

# Jackal 50 ARF

Assembly Manual



**HANGAR 9<sup>®</sup>**

*Fly First Class<sup>™</sup>*

## Notice

All instructions, warranties and other collateral documents are subject to change at the sole discretion of Horizon Hobby, Inc. For up-to-date product literature, visit <http://www.horizonhobby.com> and click on the support tab for this product.

## Meaning of Special Language

The following terms are used throughout the product literature to indicate various levels of potential harm when operating this product:

**NOTICE:** Procedures, which if not properly followed, create a possibility of physical property damage AND a little or no possibility of injury.

**CAUTION:** Procedures, which if not properly followed, create the probability of physical property damage AND a possibility of serious injury.

**WARNING:** Procedures, which if not properly followed, create the probability of property damage, collateral damage, and serious injury OR create a high probability of superficial injury.



**WARNING:** Read the ENTIRE instruction manual to become familiar with the features of the product before operating. Failure to operate the product correctly can result in damage to the product, personal property and cause serious injury.

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. Do not attempt disassembly, use with incompatible components or augment product in any way without the approval of Horizon Hobby, Inc. This 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 serious injury.

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## Intro

The Jackal 50 ARF is a Mike McConville design capable of reaching speeds in excess of 100 mph when using an engine in the .50-.60 cu. in. range on a stock muffler. We highly recommend the use of the Evolution® 60NX engine and performance muffler (EVOM1) combination, as this really allows the Jackal to perform to its fullest potential and reach speeds in excess of 120 mph.. The removable top hatch allows access to the radio equipment while the 2-piece wing allows for easy transport. The optional Pneumatic Robart Retracts (HAN502) provide additional performance and jet-like good looks.

## Product Support

For technical assistance with this product, please contact the appropriate Horizon Product Support office. See page 60.

## Specifications

Wingspan	63.0 in (160cm)
Length	56.0 in (142cm)
Wing Area	690 sq in (44.5 sq dm)
Weight	7.50–8.25 lb (3.40–3.80 kg)
Radio	5-channel (or greater) with 7 servos (6-channel or greater with 8–9 servos if using retracts)
Engine	.52–.60 2-stroke (small-case engine required)

## Included Parts Listing

### PACKAGED INDIVIDUALLY LARGE BAGS

Fuselage with rudder, canopy hatch	1
Right wing with aileron and flap	1
Left wing with aileron and flap	1
Cowling and clear cowl template	1
Right horizontal stabilizer with elevator and hinges	1
Left horizontal stabilizer with elevator and hinges	1
Rear tail hatch	1
Fiberglass inlets left and right	2

### FUSELAGE

2-56 Nylon clevis	3	Elevator (2) Rudder (1)
2mm white nylon clevis	1	Throttle
Silicone safety tubing	4	Elevator (2) Rudder (1) Throttle (1)
4-40 x 1-inch socket head cap screw	3	Rear elevator hatch to fuselage
#4 Black flat washers	3	Rear elevator hatch to fuselage
#4 lock washer	3	Rear elevator hatch to fuselage
Brass pushrod connector with setscrews	1	Throttle
4-40 x 3/8-inch chrome button head screw	4	Cowling to fuselage
Nylon torque link	3	Rudder (1) Elevator (2)
3mm x 8mm washer head wood screw	2	Inlet cheeks
1.7mm x 6mm washer head wood screw	2	Inlet cheeks
Servo extension safety clips	2	Elevator & receiver battery

### WING

Aileron and flap servo covers	2	Left and right wing servos
17mm x 12mm x 10mm servo mounting blocks	8	Aileron and flaps
1.7mm x 6mm washer headed wood screws	12	Servo covers to wing
2-56 Nylon clevis	4	Aileron and flaps
Silicone safety tubing	4	Aileron and flaps
Wood & nylon brackets	2	Fixed flap stay
2.0mm x 15mm washer head wood screw	4	Fixed flap stay
4-40 x 5/8-inch socket head cap screw	2	Wing attachment
#4 black washers	2	Wing attachment
#4 lock washers	2	Wing attachment
3mm wood plates	2	Retract air line

### LANDING GEAR

Landing gear base mount with setscrews	3	Fixed gear
Main gear struts with 4mm wire	2	Fixed gear
Nose gear strut with 4mm wire	1	Fixed gear
Nose gear steering arm with setscrew	1	Fixed gear
#6 x 1-inch wood screws	12	Landing gear mount
Hangar 9 Pro-Lite 2 1/2-inch (63.5mm) wheel	2	Main gear
Hangar 9 Pro-Lite 2 1/4-inch (57mm) wheel	1	Nose gear

4mm wheel collars with setscrews	7	Wheel axles (6) nose wheel strut (1)
Wood mount	4	Retract valve mount
Nylon clevis	1	Retract
Safety tubing	1	Retract
2-56 x 2-inch (50mm) Pushrod	1	Retract
Wood adapter plate	1	Air retract servo mount
11mm x 7mm x 48mm blocks	2	Nose gear mount spacer
3mm x 8mm washer head wood screw	2	Retract valve mount

### ENGINE MOUNT

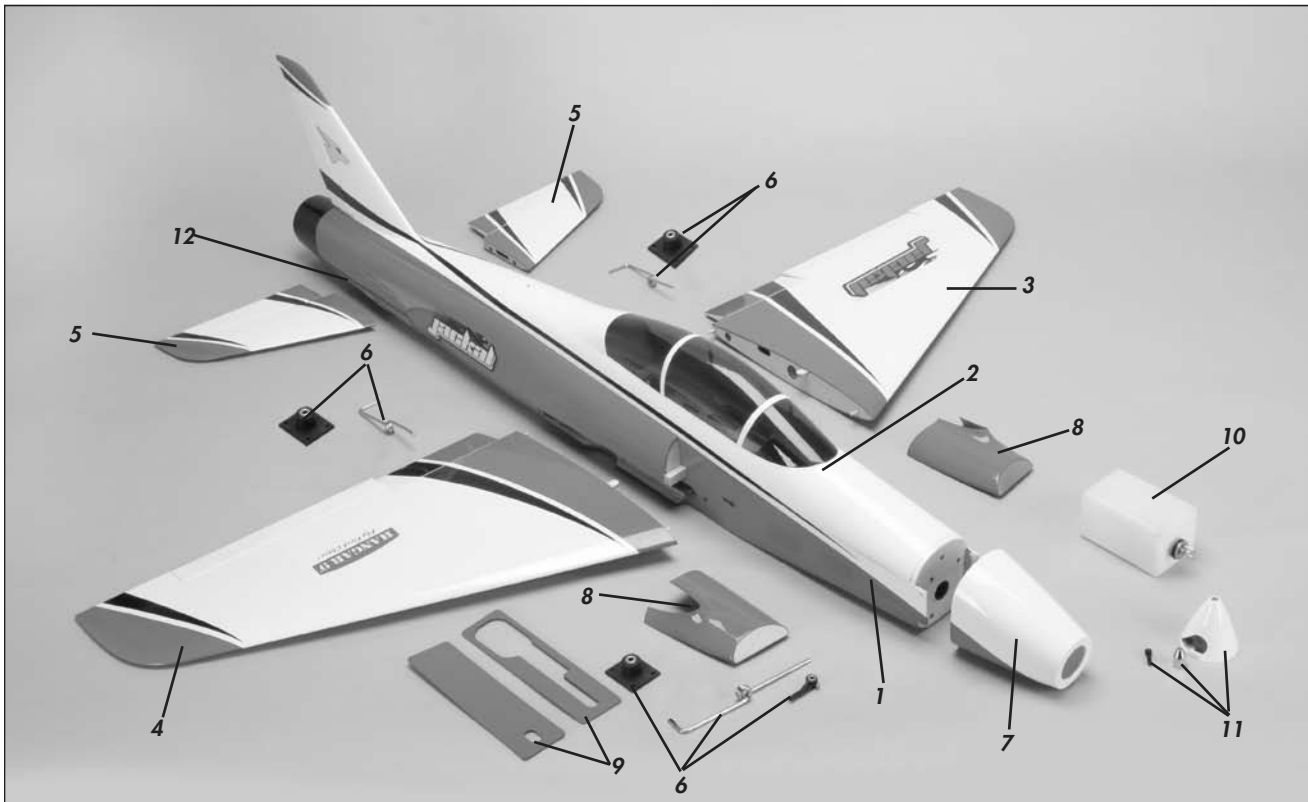
Small black nylon motor mounts	2	
8-32 x 3/4-inch socket head cap screws	4	Engine mount to firewall
#8 silver flat washers	4	Engine mount to firewall
6-32 x 1-inch socket head cap screw	4	Engine to mount
#6 silver flat washers	4	Engine to mount
6-32 nylon inserted lock nuts	4	Engine to mount

### PUSHRODS

Elevator torque rods	2	Left and right elevator
2-56 x 4 1/2-inch (114 mm) pushrod split end	1	Elevator
2-56 x 17 1/8-inch (435 mm) pushrod "Z" bend	1	Rudder
2-56 x 15 1/4-inch (387 mm) pushrod	1	Mechanical nose retract
2-56 x 6 1/2-inch (165mm) pushrod	2	Mechanical main gear retract
2mm x 31-inch (787 mm) pushrod	1	Throttle
2-56 x 2-inch (50 mm) pushrod	2	Flaps
2-56 x 3-inch (75 mm) pushrod	2	Ailerons
Small pushrod connector with setscrew & retainer	2	Nose wheel steering
Pull/Pull cable, 42-inch (1070mm)	1	Nose wheel steering
2-56 nut	3	Mechanical retracts
5/16-inch (8mm) copper tubes	4	Nose wheel steering crimps
Wire Pull/Pull cable end loops	2	Steering cables to the servo
8 5/8-inch (218mm) Nylon pushrod housing	1	Nose wheel mechanical retract

### MISC

Cockpit floor	1	Access to cockpit
13 9/16 x 3/4-inch anodized black aluminum tube	1	Wing tube
10 3/8 x 5/16-inch anodized black aluminum tube	1	Horizontal stabilizer
5 3/4 x 5/16-inch anodized black aluminum tube	1	Horizontal stabilizer
1.5mm x 6mm washer headed wood screws	12	Cockpit floor and nose wheel cover
400cc 14 oz preplumbed fuel tank	1	Glow fuel tank
11 1/2 x 3/4-inch hook and loop straps	4	Battery receiver and fuel tank
Nose wheel fuselage plate	2	Retract (1) Fixed gear (1)
Decals	1	
Instruction manual	1	



## Contents of Kit and Parts Listing

1.	HAN488001	Fuselage with Hatch and Canopy	<b>Items not shown</b>	
2.	HAN488002	Fuselage Hatch and Canopy	HAN488010	Anodized Aluminum Wing Tube
3.	HAN488003	Left Wing Panel	HAN488011	Pushrod Set
4.	HAN488004	Right Wing Panel	HAN488012	Decal Set
5.	HAN488005	Stabilizer and Elevator	HAN488014	Wood Trays and Hatches
6.	HAN488006	Fixed Landing Gear without Wheels	HAN488015	Aluminum Stabilizer Tubes
7.	HAN488007	Cowl	HAN488016	Steering Cables
8.	HAN488008	Fiberglass Inlets	HAN488017	Engine Mount
9.	HAN488009	Nose Wheel Cover Plate	HAN488018	Complete Hardware Package
10.	HAN488013	14 oz (400cc)	HAN488021	Cockpit Floor
11.	HAN488019	Painted White 2½-inch (63.5mm) Aluminum Spinner	HAN303	2¼-inch (57mm) Hangar 9 Wheels
12.	HAN488020	Rear Fuselage Hatch	HAN304	2½-inch (63mm) Hangar 9 Wheels

## Safety Precautions and Warnings

Read and follow all instructions and safety precautions before use. Improper use can result in fire, serious injury and damage to property.

### COMPONENTS

Use only with compatible components. Should any compatibility questions exist please refer to the product instructions, the component instructions or contact Horizon Hobby, Inc.

### FLIGHT

Fly only in open areas to ensure safety. It is recommended flying be done at AMA (Academy of Model Aeronautics) approved flying sites. Consult local ordinances before choosing a flying location.

### PROPELLER

Keep loose items that can get entangled in the propeller away from the prop, including loose clothing, or other objects such as pencils and screwdrivers. Especially keep your hands away from the propeller as injury can occur.

### BATTERIES

#### Notes on Lithium Polymer Batteries

When used improperly, lithium polymer batteries are significantly more volatile than alkaline or Ni-Cd/Ni-MH batteries used in RC applications. Always follow the manufacturer's instructions when using and disposing of any batteries. Mishandling of Li-Po batteries can result in fire and explosion causing serious injury and damage.

### SMALL PARTS

This kit includes small parts and should not be left unattended near children as choking and serious injury could result.

## Safe Operating Recommendations

- Inspect your model before every flight to make certain it is airworthy.
- Be aware of any other radio frequency user who may present an interference problem.
- Always be courteous and respectful of other users of your selected flight area.
- Choose an area clear of obstacles and large enough to safely accommodate your flying activity.
- Make certain this area is clear of friends and spectators prior to launching your aircraft.
- Be aware of other activities in the vicinity of your flight path that could cause potential conflict.
- Carefully plan your flight path prior to launch.
- Abide by any and all established AMA National Model Aircraft Safety Code.

## Important Information Regarding Warranty

Please read our Warranty and Liability Limitations section on page 59 before building this product. 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.

## Using the Manual

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 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.

## UltraCote® Covering Colors

- |            |         |
|------------|---------|
| • White    | HANU870 |
| • True Red | HANU866 |
| • Black    | HANU874 |

## Recommended Setup—2-Stroke Glow

- Evolution® .60NX with Muffler (EVOE0600)
- APC 10 x 7 (APC10070)
- Evolution High-Performance Muffler (EVOM1)
- Super plug (HAN3011)

## Transmitter Requirements

This model requires a minimum of a 6-channel radio to operate all the functions of your aircraft. We suggest the following radio systems available through Horizon Hobby or your local hobby distributor.

Spektrum DX6i	SPM6600
JR® Systems X9503 2.4GHz	JRP2930
JR Systems 12X 2.4GHz	JRP1200

## Radio Equipment Requirements

The following items are recommended when installing the 7-Channel AR7000 (SPM6070) or 9-Channel AR9000 receiver (SPMAR9000) in your aircraft:

DS821 Digital Sport Servo (3)	JRPS821
MN48 Mini Servo (2–4)	JSP20040
9-inch Servo Extension (Receiver Battery)	JRPA097
12-inch Servo Extension (4) (Ailerons/Flaps)	JSP98030
24-inch Servo Extension (Elevator)	JSP98040
Receiver Pack 2300mAh 6V Ni-MH	JRPB5006
JR Chargeswitch	JRPA004
Y-harness (Ailerons, 6-channel only) (2)	JSP98020

### Ailerons: MN48 Servo (2)

- 12-inch Extension (plugged into receiver) (2)
- Y-harness (if using 7-channel radio or less)

### Optional Flaps: MN48 Servo (2)

- 12-inch Extension (plugged into receiver) (2)
- Y-harness (if using 6-channel radio or less)

### Elevator: DS821 Servo

- 24-inch Extension (plugged into receiver)

### Rudder: DS821 Servo

### Throttle: DS821 Servo

## Optional Pilot

1/7-scale Jet Pilot (2)	HAN9128
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## Optional Pneumatic Retracts

Robart Retracts, All-Metal Progressive	HAN502
Robart Air Pump	ROB164G
DS821 Servo	JRPS821
Denatured alcohol	

## Optional Mechanical Retracts

Robart Retracts, All-Metal Progressive	HAN501
RT88 Retract Servo (2)	JSP20080
Y-harness	JSP98020
JR Heavy-Duty Servo arm	JRPA215
2-56 Quick Release Ball Link (2)	SUL560
Denatured alcohol	

## Field Equipment Required

- Fuel (15% recommended)
- Long Reach Glow Plug Wrench (HAN2510)
- Metered Glow Driver with Ni-Cd & Charger (HAN7101)
- 2-Cycle Sport Plug (EVOGP1)  
(For use with standard muffler)
- Super plug (HAN3011) (For use with high-performance muffler, EVOM1)
- Manual Fuel Pump (HAN118)

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## Optional Field Equipment

- Self-stick weights, 6 oz (HAN3626)
- PowerPro™ 12V Starter (HAN161)
- 12V 7Ah Sealed Battery (HAN102)
- Power Panel (HAN106)
- Blue Block After Run Oil (EVOX1001)
- Cleaner and towels

## Required Tools

Crimping tool	Clamps
Drill	Flat file
Hobby scissors	Light machine oil
Low-tack tape	Mixing cups
Mixing stick	Felt-tipped pen
Nut driver: 5/16-inch	Paper towels
Phillips screwdriver: #1, #2	Pencil
Pin vise	Rotary tool
Cutoff wheel	Sanding drum
Rubbing alcohol	Ruler
Side cutter	String
Toothpicks	T-pins
Petroleum jelly	Epoxy brush
Medium grit sandpaper	Clear tape
Pliers	
Needle nose pliers or hemostats	
Ball driver or hex wrench: 1.5mm, 5/64-inch, 3/32-inch, 7/64-inch, 1/8-inch, 4mm	
Drill bit: 1/16-inch (1.5mm), 5/64-inch (2mm), 3/32-inch, 7/64-inch (2.5mm), 1/8-inch (3mm), 9/64-inch (3.5mm), 3/16-inch (5mm)	

## Required Adhesives

Medium CA	(PAAPT02)
Thin CA	(PAAPT08)
Threadlock	(PAAPT42)
30-Minute Epoxy, 8 oz	(PAAPT39)
Zap-A-Dap-A-Goo similar or flexible adhesive	

## Before Starting Assembly

Before beginning the assembly of your model, 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**

## Elevator and Stabilizer Assembly

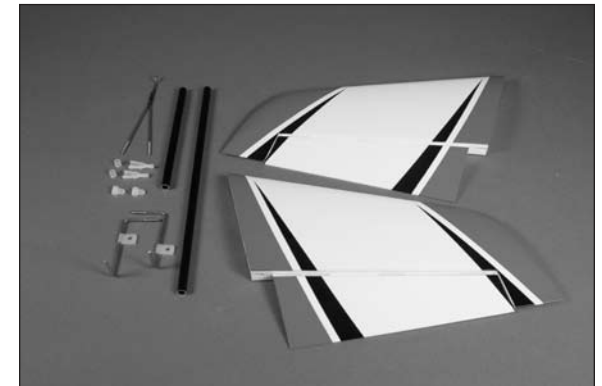
### Required Parts

Stabilizer hatch cover	
Clevis (2)	Nylon torque rod horn (2)
Silicone clevis keeper (2)	Split pushrod wire
Elevator torque rod (right and left)	
Stabilizer/elevator assembly (right and left)	
5/16 x 10 <sup>3</sup> / <sub>8</sub> -inch (8mm x 263mm) anodized tube	
5/16 x 5 <sup>3</sup> / <sub>4</sub> -inch (8mm x 146mm) anodized tube	

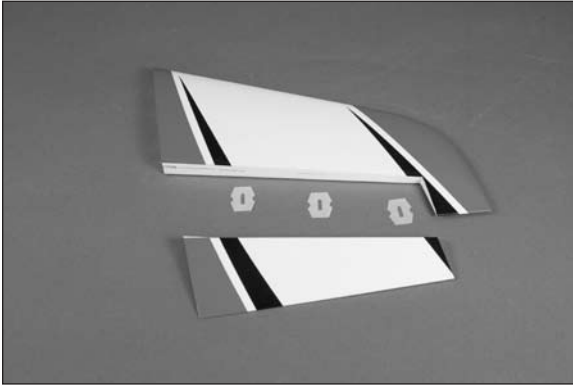
### Required Tools and Adhesives

Thin CA	30-minute epoxy
Mixing cups	Mixing sticks
Rubbing alcohol	Paper towels
Toothpicks	Low-tack tape
T-pins	Pin vise
Petroleum jelly	Phillips screwdriver: #1
Medium grit sandpaper	Ruler
Medium grit sandpaper	Pliers
Hobby knife with #11 blade	Side cutters
Clear tape	Receiver
Transmitter	Receiver battery
Drill bit: 1/16-inch (1.5mm), 5/64-inch (2mm)	

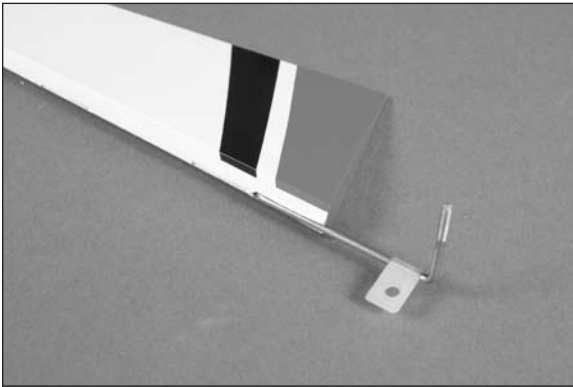
1. Locate the items for the elevator and stabilizer assembly. You will also need to remove the stabilizer hatch cover from the fuselage at this time.



