

When you install the aileron servos in the following steps you will need to install a short servo extension wire or a Y-harness. If you have a computer radio and intend to program the ailerons as "flaperons", you will need to install a 6" [152mm] extension wire on each servo and plug each aileron servo into a separate channel on a five (or more) channel receiver. Otherwise, a Y-harness can be used on a four channel receiver. The installation shown in the photos used Futaba S3107 servos and a Futaba "dual extension cord" (or Y-harness) (FUTM4130). This resulted in a very neat installation with little excess wire, but did require some careful planning to get the servo wires plugged into the extension cord. A standard Y-harness could also be used, but there would be a considerable amount of excess wire to deal with.



- □ 4. Connect a servo extension wire or “Y” harness to the right aileron **servo**. Install the right aileron servo in its mount using the grommets, eyelets and screws provided with your servo. Enlarge the mounting area as needed to fit your servo. **Note:** Be sure to route the servo wire through the hole in the wing and out the bottom of the wing.



- □ 5. Using the same technique you did with the elevator, install the aileron control linkage.

In the following step you will glue the wing into place on the fuselage. Normally, you would use a string or tape measure to align the wing with the fuselage. This will not work with this model as the foam fuselage easily flexes, making alignment using that technique difficult. This is one case where the TLAR method (That Looks About Right) works best. The center ribs of the wing also help in its alignment. Sight the model from above, making sure the wing is not cocked sideways. Sight the model from the rear to make sure the wing is parallel with the stab (see page 9, step 4).

Caution: You will need to use paper towels and alcohol to clean up any excess epoxy, but be very careful doing so. The alcohol can dissolve the paint on the fuselage, causing it to streak. Use a dry paper towel to clean the fuselage. Use another paper towel, lightly dampened in alcohol, to clean the wing. Be careful not to touch the damp paper towel to the fuselage.

- 6. Insert the wing into the fuselage and glue it into place. It is best to use 30-minute epoxy as it allows time to adjust the wing, but if you use 6-minute epoxy, practice aligning the wing before gluing it into place. Be careful not to use any excess epoxy as cleanup can be difficult. **Note:** To spread

the epoxy, slide the wing about 1/2" [12.7mm] so that it is slightly off center. Spread some epoxy on the wood of the exposed wing rib, on the top and bottom of the rib. Then, slide the wing so that it is 1/2" [12.7mm] off center in the other direction and spread some epoxy on the other exposed rib. If you are careful not to use an excess amount of epoxy, there will not be much to clean up. It does not take a lot of epoxy to hold the wing securely in place.

- 7. After the epoxy cures, return to step 3 and install the left aileron, servo and control linkage.

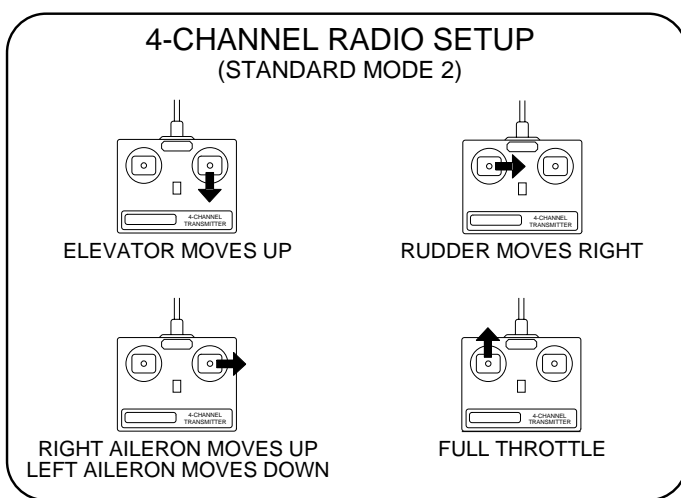
GET THE MODEL READY TO FLY

Check the Control Directions

For safety, remove the propeller from the motor. Move the throttle stick to the off position (towards you.)

