

# Kunai

## INSTRUCTION MANUAL



### SPECIFICATIONS

**Wingspan:** 55 in [1395mm]

**Length:** 36 in [915mm]

**Weight:** 20.0–21.5 oz [565–610 g]

**Wing Area:** 308 in<sup>2</sup> [19.9 dm<sup>2</sup>]

**Wing Loading:** 9.4–10.1 oz/ft<sup>2</sup>  
[29–31 g/dm<sup>2</sup>]

**Radio:** 4+ channel, 4 servos

**Motor,** A2212-10 1400 kV outrunner,

**ESC:** 20A ESC, 8x6 folding propeller

### 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

## INTRODUCTION

Congratulations and thank you for purchasing the Kunai. The Kunai's versatility makes it one of those models that everybody should own! It can be flown like a glider, like an aerobatic plane, like a hotliner or even like a pylon racer. When you *put the pedal to the metal* the Kunai's light weight, thin wing and clean lines allow it to reach *warp speed* right away! And when you cut the throttle the prop folds back and the Kunai conserves energy, allowing thrilling, power-off fly-bys with the only sound the *whoosh* of air as the Kunai silently speeds by. And if you dump the spoilers the Kunai slows to a crawl for thermal seeking and easy, feather-light landings.

For the latest technical updates or manual corrections to the Kunai visit the Great Planes web site at [www.greatplanes.com](http://www.greatplanes.com). Open the "Airplanes" link, then select the Kunai. 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.

## 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



Or via the Internet at: <http://www.modelaircraft.org>

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

## SAFETY PRECAUTIONS

### Protect Your Model, Yourself & Others... Follow These Important Safety Precautions

1. Your Kunai 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 Kunai, 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 use an R/C radio system that is in good condition, a correctly sized motor, and other components as specified in this instruction manual. All components must be correctly

installed so that the model operates correctly on the ground and in the air. You must check the operation of the model and all components before **every** flight.

4. While this kit has been flight tested to exceed normal use, if the plane will be used for extremely high stress flying, or if a motor 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.

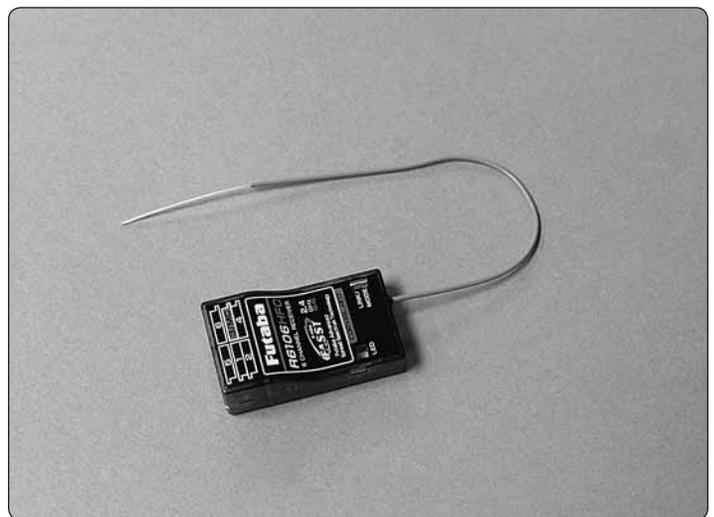
5. **WARNING:** The fuselage pod and boom included in this kit are made of fiberglass or carbon fiber, the fibers of which may cause eye, skin and respiratory tract irritation. Never blow into a part to remove fiberglass dust, as the dust will blow back into your eyes. Always wear safety goggles, a particle mask and rubber gloves when grinding, drilling and sanding fiberglass parts. Vacuum the parts and the work area thoroughly after working with fiberglass parts.

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

**NOTE:** Some technically-minded modelers who wish to check the wing, stab and motor thrust angles may do so by visiting the web site at [www.greatplanes.com](http://www.greatplanes.com) and clicking on "Technical Data."

**REMEMBER:** Take your time and follow the instructions to end up with a well-built model that is straight and true.

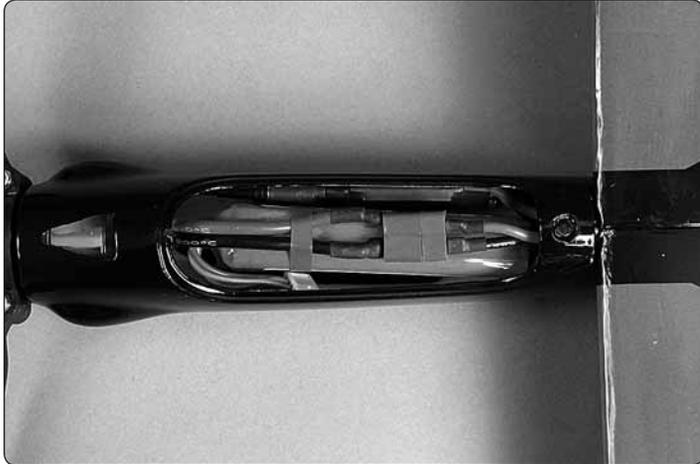
## ADDITIONAL ITEMS REQUIRED



The chart on page 3 lists the electronic items recommended to finish the Kunai. The Futaba receivers listed are recommended because the servos plug into the **end** of the receiver making it the best fit (receivers with "top plug" receptacles may not fit). Also note that a Y-connector (included) may be used for the aileron servos, but this will eliminate the option of spoilers.

For spoilerons, two 3" [75mm] servo extensions will be required (then the aileron servos can be connected into separate channels and mixed electronically through programmable mixing in your transmitter).

Servos in the 9g range up to 11mm in width are recommended (to fit under the aileron hatch covers the best), but servos up to 12mm in width are suitable. Futaba S3157 or S3117 servos are recommended for the ARF, but the Rx-R includes factory-installed servos with specifications similar to Tactic TSX5 servos.



Fuselage space in the Kunai is limited, yet there are still several battery options from 850mAh up to 1300mAh. Each has obvious tradeoffs of weight and flying time. The thinner profile of the 1200mAh (shown) fits best and the 1000mAh is a close second.

## Tools and Building Supplies

Little in the way of tools and adhesives is required to prep the Kunai. 30-minute epoxy is recommended for gluing the tail surfaces and the wing halves together and thin or medium

CA for the rest. Zap Goo (or similar) is strongly recommended for gluing in the aileron servos because it is secure, yet the servos may be extracted if ever necessary. More about gluing in the servos on page 6.

- Great Planes Pro Epoxy 30-Minute Formula (GPMR6043)
- Great Planes Pro CA Glue Thin 1/2 oz (GPMR6001)
- Zap Goo (PAAR3200)
- Great Planes Pro CA+ Glue Medium 1/2 oz (GPMR6007)
- CA accelerator (GPMR6034)
- Non-permanent threadlocker (GPMR6060)
- **Optional:** Du-Bro 1/8" [3mm] double-sided foam mounting tape (DUBQ3551 for attaching ESC)



Please do yourself a favor: If you don't already have one, purchase a quality, machined, 1.5mm Allen hex driver such as a Duratrax *Ultimate* Hex Driver (DTXR0288). Lesser-quality hex drivers end up stripping out the set screws in the propeller hub resulting in an unsecure propeller or a hub and motor that will be difficult to remove from the airplane.

Item	Specification	ARF	Rx-R
<b>Motor</b>	1400 kV 52g Brushless Inrunner	Included	
<b>Propeller</b>	8 x 6 folding (for 3.17mm shaft)	Included	
<b>ESC</b>	20A – 25A for brushless motors	GPMM1820	20A Included
<b>4-6 ch. Mini Receiver</b> (front plug)	Futaba R6106HFC <b>FASST</b> or Futaba R2008SB <b>FHSS</b>	FUTL7651 FUTL7608	
<b>3S LiPo Battery</b>	850 mAh 1000 mAh 1200 mAh 1300 mAh	GPMP0826 GPMP0830 GPMP0836 GPMP0840	
<b>Servos</b>	Four 9g servos (12mm max. width)	S3117 FUTM0417, S3157 FUTM0657, TSX5 TACM0205	Included
<b>Servo Extensions</b>	(2) 12" [300mm] (from aileron servos)	FUTM4507	Included
	<b>Spoilerons:</b> (2) 3" [75mm] (from Rx)	FUTM3909	
	<b>No spoilerons:</b> (1) Y-harness (from Rx)	Included	
<b>LiPo Balancing Charger</b>	DuraTrax Onyx 235	DTXP4235	

## ORDERING REPLACEMENT PARTS

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

To locate a hobby dealer, visit the Great Planes web site at [www.greatplanes.com](http://www.greatplanes.com). Select "Where to Buy" in the menu across the top of the page and follow the instructions provided to locate a U.S., Canadian or International dealer.