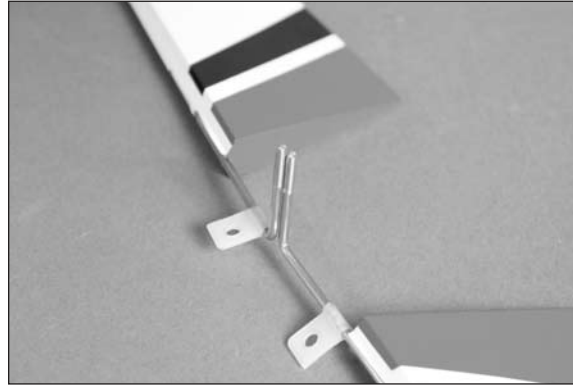
- 2. Separate the elevator and stabilizer. Set the three hinges aside at this time. Prepare the left and right stabilizer and elevator at this time.



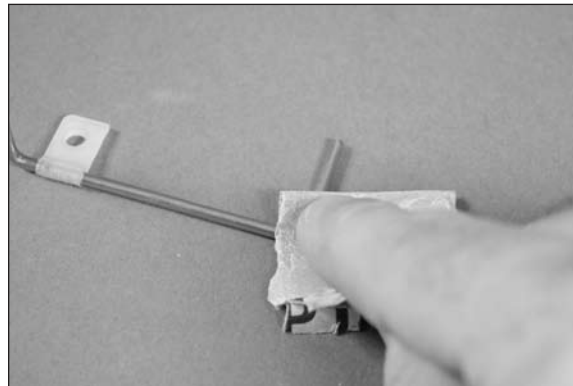
- 3. Insert the elevator torque rod into the elevator. The rod will fit tightly in the slot as shown. Note that the threaded section of the torque rod faces to the top of the elevator.



- 4. Insert the torque rod in the remaining elevator. With both elevators flat on your work surface, check to make sure the threaded sections of the rods are parallel. If not, slightly bend one of the torque rods until they are parallel. Not checking the torque rods will result in uneven throw and undesirable flight characteristics.

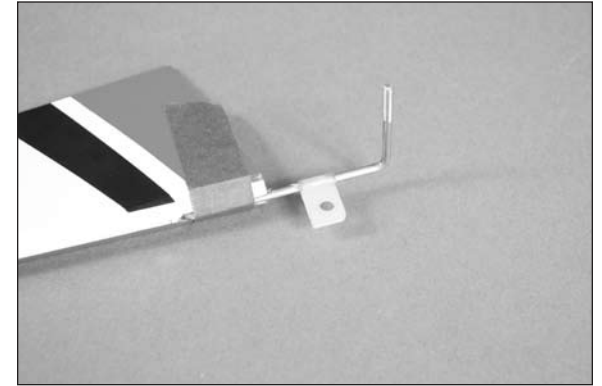


- 5. Once the torque rods are aligned, remove them from the elevators. Use medium grit sandpaper to scuff the wire where it contacts the elevator.

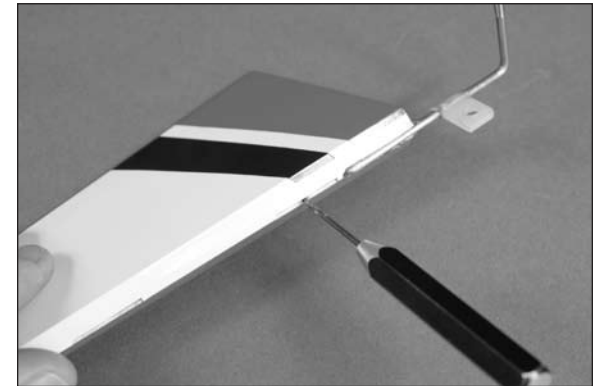


- 6. Use 30-minute epoxy to glue the torque rod to the elevator. Use a toothpick to force the epoxy into the hole in the leading edge of the elevator. Use low-tack tape to hold the torque rod in position until the epoxy fully cures. Glue the torque rods in both elevator halves at this time.

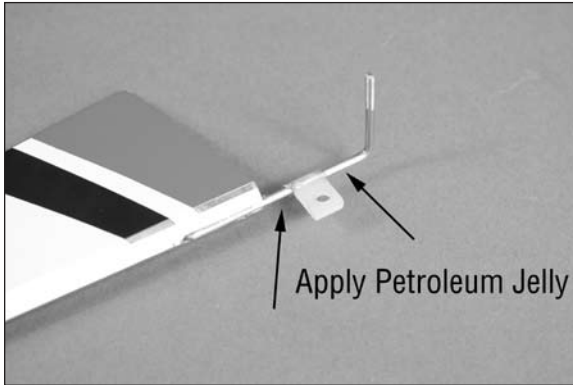
**Note:** Keep the nylon bushing slid away from the elevator to avoid getting epoxy in the bushing.



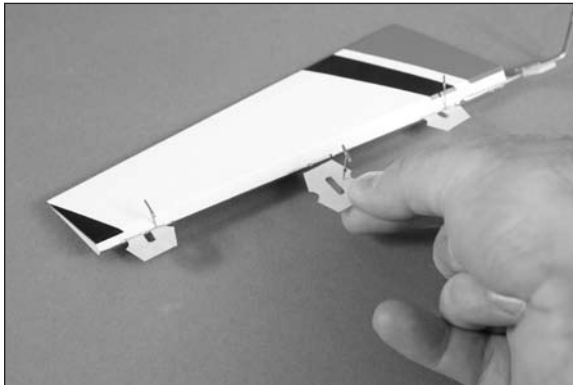
- 7. Use a pin vise and 1/16-inch (1.5mm) drill bit to drill a hole in the center of each hinge slot. This creates a tunnel for the CA to wick into, creating a better bond between the hinge and surrounding wood. Prepare both elevators and stabilizers at this time.



- 8. Apply a small amount of petroleum jelly to either side of the bushing. Work the lubricant into the bushing to help prevent epoxy from entering it when gluing the bushing to the stabilizer.

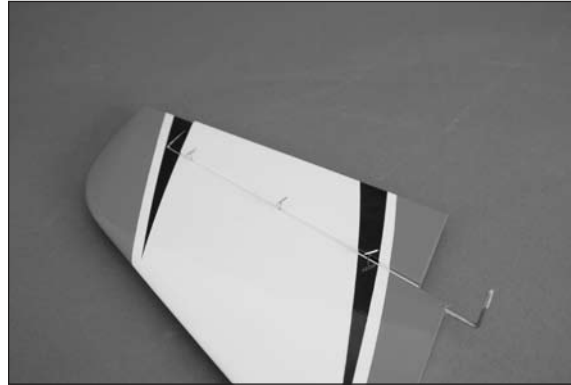


- 9. Place a T-pin in the center of three hinges. Insert the hinges into the elevator as shown.

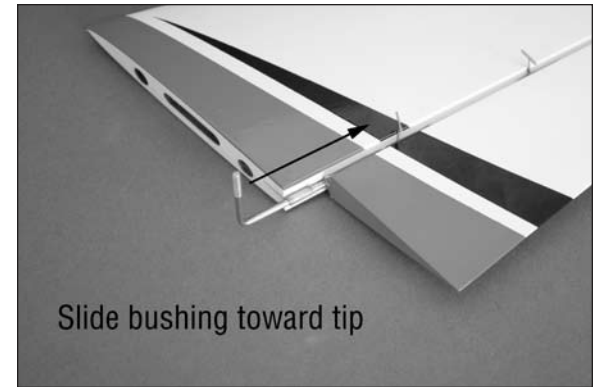
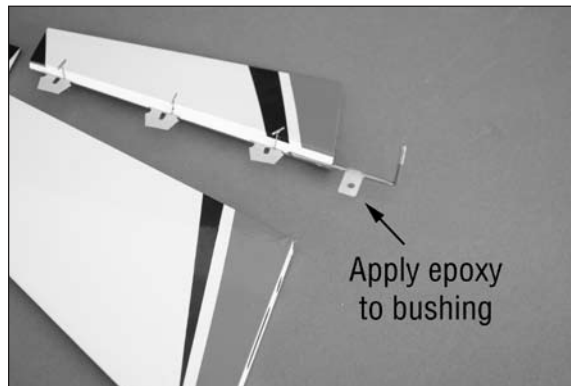


**Important:** Hinge only one elevator to the stabilizer at this time. The remaining stabilizer/elevator must be left unhinged.

- 10. Check the fit of the elevator to the stabilizer. The elevator should fit tightly against the stabilizer.

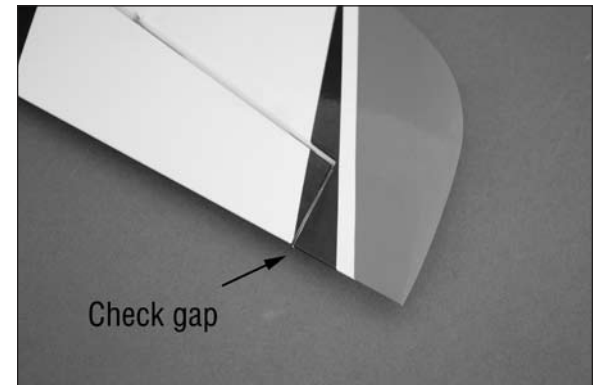


- 11. Separate the elevator from the stabilizer. Attach the elevator to the stabilizer by mixing a small amount of 30-minute epoxy and applying it to the nylon bushing to secure the bushing to the stabilizer. Make sure to slide the nylon torque rod bushing as close to the elevator as possible.



**Important:** Make sure the bushing does not extend over the root edge of the stabilizer. If so, the stabilizer will not fit correctly when installed.

- 12. Remove the T-pins from the hinges. Position the elevator so there is a 1/16-inch (1mm) gap between the tip of the elevator and stabilizer. Saturate each of the hinges on both the top and bottom of the hinge. Set the assembly aside to cure.

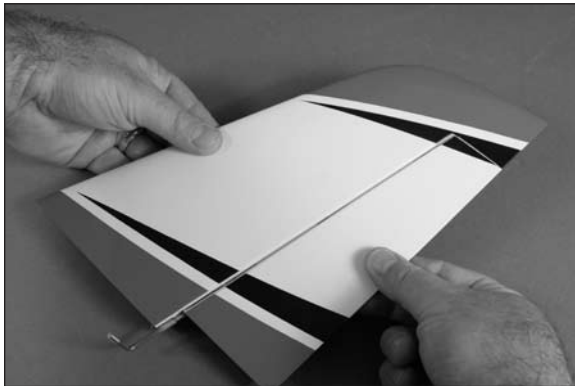




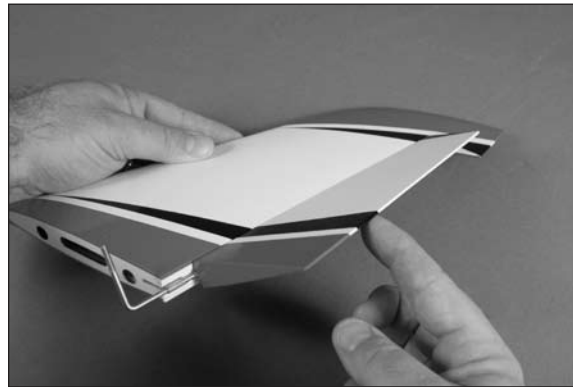


**Important:** Allow the CA to cure WITHOUT using CA accelerator. This is necessary to allow the CA to soak into the hinge, creating the best bond between the hinge and surrounding wood.

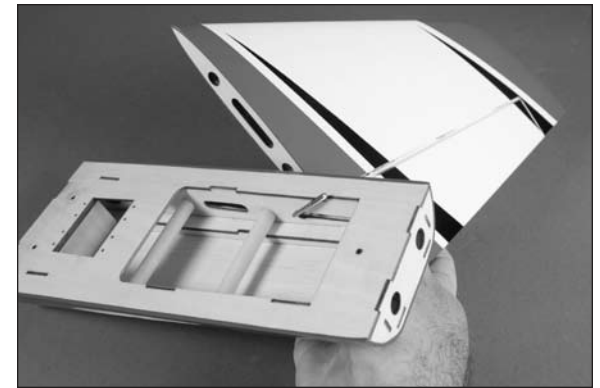
☐ 13. Once the CA and epoxy has cured, check that all the hinges are secure by gently trying to separate the elevator from the stabilizer. If any hinges are loose, re-apply CA to the loose hinges.



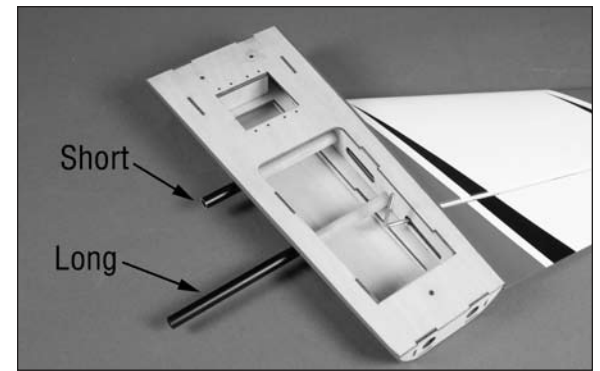
☐ 14. Break in the hinges by working the elevator up and down a number of times.



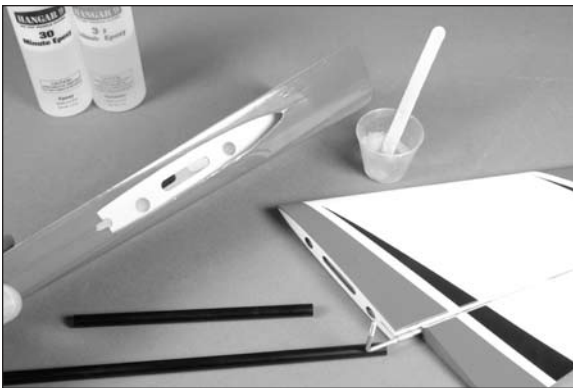
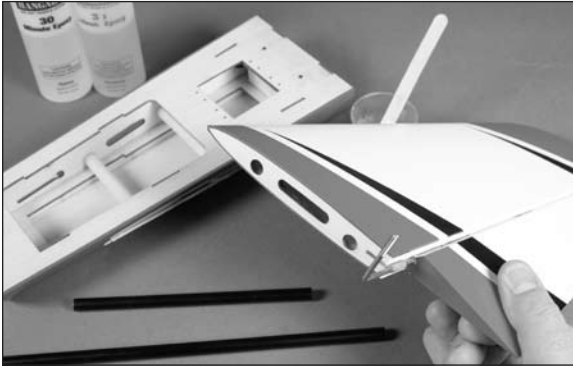
☐☐ 15. Position the stabilizer in the stabilizer hatch cover. Insert the torque rod through the slot, then rotate the stabilizer and fit it into position.



☐☐ 16. Lightly sand the stabilizer tubes using medium grit sandpaper. Use rubbing alcohol and a paper towel to remove any oil or debris from the stabilizer tubes. Slide the tubes through the stabilizer hatch. The shorter tube is near the leading edge.



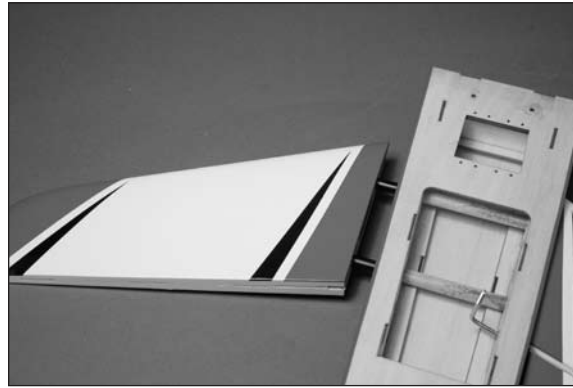
□ 17. Now that the fit has been established, use 30-minute epoxy to glue the stabilizer to the hatch, and the tubes in the stabilizer. Disassemble the stabilizer, then apply epoxy in the stabilizer sockets and the exposed wood. Apply a small amount of epoxy in the tubes in the stabilizer hatch at this time as well. Repeat Steps 15 and 16 to reassemble the one stabilizer to the stabilizer hatch.



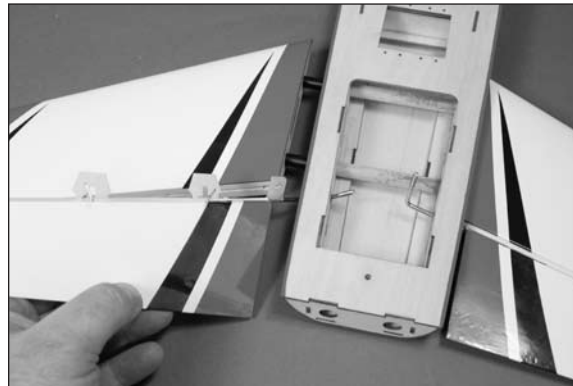
**Important:** Check to make sure there is no epoxy on the exposed tubes or base for the remaining stabilizer. If there is, use rubbing alcohol and a paper towel to remove it before it cures.

**Note:** Read through the next steps as the installation of the remaining elevator and stabilizer does take some finesse.

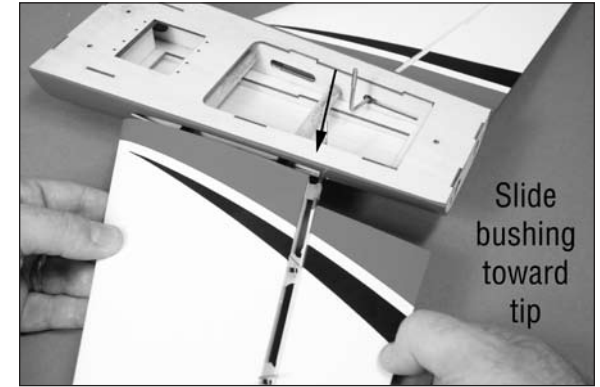
□ 18. Slide the remaining stabilizer partially on the stabilizer tubes.



