

# HANGAR 9™

## P-51 Mustang ARF

### ASSEMBLY MANUAL



#### Specifications

Wingspan: ..... 58.25 in (1480mm)

Length: ..... 50.5 in (1284mm)

Wing Area: ..... 603 sq in (38.92 sq dm)

Weight: ..... 6.5–7 lb (2.9–3.2 kg)

Radio: ..... 4-channel w/5 servos

Engine: ..... Evolution TPS

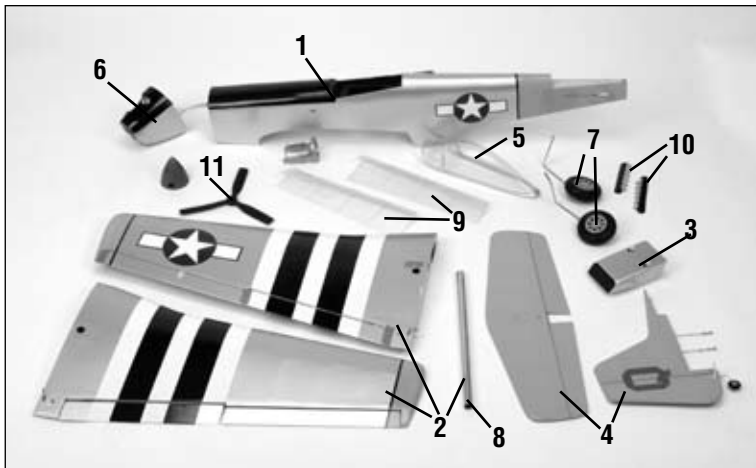
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# Contents of Kit

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## Replacement Parts

1. Fuselage	HAN2826
2. Wing w/Aluminum Tube	HAN2827
3. Belly scoop	HAN2828
4. Tail set	HAN2829
5. Canopy	HAN2830
6. Cowl	HAN2831
7. Landing Gear Set w/Wheels and Speed Brakes	HAN2832
8. Aluminum Wing Tube	HAN2833
9. Droops	HAN2835
10. Exhausts	HAN2836
11. Propeller	EVOE100P

## Items not shown

Speed Brake Set	HAN2838
Pushrod Set	HAN2837
Decal Set	HAN2834

# Radio and Engine Requirements

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## Recommended Radio Equipment

- 4-channel radio system (minimum)
- 5 standard servos (JRPS537 recommended or equivalent)
- Aileron Extension 12", Silver (JRPA114) (2)
- Y-Harness, Heavy-Duty (JRPA135)
- Receiver
- 600mAh Rx Battery Pack (JRPB600)
- Switch harness

## Recommended JR Systems

- PCM10X
- XP8103
- X-378
- XP662
- XF631

## Recommended Engines

- .40-.48 2-stroke
- .40-.82 4-stroke



**Evolution .46NT  
EVOE0460**



**JR XP6102**

# Covering Colors

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- Black HANU874
- Silver HANU881
- White HANU870
- Dark Yellow HANU889

## Field Equipment Required

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- Fuel (10%–15% nitro content)
- Glow Plug Igniter with Charger (HAN7101)
- Manual Fuel Pump (HAN118)
- Glow Plug Wrench (HAN2510)
- Glow Plug (HAN3001/3006)
- or • Start-Up Field Pack (HANSTART)

## Optional Field Equipment

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- 4-Way Wrench (DUB701)
- Cleaner & towels
- Blue Block After Run Oil (EVOX1000)
- 12V 7Ah Sealed Battery (HAN102)
- Fieldmate (HAN117)
- Extra Glow Plugs (HAN3001/3006)
- Power Panel (HAN106)
- PowerPro 12V Starter (HAN161)

## Additional Required Tools and Adhesives

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### Tools

- Drill
- Drill bits: 1/16" (1.5mm), 5/64" (2mm), 3/32" (2.5mm), 1/8" (3mm)
- Adjustable wrench
- Hex wrench: 3/32" (2.5mm)
- Hobby knife
- Hobby scissors
- Phillips screwdriver
- Pliers
- Ruler
- Clamps
- Flat blade screwdriver
- T-pins

### Adhesives

- 6-minute epoxy (HAN8000)
- Thin CA
- 30-minute epoxy (HAN8002)
- Canopy glue

### Other Required Items

- Epoxy brushes
- Measuring device (e.g. ruler, tape measure)
- Paper towels
- Masking tape
- Sandpaper
- Rotary tool w/sanding drum
- Sealing Iron (HAN101)
- Covering Glove (HAN150)
- Sealing Iron Sock (HAN141)
- Toothpicks
- Petroleum jelly
- String or Unwaxed dental floss
- Card stock

## Limited Warranty & Limits of Liability

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Pursuant to this Limited Warranty, Horizon Hobby, Inc. will, at its option, (i) repair or (ii) replace, any product determined by Horizon Hobby, Inc. to be defective. In the event of a defect, these are your exclusive remedies.

This warranty does not cover cosmetic damage or damage due to acts of God, accident, misuse, abuse, negligence, commercial use, or modification of or to any part of the product. This warranty does not cover damage due to improper installation, operation, maintenance, or attempted repair by anyone other than an authorized Horizon Hobby, Inc. service center. This warranty is limited to the original purchaser and is not transferable. In no case shall Horizon Hobby's liability exceed the original cost of the purchased product and will not cover consequential, incidental or collateral damage. Horizon Hobby, Inc. reserves the right to inspect any and all equipment involved in a warranty claim. Repair or replacement decisions are at the sole discretion of Horizon Hobby, Inc. Further, Horizon Hobby reserves the right to change or modify this warranty without notice.

REPAIR OR REPLACEMENT AS PROVIDED UNDER THIS WARRANTY IS THE EXCLUSIVE REMEDY OF THE CONSUMER. HORIZON HOBBY, INC. SHALL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

As Horizon Hobby, Inc. has no control over use, setup, final assembly, modification or misuse, no liability shall be assumed nor accepted for any resulting damage or injury. By the act of use, setup or assembly, the user accepts all resulting liability.

If you as the purchaser or user are not prepared to accept the liability associated with the use of this product, you are advised to return this product immediately in new and unused condition to the place of purchase.

## Safety Precautions

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This is a sophisticated hobby product and not a toy. It must be operated with caution and common sense and requires some basic mechanical ability. Failure to operate this product in a safe and responsible manner could result in injury or damage to the product or other property. This product is not intended for use by children without direct adult supervision.

The product manual contains instructions for safety, operation and maintenance. It is essential to read and follow all the instructions and warnings in the manual, prior to assembly, setup or use, in order to operate correctly and avoid damage or injury.

## Questions, Assistance, and Repairs

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Your local hobby store and/or place of purchase cannot provide warranty support or repair. Once assembly, setup or use of the product has been started, you must contact Horizon Hobby, Inc. directly. This will enable Horizon to better answer your questions and service you in the event that you may need any assistance.

## Questions or Assistance

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For questions or assistance, please direct your email to [productsupport@horizonhobby.com](mailto:productsupport@horizonhobby.com), or call 877.504.0233 toll free to speak to a service technician.

# Inspection or Repairs

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If your product needs to be inspected or repaired, please call for a Return Merchandise Authorization (RMA). Pack the product securely using a shipping carton. Please note that original boxes may be included, but are not designed to withstand the rigors of shipping without additional protection. Ship via a carrier that provides tracking and insurance for lost or damaged parcels, as Horizon Hobby, Inc. is not responsible for merchandise until it arrives and is accepted at our facility. Include your complete name, address, phone number where you can be reached during business days, RMA number, and a brief summary of the problem. Be sure your name, address, and RMA number are clearly written on the shipping carton.

## Warranty Inspection and Repairs

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To receive warranty service, you must include your original sales receipt verifying the proof-of-purchase date. Providing warranty conditions have been met, your product will be repaired or replaced free of charge. Repair or replacement decisions are at the sole discretion of Horizon Hobby.

## Non-Warranty Repairs

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Should your repair not be covered by warranty and the expense exceeds 50% of the retail purchase cost, you will be provided with an estimate advising you of your options. You will be billed for any return freight for non-warranty repairs. Please advise us of your preferred method of payment. Horizon Hobby accepts money orders and cashiers checks, as well as Visa, MasterCard, American Express, and Discover cards. If you choose to pay by credit card, please include your credit card number and expiration date. Any repair left unpaid or unclaimed after 90 days will be considered abandoned and will be disposed of accordingly.

Electronics and engines requiring inspection or repair should be shipped to the following address (freight prepaid):

Horizon Service Center  
4105 Fieldstone Road  
Champaign, Illinois 61822

All other products requiring inspection or repair should be shipped to the following address (freight prepaid):

Horizon Product Support  
4105 Fieldstone Road  
Champaign, Illinois 61822

# Warranty Information

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Horizon Hobby, Inc. guarantees this kit to be free from defects in both material and workmanship at the date of purchase. This warranty does not cover any parts damage by use or modification. In no case shall Horizon Hobby's liability exceed the original cost of the purchased kit. Further, Horizon Hobby reserves the right to change or modify this warranty without notice. In that Horizon Hobby has no control over the final assembly or material used for the 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.

Once assembly of the model has been started, you must contact Horizon Hobby, Inc. directly regarding any warranty question that you have. Please do not contact your local hobby shop regarding warranty issues, even if that is where you purchased it. This will enable Horizon to better answer your questions and service you in the event that you may need any assistance. 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.

Horizon Hobby  
4105 Fieldstone Road  
Champaign, Illinois 61822  
(217) 355-9511

## Warning

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An RC aircraft is not a toy! If misused, it can cause serious bodily harm and damage to property. Fly only in open areas, preferably at AMA (Academy of Model Aeronautics) approved flying sites, following all instructions included with your radio and engine.

## Before Starting Assembly

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Before beginning the assembly of your P-51 Mustang ARF, remove each part from its bag for inspection. Closely inspect the fuselage, wing panels, rudder and stabilizer for damage. If you find any damaged or missing parts, contact the place of purchase.

If you find any wrinkles in the covering, use a heat gun or covering iron to remove them. Use caution while working around areas where the colors overlap to prevent separating the colors.



**HAN100 – Heat Gun**

**HAN150 – Covering Glove**



**HAN101 – Sealing Iron**

**HAN141 – Sealing Iron Sock**

## Using the Manual

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This manual is divided into sections to help make assembly easier to understand, and to provide breaks between each major section. In addition, check boxes have been placed next to each step to keep track of each step completed. Steps with a single box (☐) are performed once, while steps with two boxes (☐ ☐) indicate that the step will require repeating, such as for a right or left wing panel, two servos, etc. Remember to take your time and follow the directions.

# Section 1: Hinging the Ailerons and Flaps

## Required Items:

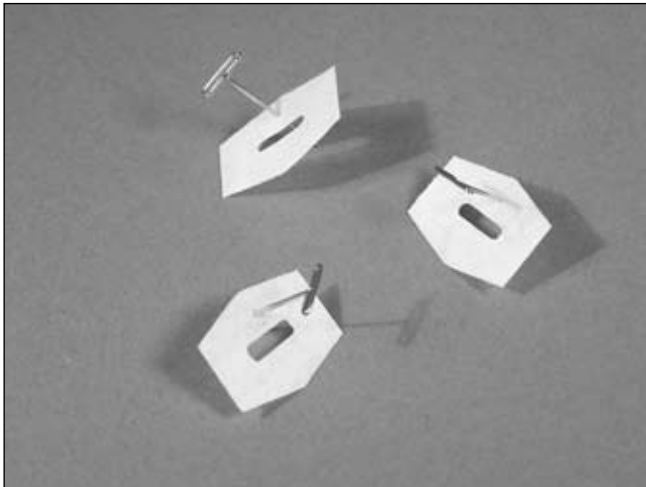
- Wing (right and left)
- Flap (right and left)
- CA hinge (12)
- Aileron (right and left)

## Required Tools and Adhesives

- T-pins
- Drill bit: 1/16" (1.5mm)
- 6-minute epoxy
- Paper towel
- Mixing stick
- Drill
- Thin CA
- Sandpaper
- Rubbing alcohol
- Toothpick

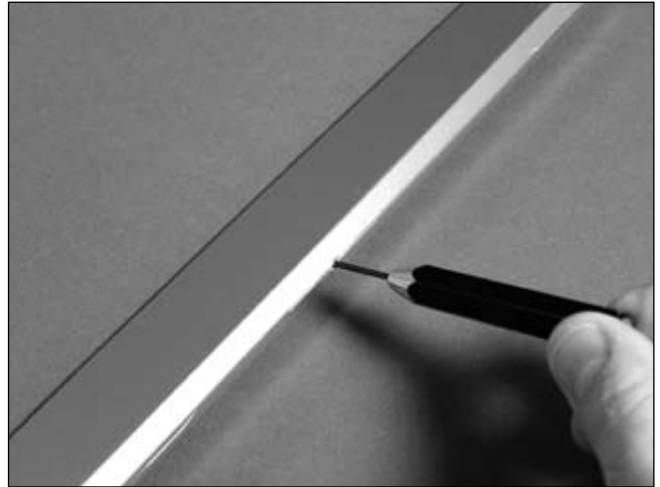
### □ □ Step 1

Remove the tape holding the flap and aileron on the wing. Locate three hinges and place a T-pin in the center of each hinge. This will help center the hinge when slid into the wing.



### □ □ Step 2

Drill a 1/16" (1.5mm) hole into the center of the three aileron hinge slots. This creates a tunnel so the thin CA used to glue the hinges can fully penetrate the hinge. Repeat the process for the hinge slots in the wing as well.



### □ □ Step 3

Slide the three hinges into the slots in the aileron. Align the slot in the hinge with the hole drilled in the previous step.

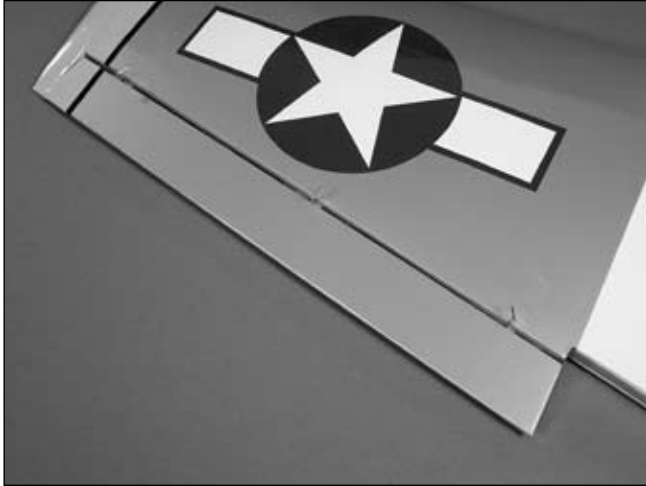




## Section 1: Hinging the Ailerons and Flaps

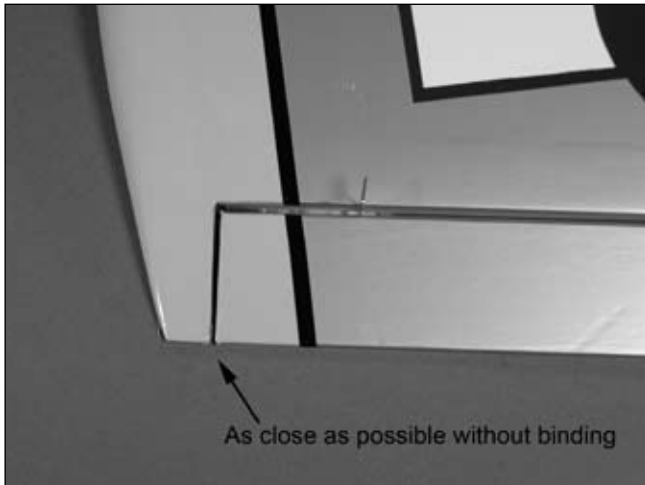
### □ □ Step 4

Slide the aileron into position on the wing by guiding the hinges into the hinge slots in the wing. Push the aileron so there is little to no gap between the aileron hinge line.



### □ □ Step 5

Check the position of the aileron in relationship to the wing tip. It must be as close as possible and still be able to move without rubbing against the wing tip. If it is not close enough to the wing tip it may interfere with the flap operation.



### □ □ Step 6

Remove the T-pins from the hinges. Deflect the aileron slightly without changing the hinge gap between the aileron and wing. Apply thin CA to each of the hinges and allow it to soak into the hinge. Do not use accelerator as it will not allow the CA to soak into the hinge. Make sure to apply enough CA to fully soak the hinge, both top and bottom.



### □ □ Step 7

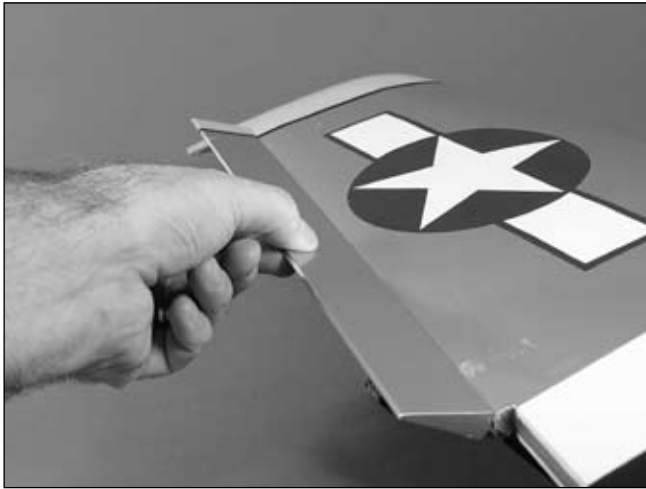
Once the CA has fully cured, gently pull on the aileron to make sure the hinges are glued securely to both the wing and aileron. Use care not to crush the wing or aileron.



## Section 1: Hinging the Ailerons and Flaps

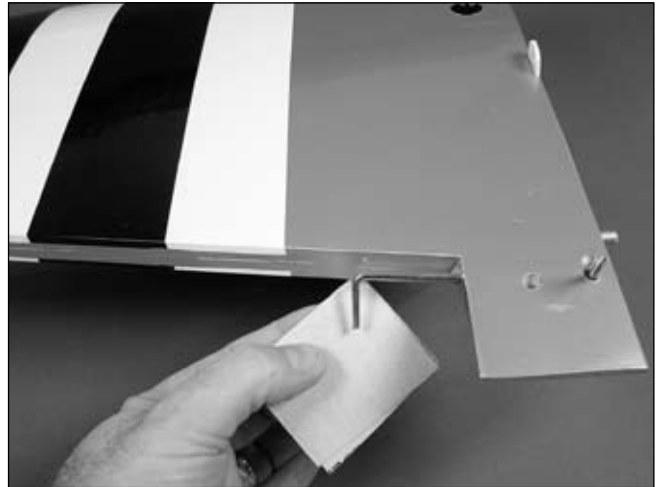
### □ □ Step 8

Flex the aileron up and down a number of times to break in the hinges.



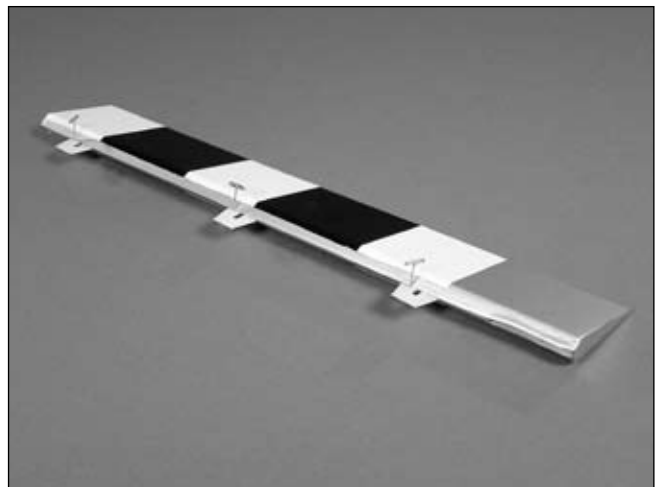
### □ □ Step 9

Use a piece of sandpaper to roughen the flap linkage where it will extend into the flap. Use rubbing alcohol and a paper towel to clean any residual dirt from the linkage. This is done to give the epoxy a surface to hold onto when the flap linkage is epoxied into the flap.



### □ □ Step 10

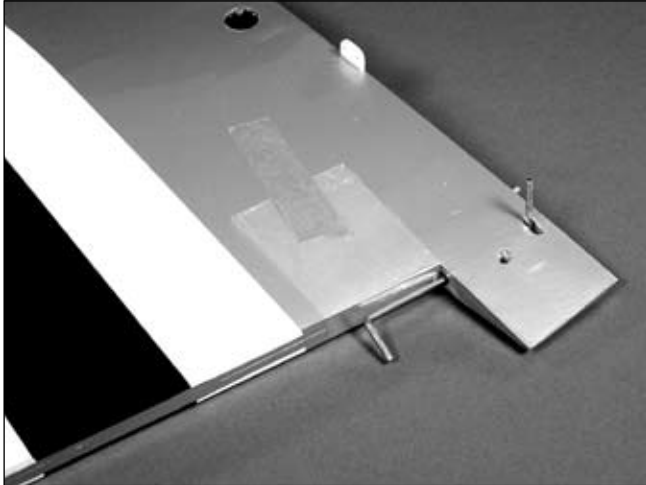
Prepare three more hinges using the technique in Step 1. Drill 1/16" (1.5mm) holes in the center of each hinge slot, both the wing and flap using the same technique as Step 2. Slide the hinges into the flap, centering the slot in the hinge with the hole drilled in the center of the slot.