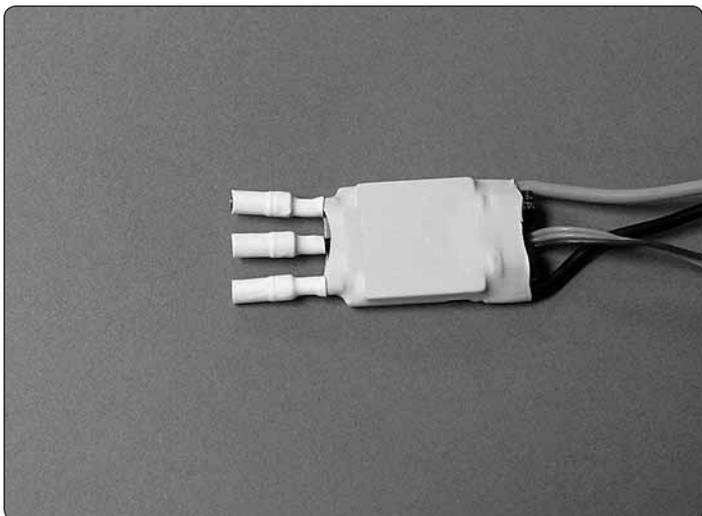
Parts may also be ordered directly from Hobby Services by calling (217) 398-0007, or via facsimile at (217) 398-7721, but full retail prices and shipping and handling charges will apply. Illinois and Nevada residents will also be charged sales tax. If ordering via fax, include a Visa® or MasterCard®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

Mail parts orders     **Hobby Services**  
 and payments by     3002 N Apollo Drive, Suite 1  
 personal check to:   Champaign IL 61822

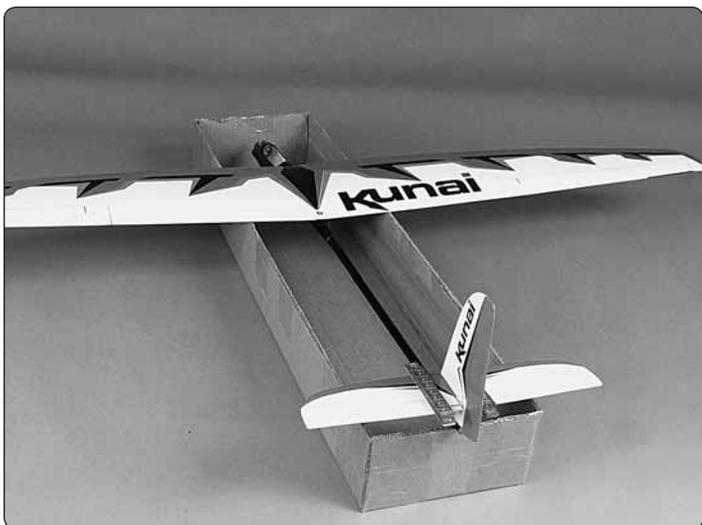
Be certain to specify the order number exactly as listed in the **Replacement Parts List**. Payment by credit card or personal check only; no C.O.D.

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

REPLACEMENT PARTS LIST	
Order No.	Description
GPMA2285	Wing
GPMA2286	Fuselage
GPMA2287	Tail Surface Set
GPMA2288	Motor
GPMA2289	Folding Propeller Assembly
GPMA2290	Propeller Blades
GPMA2291	Hatch
GPMA2292	Decals
GPMA2293	ESC



If building the ARF version that comes without a receiver you'll also need to do a little soldering to shorten the three motor wires coming from the ESC, and then re-cover the female bullet connectors with 3/16" heat shrink tubing (GPMM1056).



One final note before assembly, save the box top or bottom to use as a temporary building stand while gluing on the tail.

## KIT INSPECTION

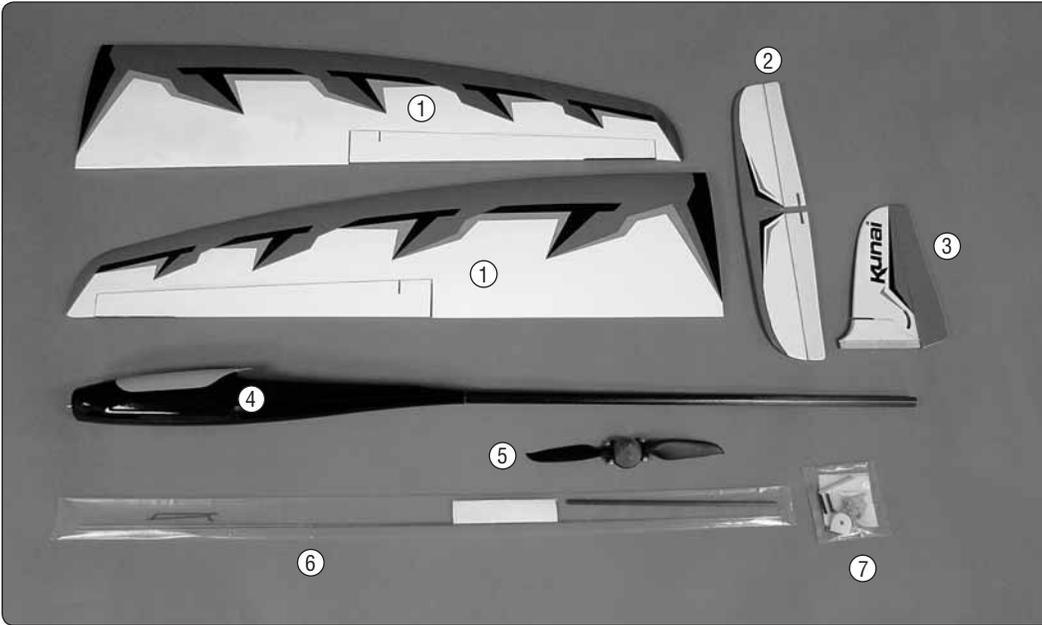
Before starting to build, take an inventory of this kit to make sure it is complete, and inspect the parts to make sure they are of acceptable quality. If any parts are missing or are not of acceptable quality, or if you need assistance with assembly, contact **Product Support**. When reporting defective 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     Ph: (217) 398-8970, ext. 5  
 Champaign, IL 61822     Fax: (217) 398-7721

E-mail: [airsupport@greatplanes.com](mailto:airsupport@greatplanes.com)

## KIT CONTENTS



### Kit Contents

1. Wing
2. Horizontal Stabilizer
3. Vertical Stabilizer
4. Fuselage
5. 8 x 6 Folding Propeller Assembly
6. Hardware A
7. Hardware B
8. Decal Sheet (not shown)

## ASSEMBLY

This instruction manual applies to both the ARF and the Rx-R editions of the Kunai. If assembling the Rx-R version, simply skip steps that do not apply. **NOTE:** Even though the control horns are glued into position in the Rx-R version, apply a couple drops of thin CA to the base of all the horns where they meet the control surfaces just for added security. Also be sure the screws on the pushrods in the aileron horns are tight and secure.

### Tighten the Covering

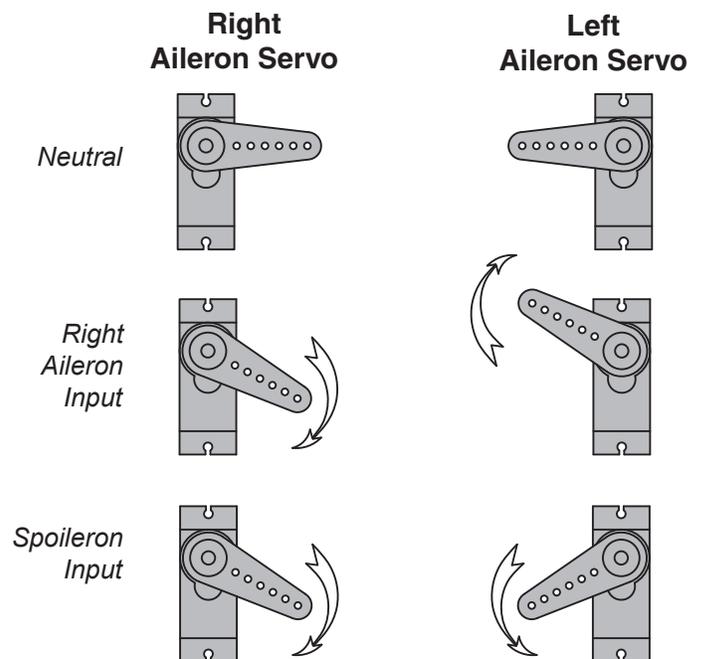


Between the time the Kunai was produced and the time you opened the box, the covering may have relaxed, causing areas of loose covering or wrinkles. The absolute best way to tighten the covering is with a covering iron and a protective, cloth covering sock. The ideal surface temperature of the cover sock should be approximately 300°F [150°C] — if using a 21<sup>st</sup> Century covering iron turn the dial to 300°F [150°C]. First glide the iron over the surface lightly to tighten the covering, then go over it again, pressing down to bond the covering to

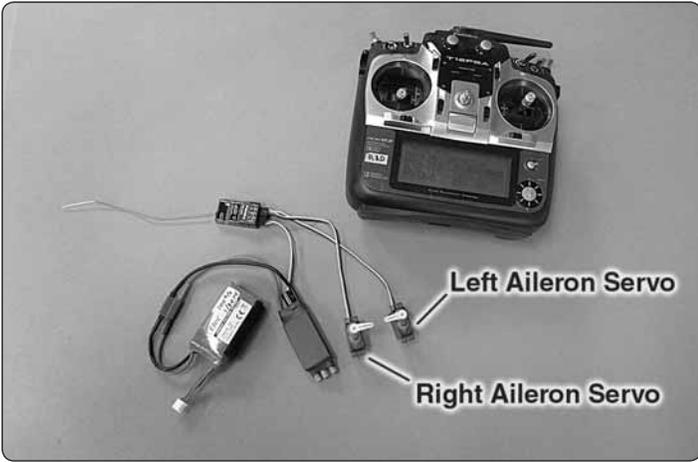
the wood underneath. **NOTE:** Avoid using a heat gun or the covering may pull away at the seams.