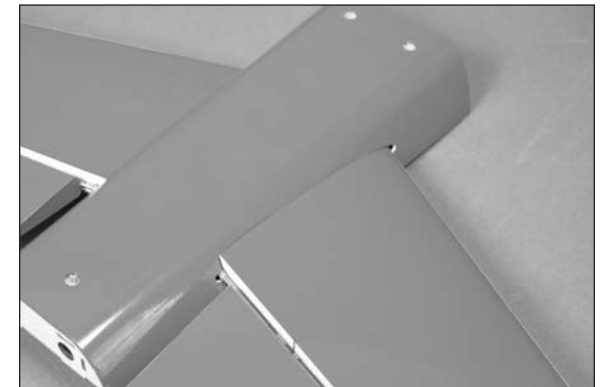
□ 19. Place a T-pin in the center of the three remaining hinges and place them in the slots in the elevator. Insert the torque rod into the stabilizer hatch.



□ 20. You will need to position the stabilizer so the bushing from the torque rod can be placed and the hinges installed. Remember the torque rod bushing must be positioned as close to the end of the elevator as possible or the stabilizer won't fit correctly.



□ 21. Slide the stabilizer into position. It may be necessary to use a hobby knife to lift the balsa on the bottom of the stabilizer hatch to allow the stabilizer to fit into position.



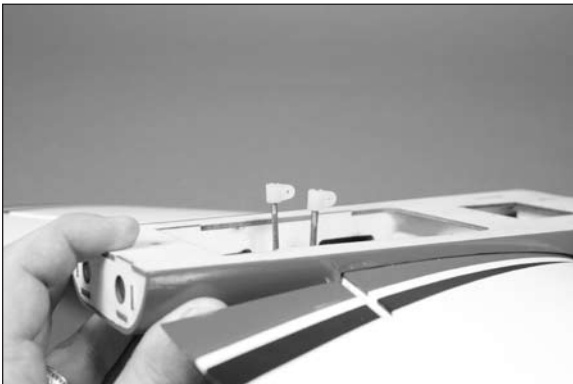
□ 22. Now that the stabilizer has been fit, we can step back and use epoxy to secure it into position. Remove the stabilizer and apply epoxy to the stabilizer tubes and to the exposed wood on the stabilizer root rib. When installing the torque rod bushing, make sure to use epoxy on the bushing and in the slot as well. Slide everything together and remove the T-pins from the hinges. Check the gap between the stabilizer and tip of the elevator so there is a 1/16-inch (1mm) gap between the two.

□ 23. Use thin CA to glue the hinges. Make sure to check and break them once the CA has fully cured.

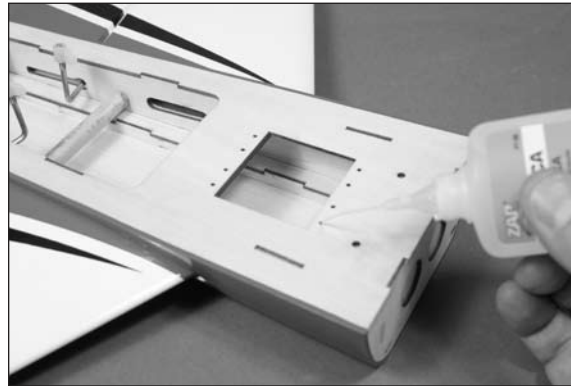
□ 24. At this time we recommend that you seal the hinge gap between the elevator and stabilizer. Use either clear covering or tape to seal the gap to prevent flutter of the control surfaces during high-speed flight.



□ 25. Thread the nylon torque rod horns on the threaded ends of the torque rods. They will be flush with the top of the threads as shown.

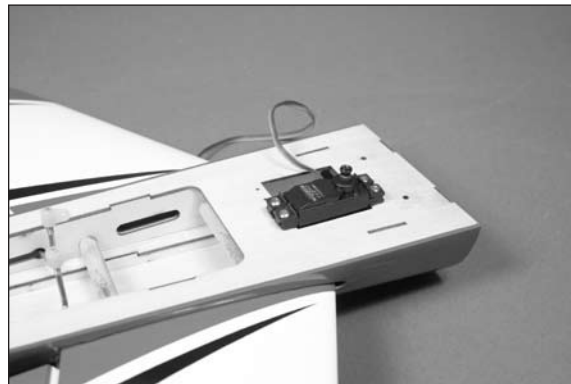


□ 26. Place 2–3 drops of thin CA in each of the four holes that will be used to mount the elevator servo. This will harden the wood, making the screws more secure.

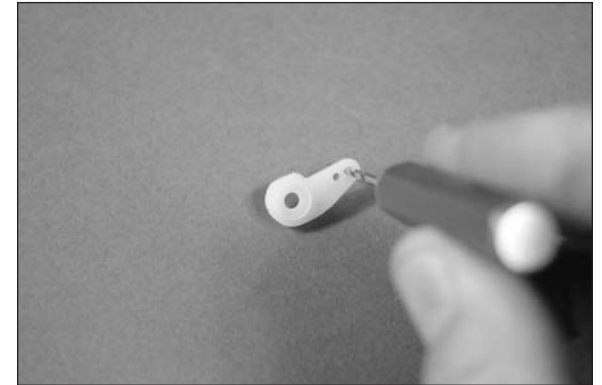


□ 27. Remove the horn from the elevator servo. Install the servo in the stabilizer hatch with the output facing away from the elevators. Use the screws included with the servo to secure it in the hatch. Make sure to install the grommets and brass eyelets before securing the servo. Use a #1 Phillips screwdriver to tighten the screws.

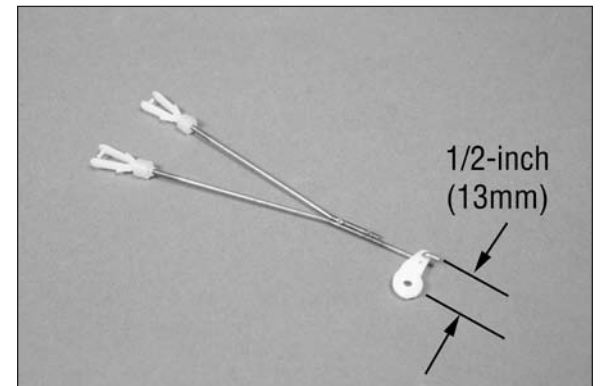
**Note:** Although there are two elevator servo positions, we DO NOT recommend using two servos. This will add too much weight to the rear of the fuselage, making it difficult to balance your model.



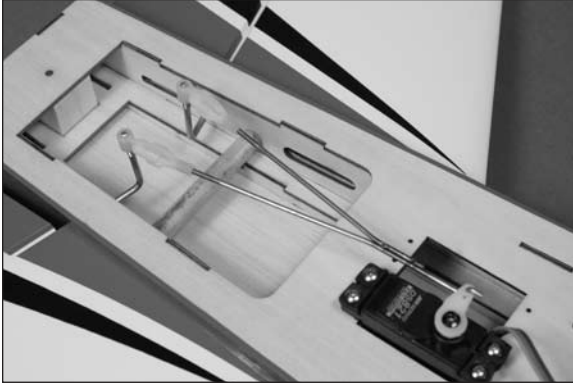
□ 28. Use a pin vise and 5/64-inch (2mm) drill bit to enlarge the hole in the servo horn. Use side cutters to remove any unused arms so they don't interfere with the operation of the servo.



□ 29. Slide a silicone clevis keeper on a clevis. Thread the clevis on the split pushrod wire. Prepare the pushrod wire with two clevises as shown. Attach the bend in the pushrod wire to a hole in the servo horn that is 1/2-inch (13mm) from the center of the horn.



□ 30. Center the elevator servo using the radio system. Attach the servo horn to the elevator servo using the screw provided with the servo. Connect the clevises to the nylon torque rod horns. It will be necessary to adjust the clevis to center both elevator halves. Once centered, slide the silicone clevis keepers over the clevises to keep them from opening accidentally.



## Rudder Linkage and Receiver Installation

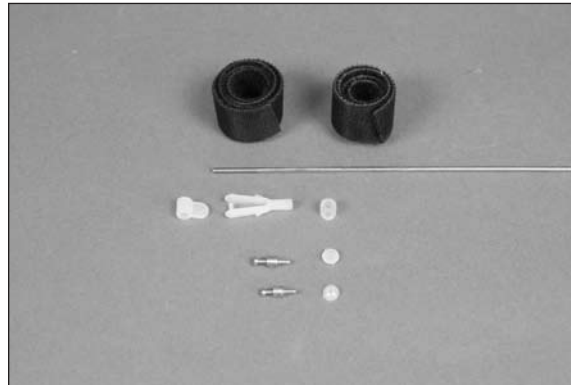
### Required Parts

Fuselage	Clevis
Silicone clevis retainer	Nylon torque rod horn
Receiver	Hook and loop strap (2)
Receiver battery	Switch harness
Transmitter	
Hook and loop tape (not included)	
17 <sup>1</sup> / <sub>8</sub> -inch (435mm) pushrod with Z-bend	
Brass pushrod connector (2)	
Nylon connector backplate (2)	
9-inch (228mm) servo extension	
1/4-inch (6mm) foam rubber (not included)	

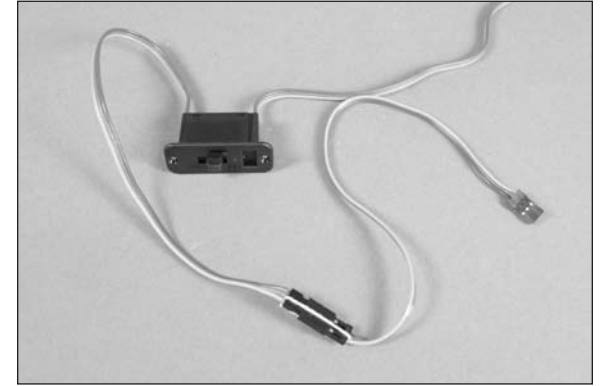
### Required Tools and Adhesives

Pin vise	Thin CA
Phillips screwdriver: #1	Side cutter
String	Ruler
Drill bit: 1/16-inch (1.5mm), 5/64-inch (2mm)	

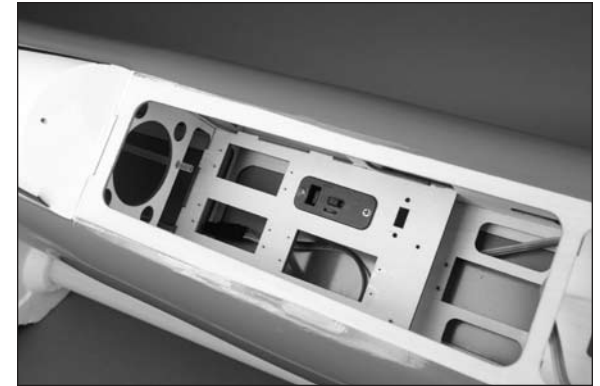
□ 1. Locate the items to install the rudder linkage and receiver. You will also need to have the fuselage and receiver battery for this section of the manual.



□ 2. Secure the 9-inch (228mm) servo extension to the switch harness lead for the battery using string or a commercially available connector.

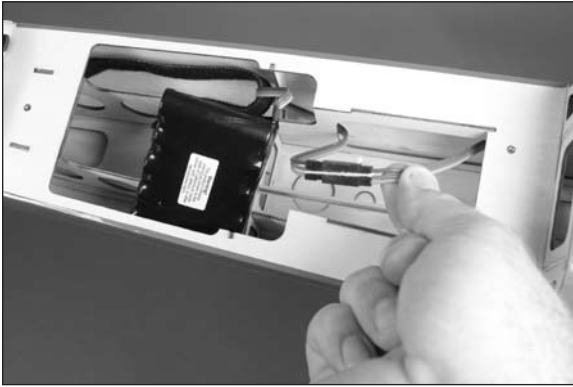


□ 3. Mount the switch in the fuselage by drilling two holes for the mounting screws using a pin vise and 1/16-inch (1.5mm) drill bit. Route the lead for the receiver under the servo tray and to the rear of the fuselage.

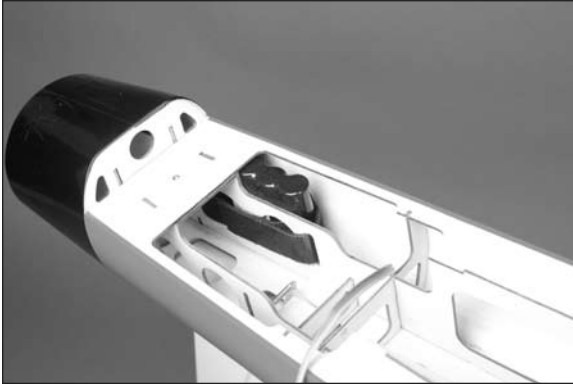


**Note:** There are additional locations and sizes of openings for switch locations in the radio tray and fuselage sides. We prefer the location shown as it can be checked visually.

- 4. Secure the 9-inch (228mm) servo extension to the battery pack lead using string or a commercially available connector.



- 5. Use a hook and loop strap to secure the receiver battery in the rear of the fuselage.

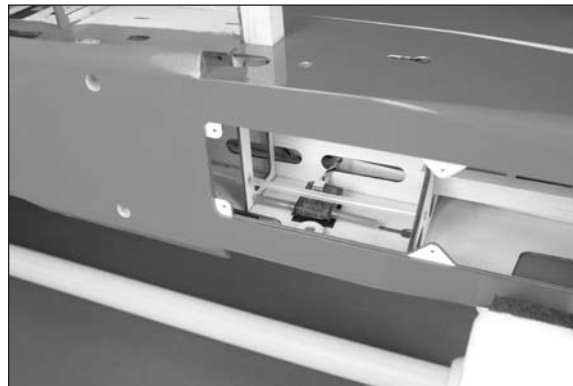


- 6. Connect the lead from the switch to the receiver. The receiver is secured in the fuselage using a hook and loop strap. Make sure to use a piece of 1/4-inch (6mm) foam between the plywood and receiver to prevent vibrations from the airframe from entering the receiver.



- 7. Use hook and loop tape (not included) to mount the remote receiver in the wheel well of the fuselage.

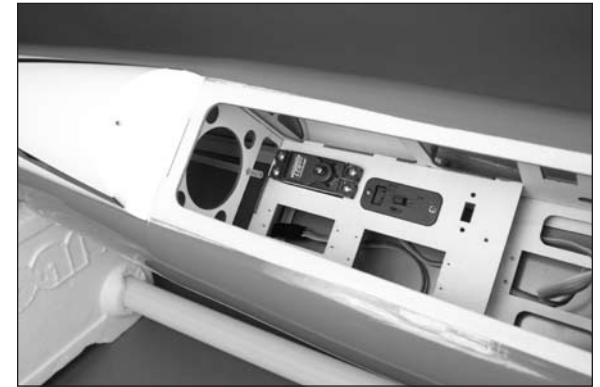
**Note:** We used short pieces of fuel tubing over the antenna of the main and remote receivers to keep them straight.



- 8. Apply 2–3 drops of thin CA in the holes for the rudder servo mounting screws.



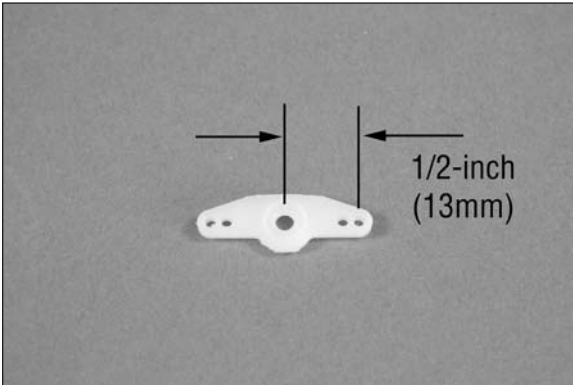
- 9. Remove the horn from the rudder servo. Use a #1 Phillips screwdriver and the screws provided with the servo to mount the rudder servo in the fuselage. Note that the output for the servo faces to the front of the fuselage.



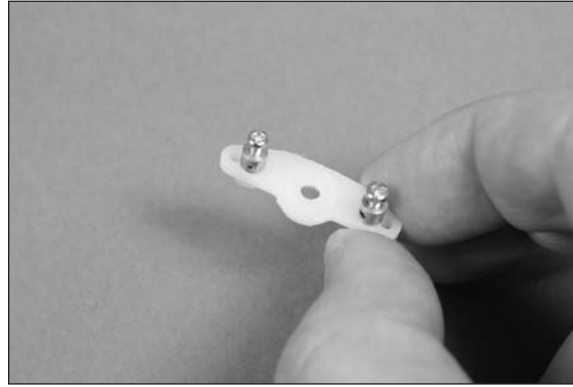
□ 10. Thread the nylon torque rod horn onto the rudder torque rod. The top of the horn will be flush with the end of the threads as shown.



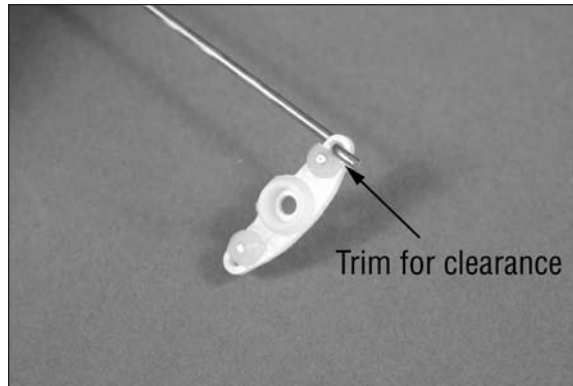
□ 11. Locate a servo horn and enlarge the holes in the arm as shown using a pin vise and 5/64-inch (2mm) drill bit. The rudder pushrod will connect to a hole in the arm that is 1/2-inch (13mm) from the center of the horn. Remove any arms from the horn that will not be used.



□ 12. Insert the brass pushrod connectors in the inner holes as shown. Use a nylon connector backplate to secure the connectors to the servo horn.



□ 13. Insert the Z-bend of the 17 1/8-inch (435mm) pushrod in the outer hole of the servo horn. You will need to trim the nylon backplate to provide clearance for the pushrod.



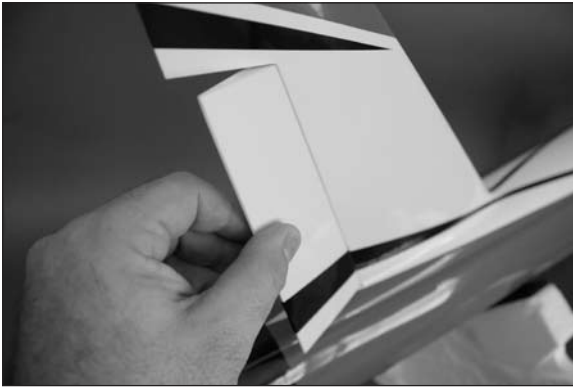
□ 14. Insert the pushrod in the rudder tube inside the fuselage. Center the rudder servo using the radio system. Secure the horn to the rudder servo using the screw previously removed.