## Section 1: Hinging the Ailerons and Flaps

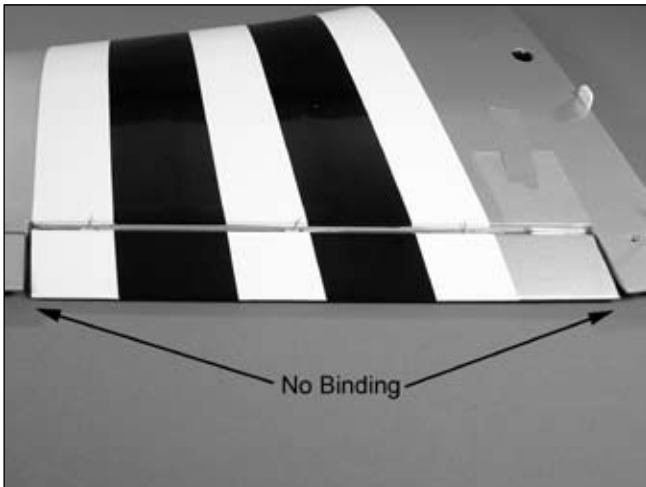
### □ □ Step 11

Cut a piece of plastic from one of the bags the wing was packaged in. Tape the plastic so it is between the wing and flap linkage, but does not cover the hinge slot. This will keep you from gluing the flap linkage to the wing in the following steps.



### □ □ Step 12

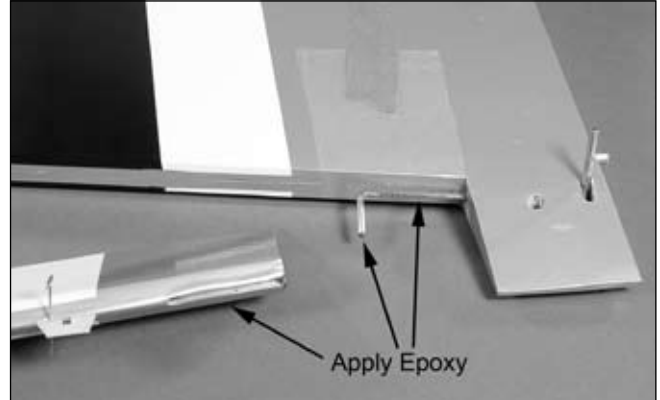
Slide the flap in position. Check that it can move freely without rubbing against the aileron or wing. The flap linkage will go into the pre-drilled hole in the flap, and the hinges into the slots in the wing.



**Note:** You will need to work quickly for the following step. Be prepared to position the flap as soon as the epoxy has been applied as described.

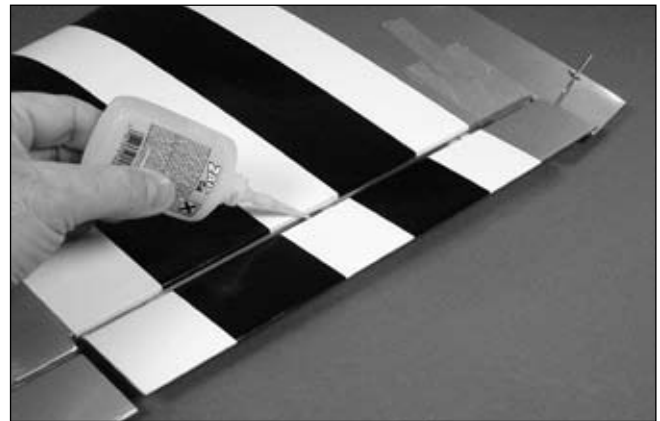
### □ □ Step 13

Once the fit has been checked, remove the flap from the wing. Mix about a tablespoon of 6-minute epoxy and apply it to the flap linkage. Use a toothpick to apply the epoxy into the hole and slot in the flap. Slide the flap in position and check the movement as described in Step 12.



### □ □ Step 14

Once the epoxy has cured, apply CA to the flap hinges as described back in Step 6 for the aileron hinges. The flap may not deflect very far upwards so do not force it to do so. Remember to apply CA to both the top and bottom.



### □ □ Step 15

Remove the plastic taped onto the wing back in Step 11. Move the flap down, and up if possible, to break in the flap hinges.

### □ Step 16

Repeat Steps 1 through 15 to install the remaining aileron and flap to the remaining wing panel.

## Section 2: Aileron Servo Installation

### Required Items:

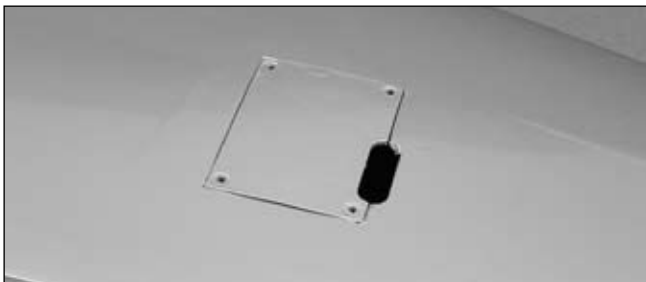
- Wing (right and left)
- Aileron servo cover (right and left)
- 3/4" x 5/16" x 9/16" (19mm x 8mm x 14mm) servo mounting block (4)
- 2mm x 8mm sheet metal screw

### Required Tools and Adhesives

- Phillips screwdriver
- Clamp
- Drill
- 6-minute epoxy
- Drill bit: 1/16" (1.5mm)
- Felt-tipped pen
- String or unwaxed dental floss
- 12" (305mm) servo extension (2)

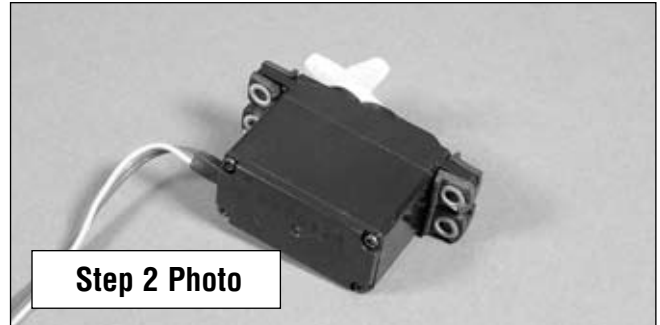
#### ☐ ☐ Step 1

Determine which servo cover belongs to which wing panel. The opening for the servo arm is offset to match the opening in the wing.



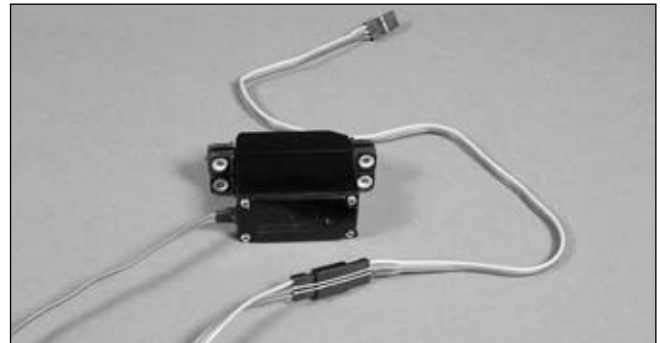
#### ☐ ☐ Step 2

Prepare the aileron servo by installing the hardware supplied with the servo.



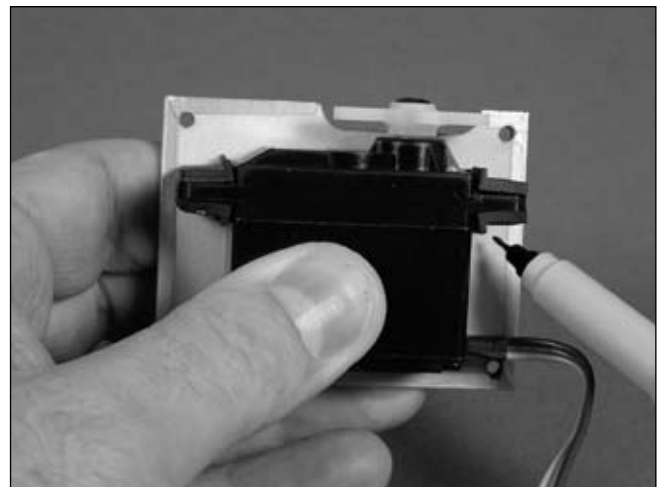
#### ☐ ☐ Step 3

Attach a 12" (305mm) servo extension to the aileron servo. Use thread or unwaxed dental floss to secure the extension to the servo lead so it will not become disconnected inside the wing.



#### ☐ ☐ Step 4

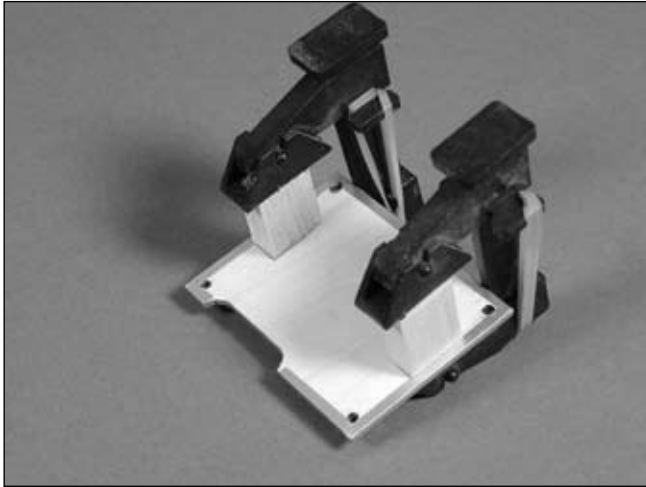
Position the servo on the servo cover so the it is centered on the cover. Also check that the servo arm is close to centered in the arm opening and the arm will not interfere with the cover when the servo is operating. Mark the location of the servo using a felt-tipped pen.



## Section 2: Aileron Servo Installation

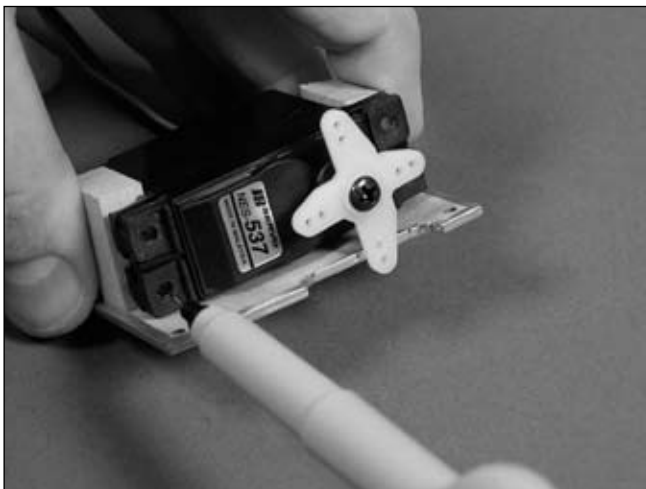
### □ □ Step 5

Mix up about a tablespoon of 6-minute epoxy to glue the two 3/4" x 5/16" x 9/16" (19mm x 8mm x 14mm) servo mounting blocks to the servo cover. Align the blocks on the marks made in the previous step. A clamp can be used to hold the blocks in position until the epoxy fully cures.



### □ □ Step 6

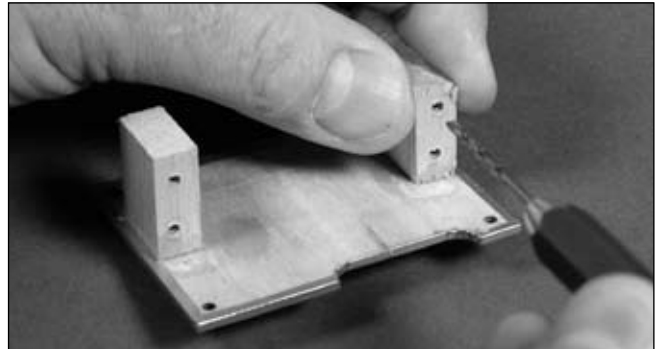
Position the servo back onto the servo cover between the blocks. With the servo slightly off the cover, mark the location for the servo mounting screws using a felt-tipped pen.



Note: The servo is placed slightly off the servo cover to help isolate it from vibration and to let the servo grommets do the job they were designed for.

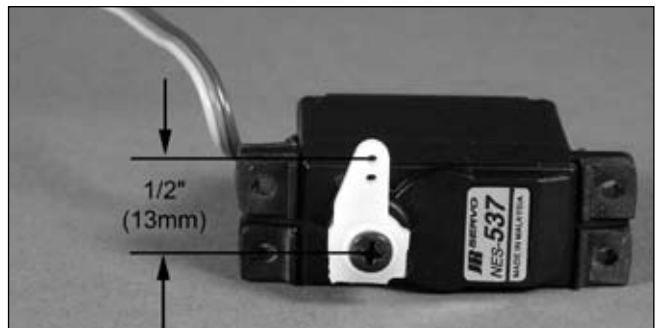
### □ □ Step 7

Remove the servo and drill the locations marked in the previous step using a 1/16" (1.5mm) drill bit.



### □ □ Step 8

Plug the aileron servo into the receiver. Use the transmitter to check the operation of the aileron servo. Center the aileron trim and attach a servo horn to the servo. The servo arm that extends out beyond the servo cover should measure 1/2" (13mm) from the center of the arm to the outer hole. Trim the remaining arms from the servo arm so they won't interfere with the operation of the servo.



### □ □ Step 9

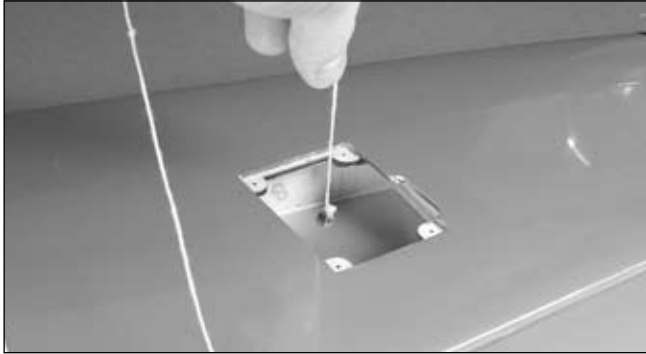
Attach the servo to the blocks using the hardware provided with the servo.



## Section 2: Aileron Servo Installation

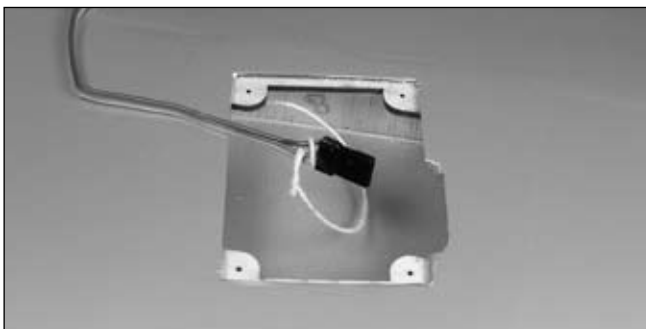
### □ □ Step 10

Tie a wheel collar onto a piece of string. Lower the string into the opening for the aileron servo. Tip the wing so the tip is facing up and lower the string through the wing. Guide the string to exit the hole in the top of the wing near the root.



### □ □ Step 11

Tie the string to the aileron servo extension. Use the string to pull the extension through the wing and out of the hole at the wing root. Use tape to keep the extension from falling back into the wing.



### □ □ Step 12

Place the aileron servo into position on the wing. Use four 2mm x 8mm sheet metal screws to attach the aileron servo cover to the wing.



### □ Step 13

Repeat Steps 2 through 12 for the remaining aileron servo.

## Section 3: Installing the Aileron Linkage

### Required Items:

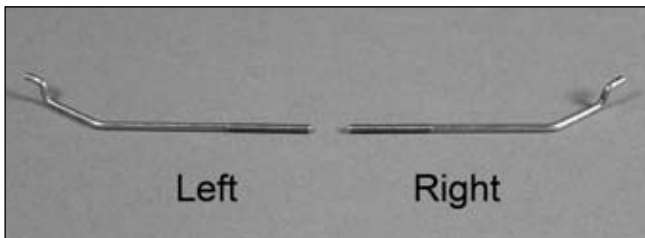
- Wing (right and left)
- Aileron linkage wire (right and left)
- Clevis w/retainer (2)
- Control horn w/backplate (2)
- 2mm x 11mm screw (2)    • 2mm x 16mm screw (4)

### Required Tools and Adhesives

- Phillips screwdriver    • Drill
- Drill bit: 5/64" (2mm)    • Felt-tipped pen
- T-pin

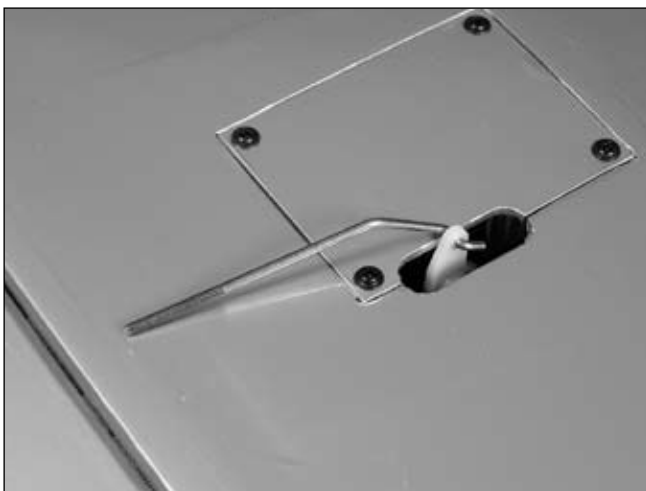
#### □ □ Step 1

Locate the aileron linkages. There is a right and left linkage as show below. (Right and left are as viewed when sitting in the pilot's seat of the aircraft.)



#### □ □ Step 2

Enlarge the outer hole of the servo arm using a 5/64" (2mm) drill bit. Connect the appropriate aileron linkage as shown.



**Note:** You may want to use painter's tape at the wing tip to tape the aileron to the wing tip so it will remain centered. This will make installing the control horn much easier.

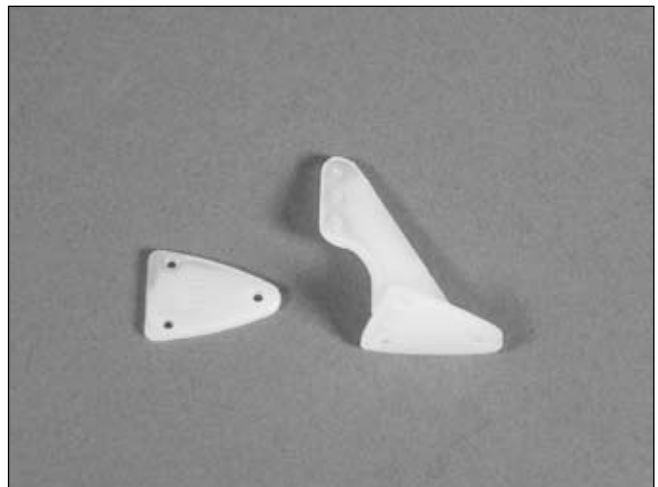
#### □ □ Step 3

With the aileron servo plugged in and the radio system on, make sure the aileron servo is centered and the trim on the radio is centered. Slide a clevis retainer onto a clevis. Thread the clevis onto the aileron linkage until the pin in the clevis is 1/16" (1.5mm) behind the aileron hinge line.



#### □ □ Step 4

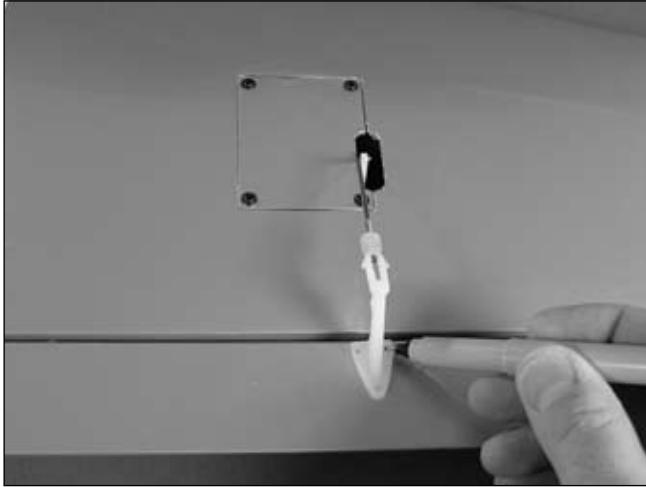
Use a hobby knife to trim the control horn backplate from the control horn.



## Section 3: Installing the Aileron Linkage

### □ □ Step 5

Attach the clevis to the outer hole on the control horn. Place the horn flat on the aileron, aligning the linkage parallel to the edge of the servo cover. Use a felt-tipped pen to mark the location for the three control horn mounting screws.



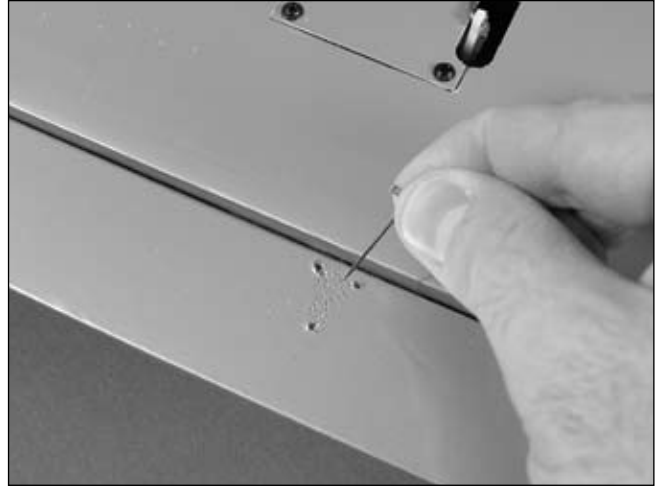
### □ □ Step 6

Use a 5/64" (2mm) drill bit to drill the locations for the three screws. Use care to drill all three holes parallel to each other.