## ASSEMBLE THE WINGS

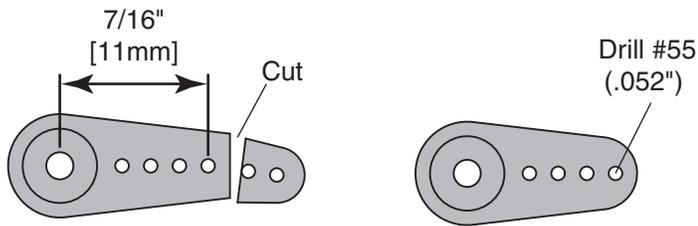
### Prepare the Aileron Servos for Installation



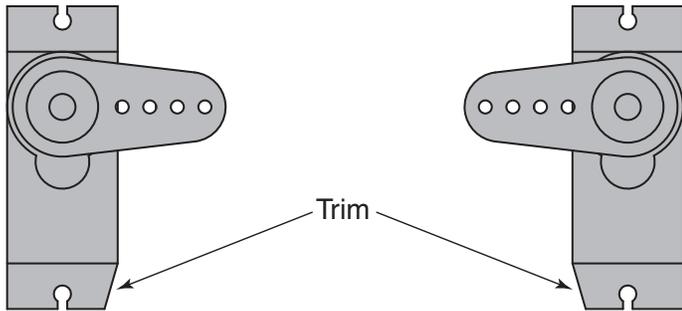
1. If your servos came with double or four-arm servo arms, cut off the unused arms for your two aileron servos. Connect the servos to your receiver with an ESC and program a mix in your transmitter and power up the servos so they will respond as shown in the illustrations (a slider or dial is suggested for controlling the spoilerons).



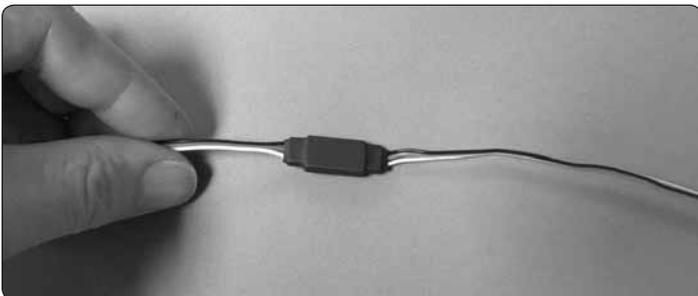
**Note:** If you do not have a radio capable of mixing the aileron servos electronically, a Y-harness will have to be used to connect both servos into a single channel in the receiver. Then, spoilers will not be an option.



❑ 2. Cut off the servo arms past the holes nearest 7/16" [11mm] out from center. Drill out the pushrod holes in the servo arms with a #55 (.052") drill. Fasten the arms to the servos with the screws—also use threadlocker if the output shaft is metal.



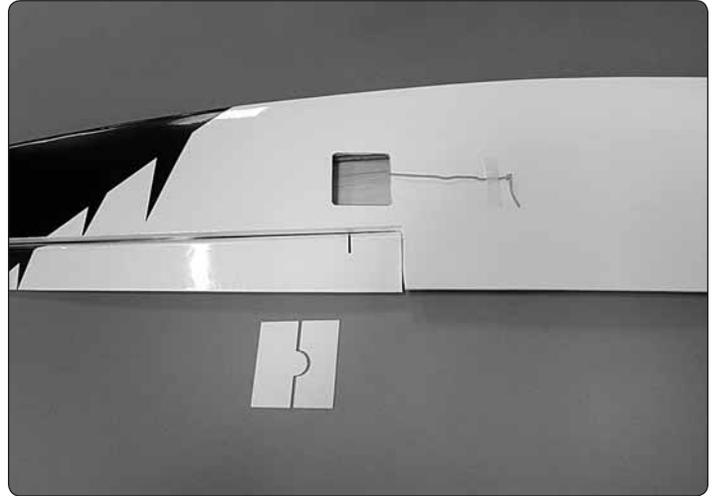
❑ 3. Slightly trim the servo mounting tabs so they won't interfere with the hatch covers.



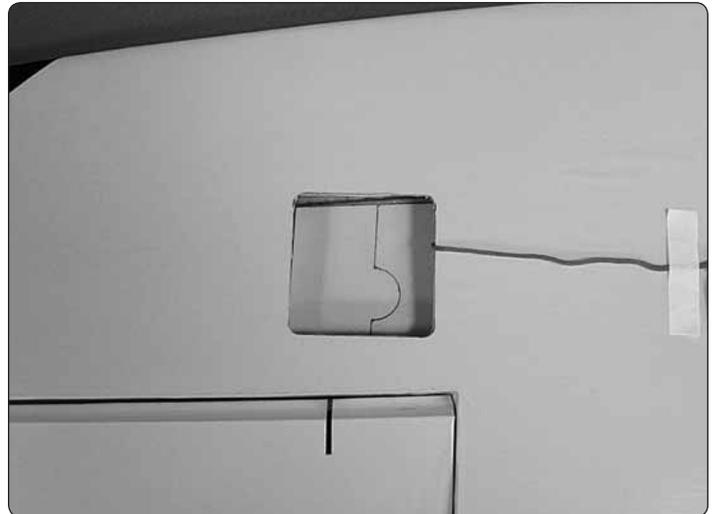
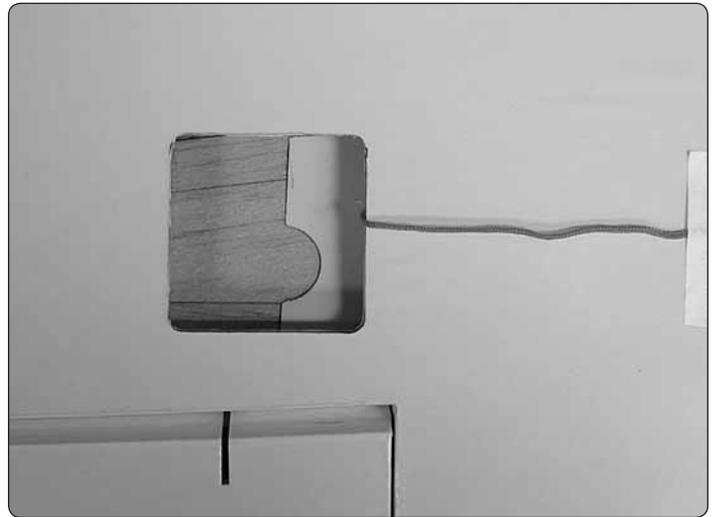
❑ 4. Connect a 12" [300 mm] servo extension to each servo. Secure the plugs with 1/2" [13 mm] shrink tubing, tape or clips.

## Install the Aileron Servos

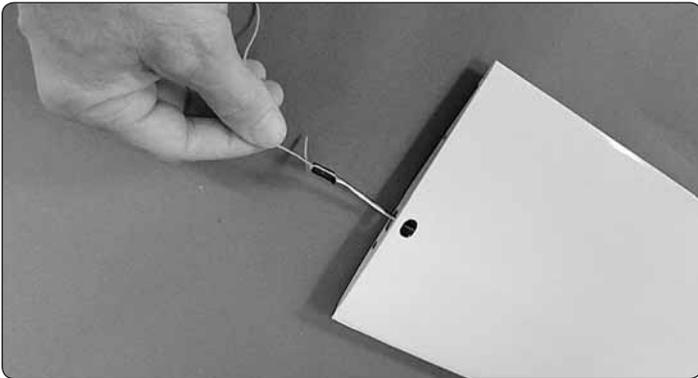
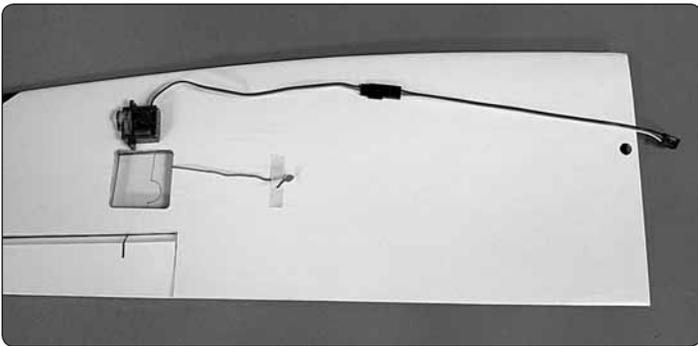
Start with the right wing so yours looks like the photos.