□□ 15. Check that all the hinges are secure by gently trying to separate the rudder from the fuselage. If any hinges are loose, re-apply CA to the loose hinges.



- 16. Break in the hinges by working the rudder right and left a number of times.



- 17. Slide a silicone clevis keeper over a nylon clevis. Thread the clevis on the rudder pushrod. With the rudder servo centered, check that when the clevis is attached to the torque rod horn that the rudder is centered. Once complete, slide the silicone keeper over the forks of the clevis to prevent it from opening accidentally.



## Stabilizer Assembly Installation

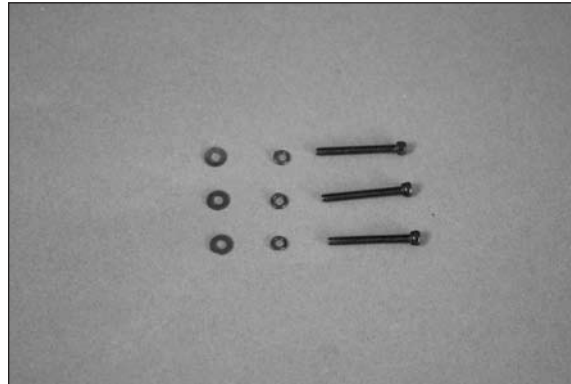
### Required Parts

- Fuselage
- #4 washer (3)
- #4 lock washer (3)
- Stabilizer/elevator assembly
- 24-inch (610mm) servo extension
- 4-40 x 1-inch socket head machine screw (3)

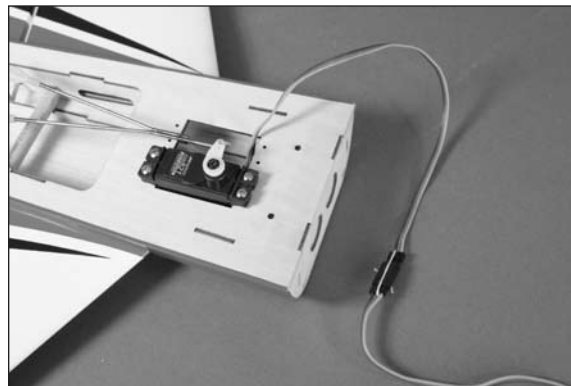
### Required Tools and Adhesives

- String
- Hex wrench or ball driver: 3/32-inch

- 1. Locate the hardware to attach the stabilizer assembly to the fuselage. You will also need the fuselage and stabilizer assembly at this time.



- 2. Use string or a commercially available connector to secure the 24-inch (610mm) servo extension to the elevator servo lead.



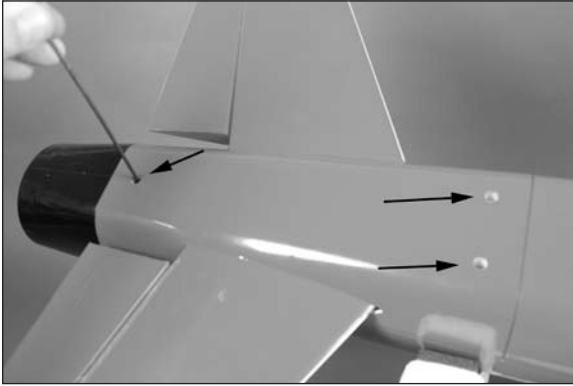
- 3. Pass the extension through the fuselage toward the receiver.



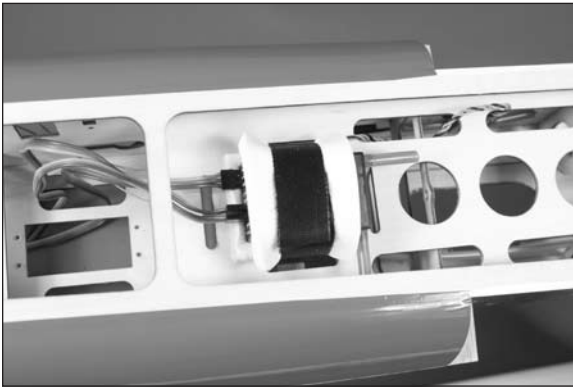
- 4. Slide a lock washer then a standard washer on the 4-40 x 1-inch socket head machine screw. Prepare all three screws at this time.



□ 5. Position the stabilizer assembly on the fuselage. Secure the assembly using the three screws prepared in the previous step. Use a 3/32-inch hex wrench or ball driver to tighten the screws. Make sure to use threadlock on the screws so they don't vibrate loose.



□ 6. Plug the extension into the elevator port of the receiver.



## Aileron Servo Installation

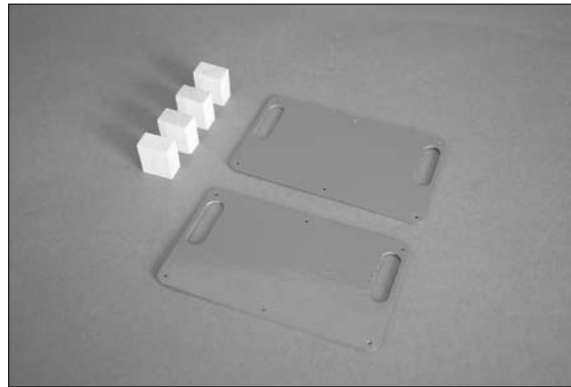
### Required Parts

Servo cover (2)	Receiver
Receiver battery	
Servo with hardware (2)	Transmitter
17mm x 12mm x 10mm servo mounting block (4)	

### Required Tools and Adhesives

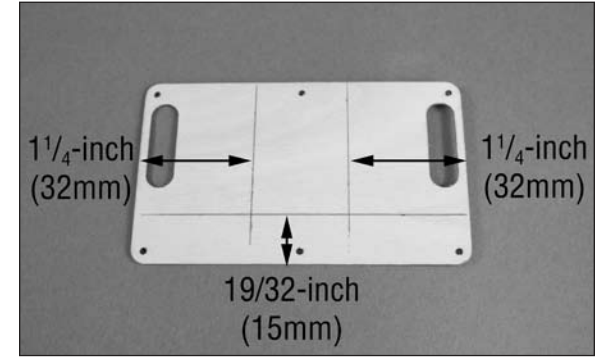
Thin CA	Medium grit sandpaper
30-minute epoxy	Mixing stick
Pencil	Side cutter
Pin vise	Drill
Ruler	Mixing cups
Drill bit: 1/16-inch (1.5mm), 5/64-inch (2mm)	

□ 1. Locate the servo covers and hardwood blocks to mount the servos to the covers.

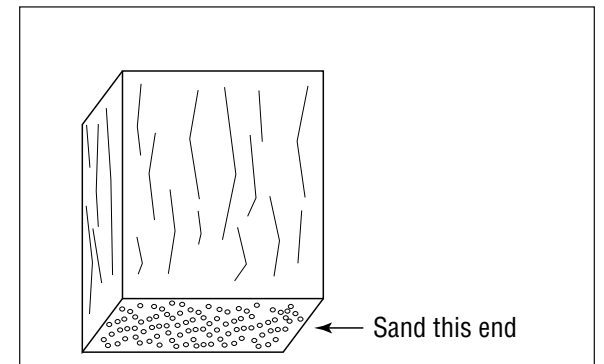
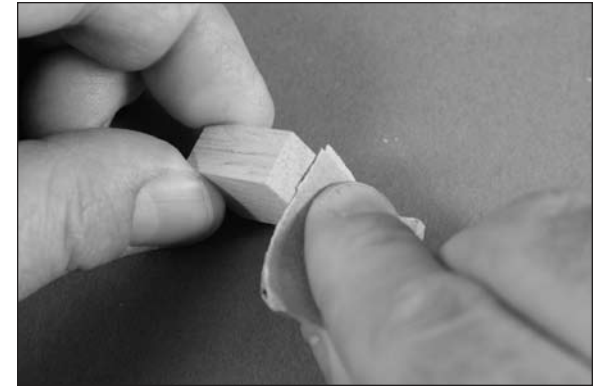


**Note:** If you are not using the recommended servos, you will need to center the servo horn in the slot in the cover and mark the location for the servo.

□□ 2. Use a pencil to draw two lines on the cover. The first line is along the bottom of the cover, 19/32-inch (15mm) from the edge. The second line is 1 1/4-inch (32mm) from the side of the cover along both sides as shown. This will center the servo horn in the slot when using the recommended servos.

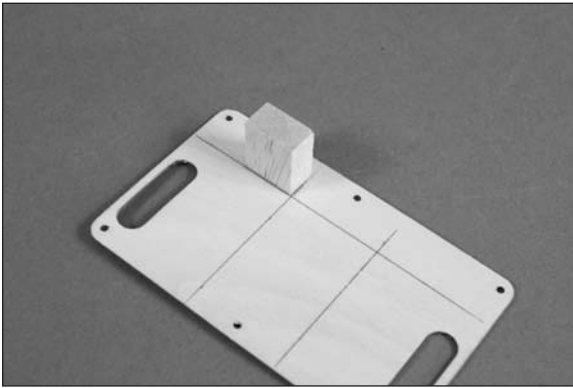


□□ 3. Lightly sand the end of the block using medium grit sandpaper. Sand the end grain as shown in the drawing.



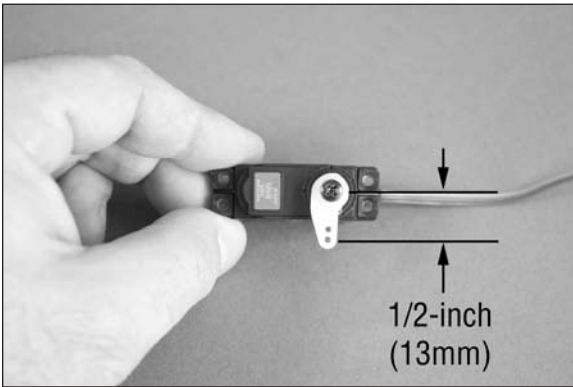


□□ 4. Use 30-minute epoxy to glue the 17mm x 12mm x 10mm hardwood block to the servo cover. Allow the epoxy to fully cure before proceeding.

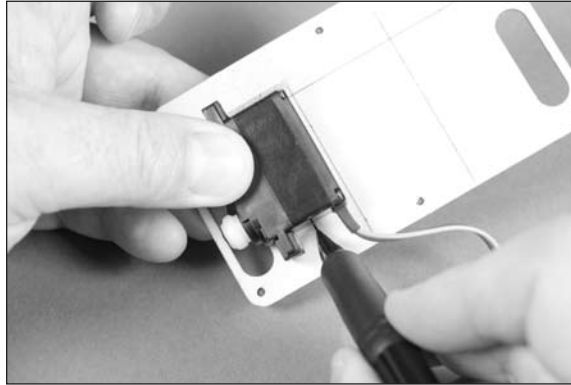


□□ 5. Repeat Steps 2 through 4 for the remaining servo cover and block.

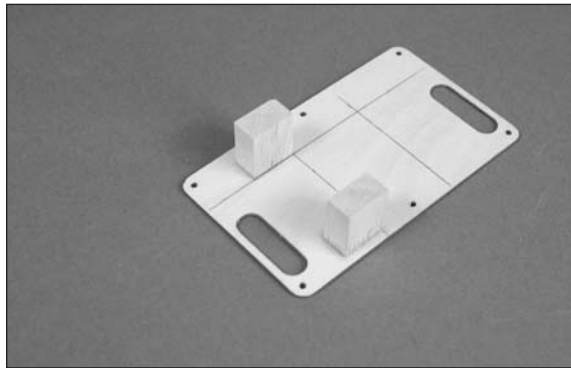
□□ 6. Prepare the aileron servo by installing the rubber grommets and brass eyelets as shown in the radio or servo instructions. Center the aileron servo using the radio system. Enlarge the hole in the servo arm using a pin vise and 5/64-inch (2mm) drill bit that is 1/2-inch (13mm) from the center of the servo horn. Use side cutters to remove any arms from the horn that may interfere with the operation of the servo.



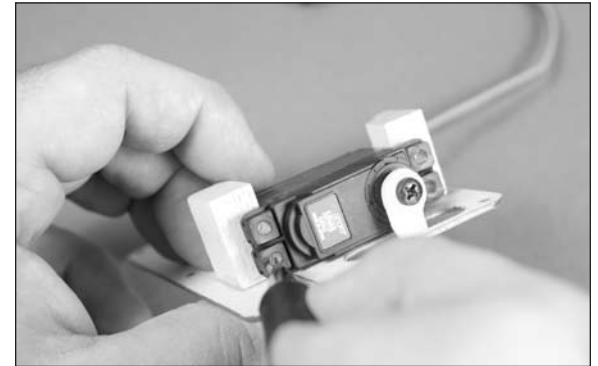
□□ 7. Position the aileron servo with the grommets resting on the first mounting block and the servo parallel to the line on the cover. Space the servo so it is not resting on the servo cover as this will cause vibrations from the airframe to be transferred to the servo. Use a pencil to mark the location for the remaining servo mounting block.



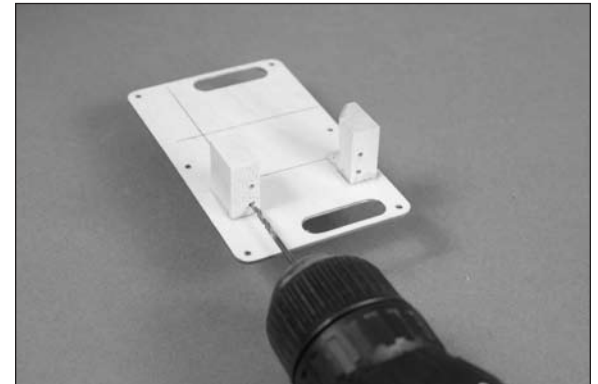
□□ 8. Use 30-minute epoxy to glue the remaining block to the cover. Don't forget to roughen the end of the block as shown in Step 3.



□□ 9. Use a pencil to mark the locations for the four servo mounting screws on the blocks.

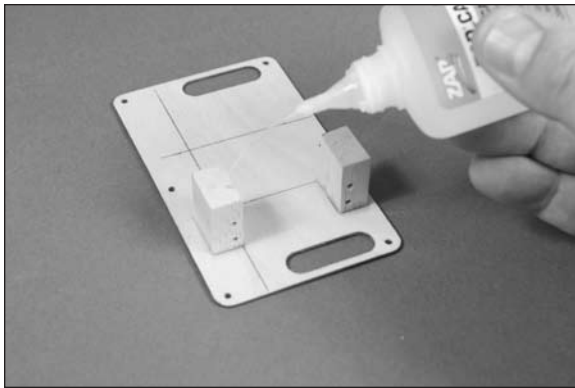


□□ 10. Use a drill and 1/16-inch (1.5mm) drill bit to drill the holes for the mounting screws.



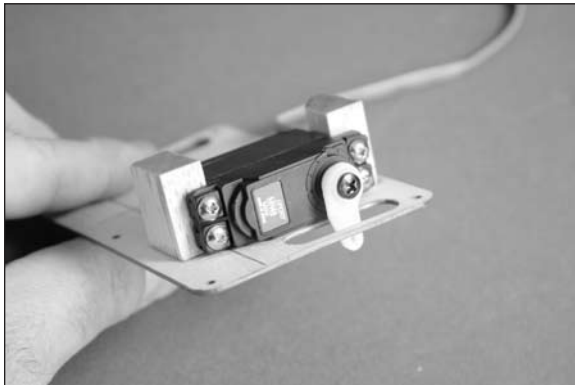
□□ 11. Apply 2–3 drops of thin CA in each hole drilled. Also saturate the top of the block using thin CA to harden the block. This will keep the block from splitting when the servo mounting screws are installed.



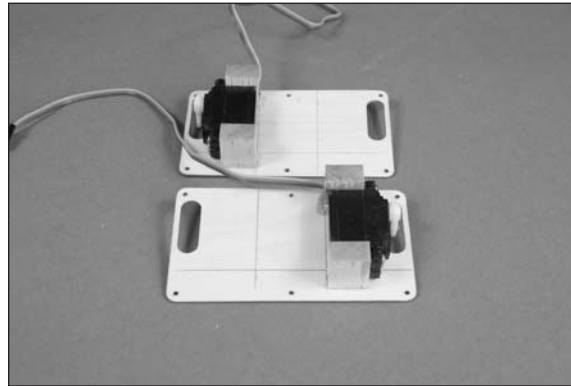


**Important:** Do not use a CA accelerator. Using an accelerator will not allow the CA to soak into the fibers of the wood, hardening the blocks.

□□ 12. Use the screws provided with the servo and a #1 Phillips screwdriver to attach the servo to the mounting blocks.



□ 13. Repeat Steps 6 though 12 to install the remaining aileron servo. Make sure you install the servo so you have a right and left servo installation as shown in the photo.



## Flap Servo Installation - Operational Flaps

### Required Parts

Servo cover with aileron servos (2)	
Receiver	Receiver battery
Servo with hardware (2)	Transmitter
17mm x 12mm x 10mm servo mounting block (4)	

### Required Tools and Adhesives

Thin CA	Low-tack tape
Mixing cup	Medium grit sandpaper
30-minute epoxy	Mixing stick
Pencil	Side cutter
Pin vise	Drill
Drill bit: 1/16-inch (1.5mm), 5/64-inch (2mm)	

**Note:** If you are installing fixed flaps, please skip this section and continue to “Flap Stay Installation,” the next section of this manual.

**Important:** The flap servos cannot be operated using a standard Y-harness. They will move in opposite directions. The options for connecting the flaps to the receiver are as follows:

**Option 1:** Use a computer radio to mix the flap channel to an auxiliary channel. This will allow the greatest versatility for the actuation of the flaps, allowing the throws and endpoint to be set in the radio programming.

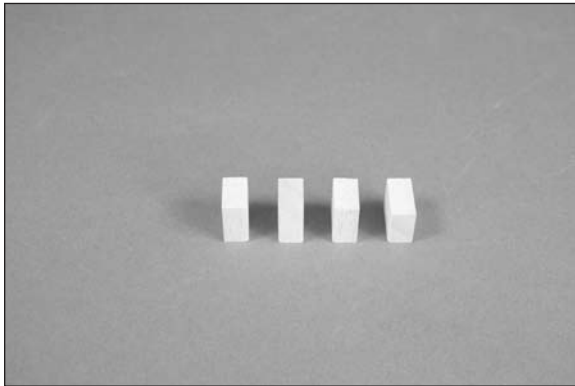
**Option 2:** Use a JR MatchBox™ from the flap channel to operate the flap servos. You will be able to set the direction of the servos as well as the throws and endpoints, matching the right and left flaps together.

**Option 3:** Use a reversing Y-harness. This will operate the flaps, but they will not be able to be adjusted individually. There may be a slight variation between the endpoints and throws between the two servos, but they will operate in unison as flaps.