### □ □ Step 7

Use a T-pin to poke holes through the covering in the area inside the triangle made by the three holes. Poke holes in the covering on both the top and bottom of the aileron.



### □ □ Step 8

Apply a small amount of thin CA in the area made by the holes in the following step. A few drops of thin CA into each hole is also required. This hardens the balsa, giving the control horn a much more solid surface to mount to. Do not use accelerator to allow the CA to penetrate into the wood.

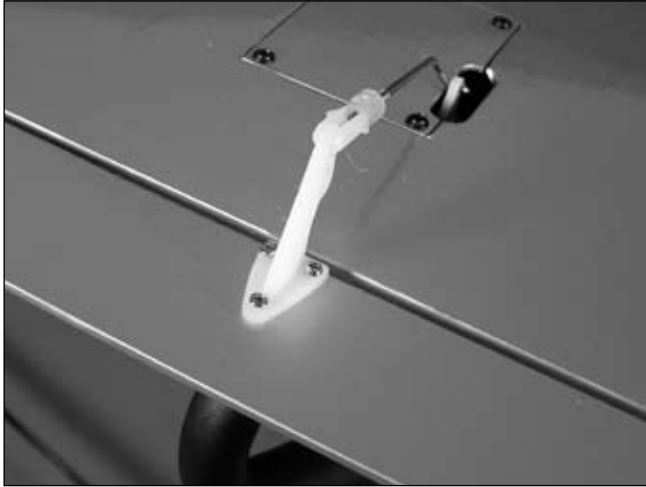




## Section 3: Installing the Aileron Linkage

### □ □ Step 9

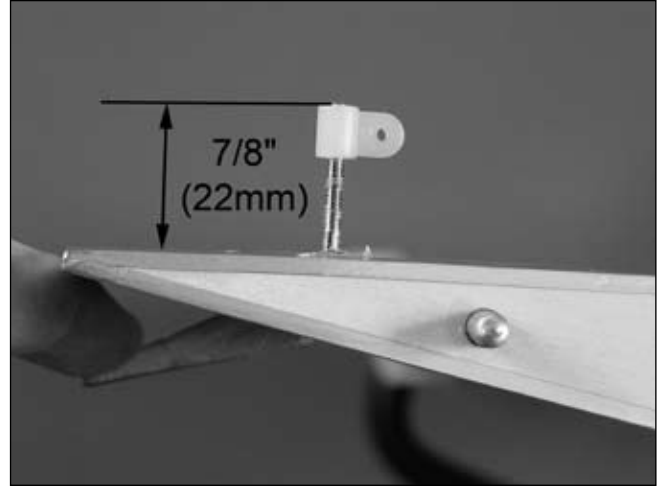
Attach the control horn to the wing using two 2mm x 16mm screws near the hinge line of the control horn and one 2mm x 11mm screw at the trailing edge of the aileron wing. The screws go into the control horn backplate which is located on the top of the aileron.



**Note:** If you have difficulty getting the screws to line up with the backplate, just use your drill bit to oval out the holes slightly. Just remember to apply some thin CA to harden the holes again.

### □ □ Step 10

Locate the flap control horn. Thread the horn onto the flap linkage so the top of the horn is 7/8" (22mm) from the top surface of the wing.



### □ Step 11

Repeat Steps 2 through 10 for the remaining aileron linkage.

## Section 4: Assembling the Wing

### Required Items:

- Left wing panel
- Right wing panel
- Aluminum wing tube
- Nylon strap
- #2 x 5/16" wood screw (2)

### Required Tools and Adhesives

- Phillips screwdriver
- Sealing iron

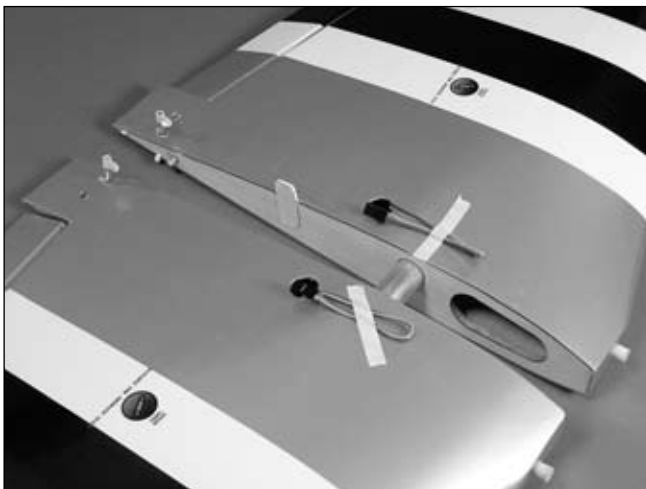
#### □ Step 1

Locate the aluminum wing tube. Slide the tube into one of the wing panels. Do not force the tube, as it will slide easily to its correct depth.



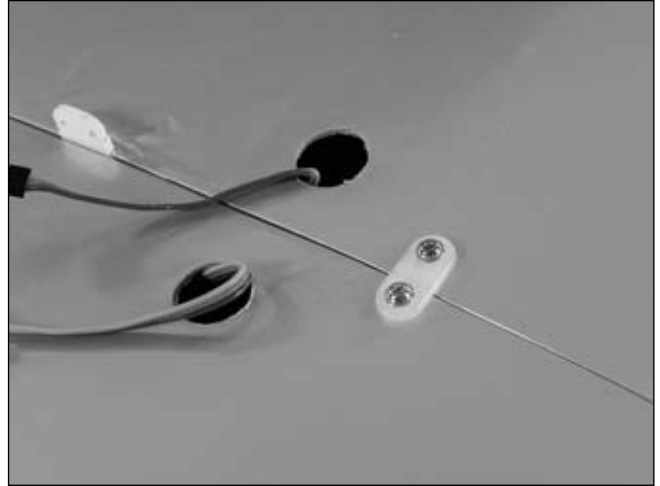
#### □ Step 2

Slide the remaining wing panel onto the aluminum wing joiner tube. As the panels get close, make sure the alignment pin goes into the hole.



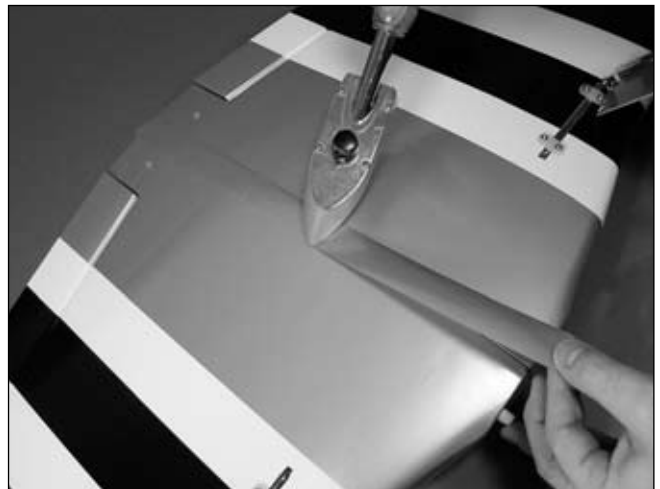
#### □ Step 3

Slide the panels tightly together, guiding the servo wires out of the way. Use a nylon strap and two #2 x 5/16" sheet metal screws to secure the two wing panels together.



#### □ Step 4

If you are not planning on taking your wing apart, a piece of covering has been supplied to cover the center joint. You will need to use a sealing iron to apply the covering to the center joint.



**Hint:** You can use 30-minute epoxy to glue the two wing halves together. Before sliding the wing together, apply a thin coat of epoxy to the exposed wood of both wing panels at the center of the wing. Slide the wing together, then use a paper towel and rubbing alcohol to remove the excess epoxy from the wing.

# Section 5: Installing the Landing Gear

## Required Items:

- Assembled wing
- Landing gear strap (4)
- 3 1/2" (76mm) wheel (2)
- Landing gear (left and right)
- #4 x 1/2" sheet metal screw (8)
- 3/16" wheel collar w/setscrew (4)
- Landing gear strap (4)

## Required Tools and Adhesives:

- Phillips screwdriver
- Ruler
- Drill bit: 3/32" (2.5mm)
- Drill
- Felt-tipped pen

### □ □ Step 1

Locate a landing gear wire. Slide a 3/16" wheel collar onto the landing gear wire, then slide the wheel with the recessed side towards the outside onto the landing gear wire.



### □ □ Step 2

Slide a second wheel collar onto the landing gear wire. Align the collar with the end of the landing gear wire. Tighten the setscrew. Slide the wheel collar installed in Step 1 against the wheel and tighten the setscrew. Don't get the collar too tight which may prevent the wheel from rolling.



**Note:** Use threadlock on the setscrews to prevent them from vibrating loose in flight.

### □ □ Step 3

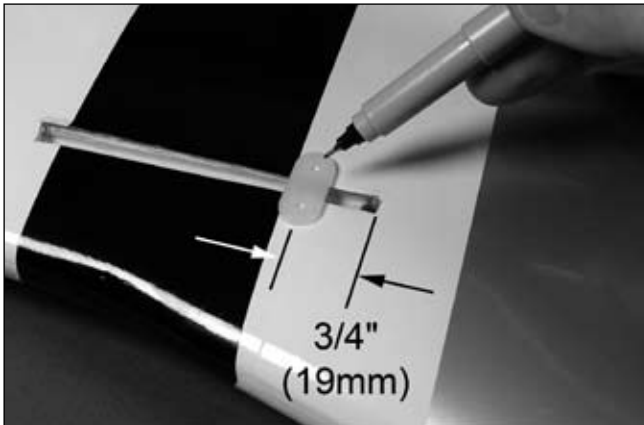
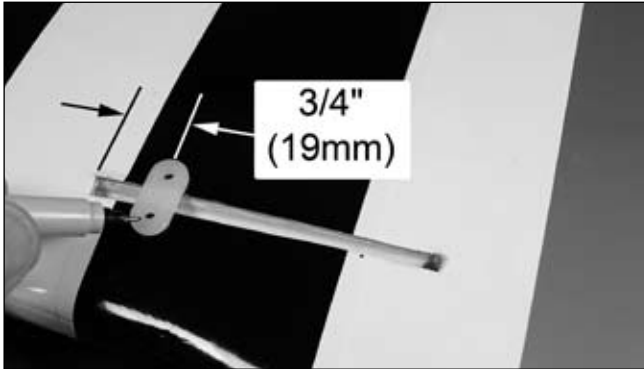
Snap the wheel cover onto the wheel.



## Section 5: Installing the Landing Gear

### □ □ Step 4

Measure in 3/4" (19mm) from each end of the landing gear slot. Position the landing gear strap so it straddles the slot evenly. Mark the locations for the screw holes using a felt-tipped pen.



### □ □ Step 5

Drill the four locations marked in the previous step using a 3/32" (2.5mm) drill bit. Be careful not to accidentally run the drill through the covering on top of the wing.



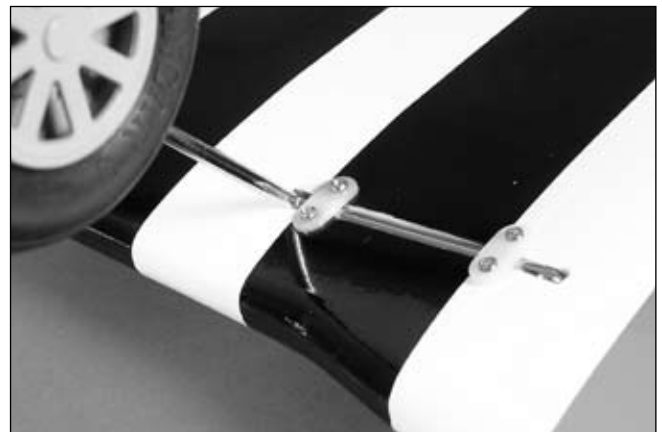
### □ □ Step 6

Locate the left landing gear strut. Slide the strut into position on the bottom of the wing. The wheel will be towards the leading edge (front) of the wing when installed correctly. Press the landing gear into the groove of the landing gear mount.



### □ □ Step 7

Locate two landing gear straps and four #4 x 1/2" sheet metal screws. Use a medium Phillips screwdriver to attach the landing gear straps using the screws. Tighten the landing gear straps until they pull the landing gear into the groove, flush with the bottom of the wing.



**Note:** Use care not to over-tighten the screws and damage the landing gear mount.

### □ Step 8

Repeat Steps 1 through 7 to install the remaining landing gear strut.

# Section 6: Installing the Engine

## Required Items

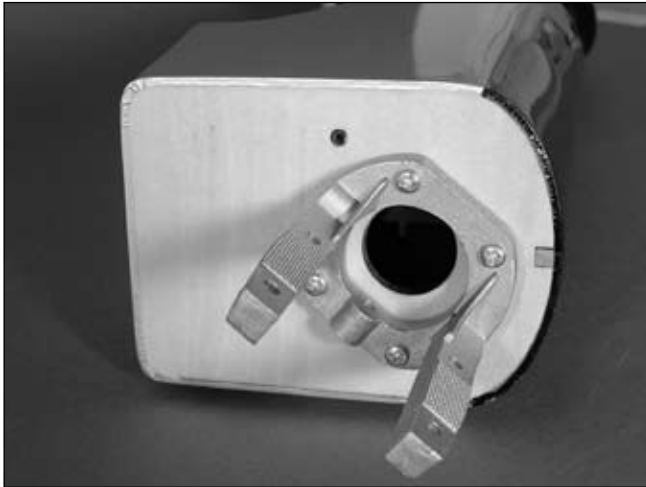
- Fuselage
- Engine mount
- Engine mount plate (2)
- 8-32 x 3/4" bolt (4)
- 8-32 x 7/8" bolt (4)
- 8-32 lock nut (4)
- 15<sup>5</sup>/<sub>8</sub>" (397mm) throttle pushrod wire
- Clevis w/retainer

## Required Tools and Adhesives

- Phillips screwdriver
- Ruler
- Threadlock (included in kit)

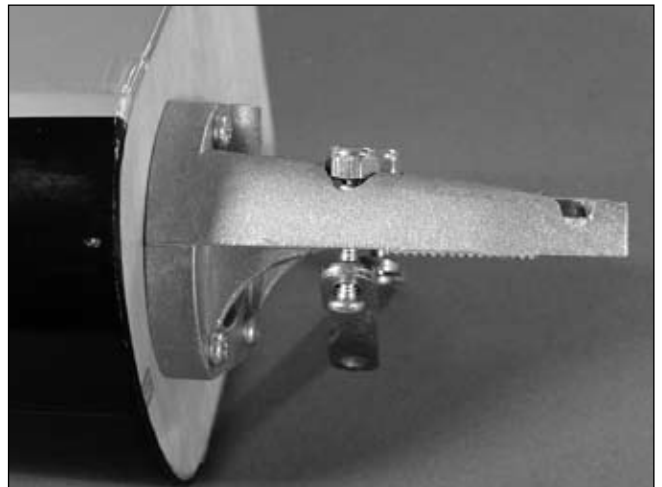
### □ Step 1

Use four 8-32 x 3/4" bolts to attach the engine mount to the firewall. Pay close attention to the orientation of the mount, as the head of the engine will face up and to the right in relationship to the pilot.



### □ Step 2

Locate the engine mount plates, two 8-32 locknuts and two 8-32 x 7/8" bolts. Slide the bolt through the smooth side of the engine mount plate. Then slide the bolt through the holes in the rear of the engine mount, with the curved side of the plate towards the center of the mount. Start an 8-32 locknut onto the bolts, but do not tighten the bolt.



## Section 6: Installing the Engine

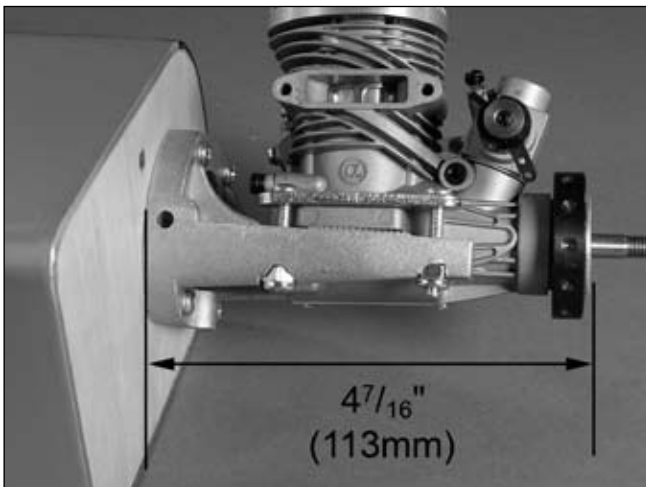
### □ Step 3

Position the engine onto the mount, sliding it between the mount and the mounting plates. Slide the two remaining 8-32 x 7/8" bolts through the front holes in the mount. Thread the two remaining 8-32 locknuts onto the screws.



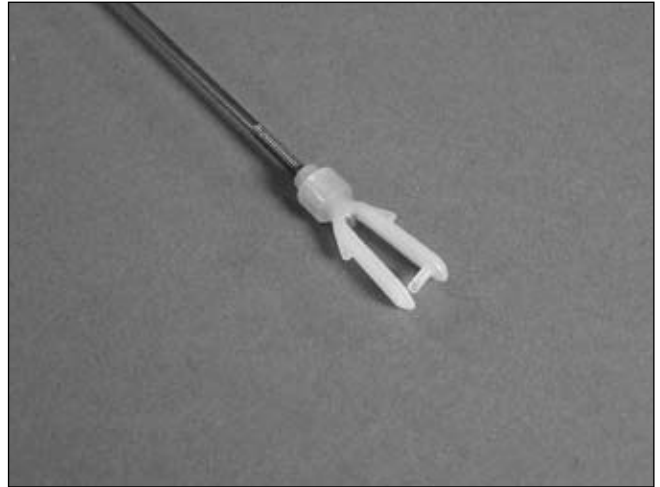
### □ Step 4

Start by tightening the bolts at the rear of the engine. Once they are snug, slide the engine so the distance from the firewall to the front of the propeller drive washer is  $4\frac{7}{16}$ " (113mm). You want to have tightened the front and rear bolts equally as the plates act as a clamp to hold the engine in position.



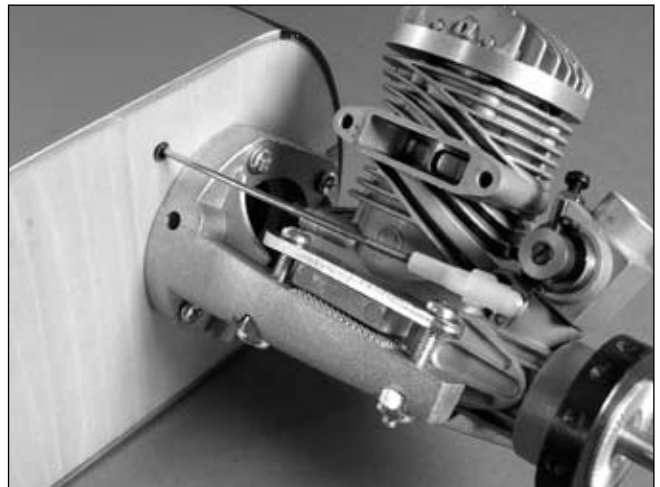
### □ Step 5

Locate the  $15\frac{5}{8}$ " (397mm) throttle pushrod wire. Slide a clevis retainer onto the clevis. Thread the clevis onto the pushrod wire until the wire can barely be seen coming through between the forks of the clevis.



### □ Step 6

Slide the pushrod wire through the tube pre-installed in the fuselage. Attach the clevis to the throttle arm, then slide the retainer over the forks of the clevis. This will prevent the clevis from opening during flight.



# Section 7: Cowling and Fuel Tank Installation

## Required Items

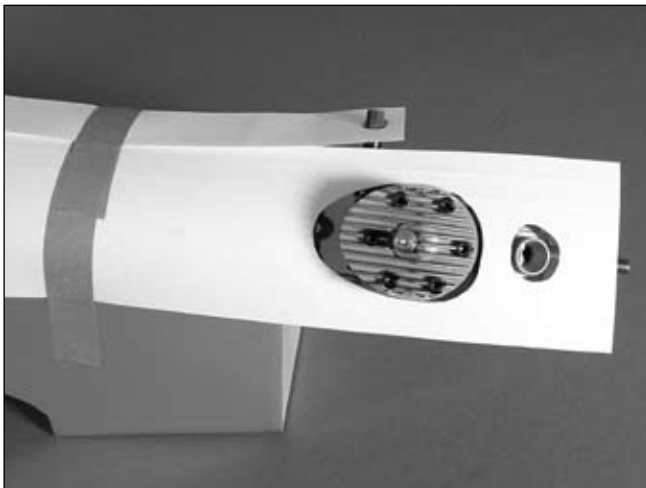
- Fuselage
- Spinner backplate
- 2mm x 10mm sheet metal screw (4)
- Cowling
- Fuel tank

## Required Tools and Adhesives

- Phillips screwdriver
- Ruler
- Drill bit: 1/16" (1.5mm), 1/8" (3mm)
- Drill
- Masking tape
- Rotary tool w/sanding drum
- Card stock
- Hobby scissors
- Felt-tipped pen

### □ Step 1

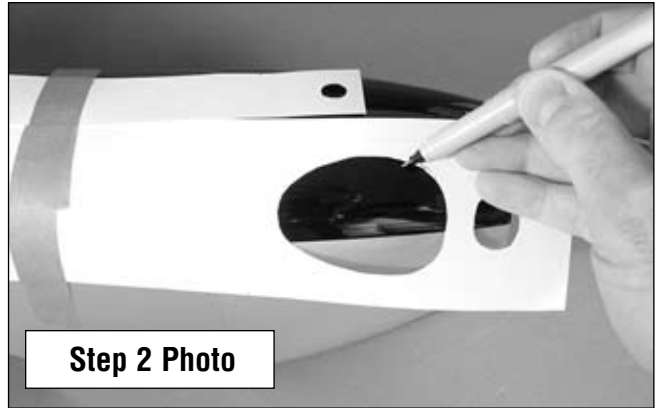
Cut pieces of card stock to indicate the location of engine items such as the needle valve, carburetor and throttle arm of the engine. Tape the card stock to the fuselage as shown.