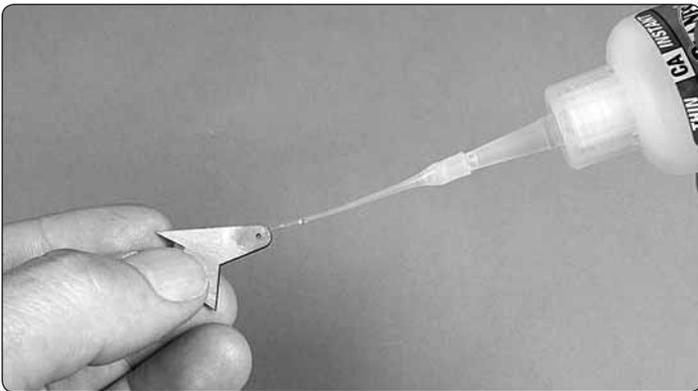
❑ 1. Use medium-grit sandpaper to roughen and clean both sides of the plastic **wing skin doublers** so glue will adhere. Test fit the doublers to the top skin in the aileron hatch. Make any adjustments to the doublers for a good fit.



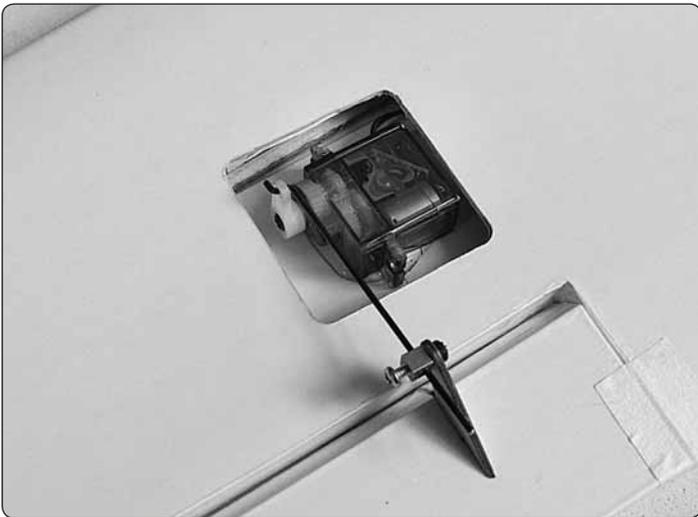
❑ 2. Glue one, then the other doubler to the top wing skin with medium CA.



❑ 3. Use the string in the wing to pull the servo wire for the **right** aileron servo out the end of the wing.



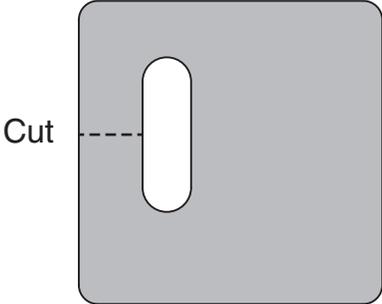
❑ 4. Wet the plywood **aileron horn** with thin CA, allow to soak in and harden, and then lightly sand smooth.



Refer to this photo while mounting the aileron servo.

❑ 5. Mount a screw-lock connector in the side of the aileron horn that faces outward (toward the wing tip)—be certain the plastic retainer snaps on tightly. If not, use another (a couple of spare servo retainers are included). Test-fit, then securely glue the horn into the slot in the aileron.

❑ 6. Connect an aileron pushrod to the hole in the aileron servo arm closest to 7/16" [11mm] out from center and fit the other end of the pushrod into the screw-lock connector on the aileron control horn.

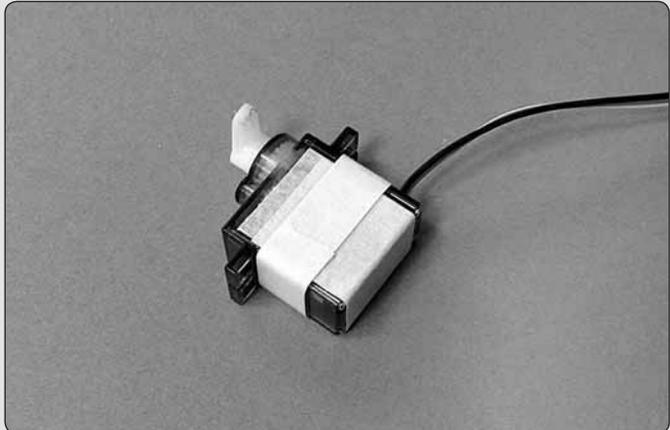


❑ 7. Temporarily lock the pushrod to the connector with a 2mm screw. Use your transmitter to operate the servo and aileron, making sure everything moves smoothly. Cut the hatch cover to fit it over the pushrod and test-fit to the wing. Make sure you can get the hatch positioned so the servo arm and pushrod will not hit the cover—this may require adjusting the pushrod in the screw-lock connector to move the servo forward or aft.

**OPTIONAL SERVO MOUNTING METHOD**

**A note about gluing in the aileron servos:**

Zap Goo (or similar) is preferred for gluing in the servos because it is **plenty** strong, but if ever necessary, the servos can be extracted by twisting them out. And then, remaining Zap Goo can be peeled out of the wing and off the servos.



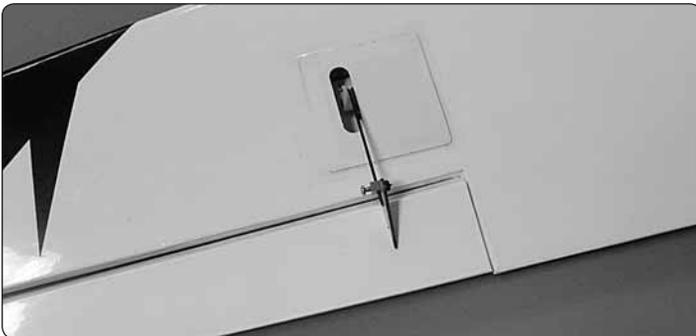
An optional way to glue in the servos is to wrap them tightly with a layer or two of masking tape, and then glue them in with epoxy or CA. If removal is ever required, cut the tape and extract the servo. Remaining tape and glue will have to be removed before installing another servo.

The following step should be performed with the radio on so the servo arm remains centered.



❑ 8. Once you've confirmed that everything operates correctly, tape the aileron centered to the wing, then glue the servo into position—it's not necessary to "glop" on lots of glue—just a medium film is all that is required. No clamping is required either—simply press the servo down to the wing. Once set into position turn off the radio. Check the servo a couple of times over the next ten or fifteen minutes to make sure it hasn't moved. After that, let the glue dry overnight before testing the ailerons.

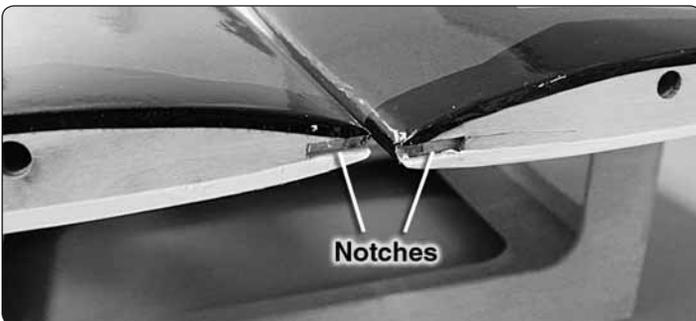
❑ 9. After the glue has dried, turn your radio on and adjust the pushrod in the screw-lock connector so the aileron will be centered. Lock the pushrod down with the screw and a small drop of threadlocker on the threads.



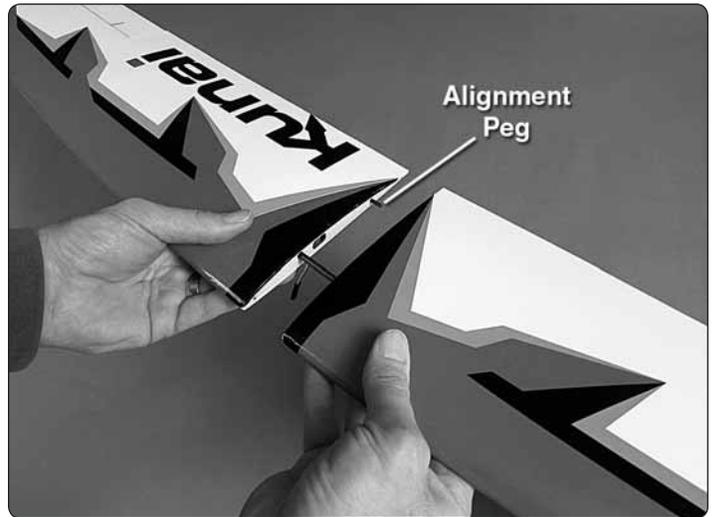
❑ 10. Tape the hatch cover to the wing with clear tape.

Build the left wing the same way.