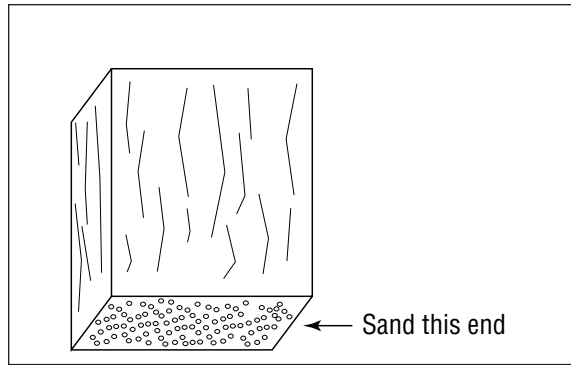
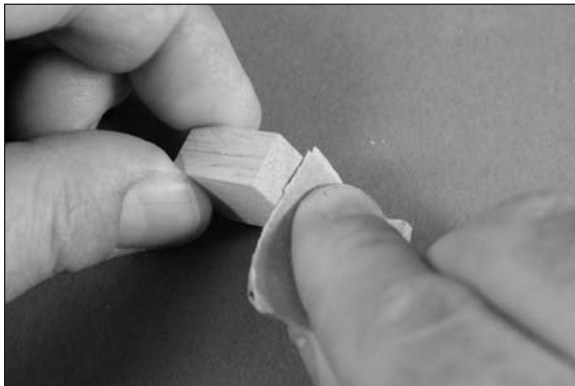
**Note:** The installation of the flap servos follows the same procedure as the aileron servos. The reference lines should be drawn on the servo covers at this time.

**Hint:** Place a piece of low-tack tape on the aileron servo. The servo covers can fit in either the left or right wing panel, but since the aileron servos are centered using the radio, you will want to make sure the aileron servos are oriented correctly in the wing when installed.

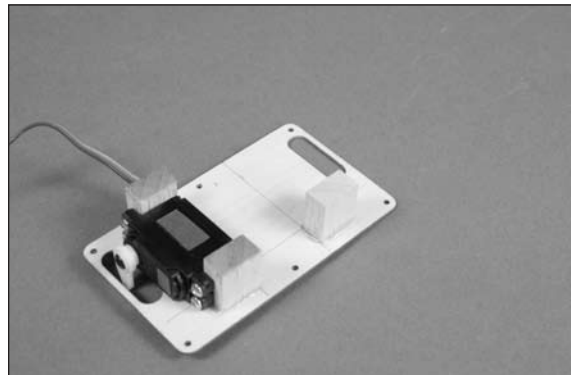
- 1. Locate hardwood blocks to mount the servos to the covers. You will also need the servo covers with the aileron servos installed.



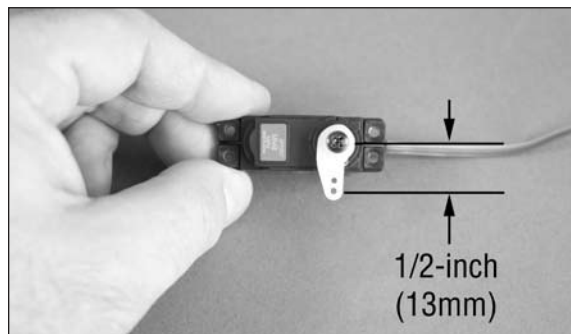
- 2. Lightly sand the end of the block using medium grit sandpaper. Sand the end grain as shown.



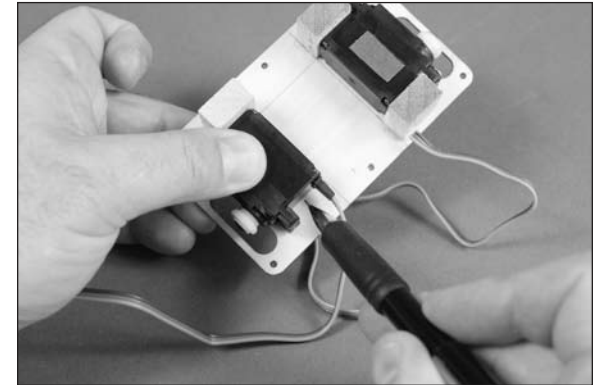
- 3. Use 30-minute epoxy to glue the 17mm x 12mm x 10mm hardwood block to the servo cover. Allow the epoxy to fully cure before proceeding.



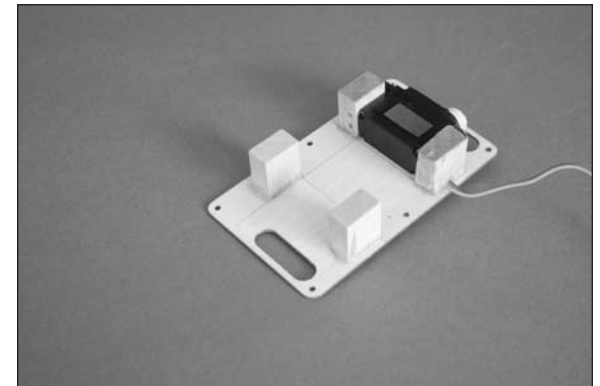
- 4. Prepare the flap servo by installing the rubber grommets and brass eyelets as shown in the radio or servo instructions. Center the flap servo using the radio system. Enlarge the hole in the servo arm using a pin vise and 5/64-inch (2mm) drill bit that is 1/2-inch (13mm) from the center of the servo horn. Use side cutters to remove any arms from the horn that may interfere with the operation of the servo.



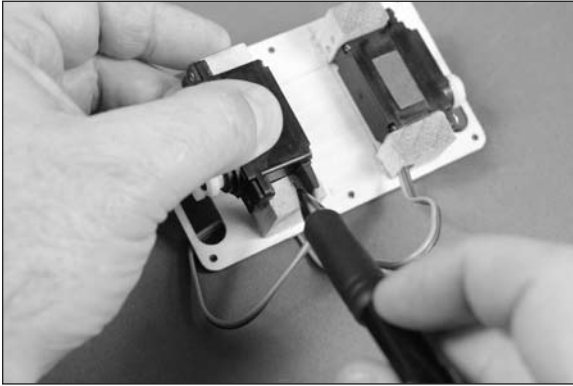
- 5. Position the flap servo with the grommets resting on the first mounting block and the servo parallel to the line on the cover. Use a pencil to mark the location for the remaining servo mounting block.



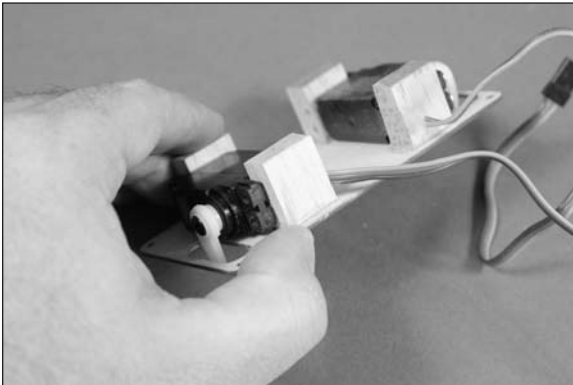
- 6. Use 30-minute epoxy to glue the remaining block to the cover. Don't forget to roughen the end of the block as shown in Step 3.



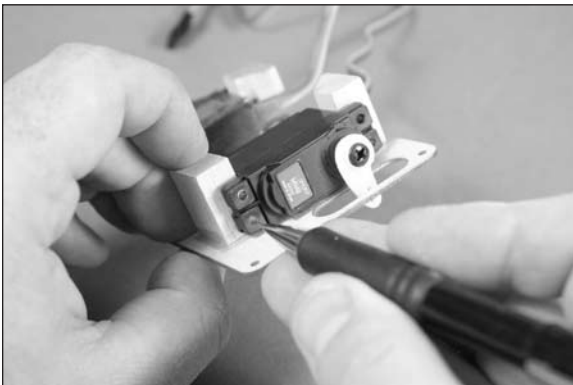
□□ 7. Position the servo on the blocks. Use a pencil to mark the front block where it will need to be trimmed to clear the servo lead.



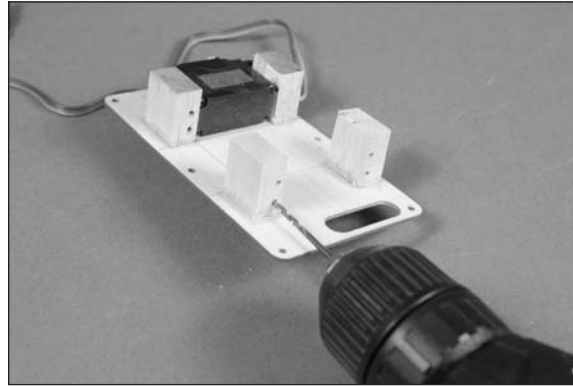
□□ 8. Use a rotary tool and sanding drum to remove the material from the block so the servo lead can clear the block.



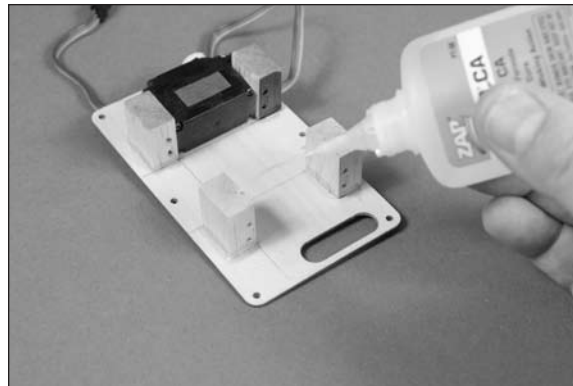
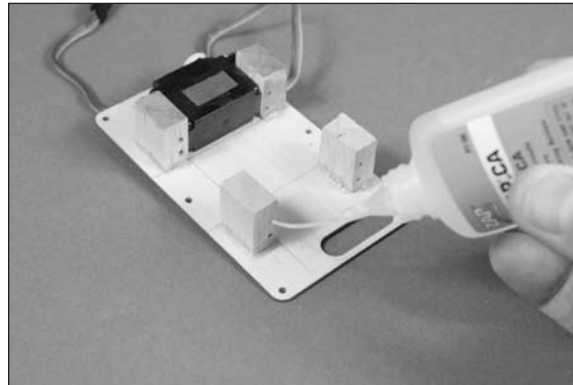
□□ 9. Use a pencil to mark the locations for the four servo mounting screws on the blocks.



□□ 10. Use a drill and 1/16-inch (1.5mm) drill bit to drill the holes for the mounting screws.

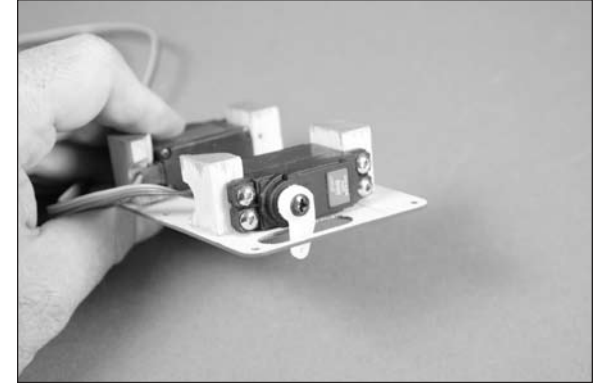


□□ 11. Apply 2–3 drops of thin CA in each hole drilled. Also saturate the top of the block using thin CA to harden the block. This will keep the block from splitting when the servo mounting screws are installed.

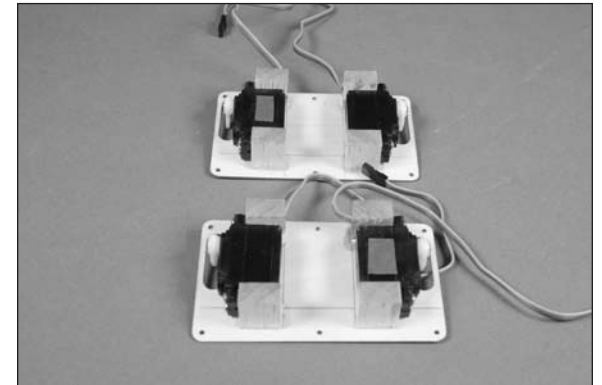


**Important:** Do not use a CA accelerator. Using an accelerator will not allow the CA to soak into the fibers of the wood, hardening the blocks.

□□ 12. Use the screws provided with the servo and a #1 Phillips screwdriver to attach the servo to the mounting blocks.



□□ 13. Repeat Steps 2 through 12 to install the remaining flap servo.



## Flap Stay Installation - Fixed Flaps

### Required Parts

Wing panel (right and left) Flap stay (right and left)  
2mm x 15mm sheet metal screw (4)

### Required Tools and Adhesives

Phillips screwdriver: #1

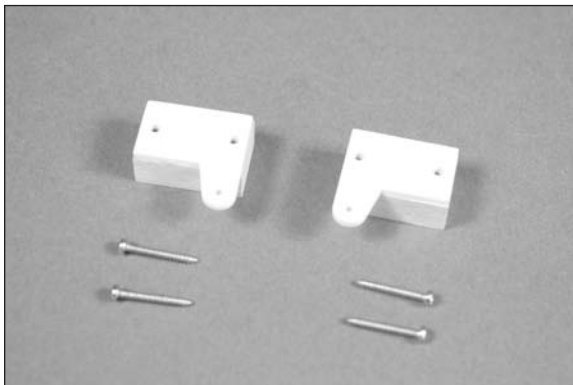
### Required Tools and Adhesives (optional)

30-minute epoxy Mixing stick  
Mixing cup Thin CA

**Note:** If you are installing operational flaps please skip this section and continue to “Flap and Aileron Linkage Installation” which is the next section of this manual.

**Note:** The flap stays installed in this section can be removed if you choose to install operational flaps in the future. They can also be installed permanently using 30-minute epoxy if you choose not to install operational flaps during the life of your model. This will be covered in this section of the manual.

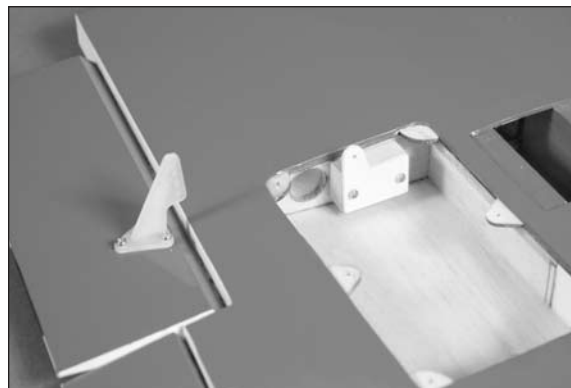
□ 1. Locate the flap stays and hardware to install them into the wing. You will also need the right and left wing panels for this step.



□□ 2. Place 2–3 drops of thin CA in each of the flap stay screw holes to harden the surrounding wood. This will help in preventing the screws from vibrating loose.



□□ 3. Use the two 2mm x 15mm sheet metal screws to secure the flap stay in the wing. Note the stay faces the trailing edge of the wing and that the nylon portion of the stay is placed more into the servo pocket as shown.



□□ 4. Optional: If you choose to install the stay permanently, use a small amount of 30-minute epoxy on the wood portion of the stay where it contacts the wing ribs. This will secure the stay in the wing, making it impossible to remove without damaging the wing.

□ 5. Repeat Steps 2 and 4 to install the remaining flap stay.

## Flap and Aileron Servo Linkage Installation

### Required Parts

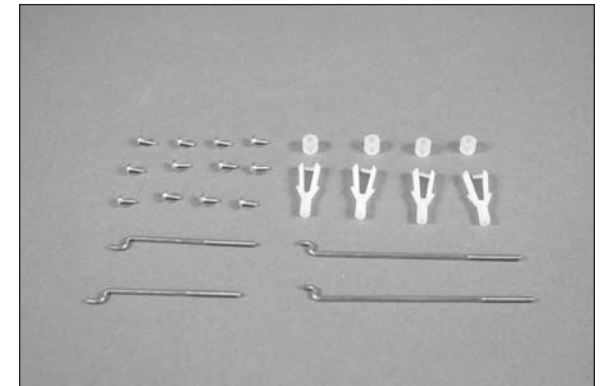
Wing panel (right and left)  
Clevis (4) Silicone clevis keeper (4)  
Servo cover assembly (right and left)  
2-56 x 3-inch pushrod (aileron) (2)  
2-56 x 2-inch pushrod (flap) (2)  
1.5mm x 6mm sheet metal screw (12)

### Required Tools and Adhesives

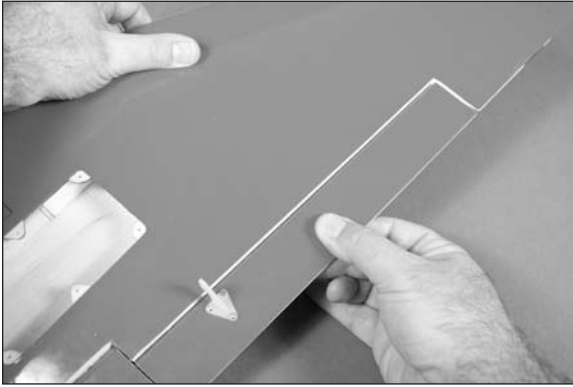
Phillips screwdriver: #1 Thin CA  
Clear tape

**Note:** This section covers the installation of the linkages for the flaps and ailerons. The installation of the flap linkages for both fixed and operational flaps follow the same procedure. Although the steps show operational flaps, a final photo will show the fixed flap linkage for reference.

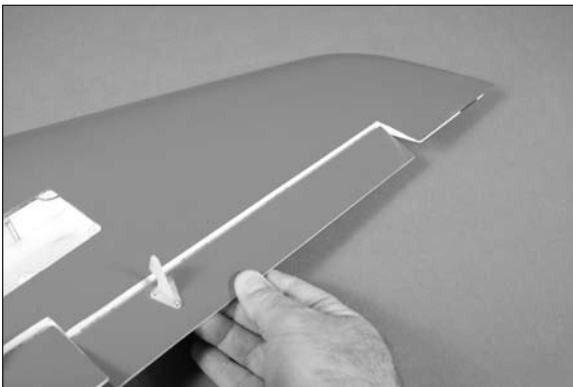
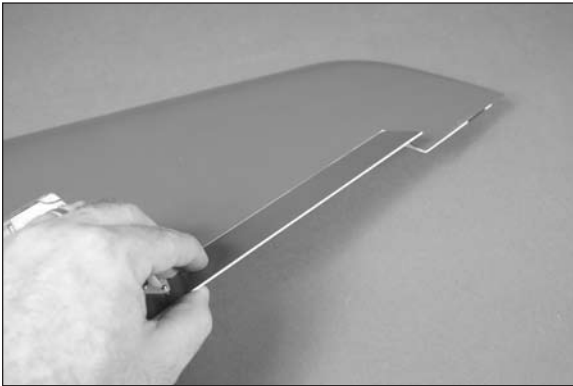
□ 1. Locate the items necessary to install the flap and aileron linkages. You will also need the servo covers with aileron (and flap) servos installed, as well as the right and left wing panels.



□□ 2. Check that all the hinges are secure by gently trying to separate the aileron and flap from the wing. If any hinges are loose, re-apply CA to the loose hinges.



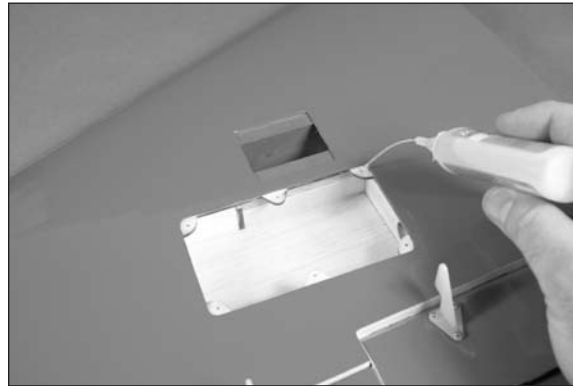
□□ 3. Break in the hinges by working the aileron and flap up and down a number of times.