### □ Step 2

Slide the cowling onto the fuselage so the front of the cowling is roughly  $4\frac{5}{16}$ " (110mm) from the firewall. Use a felt-tipped pen to transfer the locations from the card stock onto the cowling.

**Note:** It will be necessary to remove the engine from the fuselage for this step.



### □ Step 3

Place the engine back onto the fuselage. Remove a small portion of the areas transferred onto the cowl from the previous step. Slowly test fit the cowl onto the fuselage and remove material as necessary to get the cowling to fit over the engine.

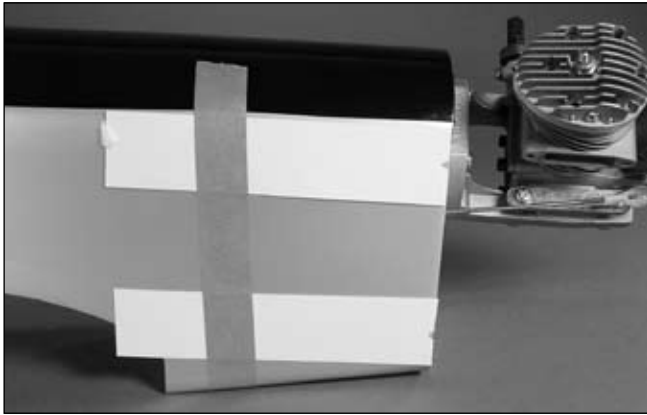


**Note:** If your cuts are a little jagged, use a rotary tool with a sanding drum to smooth up your cuts and give the cowling a nice finished look.

## Section 7: Cowling and Fuel Tank Installation

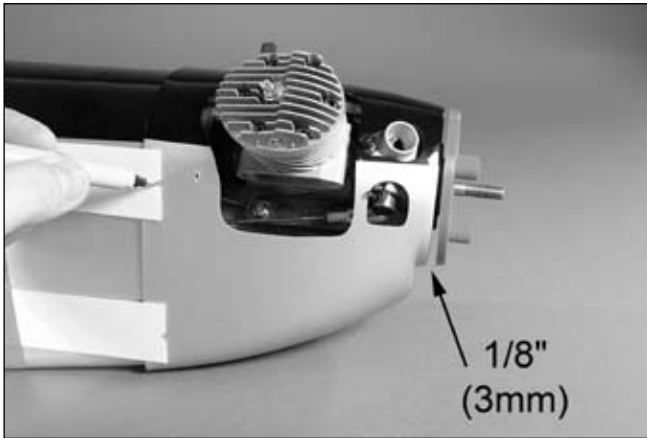
### □ Step 4

Tape pieces of card stock to the fuselage to indicate the location of the firewall.



### □ Step 5

Slide the cowling onto the fuselage. Install the propeller drive washer and the spinner backplate. Use the nut and washer from the engine to hold the backplate in position. Position the cowl so there is about 1/8" (3mm) gap between the spinner backplate and cowling. Use a felt-tipped pen to mark the locations for the cowling screws.



### □ Step 6

Remove the cowling and drill the locations marked in the last step using a 1/8" (3mm) drill bit.



### □ Step 7

Slide the cowling back onto the fuselage. Use tape to hold it in position as described in Step 5. Use a 1/16" (1.5mm) drill bit to drill into the fuselage in the locations for the cowling screws.



### □ Step 8

Run the 2mm x 10mm sheet metal screws into the holes then remove them. Apply a few drops of thin CA into the holes to harden the underlying wood. Once the CA has fully cured, secure the screws using the four 2mm x 10mm sheet metal screws.

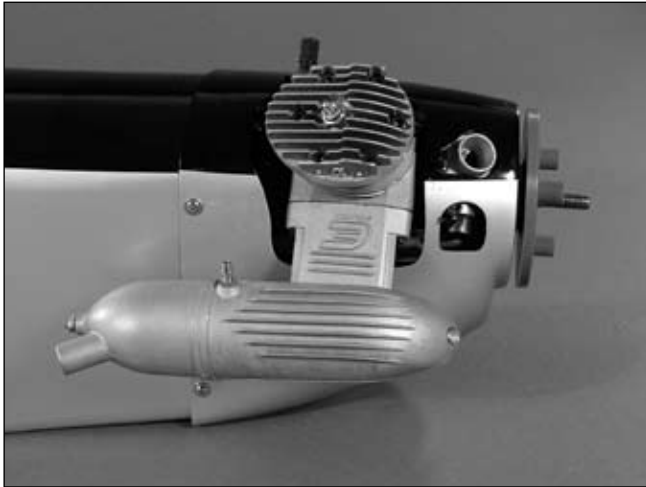




## Section 7: Cowling and Fuel Tank Installation

### □ Step 9

Attach the muffler to your engine using the hardware provided with the engine. Make sure to trim the cowling as necessary to provide at least a 1/8" (3mm) gap between the muffler and engine.

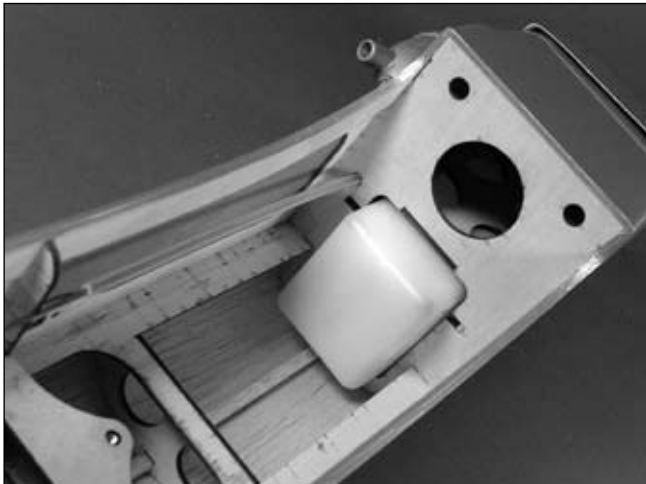


### □ Step 10

Hold the fuel tank up to a strong light to determine which line is the vent line. The vent will be bent upwards towards the top of the fuel tank.

### □ Step 11

Slide the fuel tank into position inside the fuselage. The vent must be facing towards the top of the fuselage.



### □ Step 12

Connect the fuel lines to the engine. The vent line connects to the muffler. The remaining line goes to the clunk, which connects to the carburetor.



### □ Step 13

Attach the exhaust stacks to the fuselage using the four #2 x 5/16" sheet metal screws.



**Note:** The exhaust stack for the right side of the model may need to be cut down in length. This is necessary to clear the muffler.

## Section 8: Installing the Propeller

### Required Items

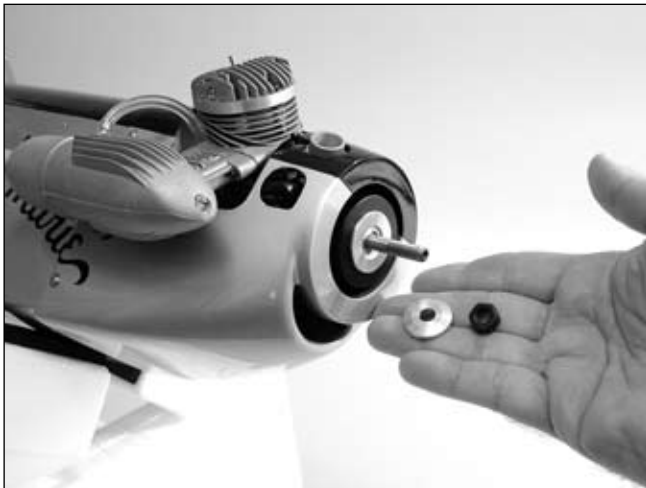
- Fuselage
- Propeller
- Spinner
- #4 x 5/8" sheet metal socket head screw (3)
- Exhaust stack, right and left
- #2 x 5/16" wood screw (4)

### Required Tools and Adhesives

- Adjustable wrench

#### ☐ Step 1

Make sure the propeller nut and washer have been removed from the engine.



#### ☐ Step 2

Slide the spinner backplate onto the engine shaft, and then slide the propeller into position.



#### ☐ Step 3

Slide the washer and thread the nut onto the engine shaft. Rotate the propeller clockwise so it is resting against the lugs of the spinner backplate. Use an adjustable wrench to tighten the propeller nut. Do not use pliers, as the nut will not be tight enough, and could come loose.



**Note:** It is suggested to read the engine instructions included with your P-51 Mustang ARF at this time to learn more on the care and operation of your Evolution® engine.

#### ☐ Step 4

Locate the three #4 x 5/8" sheet metal socket head screws. Position the spinner cone onto the spinner backplate, making sure it keys into the backplate. Use the screws and a 2.5mm or 3/32" hex wrench to secure the spinner cone to the backplate.



# Section 9: Installing the Flap Linkage

## Required Items

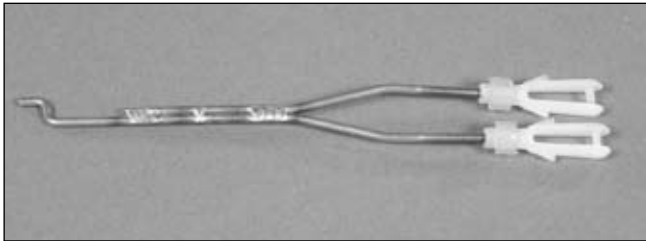
- Wing
- Flap linkage
- Clevis w/retainer (2)

## Required Tools and Adhesives

- Adjustable wrench

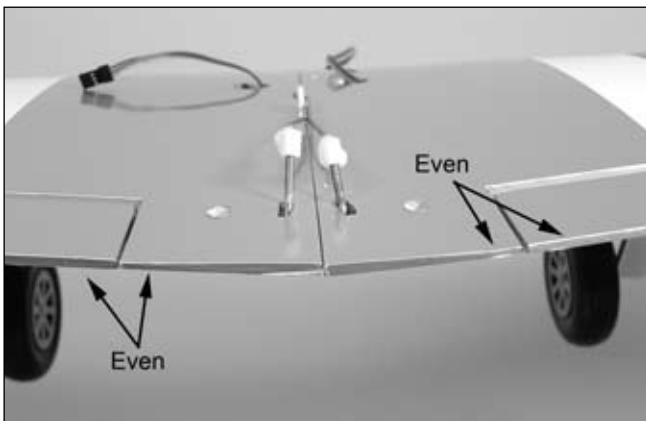
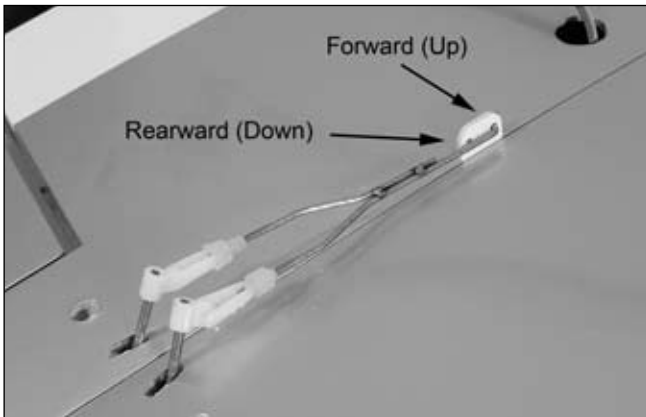
### □ Step 1

Prepare the flap linkage by sliding a clevis retainer onto a clevis. Prepare two clevises and then thread them onto the flap linkage.



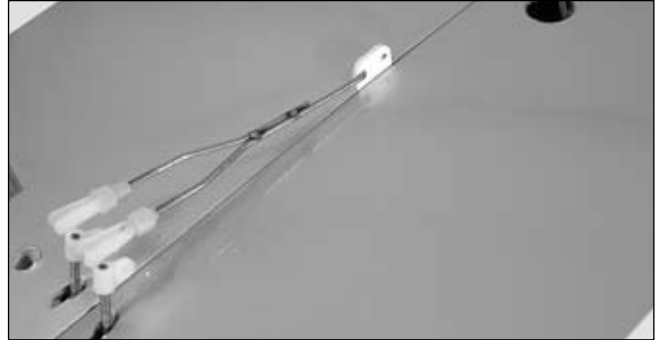
### □ Step 2

Attach the flap linkage to the forward hole in the linkage stay. With the linkage in the forward (up) position, thread the clevis until the flap is even with the wing trailing edge.



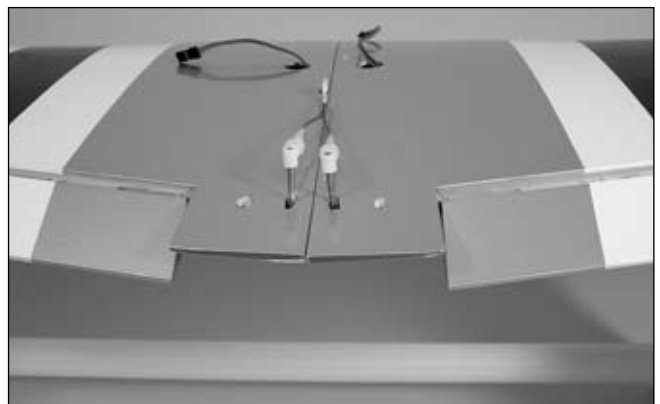
### □ Step 3

Once the flaps have been centered, disconnect the clevis from the linkage stay and flap control horns and move the linkage to the rear position.



### □ Step 4

Reconnect the clevis to the flap actuator. Slide the clevis retainers onto the clevises to prevent them from opening accidentally. The flaps will now be in the down, or **Training Mode**.



# Section 10: Radio and Linkage Installation

## Required Items:

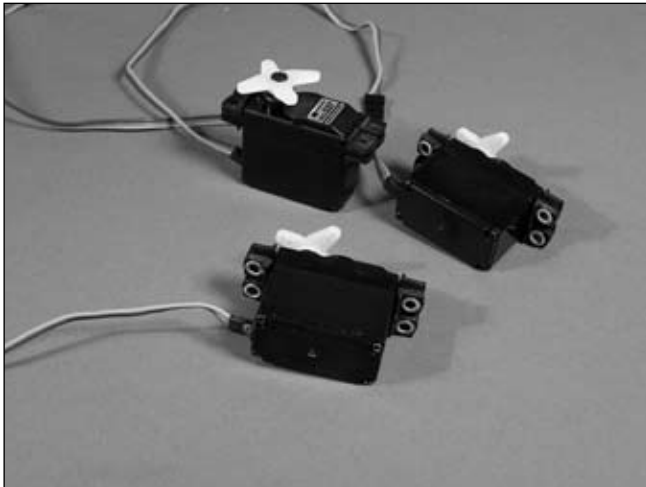
- Fuselage
- Radio foam (flat) (2)
- #4 washer
- Nylon pushrod keeper (2)
- Brass wire connector w/backplate and setscrew
- 4-40 x 1/2" socket head screw
- 23 <sup>3</sup>/<sub>8</sub>" (594mm) elevator pushrod
- 26" (660mm) rudder pushrod
- Radio plate
- Radio foam (precut)
- Clevis w/retainer (2)

## Required Tools and Adhesives:

- Servo w/hardware (3)
- Receiver
- Hex wrench: 3/32"
- Drill bit: 5/64" (2mm)
- Switch harness
- Receiver battery (flat)
- Drill

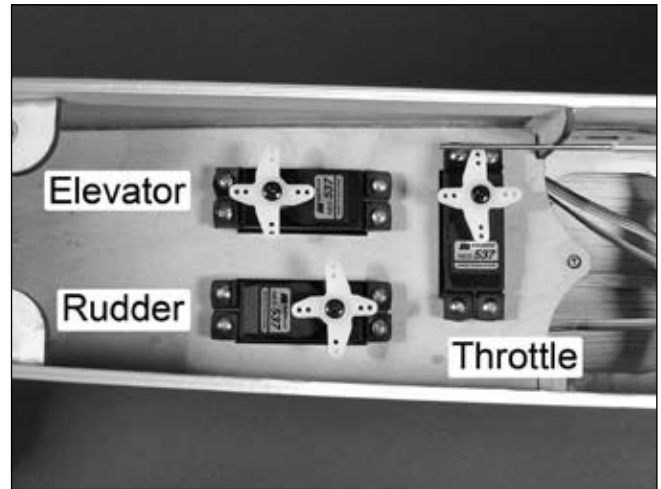
### □ Step 1

Prepare three servos by installing the grommets and brass eyelets following the instructions provided with the servos.



### □ Step 2

Install the servos into the fuselage using the screws provided with the servos.



**Note:** Even though the holes for the servo screws are pre-drilled, it is a good idea to start the screws and remove each one. Apply a few drops of thin CA to harden the plywood, and then install the servos.

### □ Step 3

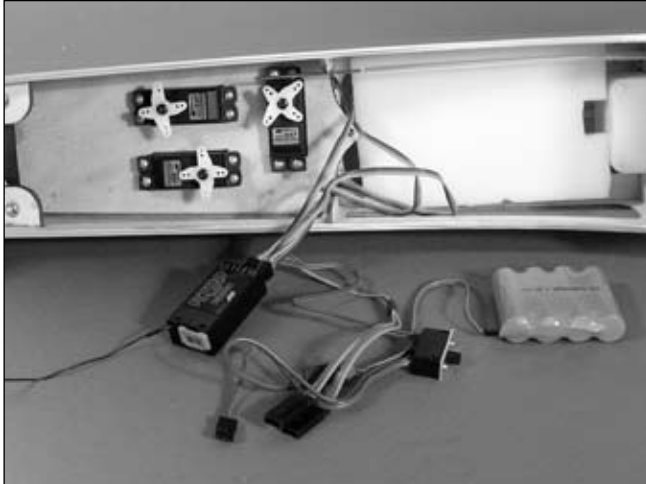
Place a flat piece of foam down into the fuselage between the fuel tank and the radio tray. Position the notch in the foam towards the fuel tank.



## Section 10: Radio and Linkage Installation

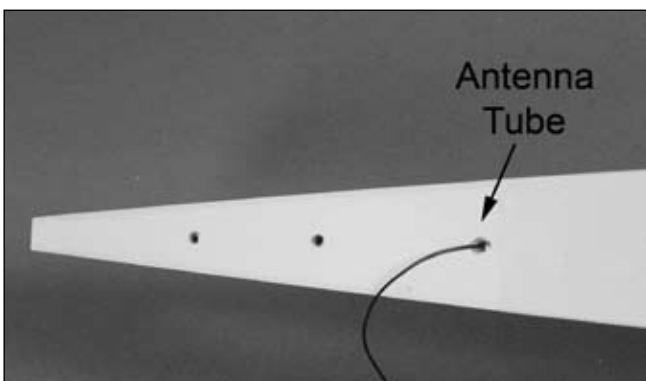
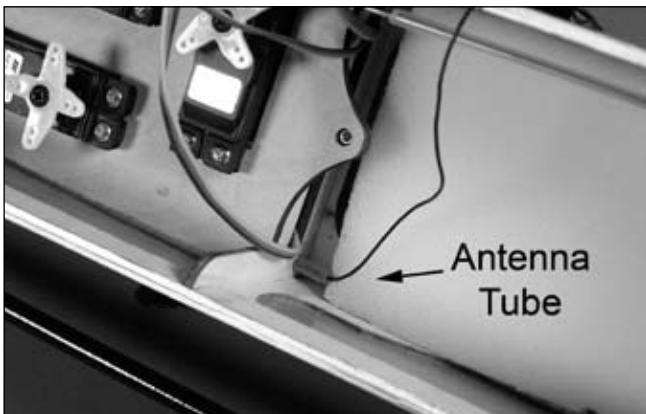
### □ Step 4

Plug the servos, switch harness and aileron Y-harness into the receiver. Plug the receiver battery into the switch harness.



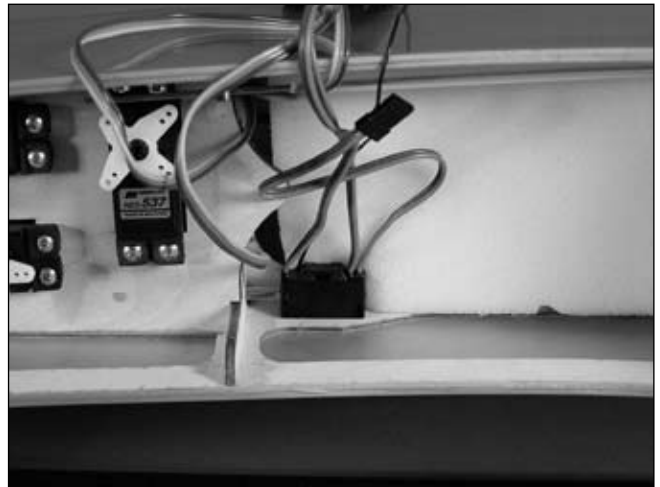
### □ Step 5

Route the antenna wire through the pre-installed tube inside the fuselage to the rear of the fuselage. The tube is located on the pilot's left side in front of the radio tray.