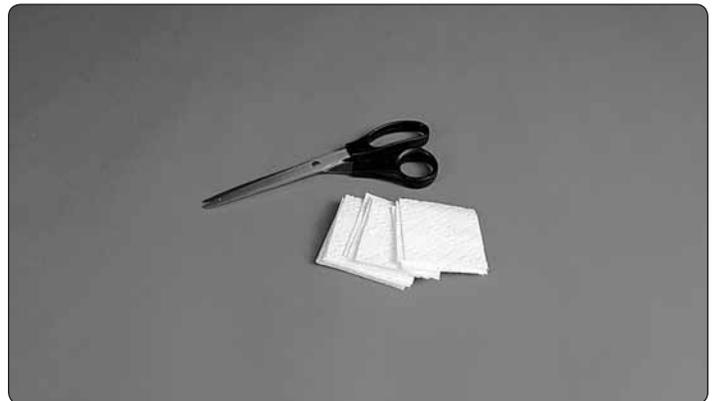
### Join the Wing Halves



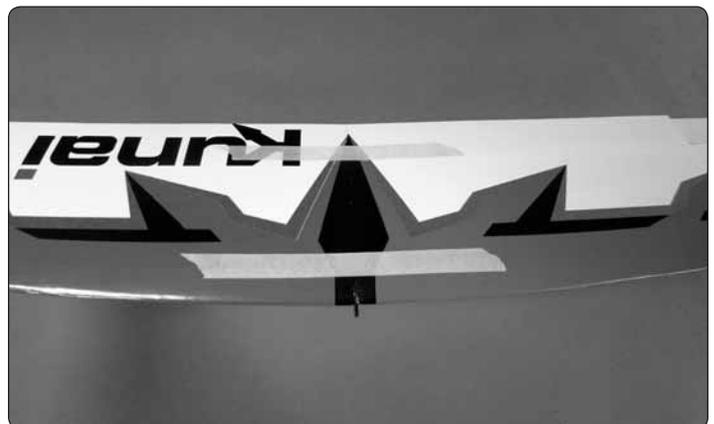
❑ 1. Cut the covering from the notches in the leading edge of both wing roots for the leading edge carbon fiber peg.



❑ 2. Scuff the **joiner rod** and one of the two **carbon pegs** with medium-grit sandpaper so glue will adhere. Test-fit the wing halves together with the rod and peg—the halves should align with each other and fit together tightly with no gaps. Make any adjustments necessary for a good fit.



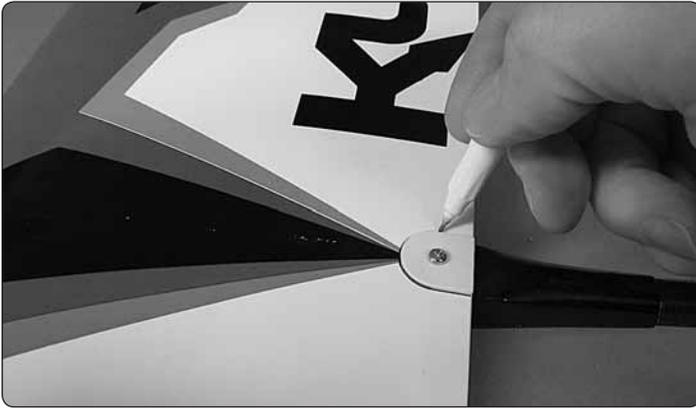
❑ 3. Cut a couple of paper towels into small squares for wiping up excess epoxy in the next step.



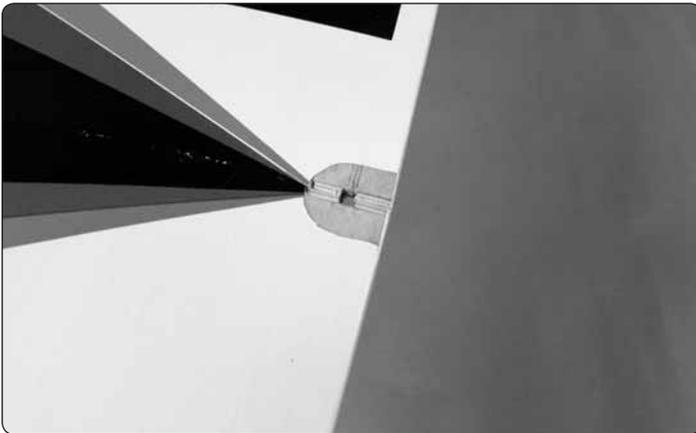
❑ 4. Apply 30-minute epoxy to all joining surfaces including all around the joiner rod and down inside the tubes in the wing and join the halves together. Install the **peg** into the leading edge. Then, use the small paper towel squares dampened with denatured alcohol to clean up excess epoxy. Use masking tape to tightly hold the halves together until the epoxy hardens.

## ASSEMBLE THE FUSELAGE

### Fit the Wing to the Fuselage



❑ 1. Bolt the wing to the fuselage with the plastic **wing bolt plate**. Use a fine-point felt-tip pen to mark the outline of the bolt plate on the wing.



❑ 2. Remove the wing from the fuselage and lightly cut 1/16" [1mm] inside the line you marked for the plate. Use a paper towel square **lightly** dampened with denatured alcohol to wipe away the ink line (too much alcohol will wick the ink under the covering). Peel the covering from the top of the wing.

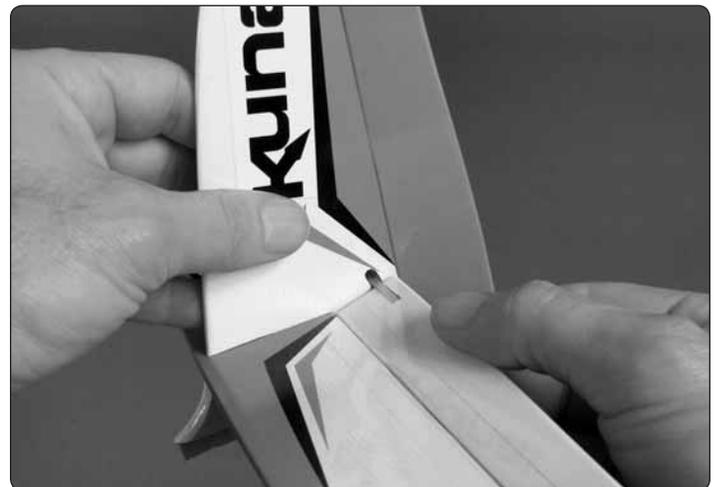
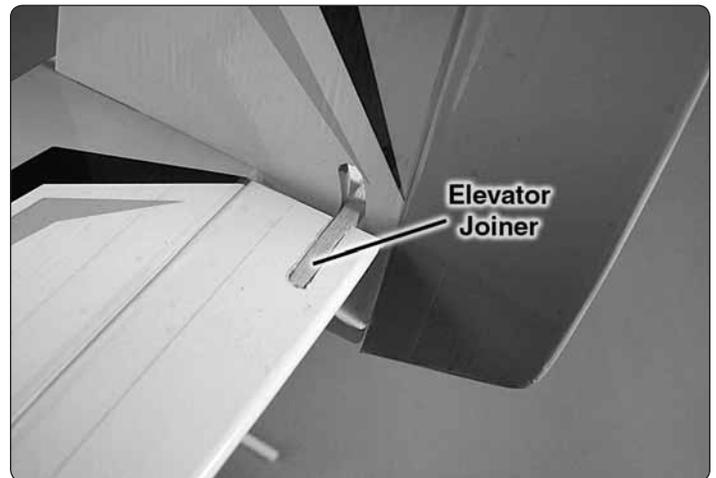


❑ 3. Using care not to get any glue on the threads of the bolt, glue the wing bolt plate into position by bolting the assembly to the fuselage.

## Glue on the Tail Surfaces

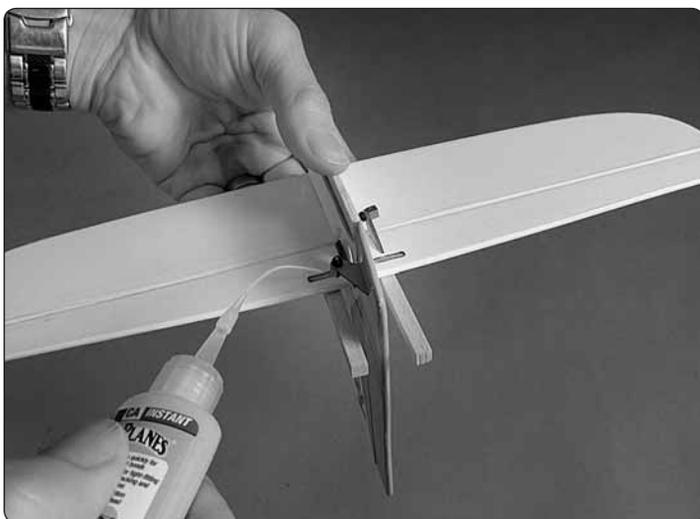


❑ 1. Same as was done for the aileron horns, wet the plywood elevator and rudder horns with thin CA, and allow the CA to harden. Then, mount the screw-lock connectors and glue the horns into place.