□□ 4. At this time we recommend that you seal the hinge gap between the wing and aileron. Use either clear covering or tape to seal the gap to prevent flutter of the control surfaces during high-speed flight.

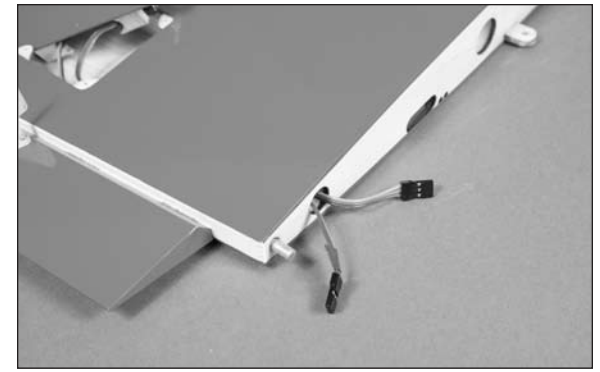
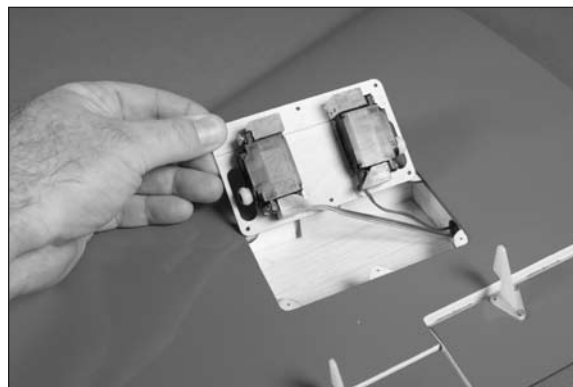
□□ 5. Apply 2–3 drops of thin CA in each of the holes that will accept the servo cover mounting screws.

**Note:** Read through the next few steps to make sure the servo cover assemblies are installed correctly. The servo output will be toward the leading edge of the wing, with the aileron servo aligning with the aileron control horn.

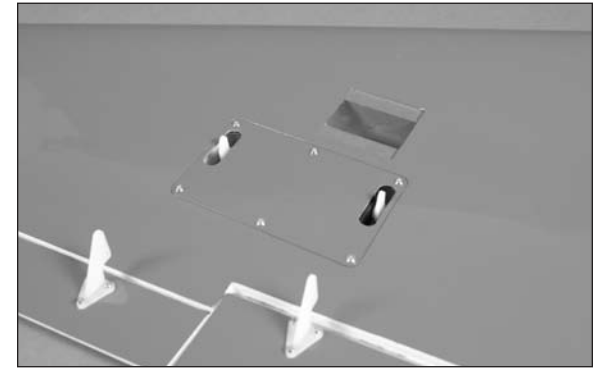


□□ 6. Guide the leads from the aileron (and flap) servos through the tube in the wing to the root.

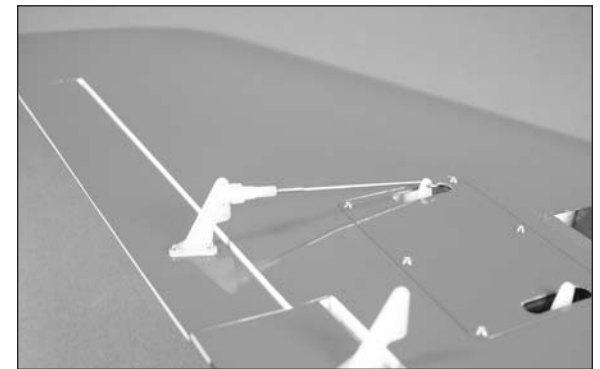
**Hint:** Place a piece of low-tack tape on the end of the aileron servo lead so it can be distinguished from the flap servo lead before guiding them through the tube.



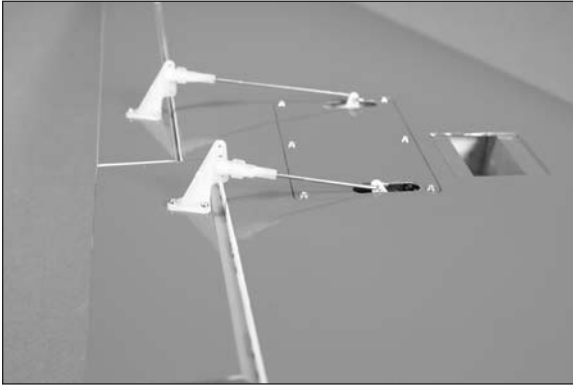
□□ 7. Use six 1.5mm x 6mm sheet metal screws and a #1 Phillips screwdriver to secure the cover to the wing.



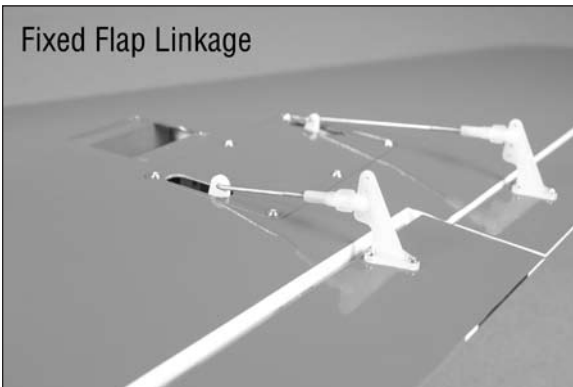
□□ 8. Attach the 2-56 x 3-inch pushrod wire to the aileron servo horn using the Z-bend in the pushrod wire. Slide a silicone clevis keeper on a clevis. Thread the clevis on the pushrod wire. With the servo centered, attach the clevis to the hole in the control horn that is three up from the control surface. Make sure the aileron is centered when the clevis is connected. Slide the silicone clevis keeper over the forks of the clevis to keep it from opening accidentally in flight.



□□ 9. Attach the 2-56 x 2-inch pushrod wire to the flap servo horn using the Z-bend in the pushrod wire. Slide a silicone clevis keeper on a clevis. Thread the clevis on the pushrod wire. With the servo centered, connect the clevis to the hole in the control horn that is one hole away from the control surface. Attach the clevis to the hole in the control horn that is two up from the control surface. With the flap in the up position, adjust the clevis so the flap is aligned with the aileron.



**Note:** When fixed flaps are used, adjust the length of the linkage to set the flap in the up position, aligned with the aileron.



□ 10. Repeat Steps 2 through 9 to install the remaining linkages.

## Nose Gear Installation - Fixed Gear

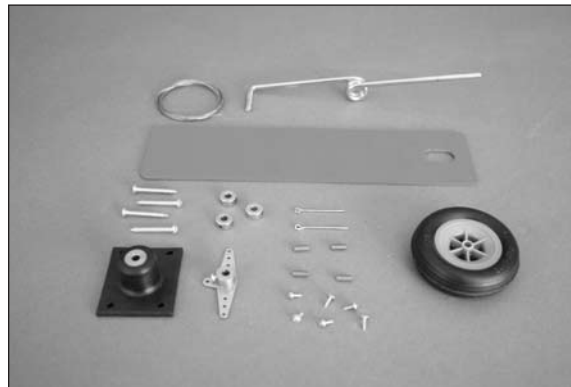
### Required Parts

Fuselage	Pull-pull fitting (2)
Landing gear base	Nose gear wire strut
Fixed gear fuselage plate	Steering arm with screw
#6 x 1/2-inch sheet metal screw (4)	
4mm wheel collar with setscrew (3)	
Nose wheel, 2 1/4-inch (57mm)	
1.6mm x 6mm sheet metal screw (6)	
Pull-pull cable, 42-inch (1070mm)	
5/16-inch (8mm) copper crimp (4)	

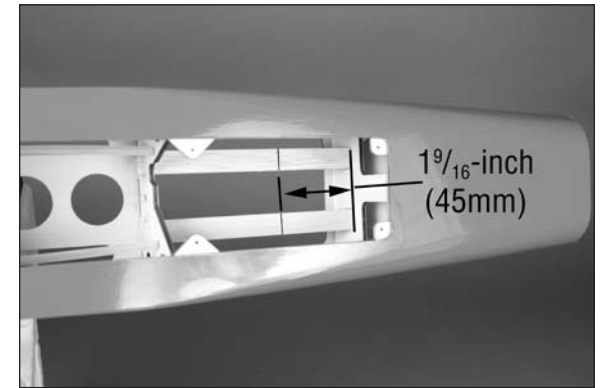
### Required Tools and Adhesives

Phillips screwdriver: #1, #2	Drill
Drill bit: 3/32-inch (2.5mm)	Pencil
Thin CA	Threadlock
Flat file	Light machine oil
Ruler	Crimping tool or pliers
Side cutter	Hex wrench: 1.5mm
Felt-tipped pen	
Needle nose pliers or hemostats	

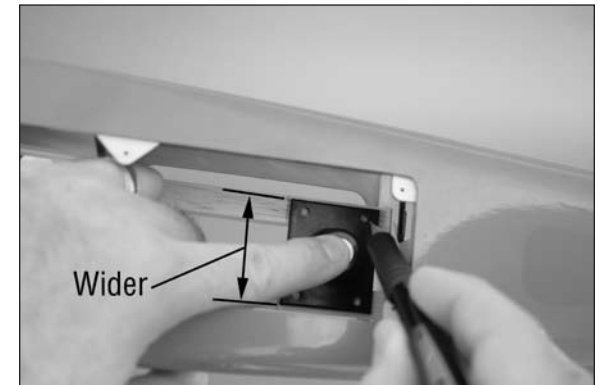
□ 1. Locate the items necessary to install the fixed nose gear in the fuselage. You will also need the fuselage for your model.



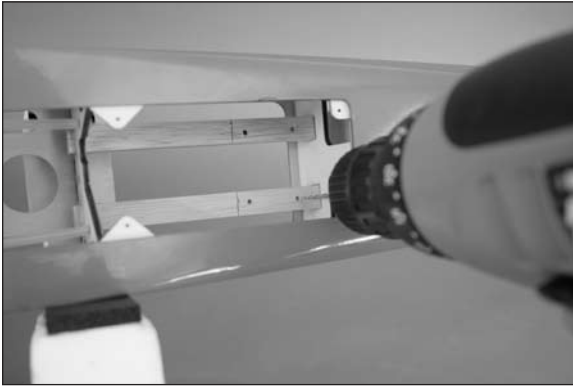
□ 2. Use a pencil to make a mark that is 1 9/16-inch (45mm) from the back of the firewall on both mounting rails.



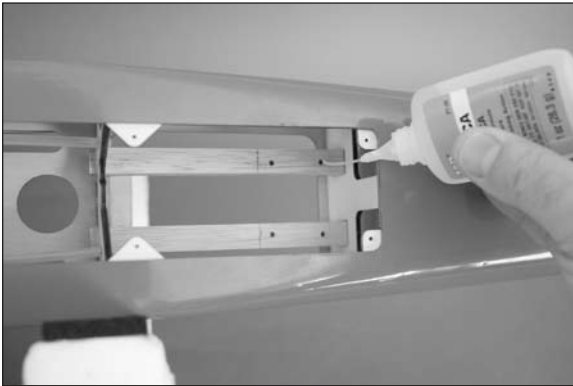
□ 3. Position the landing gear base on the rails. The base is rectangular, and the wider portion of the base will straddle the landing gear rails. Center the base on the rails, and align the rear edge of the base with the line made in the previous step. Use a pencil to transfer the location of the mounting screws on the rails.



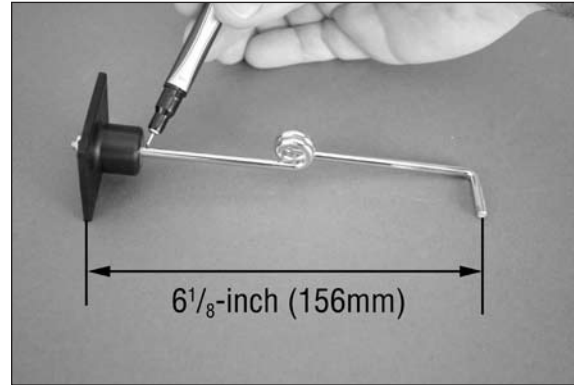
- 4. Use a drill and 3/32-inch (2.5mm) drill bit to drill the four holes for the landing gear base mounting screws.



- 5. Place 2–3 drops of thin CA in each hole to harden the surrounding wood. This will help prevent the screws from pulling loose on hard landings.



- 6. Slide the nose gear strut into the landing gear block. Place a 4mm wheel collar at the top of the block. Position the collar so the distance between the top edge of the block and centerline of the axle is 6 1/8-inch (156mm). Tighten the collar so it leaves a mark on the wire. Use a felt-tipped pen to mark the wire under the block for the steering arm location.



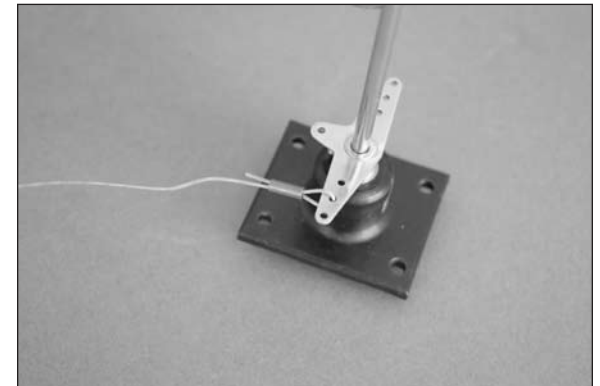
- 7. Use a flat file to make two flat areas for the wheel collar and steering arm setscrews. Make sure the flat areas are parallel to the axle. Make each flat 1/4-inch (6mm) wide.



- 8. Slide the steering arm on the nose gear strut, then the landing gear base. The wheel collar can now be placed and the setscrew tightened using a 1.5mm hex wrench. Check the distance between the top edge of the base and axle as shown in Step 6 and adjust as necessary. Slide the steering arm against the base and use a #1 Phillips screwdriver to tighten the screw. Make sure to use threadlock on both screws to prevent them from vibrating loose.



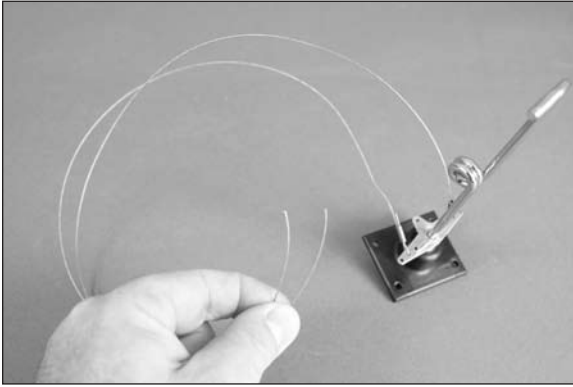
- 9. Pass the cable into a copper crimp. The wire then goes through the center hole on the steering arm, then back through the crimp. Use a crimping tool or pliers to secure the wire.



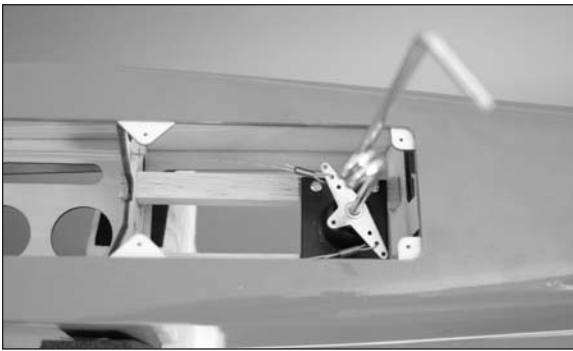
**Hint:** If it is difficult to fit the wire through the crimp, use pliers to slightly flatten the crimp to make it an oval shape when viewed from the end.



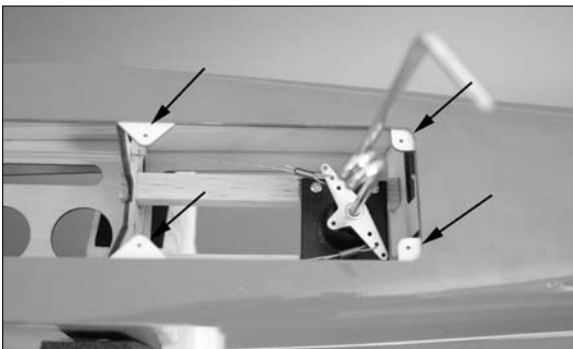
□ 10. Secure the loose end of the cable to the steering arm as described in Step 9. Use side cutters to cut the cable so equal portions of the wire extend from the steering arm.



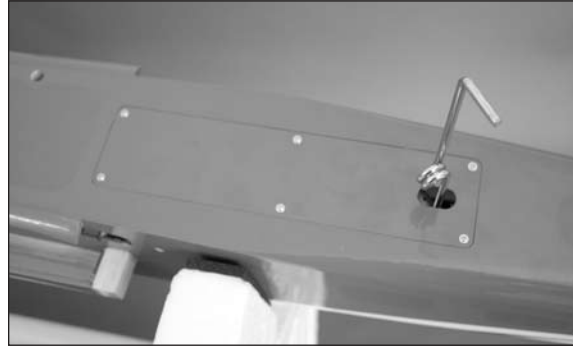
□ 11. Mount the nose gear assembly in the fuselage using four #6 x 1-inch sheet metal screws. Tighten the screws using a #2 Phillips screwdriver. Insert the steering cables into their respective tubes in the fuselage.



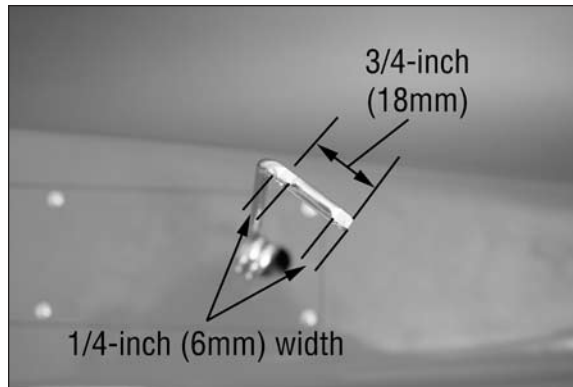
□ 12. Use 2–3 drops of thin CA in each of the holes for the screws to harden the surrounding wood.



□ 13. Use 2–3 drops of thin CA in each of the holes for the screws to harden the surrounding wood. Use six 1.5mm x 6mm sheet metal screws to attach the fixed gear fuselage plate to the fuselage. Use a #1 Phillips screwdriver to tighten the screws.



□ 14. Use a flat file to make two 1/4-inch (6mm) wide flat areas on the axle. The first is at the end of the axle, and the second centered 3/4-inch (18mm) from the end of the axle.



□ 15. Secure the wheel on the axle using two 4mm wheel collars. Remember to place a drop of oil on the axle before installing the wheel and to use threadlock on the setscrews.



□ 16. Prepare the cables to connect to the rudder servo by sliding a copper crimp on the wire, then a pull-pull fitting. The cable then goes back through the copper crimp. DO NOT crimp the cable, as it must be adjusted before securing the crimps.