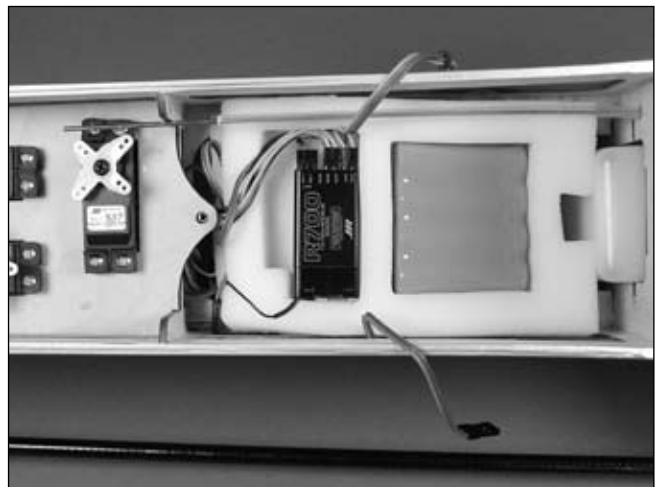
### □ Step 6

Install the switch harness into the side of the fuselage using the hardware provided with the switch harness. The switch is placed on the side of the fuselage opposite the engine exhaust.



### □ Step 7

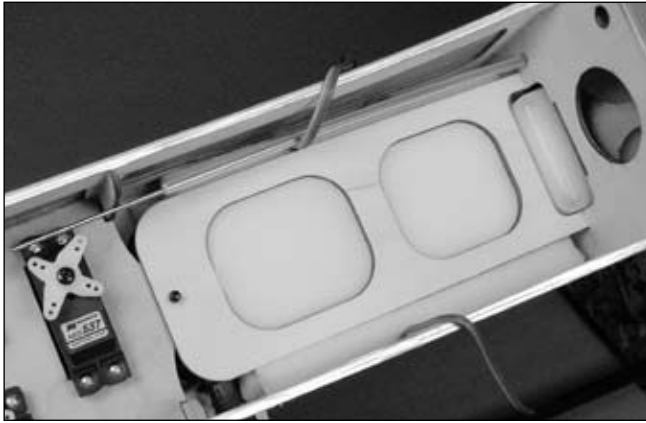
Place the pre-cut radio foam into the fuselage. The notch faces towards the fuel tank, same as the flat foam. Place the receiver battery in the opening towards the fuel tank, and the receiver in the opening near the radio tray. Tuck the servo and battery leads neatly between the layers of foam.



## Section 10: Radio and Linkage Installation

### □ Step 8

Place the remaining piece of flat foam over the receiver and receiver battery. Slide the radio tray into the notches on the sides of the fuel tank. Secure the radio tray using the 4-40 x 1/2" socket head screw and #4 washer.



**Hint:** The radio tray will only fit if the fuel tank is seated with the stopper in the opening in the firewall. You may have to wiggle the tank to get it to seat properly.

**Note:** Make sure to leave the aileron extension and the charge lead from the switch harness where they can be accessed later.

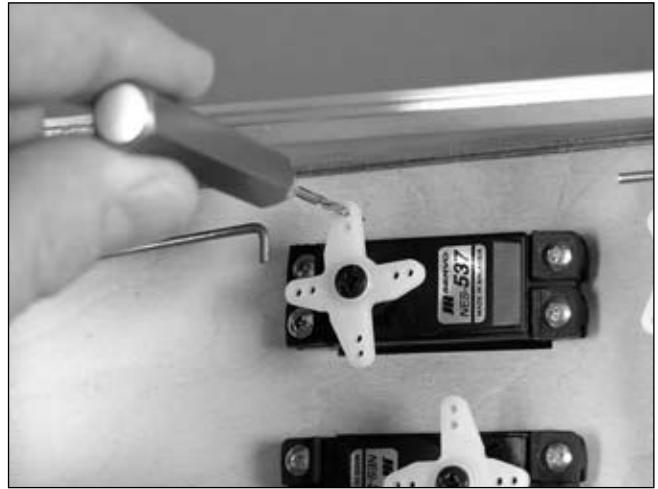
### □ Step 9

Slide the pushrods into the tube pre-installed in the fuselage. The pushrod for the elevator is 23 <sup>3</sup>/<sub>8</sub>" (594mm) in length, while the pushrod for the rudder is 26" (660mm) in length.



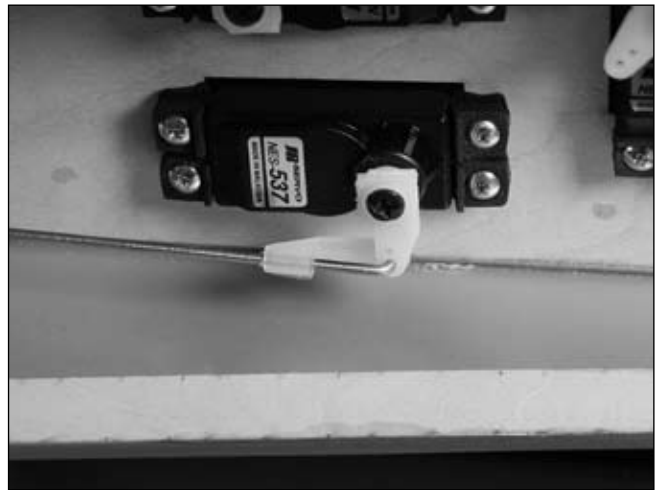
### □ Step 10

Enlarge the outer hole in the rudder and elevator servo arms using a 5/64" (2mm) drill bit.



### □ Step 11

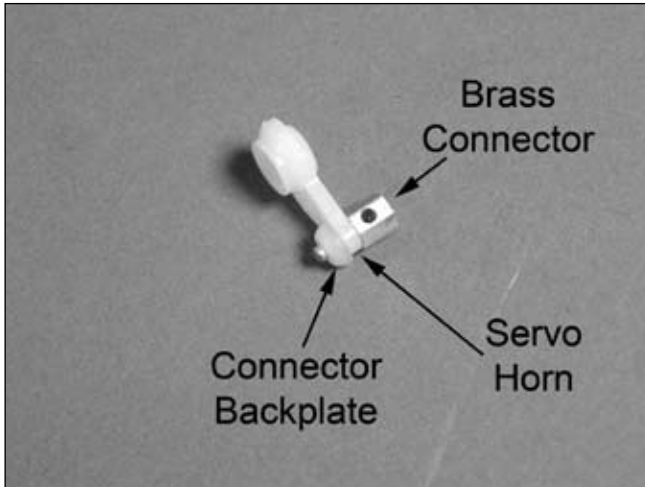
Remove the excess arms from the servo horn. Slide the pushrod wire into the hole drilled in the previous step. Slide a nylon pushrod keeper onto the wire from the opposite side of the servo arm. The keeper then "swings" over and snaps onto the pushrod wire to keep the wire from coming out of the servo arm.



## Section 10: Radio and Linkage Installation

### □ Step 12

Remove the servo horn from the throttle servo. Drill the outer hole on one of the longer arms using a 5/64" (2mm) drill bit. Slide the brass connector into the hole from the top of the servo horn. Secure the brass connector by sliding the connector backplate onto the connector from the bottom of the servo horn.



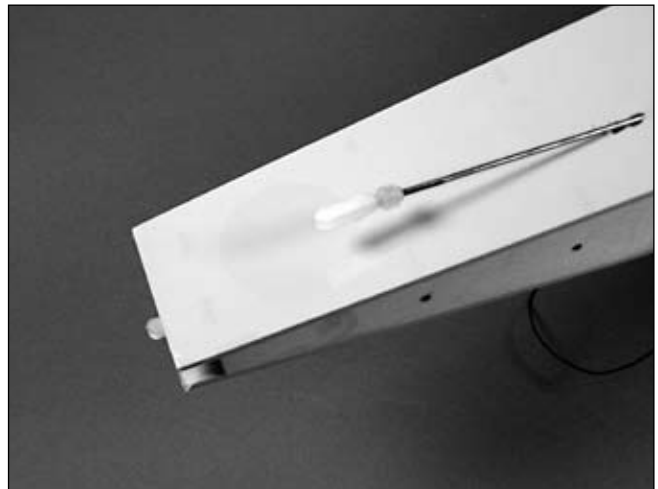
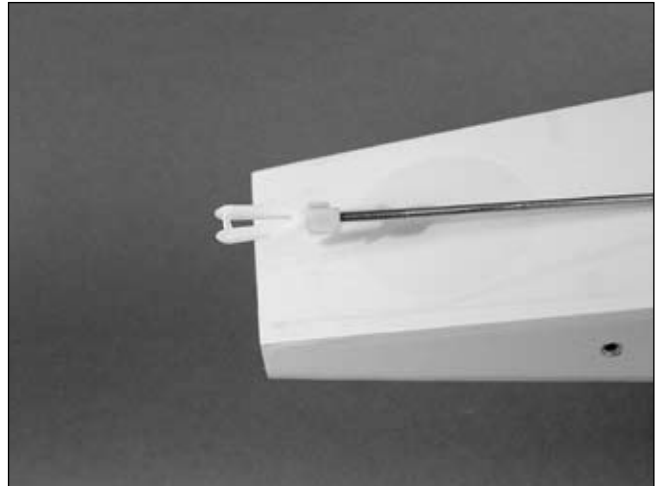
### □ Step 13

With the radio system on, center the throttle stick and throttle trim. Slide the throttle pushrod wire through the connector then install the servo horn as shown. This will provide equal travel for both high and low throttle, making setting up the linkage much easier. Temporarily install the setscrew into the brass connector.



### □ Step 14

Place a clevis retainer onto a clevis. Thread the clevis onto the elevator pushrod wire a few turns so it won't fall off. Repeat this for the rudder pushrod as well.



# Section 11: Preparing the Rudder Assembly

## Required Items:

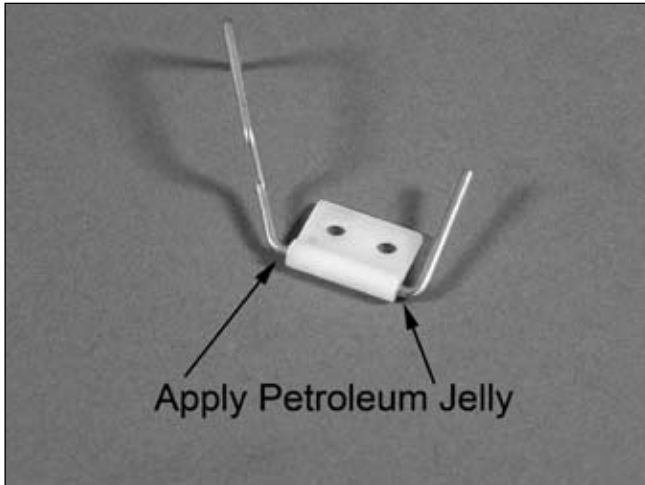
- Rudder
- CA hinge (3)
- Control horn w/backplate
- 1" (25mm) tail wheel
- 1/16" wheel collar w/setscrew
- Fin
- Tail wheel assembly
- 2mm x 12mm screw (3)

## Required Tools and Adhesives:

- Hex wrench (included with kit)
- Thin CA
- Petroleum jelly
- T-pins
- Drill bit: 1/16" (1.5mm)
- Rubbing alcohol
- Felt-tipped pen
- 6-minute epoxy
- Mixing stick
- Drill
- Paper towel
- Sandpaper

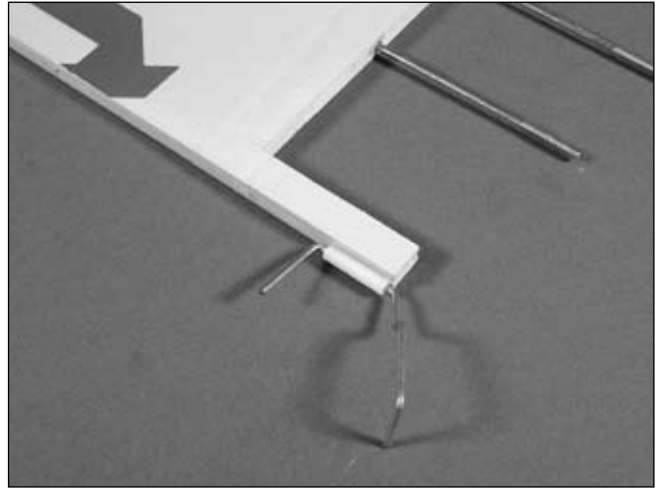
### □ Step 1

Apply a thin coat of petroleum jelly to the tail gear as shown. This will help in preventing epoxy from securing the wire to the bushing.



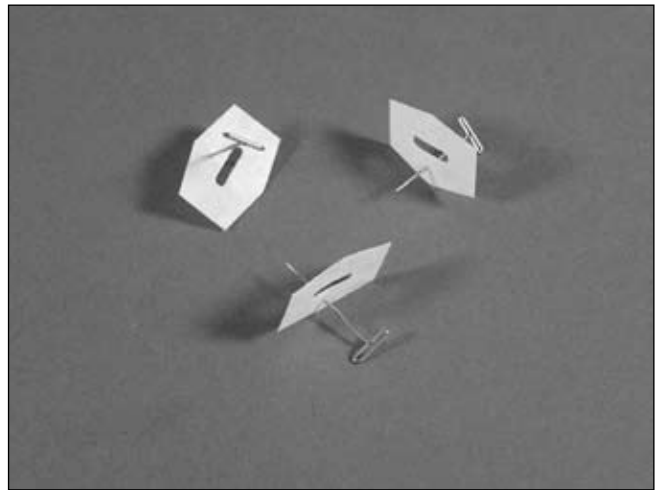
### □ Step 2

Test fit the tail gear assembly into the slot at the bottom of the fin. Trim the fin if necessary. Mix up about a tablespoon of 6-minute epoxy and apply it to both the nylon bushing where it fits into the fin and the slot in the fin. Reposition the assembly back into the fin and use a paper towel with rubbing alcohol to clean up any excess epoxy.



### □ Step 3

Place a T-pin in the center of the three CA hinges.

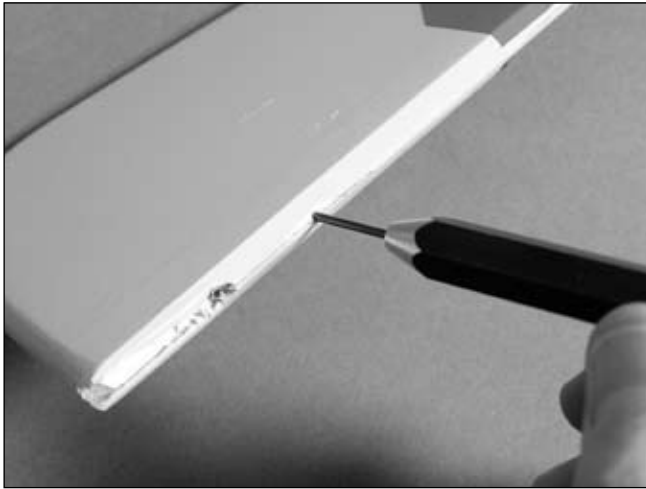




## Section 11: Preparing the Rudder Assembly

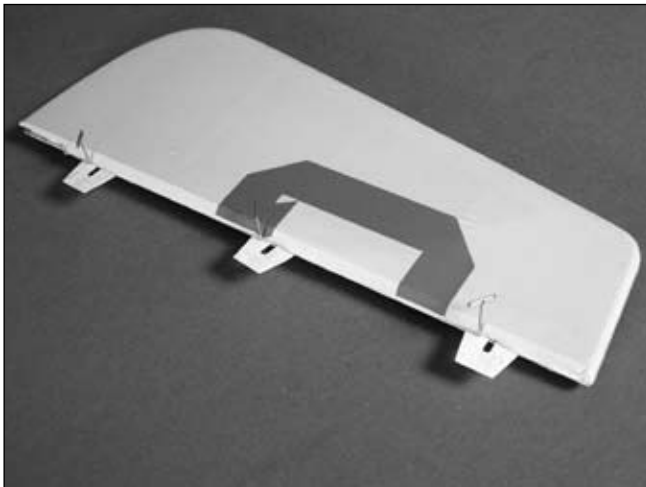
### □ Step 4

Drill a 1/16" (1.5mm) hole in the center of each hinge slot for both the rudder and fin.



### □ Step 5

Slide the three hinges into the rudder until the T-pin is resting against the hinge line of the rudder.



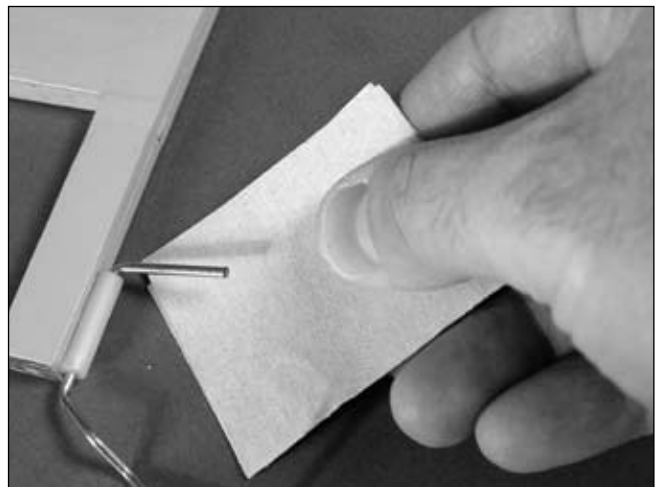
### □ Step 6

Test fit the rudder and fin together. The wire from the tail gear assembly fits into a hole that has been pre-drilled into the rudder. The rudder and fin should fit tightly together. If not, determine what is preventing them from sliding together and make the necessary adjustments so the hinge gap is tight.



### □ Step 7

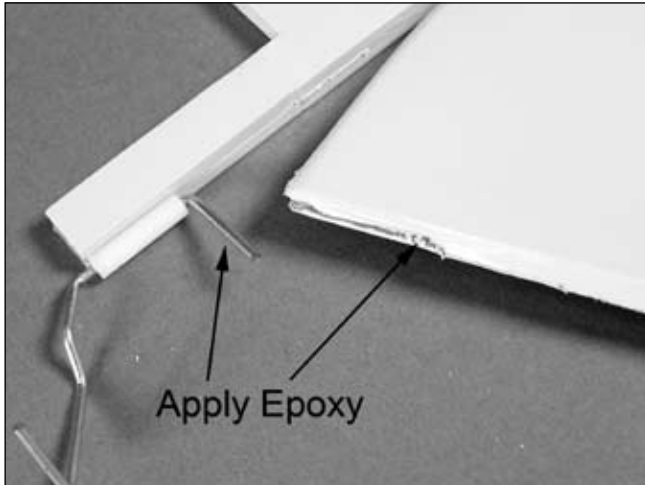
Separate the rudder and fin. Lightly sand the part of the tail gear wire that fits into the rudder. Clean the wire with rubbing alcohol and a paper towel to remove any dirt from the wire.



## Section 11: Preparing the Rudder Assembly

### □ Step 8

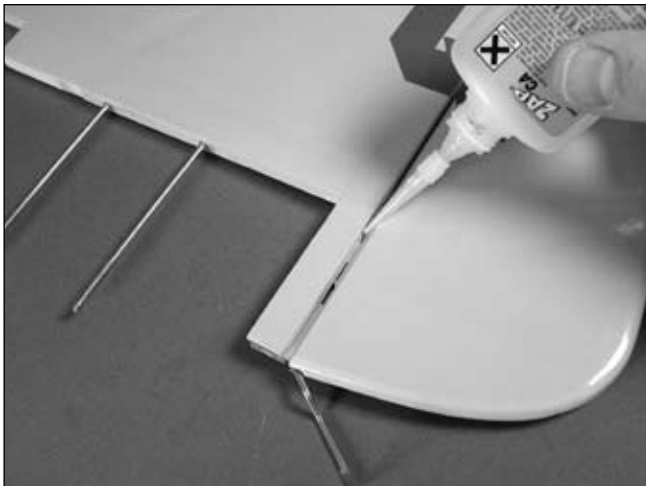
Mix up about a tablespoon of 6-minute epoxy. Apply the epoxy to the tail gear wire and the hole in the rudder. Do not apply epoxy to the slot in the rudder as this will glue the rudder to the nylon bearing, preventing the rudder from moving. Slide the rudder and fin together.



**Hint:** you can combine Steps 8 and 9 while the epoxy is curing.

### □ Step 9

Remove the T-pins from the hinges. Apply thin CA to both sides of each hinge, making sure they are saturated with the CA.

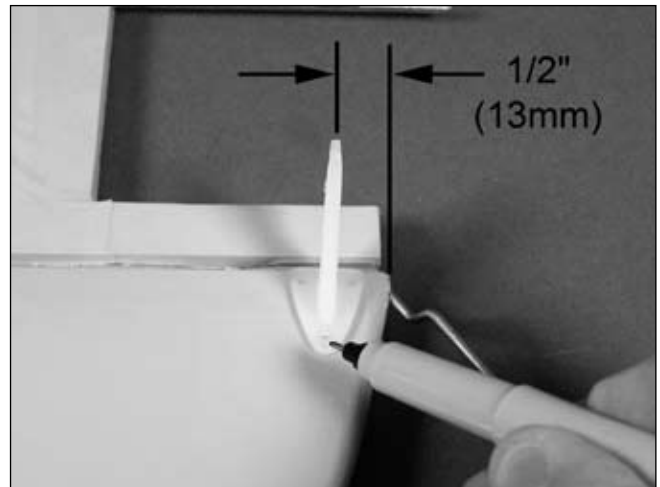


### □ Step 10

Once the CA and epoxy fully cure, test the hinges by pulling on the fin and rudder. Flex the rudder a number of times in both directions to break in the hinges.