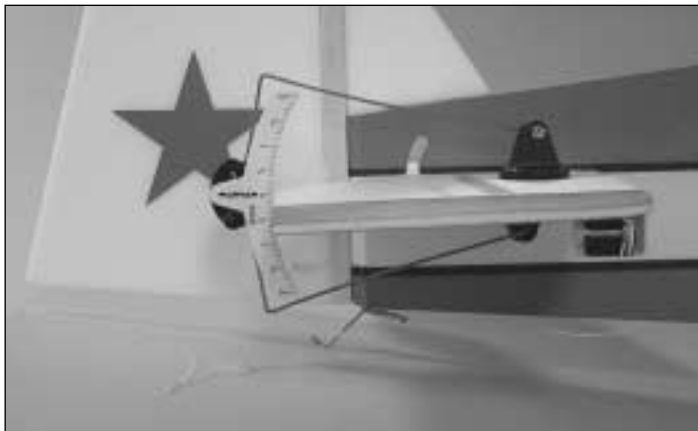
Warning: Whenever the model is not being flown or setup, the battery should be disconnected.

- 1. Connect a charged battery to the speed control. Turn on the transmitter, then follow the instructions that came with your speed control to turn on the receiver. Center the trims on the transmitter. If necessary, remove the servo arms from the servos and reposition them so they are centered. Reinstall the screws that hold on the servo arms.
- 2. With the transmitter and receiver still on, check all the control surfaces to see if they are centered. If necessary, adjust the Screw-lock connectors on the pushrods to center the control surfaces.



- 3. Make certain that the control surfaces and motor respond in the correct direction as shown in the diagram. If any of the controls respond in the wrong direction, use the servo reversing in the transmitter to reverse the servos connected to those controls. Be certain the control surfaces have remained centered. Adjust if necessary.

Set the Control Throws



Use a Great Planes AccuThrow™ (or a ruler) to accurately measure and set the control throw of each control surface as indicated in the chart that follows. If your radio does not have dual rates, we recommend setting the throws at the low rate setting. **NOTE:** The throws are measured at the widest part of the elevators, rudder and ailerons.

These are the recommended control surface throws:

	High Rate	Low Rate
ELEVATOR:	2-3/4" [70mm] up 2-3/4" [70mm] down	1-1/4" [32mm] up 1-1/4" [32mm] down
AILERONS:	1-1/2" [38mm] up 1-1/2" [38mm] down	3/4" [19mm] up 3/4" [19mm] down
RUDDER:	4" [102mm] right 4" [102mm] left	3" [76mm] right 3" [76mm] left

IMPORTANT: The Sukhoi SU-31 3D Park Flyer ARF has been **extensively** flown and tested to arrive at the throws at which it flies best. Flying your model at these throws will provide you with the greatest chance for successful first flights. If, after you have become accustomed to the way the Sukhoi SU-31 ARF flies, you would like to change the throws to suit your taste, that is fine. However, too much control throw could make the model difficult to control, so remember, "more is not always better."

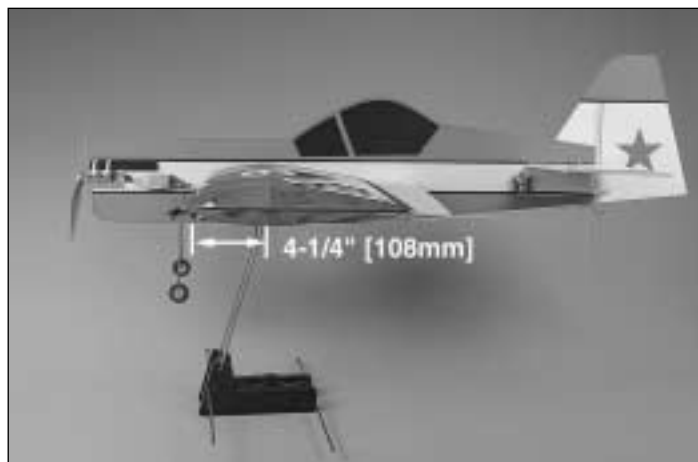
Balance the Model (C.G.)