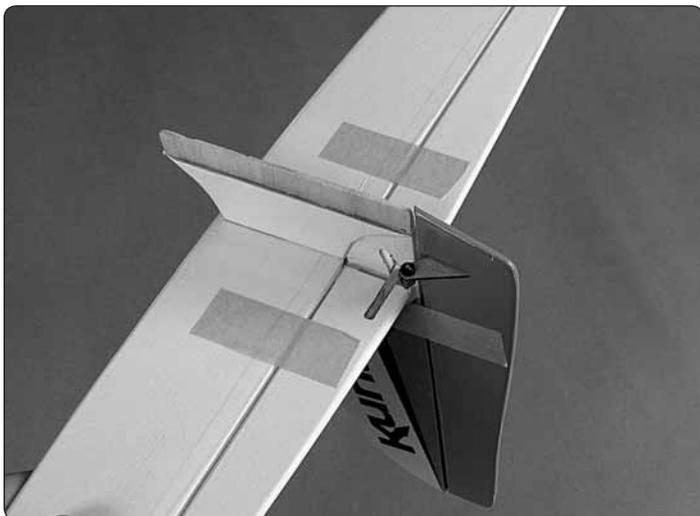


❑ 2. Test-fit, but do not glue the **horizontal stabilizer** (stab) to the **vertical stabilizer** (fin) and install (but do not glue) the wood **elevator joiner**. Move the elevators up and down, making sure the joiner clears the curved slot. Make any adjustments necessary so the elevator will move smoothly.

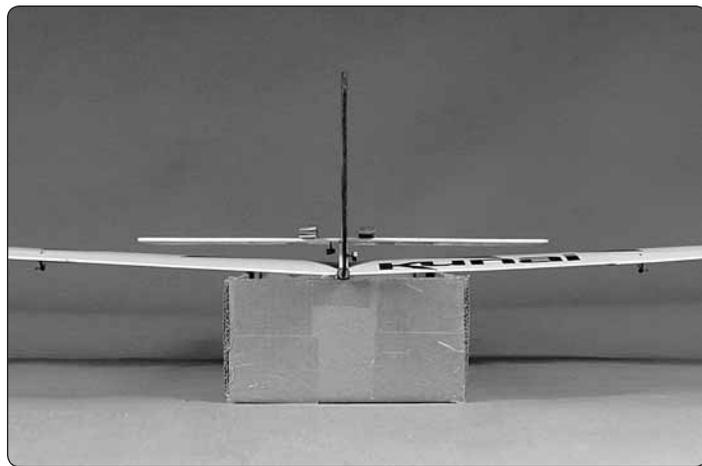
❑ 3. Glue the stab to the fin, making sure the two are perpendicular to each other.



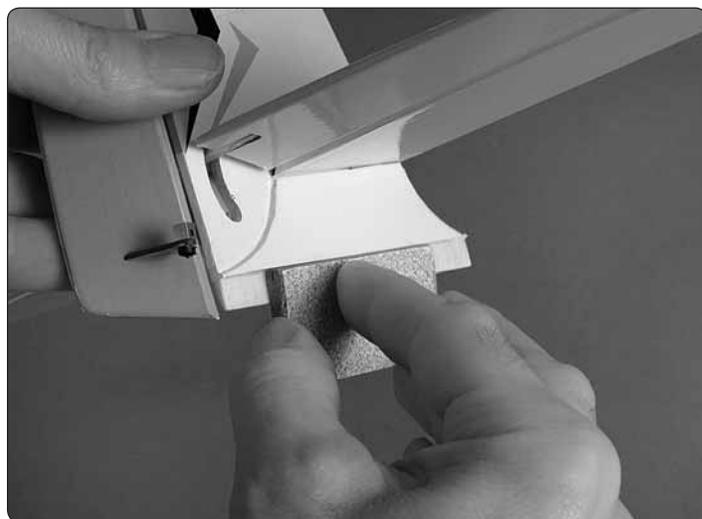
❑ 4. Glue the elevator joiner into position, making sure the elevators are parallel with each other—in the illustration, two balsa sticks were used to align the elevators while glue on the joiner dried.



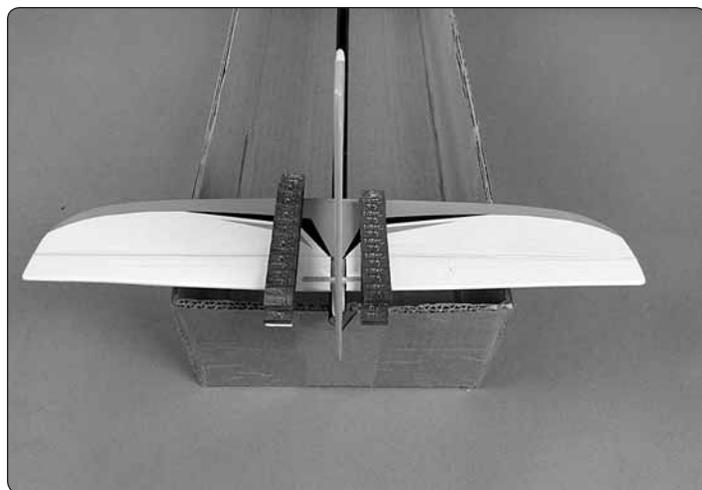
❑ 5. To aid in stab alignment in the next step it will be helpful to tape the elevators and rudder centered with the stab and fin.



❑ 6. Mount the wing to the fuselage and test-fit the stab/fin assembly into the slot in the back of the fuselage boom. View the model from behind, checking to see if the stab is parallel with the wing (the kit box top or bottom serves as a handy stand).



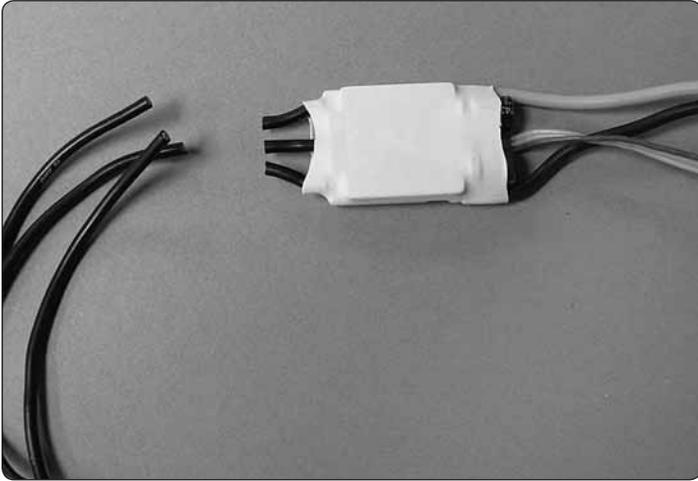
❑ 7. If necessary, sand a **slight** bevel to the appropriate side of the base of the fin. Allow it to tilt and bring the assembly into alignment with the wing.



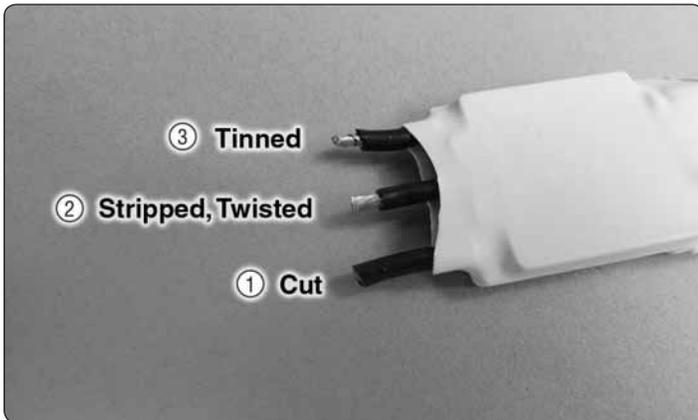
❑ 8. Once alignment is achieved, glue the assembly into position. Use strategically positioned weights to hold the stab in alignment with the wing until the glue dries.

## Install the Motor and ESC

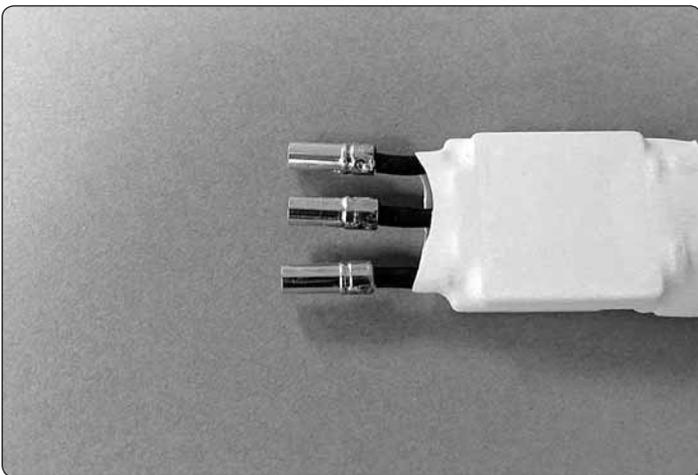
Do not mount the propeller until instructed to do so.



❑ 1. Cut off the three motor wires 1/4" [6mm] from the end of the ESC.