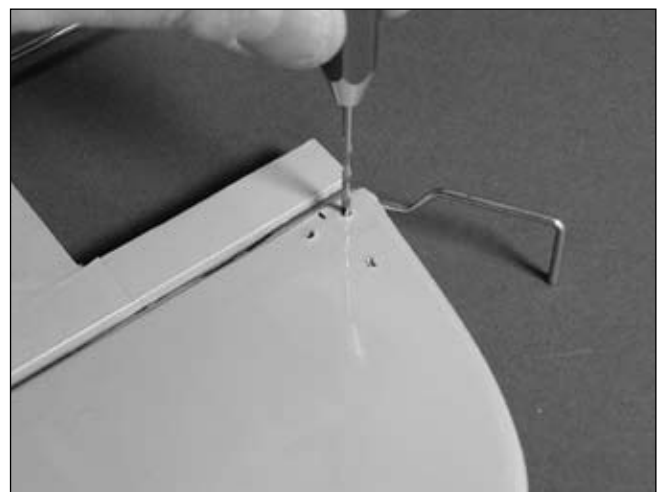
### □ Step 11

Remove the backplate from a control horn. Position the horn 1/2" (13mm) up from the bottom of the rudder. Align the holes with the hinge line of the rudder and fin. Mark the location for the three control horn mounting screws using a felt-tipped pen.



### □ Step 12

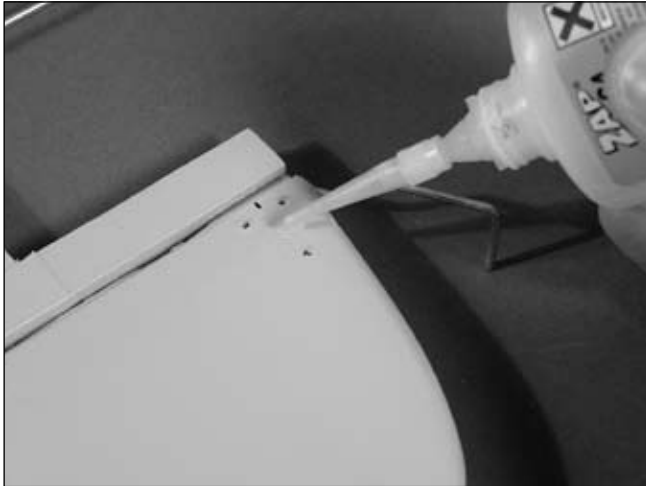
Use a 5/64" (2mm) drill bit to drill the locations for the screws.



## Section 11: Preparing the Rudder Assembly

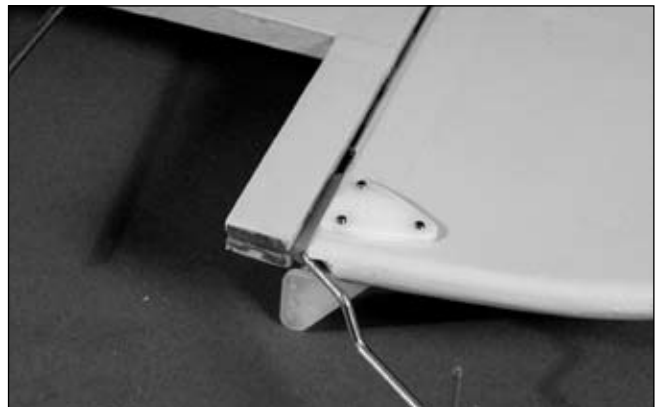
### □ Step 13

Use a T-pin to poke holes through the covering in the area inside the triangle made by the three holes. Poke holes in the covering on both sides of the rudder. Apply a small amount of thin CA in the area made by the holes in the following step. A few drops of thin CA into each hole is also required. This hardens the balsa, giving the control horn a much more solid surface to mount to. Do not use accelerator to allow the CA to penetrate into the wood.



### □ Step 14

Attach the control horn to the rudder using three 2mm x 12mm screws and the control horn backplate.



**Note:** Make sure to attach the control horn to the right side of the rudder as viewed from the pilots perspective.

### □ Step 15

Slide the 1" (25mm) tail wheel onto the tail gear wire. Secure the tail wheel using a 1/16" wheel collar and setscrew. Use threadlock on the setscrew to prevent it from coming loose in flight.



## Section 12: Preparing the Stabilizer Assembly

### Required Items:

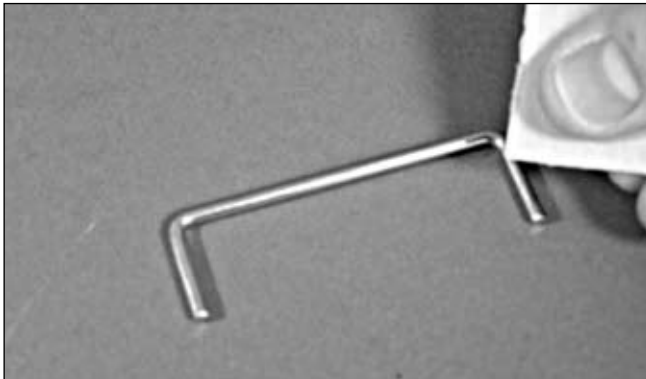
- Stabilizer
- Elevator (2)
- CA hinge (6)
- Elevator joiner wire
- Control horn w/backplate
- 2mm x 12mm screw (3)

### Required Tools and Adhesives:

- Thin CA
- 6-minute epoxy
- Mixing stick
- T-pins
- Drill
- Drill bit: 1/16" (1.5mm)
- Paper towel
- Rubbing alcohol
- Sandpaper
- Felt-tipped pen

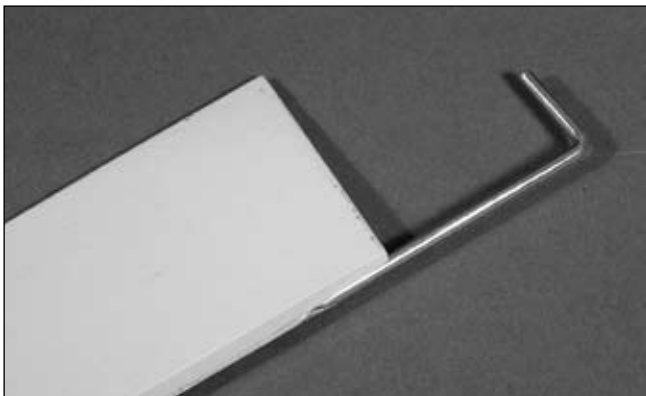
#### □ Step 1

Locate the elevator joiner wire. Use sandpaper to roughen the wire. Clean the joiner wire using rubbing alcohol and a paper towel.



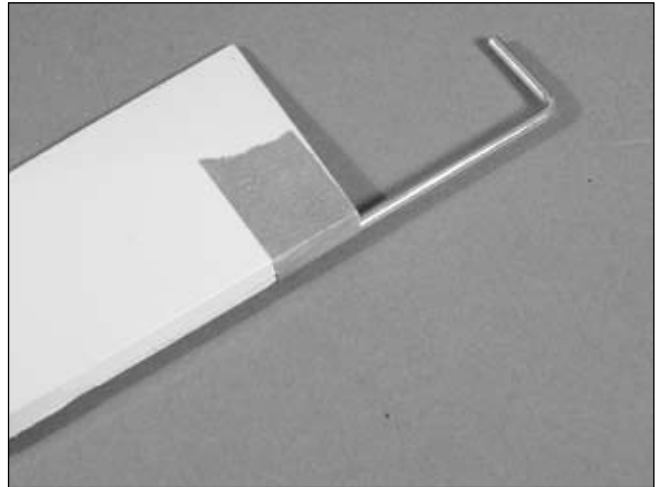
#### □ Step 2

Test fit the joiner wire into one of the elevators. It will slide in the elevator so the wire does not protrude beyond the hinge line of the elevator.



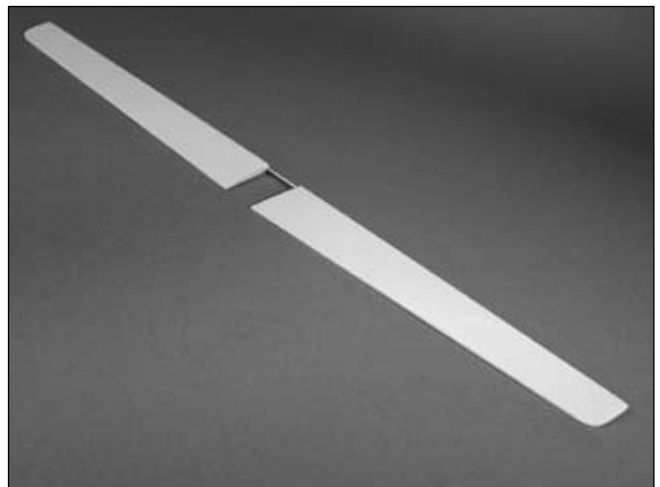
#### □ Step 3

Mix up a small amount of 6-minute epoxy. Apply the epoxy to the slot and hole in the elevator, and to the joiner wire where it contacts the elevator. Slide the wire into position and use tape to hold the wire in position until the epoxy cures.



#### □ Step 4

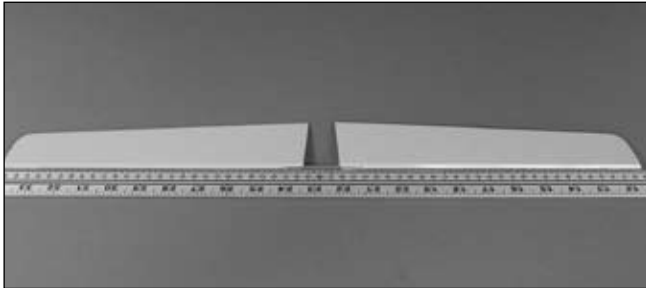
Test fit the remaining elevator to the joiner wire. Make sure both elevators are parallel by resting them on a flat surface. Either bend the wire or enlarge the hole in the remaining elevator if necessary so both elevators are parallel.



## Section 12: Preparing the Stabilizer Assembly

### ☐ Step 5

Use a straight edge along the hinge line to make sure the hinge line between the two elevators are aligned. Bend the wire or enlarge the hole in the elevator to achieve alignment.



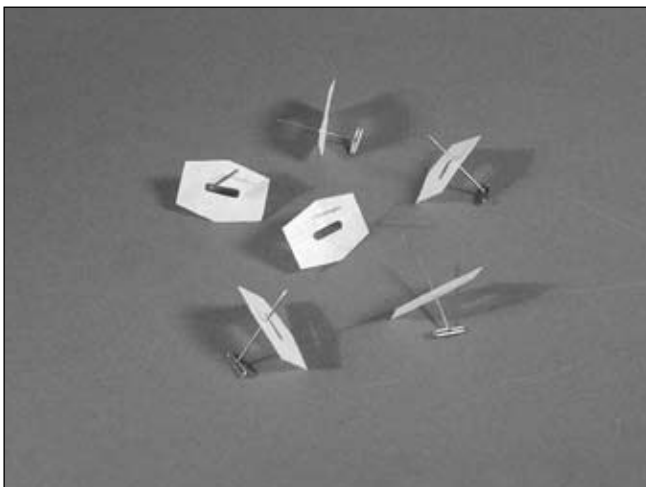
### ☐ Step 6

Slide the final elevator from the joiner wire once it has been aligned. Mix up some 6-minute epoxy and apply it to the joiner wire and hole in the elevator. Slide the two together. Rest the elevator assembly on a flat surface. Check the alignment as described in Steps 4 and 5 while the epoxy cures.

**Hint:** Use weights on the elevators to keep them flat on your work surface while the epoxy cures.

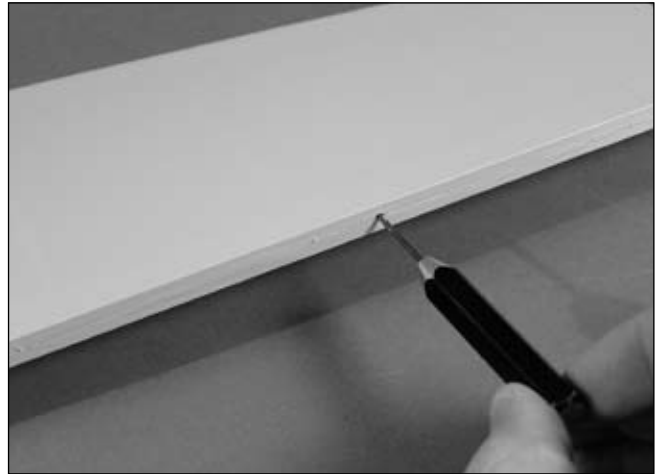
### ☐ Step 7

Prepare six CA hinges by placing a T-pin in the center of each hinge.



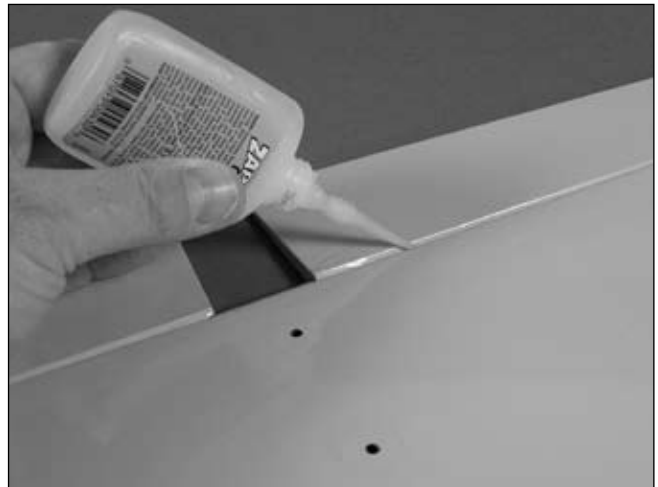
### ☐ Step 8

Drill a 1/16" (1.5mm) hole in the center of each hinge slot for the elevators and stabilizer.



### ☐ Step 9

Install the hinges into the elevators. Slide the elevators and stabilizer together. Use thin CA to glue each of the six hinges, both top and bottom.



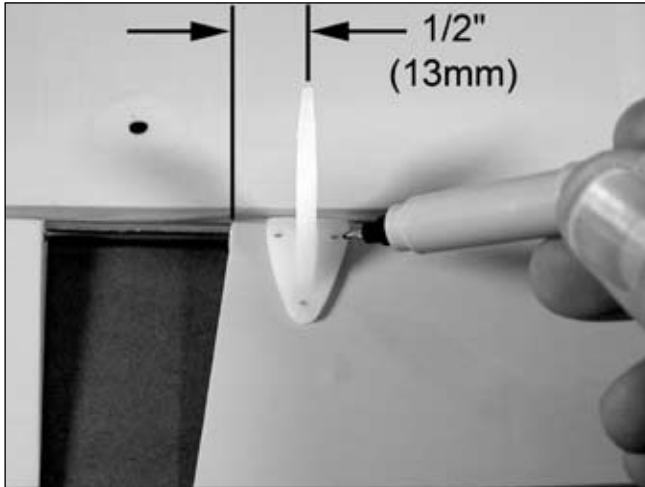
### ☐ Step 10

Test how well the hinges are glued in by pulling on the elevator and stabilizer. Flex the elevators a few times to break in the hinges.

## Section 12: Preparing the Stabilizer Assembly

### □ Step 11

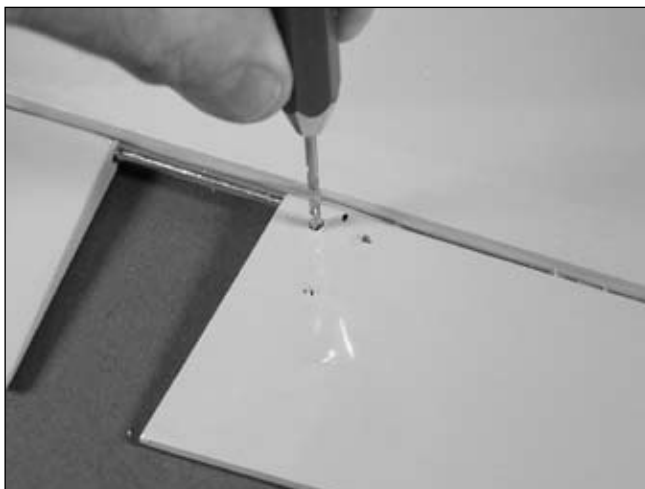
Remove the backplate from a control horn. Position the horn 1/2" (13mm) from the inside edge of the elevator. Align the holes with the hinge line of the stabilizer and elevator. Mark the location for the three control horn mounting screws using a felt-tipped pen.



**Note:** The elevator control horn is located on the pilot's left side. It will be located underneath the stabilizer/elevator when the assembly is installed on the aircraft.

### □ Step 12

Use a 5/64" (2mm) drill bit to drill the locations for the screws.



### □ Step 13

Use a T-pin to poke holes through the covering in the area inside the triangle made by the three holes. Poke holes in the covering on both sides of the rudder. Apply a small amount of thin CA in the area made by the holes in the following step. A few drops of thin CA into each hole is also required. This hardens the balsa, giving the control horn a much more solid surface to mount to. Do not use accelerator to allow the CA to penetrate into the wood.



### □ Step 14

Attach the control horn to the rudder using three 2mm x 12mm screws and the control horn backplate.



## Section 12: Installing the Tail Surfaces

### Required Items:

- Fuselage
- Stabilizer/elevator
- Rudder/Fin

### Required Tools and Adhesives:

- Pliers or adjustable wrench

#### □ Step 1

Locate the stabilizer/elevator assembly. Locate the fin/rudder assembly and remove the nuts and washers from the threaded rods on the fin. Position the stabilizer/elevator assembly so the control horn will face down, away from the fin. The threaded rods from the rudder/fin assembly will slide into the two holes in the stabilizer. The fuselage fairing has been slid into position on the fin in the photograph.



#### □ Step 2

Thread the nuts onto the rod, tightening them snugly against the bottom of the fuselage using pliers or an adjustable wrench. Do not over-tighten the nuts.



## Section 13: Attaching the Wing

### Required Items:

- Fuselage assembly
- Wing assembly
- Radiator scoop
- 1/4-20 x 2" nylon bolt (2)

### Required Tools and Adhesives:

- Flat blade screwdriver

#### ☐ Step

Locate the servo leads from the wing and plug them into the leads for the ailerons located in the fuselage. These leads are identical, so you can plug either of the aileron servo leads into either of the extensions.



#### ☐ Step

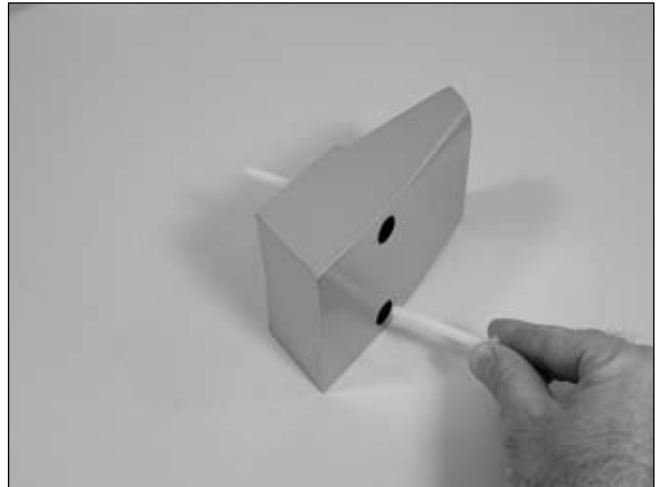
Guide the wing dowels at the front of the wing into the holes located in the fuselage. Allow the wing to drop down and rest in the wing saddle of the fuselage.



**Note:** Check to make sure the servo leads are inside the fuselage and not caught between the wing and fuselage.

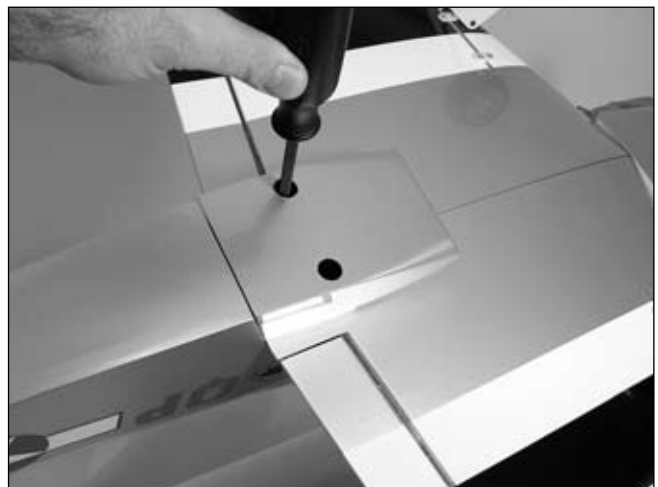
#### ☐ Step

Locate the two 1/4-20 x 2" nylon wing bolts. Slide the bolts into the holes in the radiator scoop so the threads are exposed.



#### ☐ Step

Place the radiator scoop onto the wing, guiding the bolts into the bolt holes in the wing. Use a flat blade screwdriver to tighten bolts, securing the wing to the fuselage. It is helpful to pull the back of the wing away from the fuselage so you can guide the bolts into the holes in the fuselage to start them threading into the holes.