More than any other factor, the **C.G.** (balance point) can have the **greatest** effect on how a model flies and may determine whether or not your first flight will be successful. If you value this model and wish to enjoy it for many flights, **DO NOT OVERLOOK THIS IMPORTANT PROCEDURE.** A model that is not properly balanced will be unstable and possibly unflyable.

At this stage the model should be in ready-to-fly condition with all of the systems in place including the motor, battery, landing gear and the radio system.

1. Use a felt-tip pen or 1/8"-wide tape to accurately mark the C.G. on the bottom of the wing on both sides of the fuselage. **The C.G. is located 4-1/4" [108mm] back from the leading edge of the wing.**

This is where your model should balance for the first flights. Later, you may wish to experiment by shifting the C.G. up to 5/16" [8mm] forward or 5/16" [8mm] back to change the flying characteristics. Moving the C.G. aft makes the model more maneuverable, but could also cause it to become too difficult to control. In any case, **start at the recommended balance point** and do not at any time balance the model outside the specified range.



2. Place the model on a Great Planes CG Machine, or lift it at the balance point you marked.

3. If the tail drops, the model is "tail heavy" and the battery pack must be shifted forward or weight must be added to the nose to balance. If the nose drops, the model is "nose heavy" and the battery pack must be shifted aft or weight must be added to the tail to balance. If possible, relocate the battery pack to minimize or eliminate any additional ballast required. If additional weight is required use Great Planes (GPMQ4485) "stick on" lead. A good place to add stick-on nose weight is just behind the motor. Begin by placing incrementally increasing amounts of weight on the top of the fuse above the motor until the model balances. Once you have determined the amount of weight required, it can be permanently attached. If required, tail weight may be added by cutting a slot in the bottom of the fuse and gluing it permanently inside.

4. **IMPORTANT:** If you found it necessary to add any weight, recheck the C.G. after the weight has been installed.

Balance the Model Laterally

- ❑ 1. With the wing level, have an assistant help you lift the model by the motor propeller shaft and the bottom of the fuse under the TE of the fin. Do this several times.
- ❑ 2. If one wing always drops when you lift the model, it means that side is heavy. Balance the airplane by adding weight to the other wing tip. An airplane that has been laterally balanced will track better in loops and other maneuvers.

PREFLIGHT

Identify Your Model

No matter if you fly at an AMA sanctioned R/C club site or if you fly somewhere on your own, you should always have your name, address, telephone number and AMA number on or inside your model. It is required at all AMA R/C club flying sites and AMA sanctioned flying events. Fill out the identification tag on the back cover of this manual and place it on your model.

Charge the Transmitter Batteries

Follow the instructions that came with your radio to charge the batteries the evening before you plan to fly. You should always charge the transmitter batteries before flying and at other times as recommended by the radio manufacturer.

Balance Propellers



Carefully balance your propeller and spare propellers before you fly. An unbalanced prop can be the single most significant cause of vibration that can damage your model. Not only will motor mounting screws and bolts loosen, possibly with disastrous effect, but vibration may also damage your radio receiver and battery.

We use a Top Flite Precision Magnetic Prop Balancer™ (TOPQ5700) in the workshop and keep a Great Planes Fingertip Prop Balancer (GPMQ5000) in our flight box.

Ground Check

Before you fly you should perform one last overall inspection to make sure the model is truly ready to fly and that you haven't overlooked anything. If you are not thoroughly familiar with the operation of R/C models, ask an experienced modeler to perform the inspection. Check to see that you have the radio installed correctly and that all the controls are connected properly. The motor must also be checked by confirming that the prop is rotating in the correct direction and the motor sounds like it is reaching full power. Make certain all control surfaces (elevators, rudder, ailerons) are secure, the pushrods are connected, the controls respond in the correct direction, radio components are securely mounted and the C.G. is correct.

Range Check

Ground check the operational range of your radio before the first flight of the day. With the transmitter antenna collapsed and the receiver and transmitter on, you should be able to walk at least 100 feet away from the model and still have control. Have an assistant stand by your model and, while you work the controls, tell you what the control surfaces are doing. Repeat this test **with the motor running** at various speeds with an assistant holding the model, using hand signals to show you what is happening. If the control surfaces do not respond correctly, **do not fly!** Find and correct the problem first. Look for loose servo connections or broken wires, corroded wires on old servo connectors, poor solder joints in your battery pack or a defective cell, or a damaged receiver crystal from a previous crash.