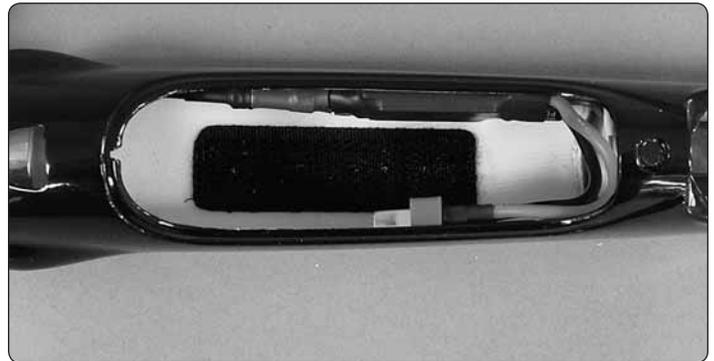
❑ 2. Strip, twist, then tin the exposed wire as shown in the image (for illustration purposes the middle wire has been stripped and twisted and the top wire has been tinned in preparation for re-soldering on the bullets).



❑ 3. Unsolder the bullet connectors from the cut off wires and solder them back onto the ESC. The best way is to heat the bullet, then insert the wire into the molten solder in the bullet and allow it to harden.

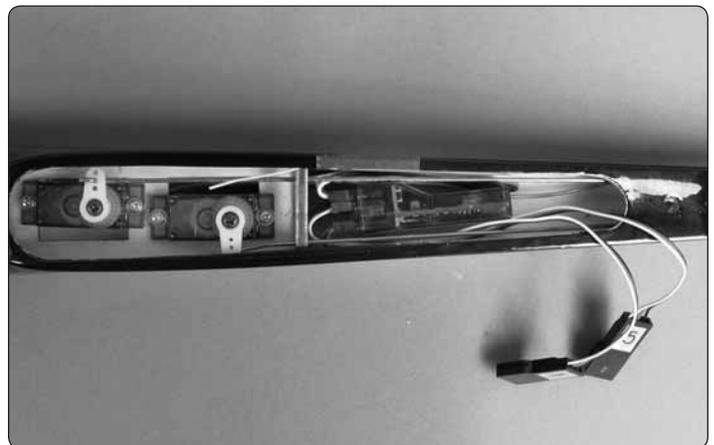


❑ 4. Insulate the bullet connectors with 3/16" [5mm] shrink tubing, then connect the ESC to the motor so the motor will turn the correct direction (this will require temporary connection of the receiver and a battery). Guide the lead wire from the ESC down under the servo tray. Then, use thin, double-sided foam tape to mount the ESC to the fuselage side. **NOTE:** Be certain the motor wires do not rub against the motor.



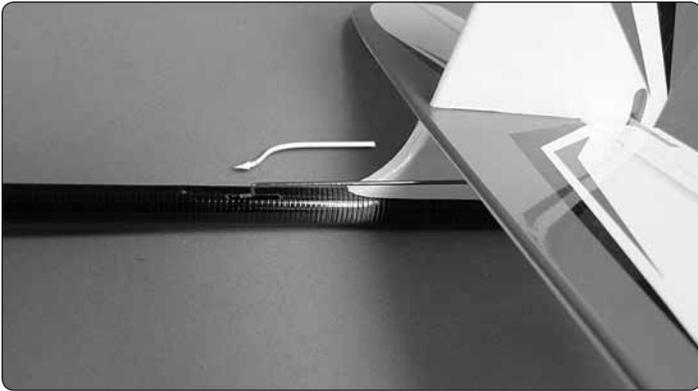
❑ 5. Attach an approximately 2-1/2" [60mm] strip of the rougher, "hook" side of the included adhesive-back hook-and-loop material to the bottom of the fuselage as shown. For added security, apply a few drops of thin CA around the edges of the strip to glue it down to the fuselage.

## Install the Servos and Receiver

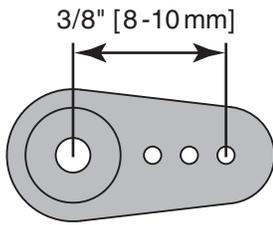


Refer to this photo while performing final radio installation.

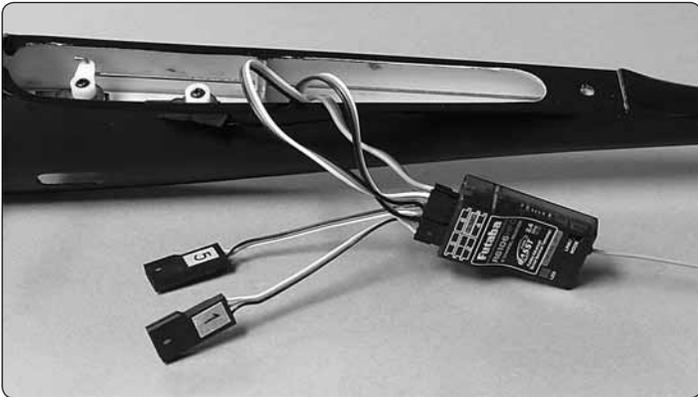
❑ 1. Place the elevator and rudder servos in the servo tray, but do not screw them down yet.



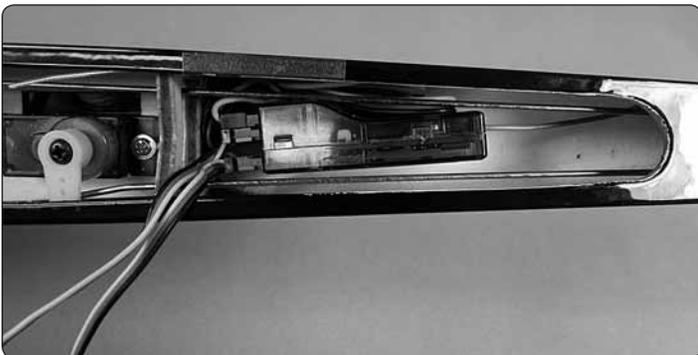
❑ 2. Slide the pushrods up through the slots in the fuselage boom.



❑ 3. Trim two servo arms down to holes 3/8" [8mm – 10mm] from center and drill out the holes with a #55 (.052") drill. Connect the pushrods to the servo horns and temporarily to the screw-lock connectors on the rudder and elevator. Then fit the servo arms on the servos.



❑ 4. Connect the ESC, servos and two 3" [75mm] servo extensions to the aileron channels in your receiver.



❑ 5. Mount the receiver in the fuselage with 1/8" [3mm] double-sided foam mounting tape and tuck all excess wiring neatly out of the way.

❑ 6. Turn on the transmitter and connect a battery to the ESC so you can operate the servos with your radio. Position the servos laterally on the servo tray so the pushrods move smoothly and do not interfere with the receiver or anything else. Drill 1/16" [1.6mm] holes through the servo tray for the mounting screws and temporarily mount the servos. Remove the screws, harden the screw holes with thin CA, and allow to harden. Then, mount the servos with the screws.

❑ 7. With the servos and elevator and rudder centered (and the radio system still on), lock the pushrods to the screw-lock connectors with 3mm screws and a drop of threadlocker.

## FINAL ASSEMBLY

### Set the Control Throws



Measure the control throws at the **widest part** of the elevator, ailerons and rudder. If necessary, use the programming in your radio and/or reposition the pushrods on the servo arms to achieve the specified throws in the following chart. (Moving the pushrods **out** on the servo arms will provide more throw. Moving the pushrods **in** on the servo arms will provide less throw.)

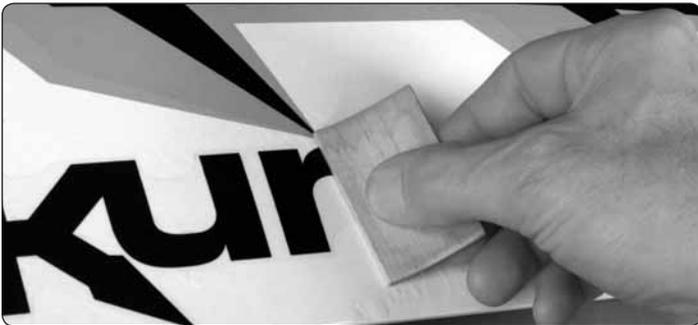
These are the recommended control surface throws:				
	LOW		HIGH	
	Up	Down	Up	Down
ELEVATOR	3/16" [5mm] 11°	3/16" [5mm] 11°	5/16" [8mm] 18°	5/16" [8mm] 18°
	3/8" [10mm] 13°	3/8" [10mm] 13°	3/4" [19mm] 27°	1/2" [13mm] 18°
AILERON	1/2" [13mm] 24°	1/2" [13mm] 24°	3/4" [19mm] 37°	3/4" [19mm] 37°
	Right	Left	Right	Left
RUDDER	1/2" [13mm] 24°	1/2" [13mm] 24°	3/4" [19mm] 37°	3/4" [19mm] 37°
SPOILERON	Up			
	1/2" [13mm]		18° up	

## Decal Application

To facilitate positioning and eliminate air bubbles, apply the decals wet.



- ❑ 1. Peel the decal from the sheet and spray the sticky side with window cleaner.