# Section 14: Final Assembly

## Required Items:

- Fuselage
- Wing
- Exhaust stack (right and left)
- Decal set
- Canopy
- #2 x 5/16" sheet metal screws (4)

## Required Tools and Adhesives:

- Phillips screwdriver
- Felt-tipped pen
- Sandpaper
- Masking tape
- Rubbing alcohol
- Paper towel
- Canopy glue

### □ Step 1

Cut the decals from the decal sheet. Use the box to aid in the location of the decals on the fuselage and wing.

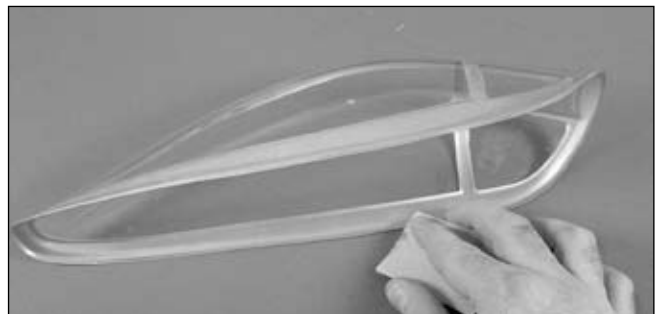
### □ Step 2

Position the canopy on top of the fuselage. Use a felt-tipped pen to trace the outline of the canopy onto the fuselage.



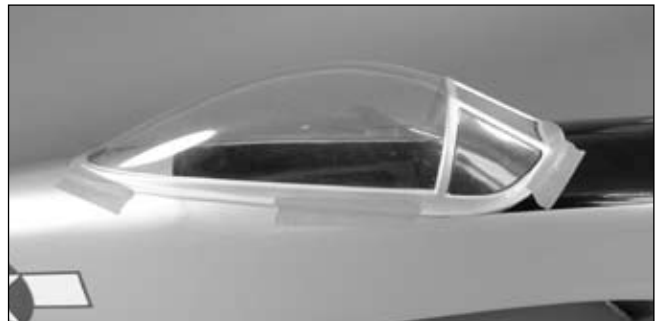
### □ Step 3

Use sandpaper to lightly sand inside the line drawn on the fuselage. Also sand the inside of the canopy where it will contact the fuselage. Use rubbing alcohol and a paper towel to remove any dirt from both the canopy and fuselage.



### □ Step 4

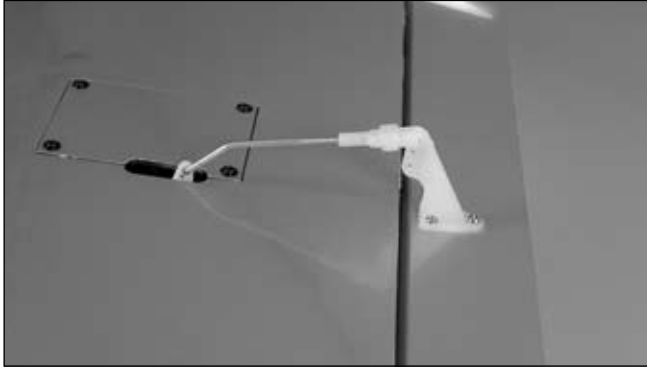
Apply a thin bead of canopy glue to the inside edge of the canopy. Position the canopy onto the fuselage and use masking tape to hold the canopy to the fuselage until the canopy glue has had time to fully cure.



## Section 15: Centering the Control Surfaces

### Ailerons

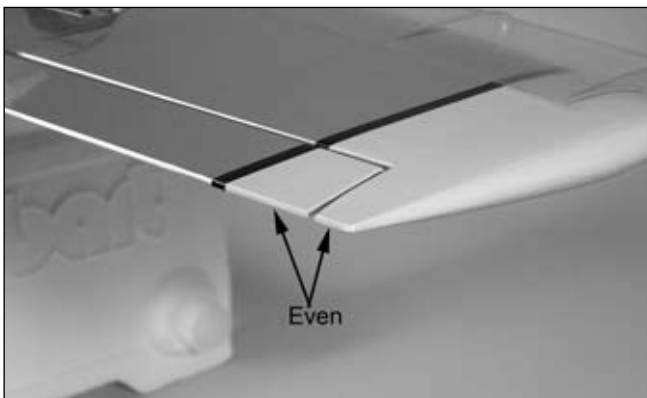
Check to make sure the clevis is located in the outer hole of the control horn. If not, slide the clevis retainer forward, disconnect the clevis, connect it in the correct location, and slide the clevis retainer back into position.



Connect the aileron servo leads as described in the previous section. Center the aileron trim on the transmitter.



Turn on the transmitter, then the receiver. Thread the clevis as necessary until the aileron is even with the wing tip.



### Elevator

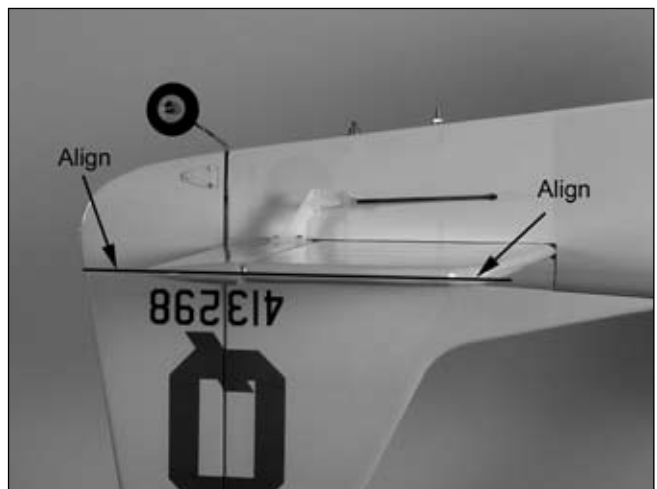
Connect the elevator clevis to the center hole on the elevator control horn.



Center the trim lever for the elevator on the transmitter.



With the radio system on, thread the clevis until the elevator is aligned with the stabilizer. Slide the clevis retainer onto the clevis to secure its location.



## Section 15: Centering the Control Surfaces

### Rudder

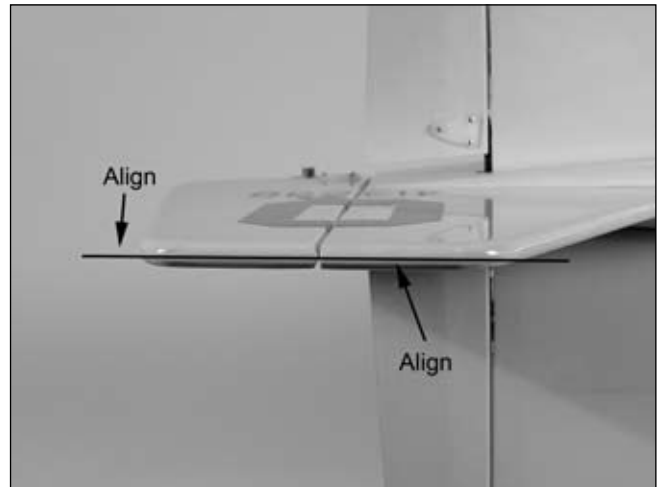
Connect the rudder clevis to the center hole on the rudder control horn.



Center the trim lever for the rudder on the transmitter.



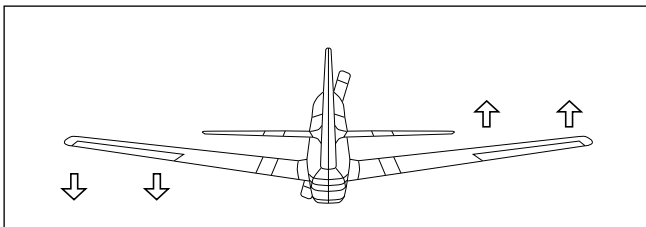
With the radio system on, thread the clevis until the rudder is aligned with the fin. Slide the clevis retainer onto the clevis to secure its location.



## Section 16: Checking the Control Surface Directions

### Ailerons

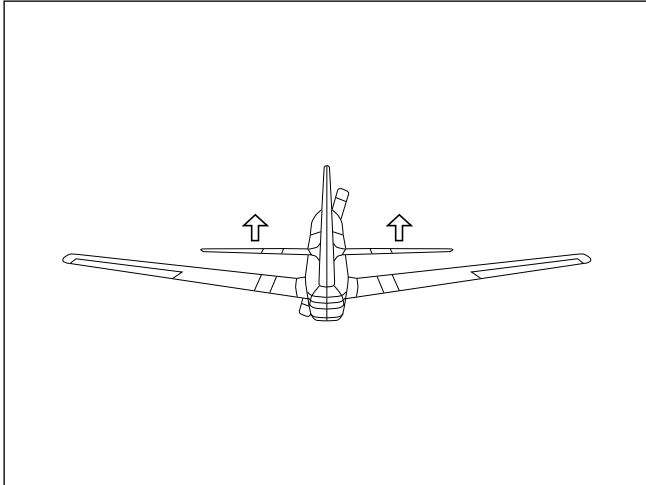
Turn on the transmitter, then the receiver. Move the aileron stick to the right, which is the input for a right turn. The right aileron will move up, and the left aileron will move down. If not, check the radio instructions on how to reverse the direction electronically at the transmitter.



## Section 16: Checking the Control Surface Directions

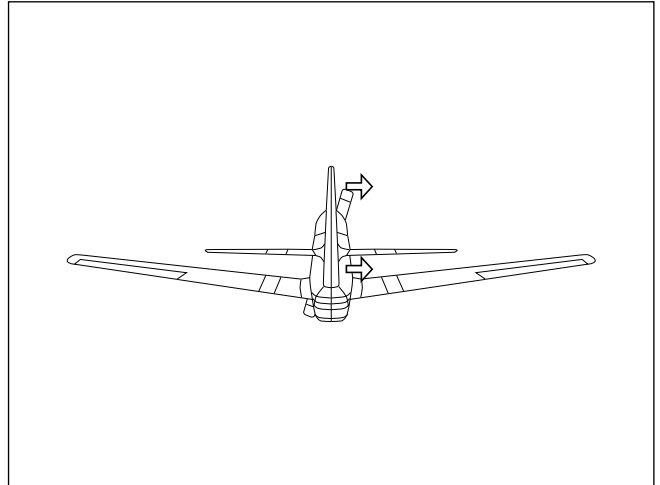
### Elevator

With the radio system still on, pull back on the elevator control stick to give an up elevator input. The elevator should move up from center. If not, check the radio instructions on how to reverse the direction electronically at the transmitter.



### Rudder

The final control surface direction to check is the rudder. With the radio system on, move the rudder stick to the right, this will make the plane turn right. The rudder should deflect to the right as well. If not, check the radio instructions on how to reverse the direction electronically at the transmitter.

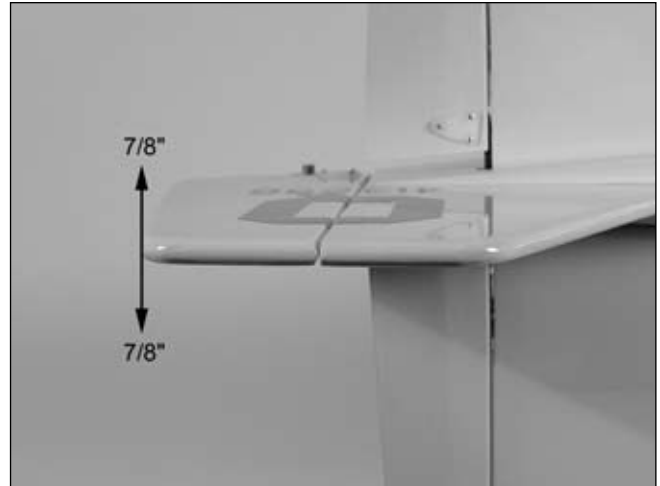
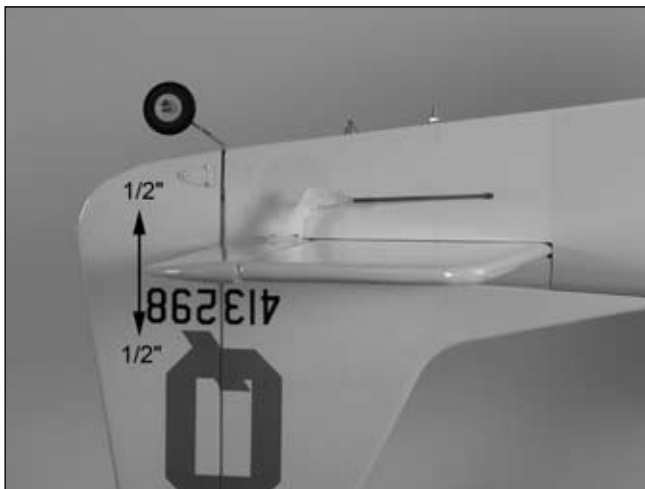
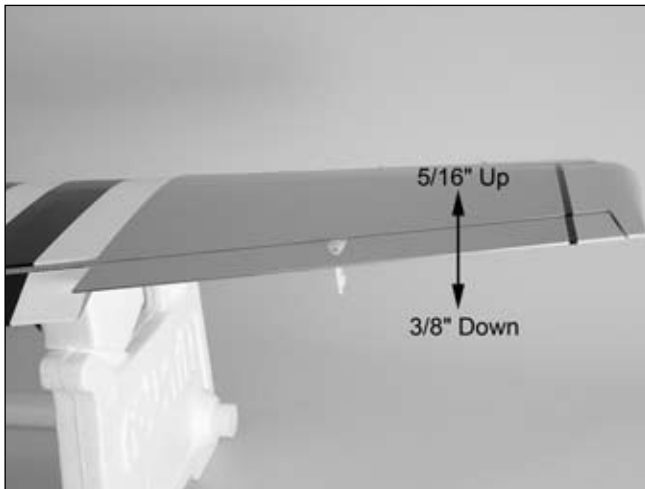


**Note:** Operating the functions at the transmitter opposite as described will result in the control surfaces moving opposite as well.

## Section 17: Checking the Control Throw Amounts

The following section covers checking the amount of throw each control surface has and how to increase or decrease the amount of throw to match the throws listed in the manual. In addition, you will check to make sure each control surface is moving the correct direction when operated from the transmitter.

After checking that the controls are moving in the correct directions, the amount of the control movement must be checked. By moving the control stick of each surface to its full deflection, you will measure the amount the surface has moved. By holding a ruler next to the surface and establishing a reference, use the radio to make the surface move and compare the measurements to those shown.



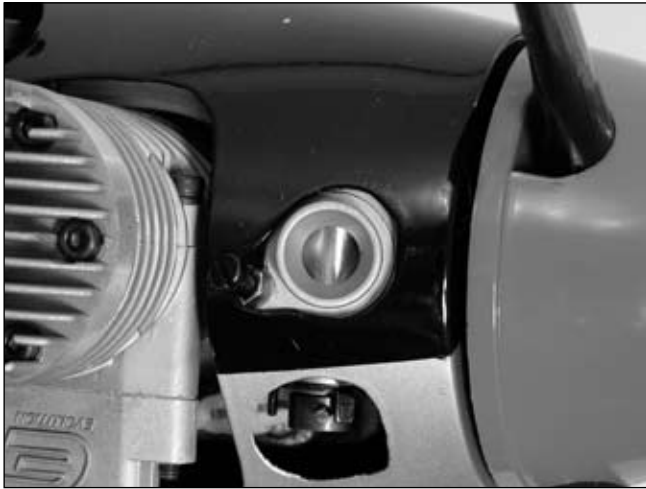
**Hint:** Place your ruler on a solid surface, rather than hold it in the air, to take measurements. This will guarantee your ruler is not moving. If the ruler is moving you will get inaccurate readings.

**Note:** If you have a fellow modeler with a throw gauge that measures in degrees you can borrow, the amounts are 12-degrees instead of 1/2" for the elevator, 15-degrees instead of 7/8" for the rudder, and 10-degrees instead of 5/16" and 12-degrees instead of 3/8" for the ailerons.

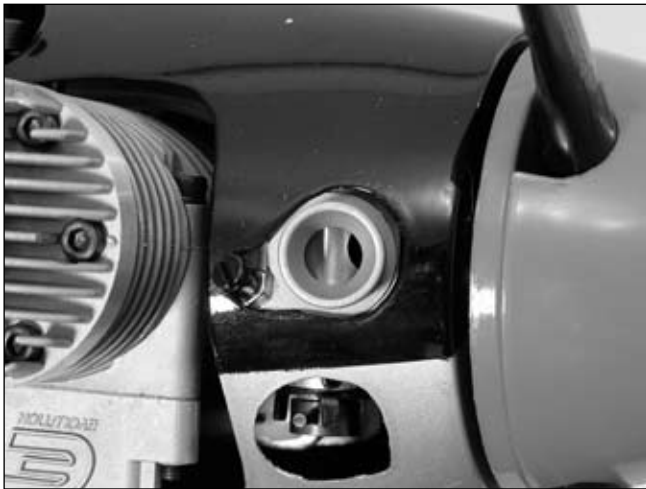
If the throws of the control surfaces are not moving the amounts as described, you may need to change the Travel Adjustment setting in the radio. To do so, read the section in the radio manual on programming the radio.

## Section 18: Adjusting the Throttle

With the radio system on, move the trim lever and throttle lever towards the bottom of the transmitter. Look into the carburetor to check that the barrel is closed.



Move the trim lever up towards the top of the transmitter. The barrel in the carburetor should have an opening of around 1/16".



Move the throttle stick towards the top of the transmitter. The carburetor will now be in the fully open position.



If the throttle is not operating as described, you may need to change the Travel Adjustment setting in the radio. To do so, read the section in the radio manual on programming the radio.

**Note:** Once all the radio adjustments are complete, remember to turn off both the receiver and the transmitter.

## Section 19: Balancing Your P-51 ARF

In order for your P-51 Mustang ARF to fly correctly, you will need to check the balance of the plane. This is done by supporting the aircraft either using your fingers, or by using a balancing stand. Not checking the balance can result in an aircraft that is difficult to fly, which can lead to the possibility of crashing your model.

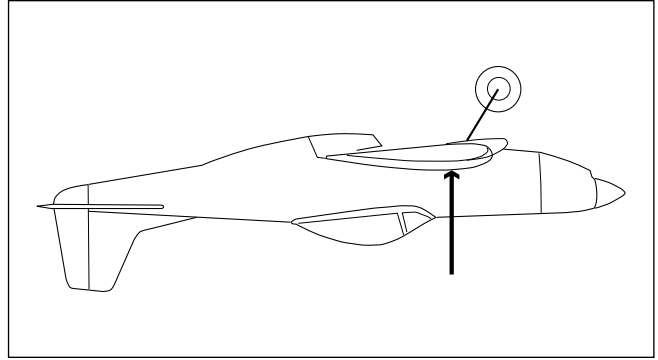
### Marking the Balance Point

The first step in balancing your P-51 Mustang ARF is to mark the location for the balance point. Measure back  $4\frac{1}{2}$ " against the fuselage to the very front edge of the wing, which is where the wing plugs into the fuselage. Mark the location on both sides of the fuselage using a felt-tipped pen to mark the balance location.

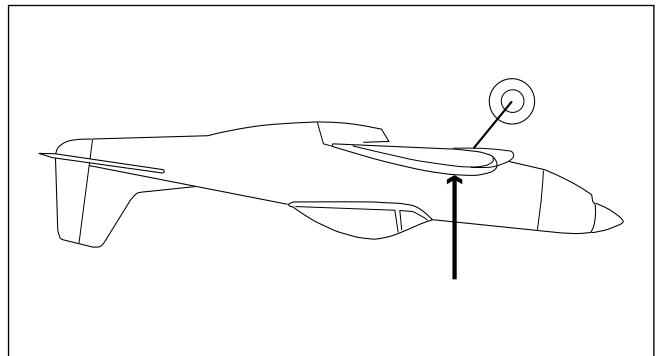


### Lifting the Model and Observations

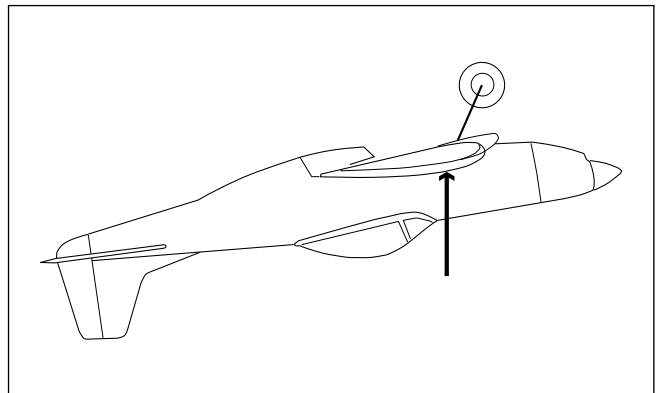
The P-51 Mustang ARF is balanced using either your fingers or a balancing stand. The stand in the photo was made from a dowel rod and a flat piece of wood. The dowel was cut down and holes drilled in the wood, then the dowel plugged into the wood. Use pencil erasers to prevent the ends of the dowel from damaging your wing. Place or lift the airplane so it is supported at the marks made in the previous step. The plane will rest level when balanced correctly. If not, weights must be added to correct any balancing problems.



**Balanced Correctly**



**Nose Heavy – Add Weight to Tail**



**Tail Heavy – Add Weight to Nose**

## Section 19: Balancing Your P-51 ARF

### Adding Weights to Correct the Balance

Due to manufacturing differences, it is possible that the P-51 Mustang ARF may not be balanced properly. Weights can be added to either the tail or the nose of your P-51 Mustang ARF if it does not balance properly. Stick-on weights are the easiest to use, and come in sizes that are easily placed on your plane. Add just enough weight as necessary to balance your plane. Once the weight has been added, make sure it is secure and will not fall off in flight.