MOTOR SAFETY PRECAUTIONS

Failure to follow these safety precautions may result in severe injury to yourself and others.

Get help from an experienced pilot when learning to operate motors.

Use safety glasses when starting or running motors.

Do not run the motor in an area of loose gravel or sand; the propeller may throw such material in your face or eyes.

Keep your face and body as well as all spectators away from the plane of rotation of the propeller as you start and run the motor.

Keep these items away from the prop: loose clothing, shirt sleeves, ties, scarfs, long hair or loose objects such as pencils or screwdrivers that may fall out of shirt or jacket pockets into the prop.

The motor gets hot! Do not touch it during or right after operation.

The electric motor and battery used in your Sukhoi SU-31 ARF are very powerful and the spinning propeller has a lot of momentum; therefore, if you touch the propeller while it is spinning it may inflict severe injury. Respect the motor and propeller for the damage it is capable of and take whatever precautions are necessary to avoid injury. Always disconnect and remove the battery until you are ready to fly again and always make sure the switches are turned off before connecting the battery.

AMA SAFETY CODE (EXCERPT)

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

General

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

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

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

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

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

Radio Control

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

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

3. I will perform my initial turn after takeoff away from the pit or spectator areas and I will not thereafter fly over pit or spectator areas, unless beyond my control.

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

CHECK LIST

During the last few moments of preparation your mind may be elsewhere anticipating the excitement of the first flight. Because of this, you may be more likely to overlook certain checks and procedures that should be performed before the model is flown. To help avoid this, a checklist is provided to make sure these important areas are not overlooked. Many are covered in the instruction manual, so where appropriate, refer to the manual for complete instructions. Be sure to check the items off as they are completed (that's why it's called a *check list!*).

- 1. Check the C.G. according to the measurements provided in the manual.
- 2. Be certain the battery and receiver are securely mounted in the fuse.
- 3. Extend your receiver antenna and make sure it has a strain relief to keep tension off the solder joint inside the receiver.
- 4. Balance your model laterally as explained in the instructions.
- 5. Use threadlocking compound to secure critical fasteners such as the screw-lock pushrod connectors, etc.
- 6. Add a drop of oil to the axles so the wheels will turn freely.
- 7. Make sure all hinges are **secure**.
- 8. Reinforce holes for wood screws with thin CA where appropriate (servo mounting screws).
- 9. Confirm that all controls operate in the correct direction and the throws are set up according to the manual.
- 10. Make sure that all servo arms are secured to the servos with the screws included with your radio.
- 11. Secure connections between servo wires and Y-connectors or servo extensions with vinyl tape, heat shrink tubing or special clips suitable for that purpose.
- 12. Make sure any servo extension cords you may have used do not interfere with other systems (servo arms, pushrods, etc.).
- 13. Balance your propeller (and spare propellers).
- 14. Tighten the propeller nut.
- 15. Place your name, address, AMA number and telephone number on or inside your model.
- 16. Cycle your battery pack (if necessary) and make sure it is fully charged.
- 17. If you wish to photograph your model, do so before your first flight.
- 18. Range check your radio when you get to the flying field.

FLYING

The Sukhoi SU-31 ARF is a great-flying model that flies smoothly and predictably. The Sukhoi SU-31 ARF does not, however, possess the self-recovery characteristics of a primary R/C trainer and should be flown only by experienced R/C pilots. If you are an inexperienced modeler we strongly urge you to seek the assistance of a competent, experienced R/C pilot to check your model for airworthiness AND to teach you how to fly.