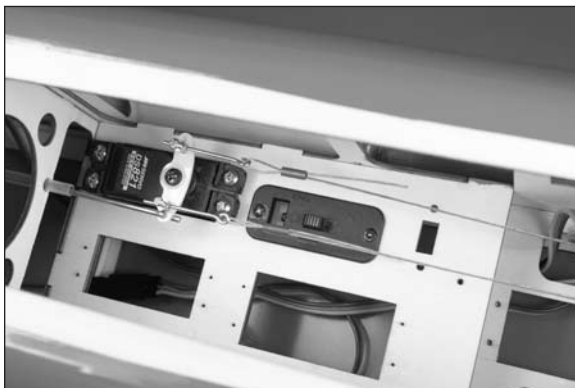


□ 17. Insert the pull-pull fittings in the brass pushrod connectors. With the end of the pull-pull fitting extending 1/4-inch (6mm) through the connector, use a #1 Phillips screwdriver to lightly tighten the screw in the connector to hold the fitting in place.



□ 18. Adjust the cables so there is light and equal tension on both cables. Check to make sure that when the rudder servo is centered, the nose wheel is parallel to the fuselage center line.

**Hint:** Use needle nose pliers or hemostats to tension the cables.



□ 19. Slide the crimp as close to the pull-pull fitting as possible. This will keep the setting on the cables. Carefully remove the fittings from the pushrod connector and use crimping pliers to secure the position of the crimps. Trim any excess cable using side cutters. Place the fittings back in the connector and tighten the screw in the connector to secure the fittings. Use threadlock on the screw to prevent it from vibrating loose.

**Important:** It may be necessary to check the tension of the cables periodically as they can stretch over time. Also use the connectors and fittings to adjust the steering if you find your model does not taxi straight down the runway.

## Nose Gear Installation - Mechanical Retract

### Required Parts

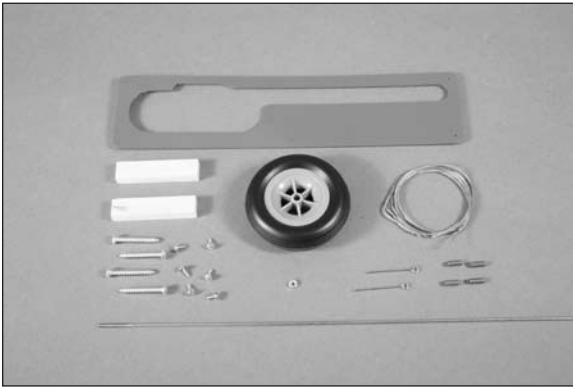
Fuselage	Nose gear retract
2-56 nut	Retract gear fuselage plate
Pull-pull fitting (2)	Retract servo (2)
Axle	Axle keeper
Nylon axle spacer	Heavy-duty servo arm (2)
Y-harness	Transmitter
2-56 ball links (not included)	
#6 x 12-inch sheet metal screw (4)	
Nose wheel, 2 1/4-inch (57mm)	
11mm x 7mm x 48mm hardwood block (2)	
1.6mm x 6mm sheet metal screw (6)	
2-56 x 15 1/4-inch pushrod wire, threaded both ends	
Pull-pull cable, 42-inch (1070mm)	
5/16-inch (8mm) copper crimp (4)	
8 5/8-inch (218mm) pushrod tube	

### Required Tools and Adhesives

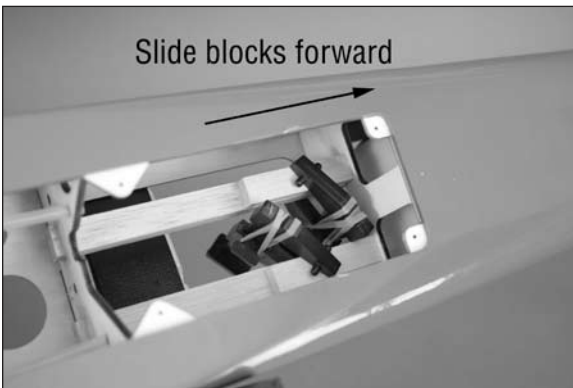
Felt-tipped pen	Medium CA
Side cutters	Mixing sticks
Clamps	Epoxy brush
Phillips screwdriver: #1, #2	Drill
Thin CA	Threadlock
Flat file	Light machine oil
Ruler	Crimping tool or pliers
Mixing cup	30-minute epoxy
Rotary tool with cutoff wheel	Side cutter
Pencil	Denatured alcohol
Hex wrench or ball driver: 5/64-inch	
Drill bit: 3/32-inch (2.5mm), 3/16-inch (5mm)	
Needle nose pliers or hemostats	

**Important:** Before installing the nose gear retract, it is recommended to use a fuel-proof paint or thinned epoxy (mix 20% denatured alcohol to 80% epoxy) to seal all the wood inside the opening for the nose gear. This will protect the wood and extend the life of your model.

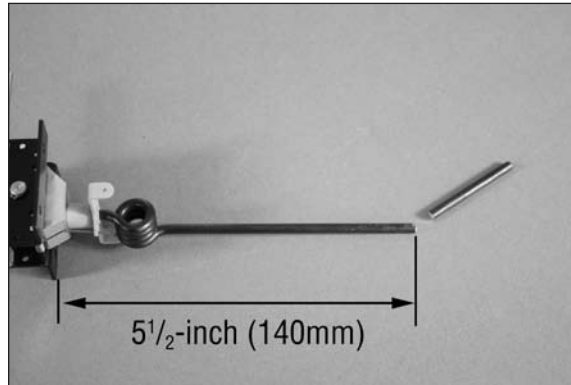
□ 1. Locate the items necessary to install the mechanical retract nose gear in the fuselage. You will also need the fuselage for your model.



□ 2. Use 30-minute epoxy to glue the two 11mm x 7mm x 48mm hardwood blocks to the landing gear rails. The wider 11mm measurement will match the width of the landing gear rails in the fuselage. Slide the blocks forward on the rails so they fit tightly against the back of the former. Use small clamps to hold them in position until the epoxy fully cures.



□ 3. Use a rotary tool and cutoff wheel to cut the length of the nose gear strut to 5½-inch (140mm) as shown in the photo below. Measure from the bottom edge of the mounting flange of the retract housing.



□ 4. Use a drill and 3/16-inch (5mm) drill bit to enlarge the hole in the wheel.



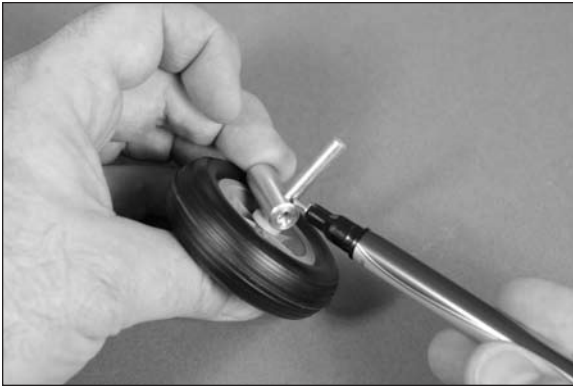
**Note:** We recommend the use of a drill press to enlarge the hole in the wheel so it is straight.

□ 5. Slide the axle through the hole in the wheel. Slide a nylon spacer on the axle from the opposite side.

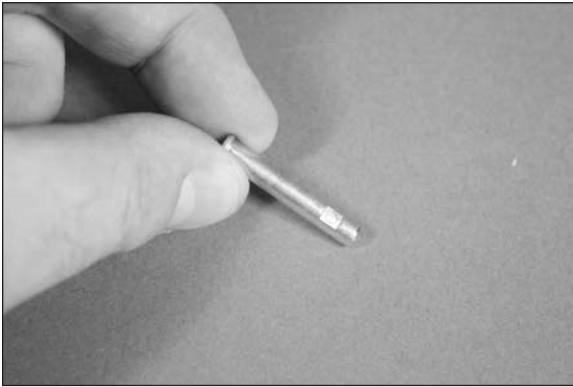


□ 6. Slide the adapter on the axle. Use a felt-tipped pen to mark the location for the setscrew and the outside edge where the axle will need trimmed.

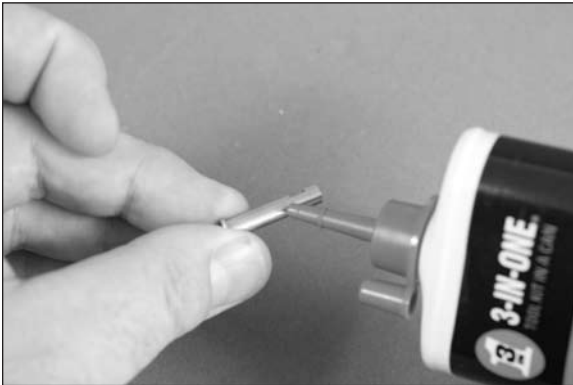




□ 7. Use a rotary tool and cutoff wheel to trim the length of the axle. Use a flat file to make a 1/4-inch (6mm) wide flat where the setscrew from the adapter will rest.



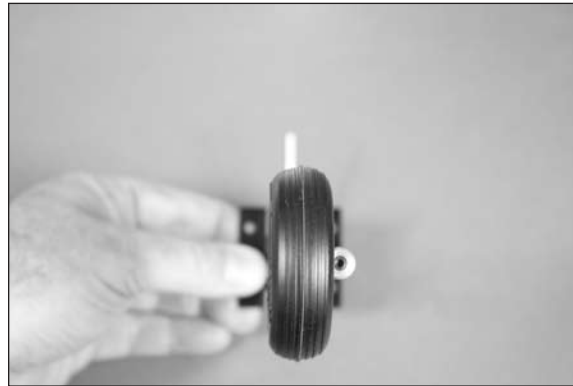
□ 8. Place a drop of light machine oil on the axle before sliding it into the wheel so it rolls smoothly during takeoff and landing.



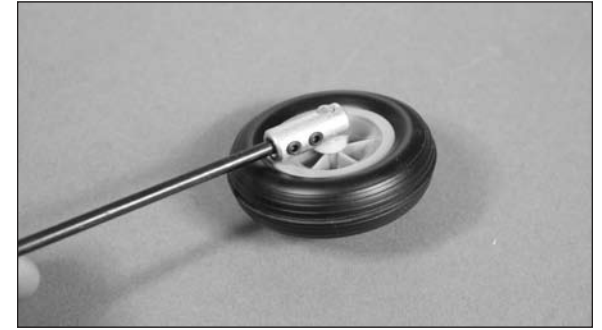
□ 9. Assemble the nose wheel assembly as shown. Use threadlock on the setscrew before using a 5/64-inch hex wrench or ball driver to tighten the setscrew on the flat area made in the previous step.



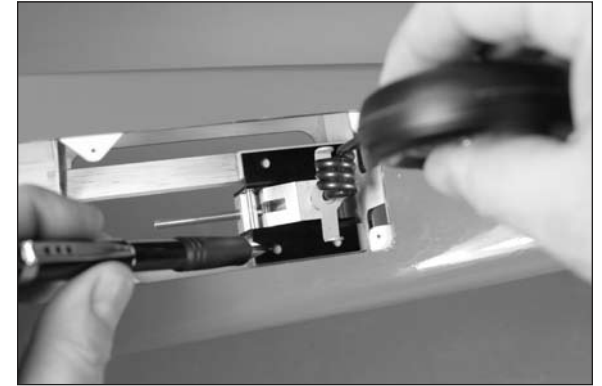
□ 10. Before attaching the nose wheel assembly to the nose gear wire, use a flat file to make flats for the setscrews on the nose gear wire for the adapter. Make sure the nose wheel is aligned with the retract actuator when the steering arm is perpendicular to the actuator.



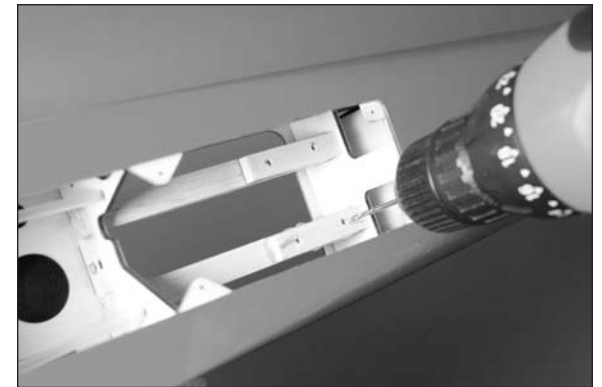
□ 11. Use the setscrews included with your retracts and threadlock to secure the adapter to the nose gear wire.



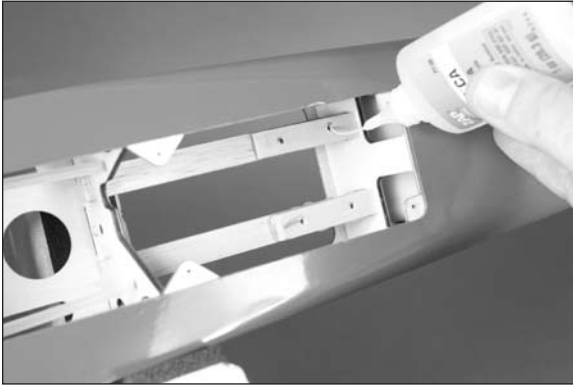
□ 12. Position the retract mechanism on the rails. Center the mechanism on the rails, and align the rear edge of the mechanism with end of the hardwood blocks. Use a pencil to transfer the location of the mounting screws on the rails.



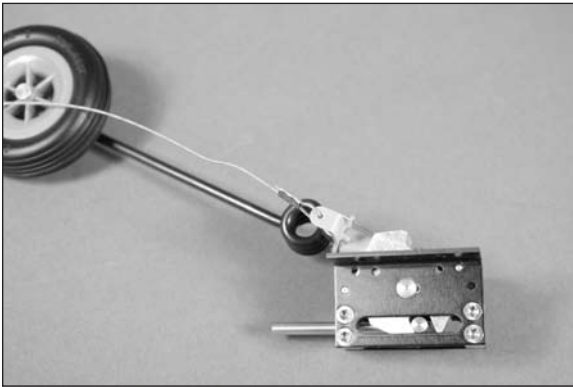
□ 13. Use a drill and 3/32-inch (2.5mm) drill bit to drill the four holes for the landing gear base mounting screws.



- 14. Place 2–3 drops of thin CA in each hole to harden the surrounding wood. This will help prevent the screws from pulling loose on hard landings.

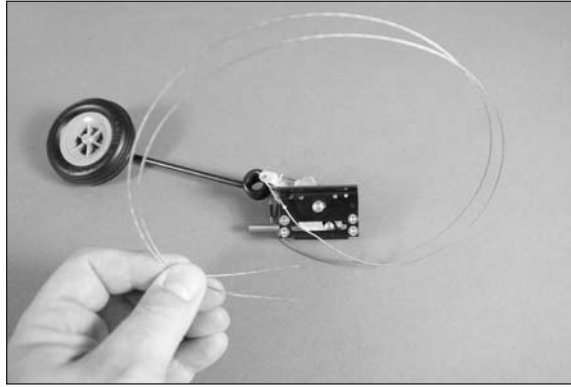


- 15. Pass the cable into a copper crimp. The wire then goes through the hole in the steering arm, then back through the crimp. Use a crimping tool or pliers to secure the wire.

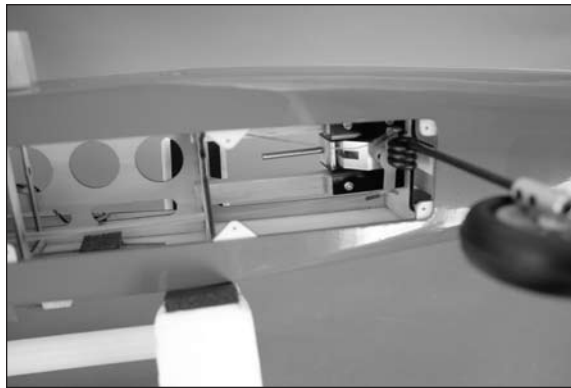


**Hint:** If it is difficult to fit the wire through the crimp, use pliers to slightly flatten the crimp to make it an oval shape when viewed from the end.

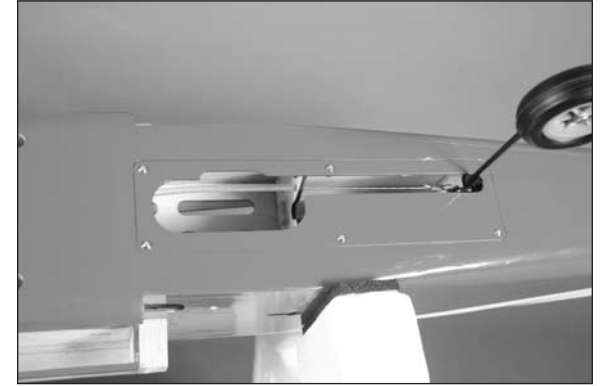
- 16. Secure the loose end of the cable to the steering arm as described in Step 13. Use side cutters to cut the cable so equal portions of the wire extend from the steering arm.



- 17. Mount the nose gear assembly in the fuselage using four #6 x 1-inch sheet metal screws. Tighten the screws using a #2 Phillips screwdriver. Insert the steering cables into their respective tubes in the fuselage.



- 18. Use 2–3 drops of thin CA in each of the holes for the screws to harden the surrounding wood. Use six 1.5mm x 6mm sheet metal screws to attach the retract gear fuselage plate to the fuselage. Use a #1 Phillips screwdriver to tighten the screws.



**Important:** Make sure the nose gear is in the down and locked position before connecting the cables to the rudder servo. If the gear is up, the cables will not be installed correctly and your nose gear retract will not operate properly.

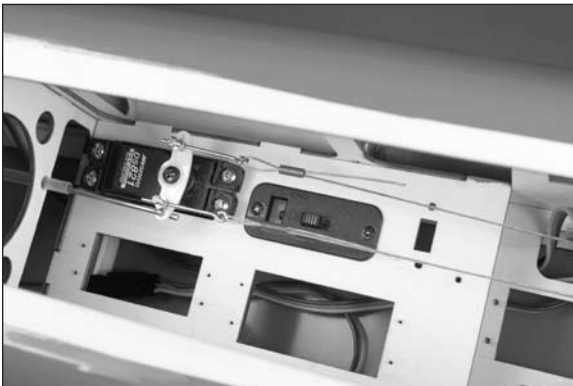
- 19. Prepare the cables to connect to the rudder servo by sliding a copper crimp on the wire, then a pull-pull fitting. The cable then goes back through the copper crimp. **DO NOT** crimp the cable, as it must be adjusted before securing the crimps.



- 20. Insert the pull-pull fittings in the brass pushrod connectors. With the end of the pull-pull fitting extending 1/4-inch (6mm) through the connector, use a #1 Phillips screwdriver to lightly tighten the screw in the connector to hold the fitting in place.



- 21. Adjust the cables so there is light and equal tension on both cables. Check to make sure that when the rudder servo is centered, the nose wheel is parallel to the fuselage center line.