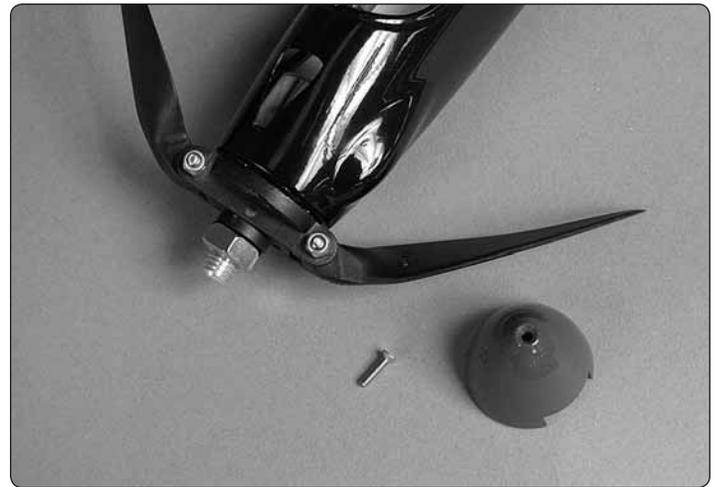
- ❑ 2. Position the decal and squeegee out air bubbles and window cleaner with a piece of soft balsa or similar.

## Balance the Model

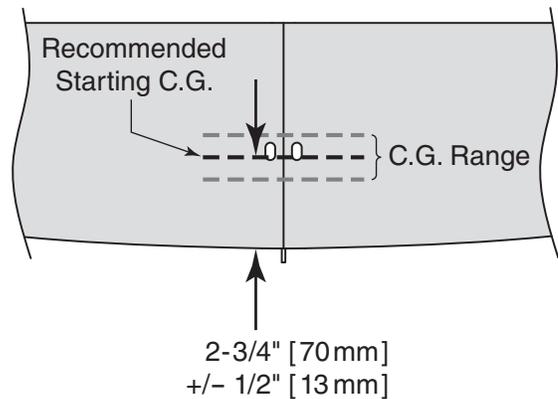
Balanced anywhere within the recommended C.G. range the Kunai flies well. Balanced toward the aft end of the C.G. range the Kunai will respond faster and glide slower for maximizing lift in rising air as well as reduced ground speed for feather-like landings, but will also require more pilot input in windier conditions. Balanced nearer the forward end of the C.G. range the Kunai will be more stable for faster speeds and better wind penetration.



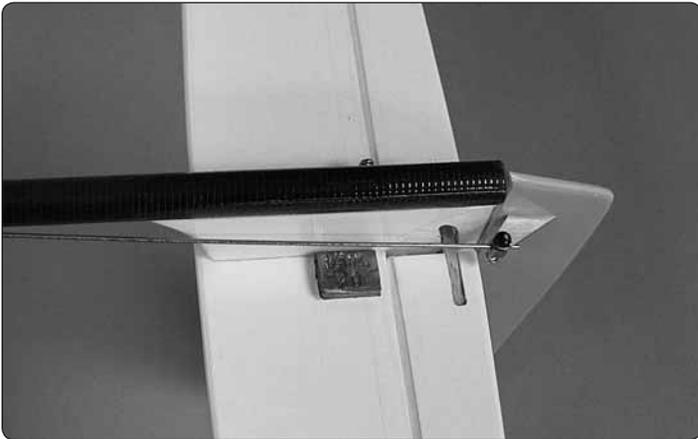
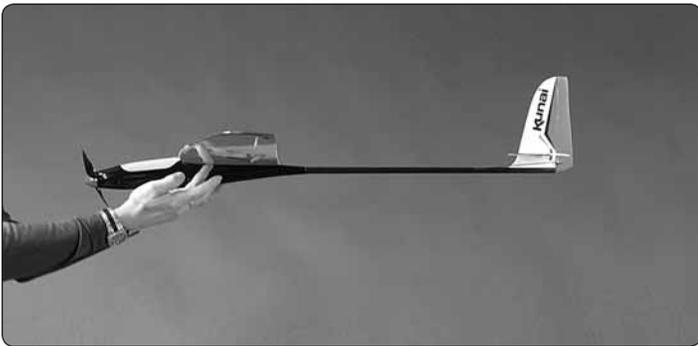
- ❑ 1. If you haven't yet done so, mount the propeller shaft to the motor using a drop of threadlocker on the set screws and a quality, 1.5mm hex driver to tighten the screws—be certain the back of the propeller shaft does not contact the heads of the motor mounting screws.



- ❑ 2. Mount the back plate/propeller hub assembly to the propeller shaft and tighten the nut. Then, mount the spinner cone.



- ❑ 3. The recommended beginning C.G. location is 2-3/4" [70m] back from the leading edge of the wing where it meets the fuselage. The forward and aft C.G. are 1/2" [13mm] either side of that. Measure and mark the C.G. on the bottom of the wing according to the measurements—narrow strips of tape allow you to feel the lines with your fingers when suspending the plane while balancing.
- ❑ 4. Mount the wing to the fuselage. The Kunai must be in ready-to-fly condition with the battery installed and the propeller mounted.



❑ 5. Lift the Kunai with your fingertips to see where it balances. If necessary, add nose or tail ballast to get it to balance where desired. **Note:** With the 1200mAh battery pack and no additional ballast the Kunai will balance near the forward C.G. location. To get it to balance at the middle location approximately .25 oz [7g] of stick-on ballast may be required on the tail.

❑ 6. Also balance the Kunai laterally by lifting the model by the spinner cone and by the fuselage boom under the fin. Do this several times and observe if one wing consistently drops indicating it is the heavier side. Add weight to the bottom of the wing (or inside the wing tip) of the light side until the Kunai balances laterally.

## FINAL PREPARATIONS

### Set a Flight Timer

The best way to prevent unplanned dead-stick landings or damaged batteries due to over discharging is to use a flight timer.

Given battery consumption in the range of 200mAh-per-minute to 300mAh-per-minute, the **minimum** motor run time even with an 850mAh battery should be over two minutes, so start out by setting the timer in your transmitter to two minutes. Link the timer to your throttle stick so only motor run time is counted. Fly until the timer runs out and land. Note the total time on your transmitter and recharge the battery. Divide the capacity that went back into your battery (as noted on your charger) by the time to calculate your average battery consumption for that flight. Divide 80% of your battery capacity by the consumption rate to determine your new target flight time.

### Example:

Suppose you are using a 1200mAh battery and after you landed the motor run time on the timer in your transmitter was 2:15 (2.25 minutes). And it took 560mAh to recharge your battery.

Divide 560mAh by 2.25 minutes to calculate an average battery consumption rate of about 249mAh-per-minute.

Your limit capacity to use from a 1200mAh battery is 960mAh (1200mAh x .8), so 960mAh divided by 249mAh/minute = 3.8 minutes (3 minutes, 50 seconds).

Maybe on your second flight set your timer to 3 minutes and repeat the procedure to continue to log data for calculating target flight times.

The more data you log and the more calculations you do the more accurate your calculated flight times will be so you never have an unplanned dead-stick landing or over discharge your batteries.

You can use the worksheet on page 15 to record flight times and recharge capacity, for calculating target flight times (as well as average, in-flight current which is also useful data). The second row contains formulas for the calculations for that row. Row #1 is already filled out with figures from the example given above:



Additionally, use a LiPo cell checker to check individual cell voltage after each flight. The resting, non-loaded, individual cell voltage after a flight should be no less than **3.7 V/cell**.

## FLYING

### Motor Safety Precautions

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

- Wear safety glasses whenever running motors.
- Keep your face and body as well as all spectators away from the plane of rotation of the turning propeller.
- Keep loose clothing and objects such as pencils or screwdrivers that may fall out of shirt or jacket pockets away from the prop.

## Flight

There's nothing extraordinary that you need to be made aware of before flying the Kunai – it has no unusual characteristics and simply does what you tell it. **Before flying, always check control response first to make sure everything is operating correctly.**



To launch, simply hold the model overhead, apply 3/4 to full-throttle and give the Kunai a light toss at a slightly upward angle – maybe ten degrees or so. Once airborne lower the

throttle as necessary and trim for straight-and-level flight. Enjoy flying the Kunai while learning its flight characteristics including stall, spin and spin recovery characteristics from a high altitude.

Also at high altitude, extend the spoilerons to see how it reacts. Until the Kunai bleeds off speed it will initially balloon when the spoilerons are extended, but will reach “equilibrium” and establish a gentle, slow, gradually descending glide (unless rising air is encountered). Add partial throttle, retract the spoilerons, and then add more throttle to climb out. Practice a few circuits like this to know what to expect when it's actually time to land.

When your timer sounds and it's time to land, extend half spoilerons on the crosswind leg, turn onto base aligning the Kunai with the landing zone and extend full spoilerons whenever necessary. Continue feeding up elevator until all up elevator has been applied and the Kunai gently touches down.

	A	B	C	D	E	F	G
	FORMULAS		B / A		D x .8	E / C	B / 1000 / (A / 60)
	Flight Time (.10ths)	Recharge Capacity	mAh/minute	Battery Capacity	Target Capacity to Use in Flight	Recommended Flight Time	Avg. In-Flight Current
1	2.25 min	560 mAh	249 mAh/min	1200 mAh	960 mAh	3.50 min	14.9 A
2							
3							
4							
5							
6							
7							
8							
9							
10							