CAUTION (THIS APPLIES TO ALL R/C AIRPLANES): If, while flying, you notice an alarming or unusual sound such as a low-pitched “buzz,” this may indicate control surface *flutter*. Flutter occurs when a control surface (such as an aileron or elevator) or a flying surface (such as a wing or stab) rapidly vibrates up and down (thus causing the noise). In extreme cases, if not detected immediately, flutter can actually cause the control surface to detach or the flying surface to fail, thus causing loss of control followed by an impending crash. The best thing to do when flutter is detected is to slow the model **immediately** by reducing power, then land as soon as safely possible. Identify which surface fluttered (so the problem may be resolved) by checking all the servo grommets for deterioration or signs of vibration. Make certain all pushrod linkages are secure and free of play. If it fluttered once, under similar circumstances it will probably flutter again unless the problem is fixed. Some things which can cause flutter are; Excessive hinge gap; Not mounting control horns solidly; Poor fit of clevis pin in horn; Side-play of wire pushrods caused by large bends; Excessive free play in servo gears; Insecure servo mounting; and one of the most prevalent causes of flutter; Flying an over-powered model at excessive speeds.

Takeoff

Remember to takeoff into the wind. When you're ready, point the model straight down the runway, hold a bit of up elevator to keep the tail on the ground, then gradually advance the throttle. As the model gains speed decrease up elevator allowing the tail to come off the ground. One of the most important things to remember with a tail dragger is to always be ready to apply right rudder to counteract motor torque. Gain adequate speed before gently applying up elevator, lifting the model into the air. Be smooth on the elevator stick, allowing the model to establish a **gentle** climb to a safe altitude before turning into the traffic pattern.

OK, ok - this is a highly aerobatic model. After the first flight, a takeoff run of a few feet with a vertical climb might be in order. But please, don't do this on the first flight. Get used to the control throws first.

Flight

For reassurance and to keep an eye on other traffic, it is a good idea to have an assistant on the flight line with you. Tell him to remind you to throttle back once the plane gets to a comfortable altitude. While full throttle is usually desirable for takeoff, most models fly more smoothly at reduced speeds.

Take it easy with the Sukhoi SU-31 ARF for the first flight, gradually getting acquainted with it as you gain confidence. Adjust the trims to maintain straight and level flight. After flying around for a while and while still at a safe altitude with plenty of battery life, practice slow flight and execute

practice landing approaches by reducing the throttle to see how the model handles at slower speeds. Add power to see how she climbs as well. Continue to fly around, executing various maneuvers and making mental notes (or having your assistant write them down) of what trim or C.G. changes may be required to fine tune the model so it flies the way you like. Mind your battery charge, but use this first flight to become familiar with your model before landing.

Landing

To initiate a landing approach, lower the throttle while on the downwind leg. Allow the nose of the model to pitch downward to gradually bleed off altitude. Continue to lose altitude, but maintain airspeed by keeping the nose down as you turn onto the crosswind leg. Make your final turn toward the runway (into the wind) keeping the nose down to maintain airspeed and control. Level the attitude when the model reaches the runway threshold, modulating the throttle as necessary to maintain your glide path and airspeed. If you are going to overshoot, smoothly advance the throttle (always ready on the right rudder to counteract torque) and climb out to make another attempt. When you're ready to make your landing flare and the model is a foot or so off the deck, smoothly increase up elevator until it gently touches down. Once the model is on the runway and has lost flying speed, hold up elevator to place the tail on the ground.

One final note about flying your model. Have a goal or flight plan in mind for **every** flight. This can be learning a new maneuver(s), improving a maneuver(s) you already know, or learning how the model behaves in certain conditions (such as on high or low rates). This is not necessarily to improve your skills (*though it is never a bad idea!*), but more importantly so you do not surprise yourself by impulsively attempting a maneuver and suddenly finding that you've run out of time, altitude or airspeed. Every maneuver should be deliberate, not impulsive. For example, if you're going to do a loop, check your altitude, mind the wind direction (anticipating rudder corrections that will be required to maintain heading), remember to throttle back at the top and make certain you are on the desired rates (high/low rates). A flight plan greatly reduces the chances of crashing your model just because of poor planning and impulsive moves. **Remember to think.**

Have a ball!

But always stay in control and fly in a safe manner.

GOOD LUCK AND GREAT FLYING!

This model belongs to:					
	Name	Address	City, State Zip	Phone number	AMA number