**Note:** The balance point of your P-51 Mustang ARF can vary 1/4" forward or rearward without causing any problems. If your plane is only slightly out of balance, try placing the balancing stand towards the nose or tail by this 1/4" and recheck the balance. If it looks good and sits level, then you're good to go!

## Section 20: Flight Preparations

Flight preparations are the items you must check each time you travel to the flying field. Because the P-51 Mustang ARF will encounter a variety of situations, it is best to keep an eye on the various components of your model to keep it in the best flying condition.

### Checking the Frequency

When at the field, check to see if there is some form of frequency control in use. Usually there are clips each pilot will use signifying the channel their plane is on. This will prevent other pilots from turning on their radio systems if more than one pilot is using the same frequency. Operating two aircraft at the same time on a single frequency will lead to the demise of one or both aircraft.

### Checking the Controls

Before starting your engine, check to make sure the controls are operating in the correct directions and the linkages and surfaces are not binding anywhere. Also look at the clevises and clevis retainers to make sure they are secure and will not come loose or fail in flight.

### Range Check the Radio

A range check should be part of the preflight process as well. The instructions provided with your radio system will detail the correct procedure for checking the range of your particular radio system. This procedure is best done with a partner to hold your aircraft and check for any abnormalities.

### Fueling the P-51 Mustang ARF

Fill the fuel tank with the proper fuel. Fill the tank by connecting the fuel pump to the line going to the needle valve. Disconnect the fuel line attached to the pressure fitting of the muffler; your tank is full when fuel begins to run out of the pressure line. Reconnect the fuel lines to the needle valve assembly and muffler.

**Note:** It is very important to reconnect the lines to the correct place. If they are reconnected incorrectly, the engine will not run properly.



# Section 21: Maintaining Your P-51 Mustang ARF

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The following is a check list that you should follow every time you have completed a flying session with your P-51 Mustang. Doing so will keep your aircraft in the best flying condition.

## **Clean Up**

After a long flying session with your P-51 Mustang ARF, you will want to clean it up before loading it into your vehicle to head home. Use a cleaner such as Windex or 409 and a paper towel to wipe down the exterior of your plane, removing the fuel residue. Remember a clean plane will last longer since the fuel won't be allowed to soak into any exposed wood.

## **Checking the Propeller**

Check to make sure the propeller is tightly secured to the engine. If not, remove the spinner and use a crescent wrench to tighten it back down. If you have had any not-so-great landings, you will want to inspect the propeller for any damage. Small nicks and scratches can quickly become fractures, causing the propeller to be unsafe for flight. Always carry a few spare propellers so a damaged propeller can be replaced at the field, increasing your flying time per trip to the field.

## **Checking the Clevises**

Inspect the aileron, elevator and rudder clevises to make sure they are connected and in good working order. If you find a clevis that is showing signs of wear or is broken, replace it with a new clevis. Also check the nylon connectors at the servo for any wear or damage. If they look worn or in bad shape, replace them as well.

## **Checking the Control Horns**

Inspect the control horns to make sure they have not crushed the wood of the control surface. If so, remove the control horn screws to remove the control horn. Place 2–3 drops of thin CA into each of the screw holes. In addition, use a T-pin to poke small holes in the covering in the area where the control horn mounts, then saturate the area with thin CA. This will harden the wood and give the control horns a solid surface to be mounted to.

## **Checking the Wheel Collars**

Check the setscrews on the main and tail wheel collars to make sure they are not loose. Use a 1.5mm hex wrench to tighten the setscrews. It is suggested if they loosen frequently to remove them, apply threadlock to the setscrews, then secure the wheel collars back into position.

## **Check the Muffler Bolts**

Use a 2.5mm hex wrench to make sure the bolts holding the muffler onto the engine are tight and have not vibrated loose during flight.

## **Check the Engine Mount Bolts**

Remove the spinner and propeller from the engine. Remove the exhaust stacks from the fuselage, and then remove the cowling from the fuselage. Remove the muffler from the engine, and then use a Phillips screwdriver to make sure the four bolts securing the engine to the mount are tight.

## Section 22: Progressing With Your Flying Skills

The P-51 Mustang ARF is a special trainer plane in that it will allow you to go from learning the basics of flight all the way up to performing aerobatics without upgrading or purchasing a new plane. As you learn to fly and become ready for a little more challenge, the P-51 Mustang ARF will grow with you.

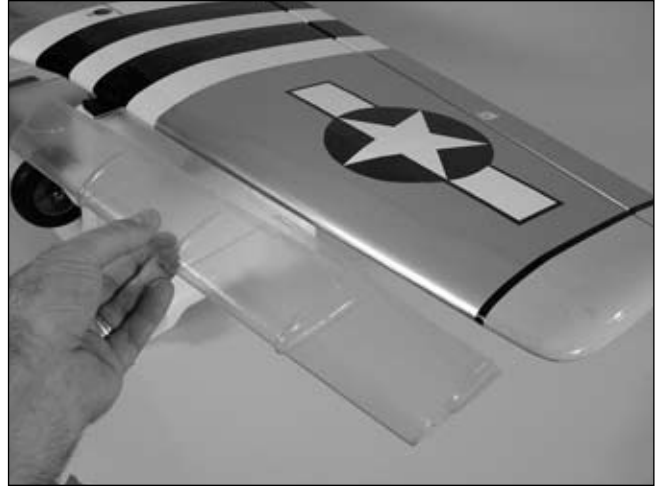
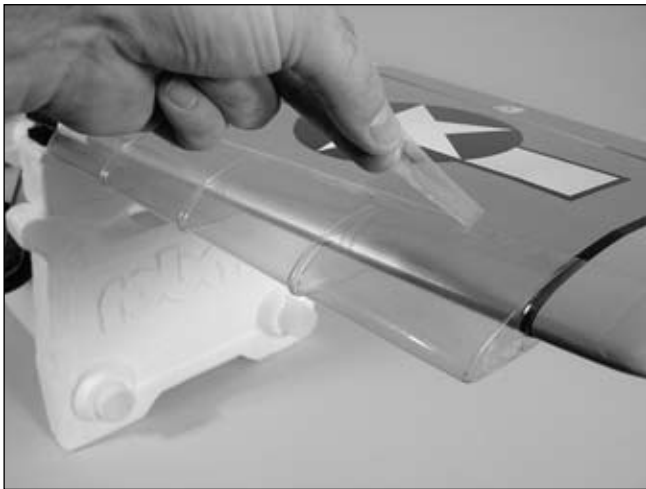
The following items can be installed depending on your particular skill level. The wing droops, flap setting and speed brakes are all items you can add to your P-51 ARF to make it more suitable for your particular skill level.

### Graduate

If you may be a bit apprehensive about the flying characteristics of your P-51 Mustang ARF install the clear anti-spin NACA droops. This is done by simply using clear tape on the top and bottom to hold them in place on the wing. Without the droops, your P-51 Mustang ARF will be an all-out aerobatic warbird. In the air, you can do a variety of aerobatics such as rolls, loops, spins and snap rolls.

#### ☐ Step 1

The droops are held on with clear tape. Simply using clear tape will allow you to install the droops. When you are done using the wing droops, set them aside for training a budding young pilot in the future.



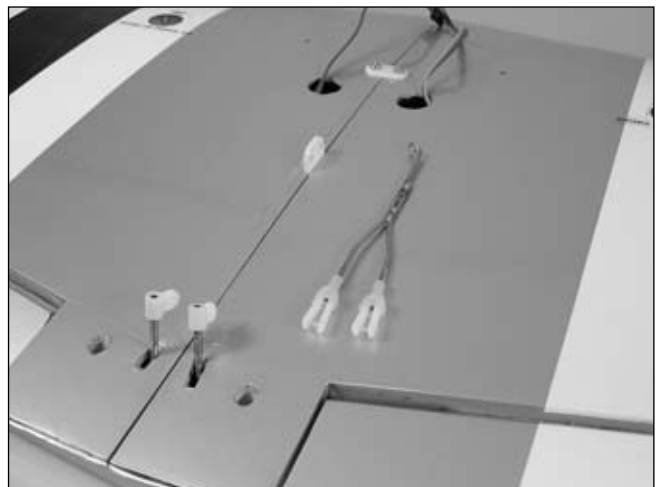
After you have graduated from the Progressing Training System and are enjoying your P-51 Mustang ARF in its aerobatic mode, you can take it even a step further and add functional flaps. To do this, you'll need to purchase an additional servo from your local hobby store such as the JR 537 servo. Then, simply remove the covering over the flap servo slot in the center of the wing and install the servo. Hook up the linkage to the servo following the directions and you have a scale P-51 Mustang complete with functioning landing flaps.

### Advanced

If you feel that you want a little slower flight speed for your P-51 Mustang ARF, it is suggested to move the flaps to the lower position. This is done after you have installed the wing droops.

#### ☐ Step 1

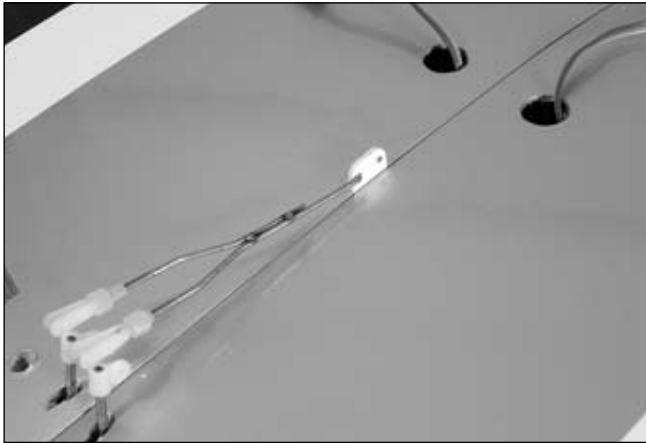
Disconnect the flap linkage from the flap control horns. Remove the linkage from the linkage stay.



## Section 22: Progressing With Your Flying Skills

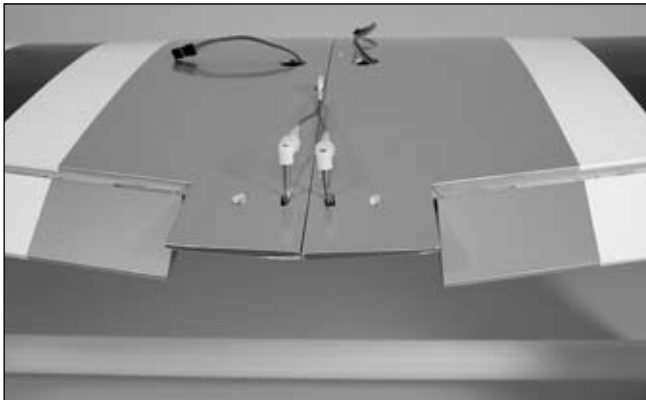
### □ Step 2

Move the linkage to the rear hole in the flap linkage stay.



### □ Step 3

Reconnect the clevises and check that the flaps are in the down position. Check both the right and left flaps to make sure they are deflected equal amounts from the wing.



### Intermediate

To complete the conversion of your P-51 Mustang to a docile trainer, all you need to do is install the speed brakes. With the speed brakes installed, the flaps in the down position and the NACA wing droops all installed, you have a plane that can be used, with a trained flight instructor, for basic training.

### □ Step 1

Position the speed brakes as shown on the landing gear wires. Use three tie wraps to secure the speed brakes to the landing gear. The brakes will rest against the landing gear strap, which will prevent them from rotating during flight.



## Section 23: Adding a Flap Servo

### Required Tools and Adhesives:

- Plier (2)
- Drill bit: 1/16" (1.5mm)

#### ☐ Step 1

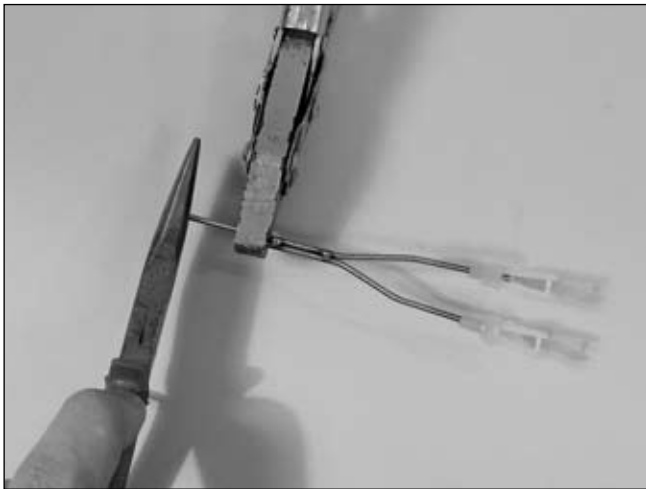
Remove the flap linkage from the aircraft.

#### ☐ Step 2

Remove the flap linkage stay from the wing. Be careful when removing the stay as not to damage the wing.

#### ☐ Step 3

The "Z" bend in the linkage will need to be rotated 90-degrees to connect to the servo. Use two pairs of pliers, one to hold the linkage, and the other to twist the "Z" bend.



#### ☐ Step 4

Remove the covering from the wing for the flap servo. This area is in the left wing panel right next to where the flap linkage stay was located.



#### ☐ Step 5

Place the servo (not included) into the opening. Use a 1/16" (1.5mm) drill bit to drill holes in the underlying wood for the servo mounting screws. Once the holes are drilled, use the four screws that were provided with the servo to secure it into position.



**Note:** Make sure to read the instructions included with the servo for installing the grommets and brass eyelets.

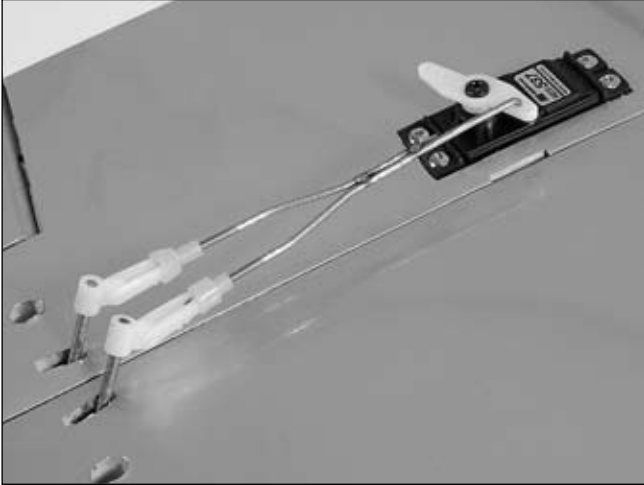
#### ☐ Step 6

Plug the servo into the 5th channel of the receiver.

## Section 23: Adding a Flap Servo

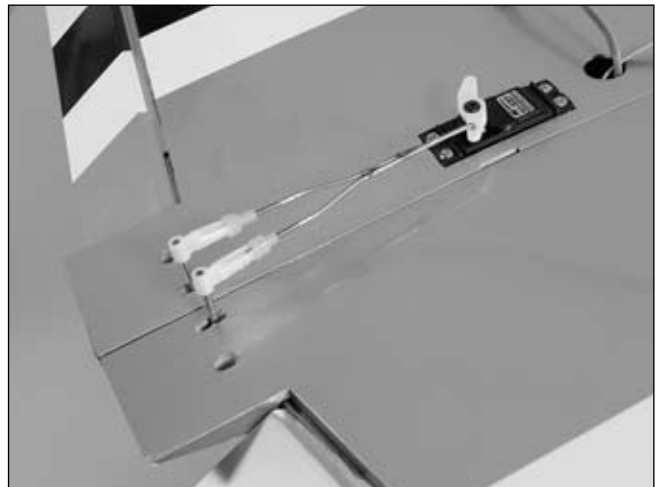
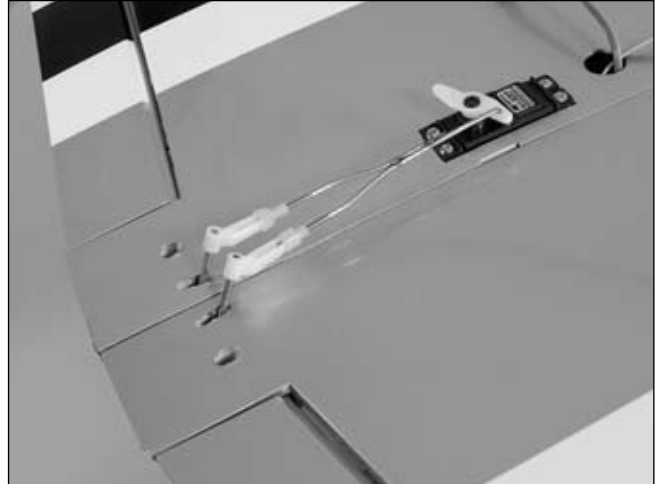
### □ Step 7

Turn on your radio system. Move the control on the transmitter to the up position. Attach the servo arm and secure it with the screw provided with the servo. The servo arm should be offset towards the leading edge of the wing as shown in the photo. Attach the flap linkage to the flap servo arm.



### □ Step 8

Check the operation of the flaps from the radio system. The flaps will now move from up to a lowered position using the radio system.



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## National Model Aircraft 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 higher than approximately 400 feet within 3 miles of an airport without notifying the airport operator. I will give right-of-way and avoid flying in the proximity of full-scale aircraft. Where necessary, an observer shall be utilized to supervise flying to avoid having models fly in the proximity of full-scale aircraft.
- 3) Where established, I will abide by the safety rules for the flying site I use, and I will not willfully and deliberately fly my models in a careless, reckless and/or dangerous manner.
- 4) The maximum takeoff weight of a model is 55 pounds, except models flown under Experimental Aircraft rules.
- 5) I will not fly my model unless it is identified with my name and address or AMA number, on or in the model. (This does not apply to models while being flown indoors.)
- 6) I will not operate models with metal-bladed propellers or with gaseous boosts, in which gases other than air enter their internal combustion engine(s); nor will I operate models with extremely hazardous fuels such as those containing tetranitromethane or hydrazine.

- 7) I will not operate models with pyrotechnics (any device that explodes, burns, or propels a projectile of any kind) including, but not limited to, rockets, explosive bombs dropped from models, smoke bombs, all explosive gases (such as hydrogen-filled balloons), or ground mounted devices launching a projectile. The only exceptions permitted are rockets flown in accordance with the National Model Rocketry Safety Code or those permanently attached (as per JATO use); also those items authorized for Air Show Team use as defined by AST Advisory Committee (document available from AMA HQ). In any case, models using rocket motors as a primary means of propulsion are limited to a maximum weight of 3.3 pounds and a G series motor. (A model aircraft is defined as an aircraft with or without engine, not able to carry a human being.)
- 8) I will not consume alcoholic beverages prior to, nor during, participation in any model operations.
- 9) Children under 6 years old are only allowed on the flight line as a pilot or while receiving flight instruction.

### RADIO CONTROL

- 1) I will have completed a successful radio equipment ground range 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) At all flying sites a straight or curved line(s) must be established in front of which all flying takes place with the other side for spectators. Only personnel involved with flying the aircraft are allowed at or in the front of the flight line. Intentional flying behind the flight line is prohibited.
- 4) I will operate my model using only radio control frequencies currently allowed by the Federal Communications Commission. (Only properly licensed Amateurs are authorized to operate equipment on Amateur Band frequencies.)

# 2006 Official AMA

## National Model Aircraft Safety Code

- 5) Flying sites separated by three miles or more are considered safe from site-to site interference, even when both sites use the same frequencies. Any circumstances under three miles separation require a frequency management arrangement, which may be either an allocation of specific frequencies for each site or testing to determine that freedom from interference exists. Allocation plans or interference test reports shall be signed by the parties involved and provided to AMA Headquarters. Documents of agreement and reports may exist between (1) two or more AMA Chartered Clubs, (2) AMA clubs and individual AMA members not associated with AMA Clubs, or (3) two or more individual AMA members.
- 6) For Combat, distance between combat engagement line and spectator line will be 500 feet per cubic inch of engine displacement. (Example: .40 engine = 200 feet.); electric motors will be based on equivalent combustion engine size. Additional safety requirements will be per the RC Combat section of the current Competition Regulations.
- 7) At air shows or model flying demonstrations, a single straight line must be established, one side of which is for flying, with the other side for spectators.
- 8) With the exception of events flown under AMA Competition rules, after launch, except for pilots or helpers being used, no powered model may be flown closer than 25 feet to any person.
- 9) Under no circumstances may a pilot or other person touch a powered model in flight.

### **Organized RC Racing Event**

- 10) An RC racing event, whether or not an AMA Rule Book event, is one in which model aircraft compete in flight over a prescribed course with the objective of finishing the course faster to determine the winner.
- A. In every organized racing event in which contestants, callers and officials are on the course:
1. All officials, callers and contestants must properly wear helmets, which are OSHA, DOT, ANSI, SNELL or NOCSAE approved or comparable standard while on the racecourse.
  2. All officials will be off the course except for the starter and their assistant.
  3. "On the course" is defined to mean any area beyond the pilot/staging area where actual flying takes place.
- B. I will not fly my model aircraft in any organized racing event which does not comply with paragraph A above or which allows models over 20 pounds unless that competition event is AMA sanctioned.
- C. Distance from the pylon to the nearest spectator (line) will be in accordance with the current Competition Regulations under the RC Pylon Racing section for the specific event pending two or three pylon course layout.
- 11) RC night flying is limited to low-performance models (less than 100 mph). The models must be equipped with a lighting system that clearly defines the aircraft's attitude at all times.



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