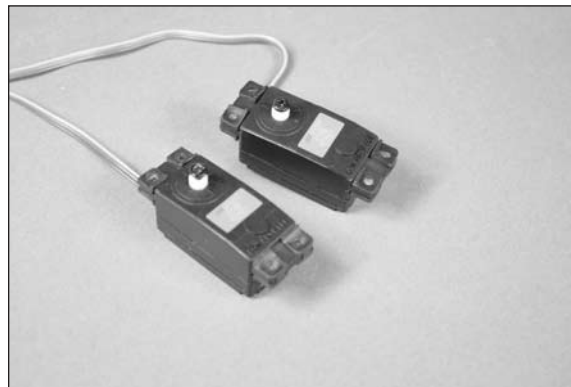
**Hint:** Use needle nose pliers or hemostats to tension the cables.

- 22. Slide the crimp as close to the pull-pull fitting as possible. This will keep the setting on the cables. Carefully remove the fittings from the pushrod connector and use crimping pliers to secure the position of the crimps. Trim any excess cable using side cutters. Place the fittings back in the connector and tighten the screw in the connector to secure the fittings. Use threadlock on the screw to prevent it from vibrating loose.

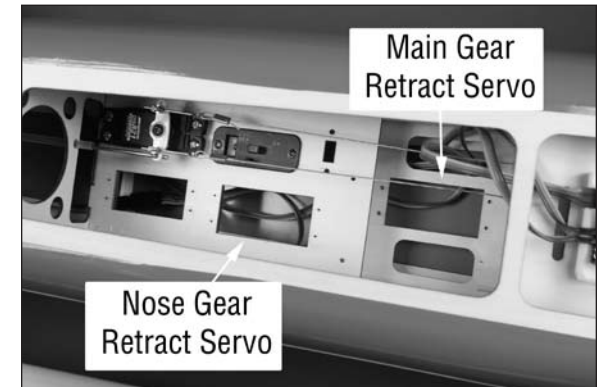
**Important:** It may be necessary to check the tension of the cables periodically as they can stretch over time. Also use the connectors and fittings to adjust the steering if you find your model does not taxi straight down the runway.

**Note:** Although the retracts for the wing will not be installed until later in the manual, we will be installing the main gear retract servo at this time. Once the nose gear and throttle linkages are installed, the installation of the main gear retract servo will be difficult.

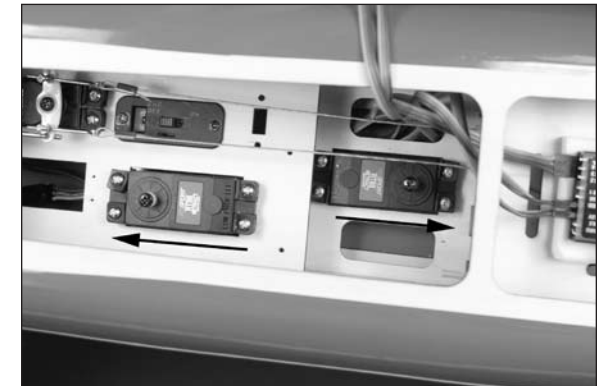
- 23. Prepare the two retract servos using the grommets and brass eyelets. Remove the horns from the servos at this time.



- 24. Apply 2–3 drops of thin CA in the holes for the main gear and nose gear retract servo mounting screws. This hardens the wood so the screws don't vibrate loose.

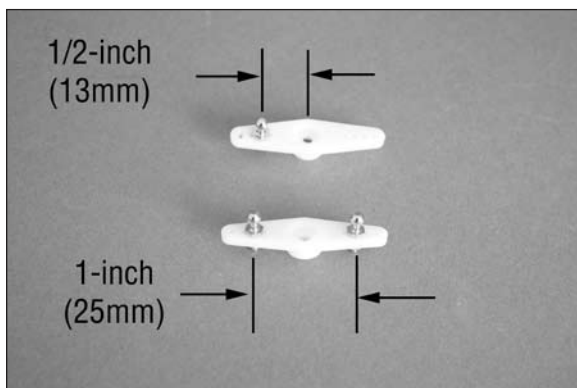


- 25. Mount the retract servos in the fuselage using the screws provided with the servos. Use a #1 Phillips screwdriver to tighten the screws. The output for the nose gear retract faces the rear of the fuselage, while the output for the main gear retract servo faces to the front of the fuselage.



- 26. Plug the retract servos into a Y-harness. The Y-harness is then plugged into the gear channel of the receiver.

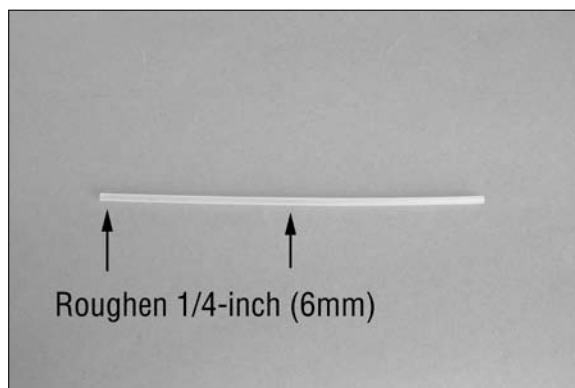
□ 27. Prepare the main gear and nose gear servo arms. Install the ball ends so they are 1-inch (25mm) apart as shown. The nose gear servo arm uses only one ball link, but it is positioned the same as the main gear.



□ 28. Install the servo arms on the retract servos as shown. The nose gear is shown in the down position. Make sure the switch on the radio is also in the position you will want as the down setting.



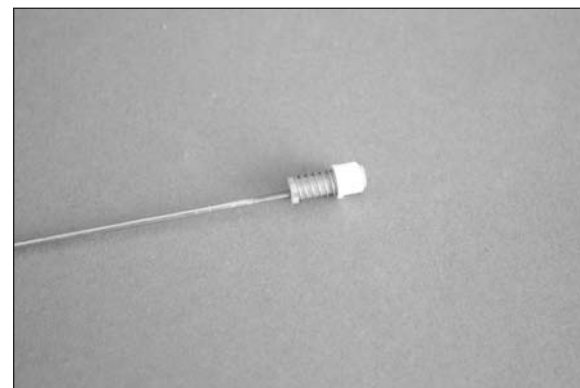
□ 29. Locate the 8<sup>5</sup>/<sub>8</sub>-inch (217mm) pushrod tube. Roughen the first 1/2-inch (12mm) at the end and also a 1/2-inch (12mm) section at the center of the tube.



□ 30. Slide the pushrod tube in the fuselage with the end that was not sanded toward the nose gear. Center the tube and use medium CA to glue the tube to the center former and the former near the servo compartment. Do not glue the tube near the nose gear as it must be able to move to operate properly.

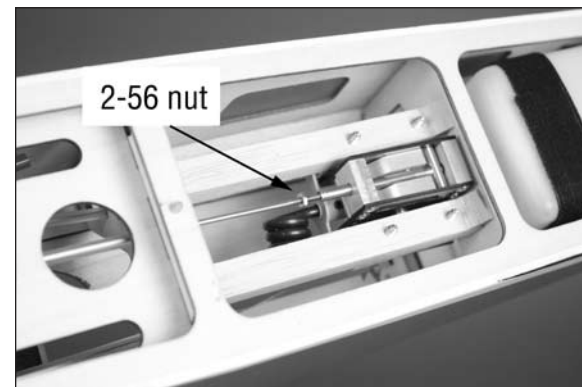


□ 31. Thread the ball end on the 2-56 x 15<sup>1</sup>/<sub>4</sub>-inch pushrod wire. Start by setting it at around 12 to 14 turns on the wire. Its final position will be adjusted once the pushrod is installed.



□ 32. Insert the pushrod wire into the pushrod tube. Once the threads are exposed near the nose gear, thread a 2-56 nut on the threads as shown. The pushrod can then be threaded into the actuator for the nose gear.

**Hint:** It is easier to thread the pushrod wire into the actuator when the nose gear is in the up position.



□ 33. It's now time to set the length of the retract linkage. With the nose gear in the down and locked position, use the radio to move the servo to the down position. Adjust the length of the linkage so the ball end fits on the ball without any binding. Use the radio to move the retract servo to the up position. Check that the retract is in up and locked. You may need to fine-tune the length of the linkage to allow it to move from up to down, locking the retract in both positions.

□ 34. Use the radio to cycle the gear a number of times, checking that the length of the linkage is correct. Although it is important the gear locks in both the up and down positions, it is most critical it is fully locked when down or it may collapse on the runway during takeoff or landing. Also make sure the servo is not binding at either position, as this will quickly drain the receiver battery. Take your time to set the linkage perfectly. Once complete, tighten the 2-56 nut against the retract actuator to prevent it from changing position.

## **Nose Gear Installation - Pneumatic Retract**

### **Required Parts**

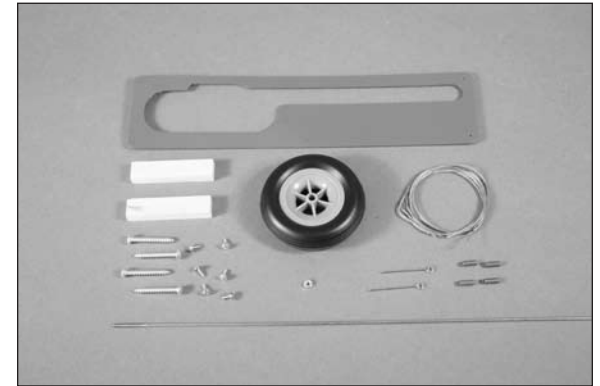
Fuselage	Nose gear retract
Axle adapter	Steel axle
Nylon spacer	2-56 nut
Retract gear fuselage plate	Pull-pull fitting (2)
Retract servo	
#6 x 12-inch sheet metal screw (4)	
Nose wheel, 2 <sup>1</sup> / <sub>4</sub> -inch (57mm)	
11mm x 7mm x 48mm hardwood block (2)	
1.6mm x 6mm sheet metal screw (6)	
Pull-pull cable, 42-inch (1070mm)	
5/16-inch (8mm) copper crimp (4)	

### **Required Tools and Adhesives**

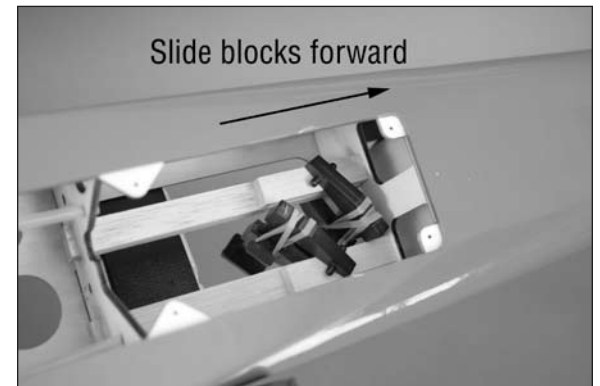
Phillips screwdriver: #1, #2	Drill
Drill bit: 3/32-inch (2.5mm)	Pencil
Thin CA	Threadlock
Flat file	Light machine oil
Ruler	Crimping tool
Rotary tool with cutoff wheel	Side cutter
30-minute epoxy	Felt-tipped pen
Mixing cup	Clamps
Mixing stick	Epoxy brush
Denatured alcohol	
Needle nose pliers or hemostats	

**Important:** Before installing the nose gear retract, it is recommended to use a fuel-proof paint or thinned epoxy (mix 20% denatured alcohol to 80% epoxy) to seal all the wood inside the opening for the nose gear. This will protect the wood and extend the life of your model.

□ 1. Locate the items necessary to install the pneumatic retract nose gear in the fuselage. You will also need the fuselage for your model.

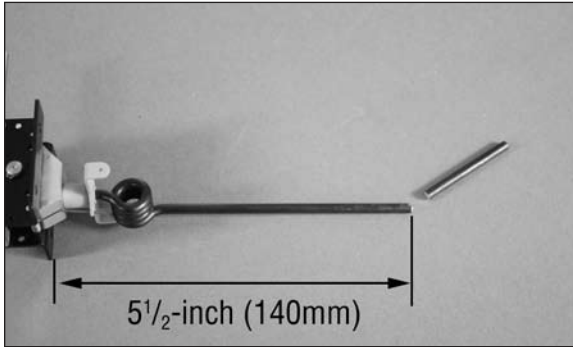


□ 2. Use 30-minute epoxy to glue the two 11mm x 7mm x 48mm hardwood blocks to the landing gear rails. The wider 11mm measurement will match the width of the landing gear rails in the fuselage. Slide the blocks forward on the rails so they fit tightly against the back of the former. Use small clamps to hold them in position until the epoxy fully cures.





- 3. Use a rotary tool and cutoff wheel to cut the length of the nose gear strut to  $5\frac{1}{2}$ -inch (140mm) as shown in the photo below. Measure from the bottom edge of the mounting flange of the retract housing.

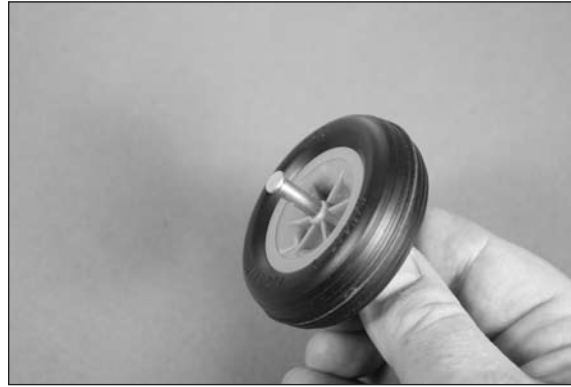


- 4. Use a drill and 3/16-inch (5mm) drill bit to enlarge the hole in the wheel.



**Note:** We recommend the use of a drill press to enlarge the hole in the wheel so it is straight.

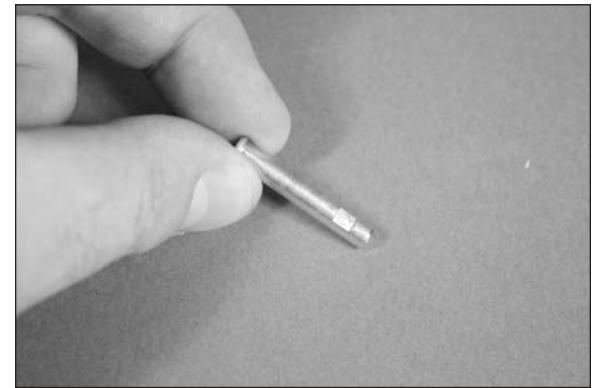
- 5. Slide the axle through the hole in the wheel. Slide a nylon spacer on the axle from the opposite side.



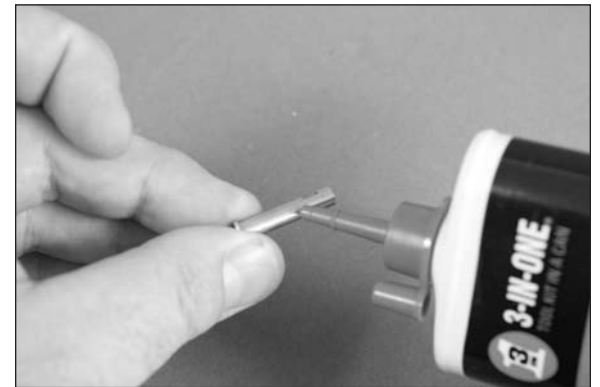
- 6. Slide the adapter on the axle. Use a felt-tipped pen to mark the location for the setscrew and the outside edge where the axle will need trimmed.



- 7. Use a rotary tool and cutoff wheel to trim the length of the axle. Use a flat file to make a 1/4-inch (6mm) wide flat where the setscrew from the adapter will rest.



- 8. Place a drop of light machine oil on the axle before sliding it into the wheel so it rolls smoothly during takeoff and landing.



□ 9. Assemble the nose wheel assembly as shown. Use threadlock on the setscrew before tightening it on the flat area made in the previous step.



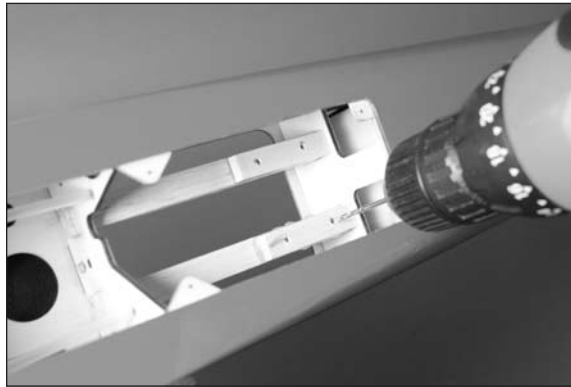
□ 10. Before attaching the nose wheel assembly to the nose gear wire, use a flat file to make flats for the setscrews on the nose gear wire for the adapter. Use the setscrews included with your retracts and threadlock to secure the adapter to the nose gear wire. Make sure the nose wheel is aligned with the retract air cylinder when the steering arm is perpendicular to the actuator.



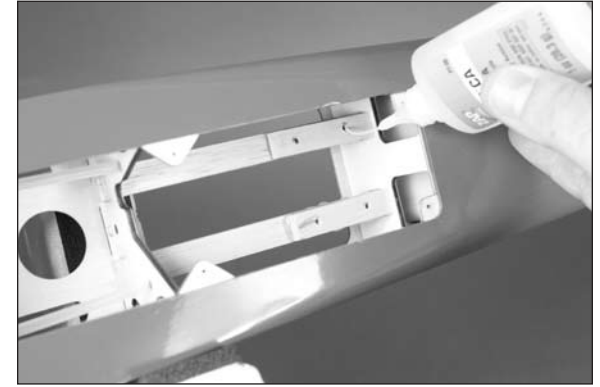
□ 11. Position the retract mechanism on the rails. Center the mechanism on the rails, and align the rear edge of the mechanism with end of the hardwood blocks. Use a pencil to transfer the location of the mounting screws on the rails.



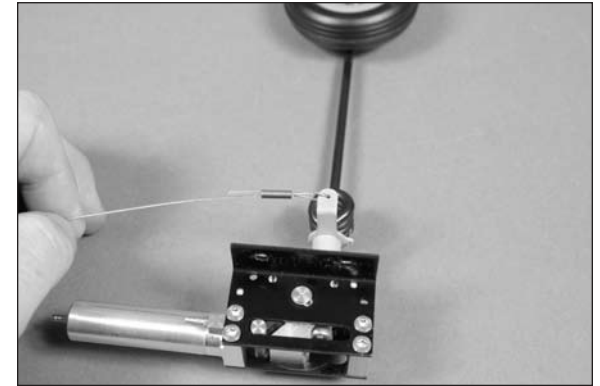
□ 12. Use a drill and 3/32-inch (2.5mm) drill bit to drill the four holes for the landing gear base mounting screws.



□ 13. Place 2–3 drops of thin CA in each hole to harden the surrounding wood. This will help prevent the screws from pulling loose on hard landings.

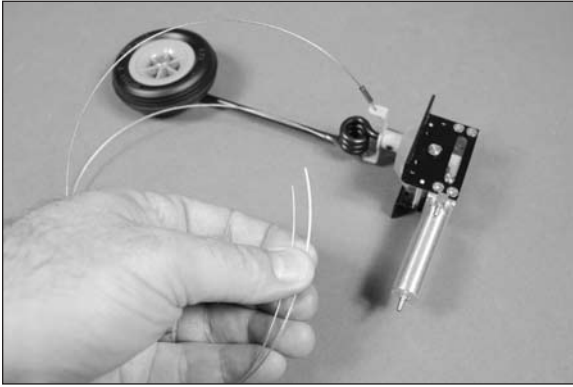


□ 14. Pass the cable into a copper crimp. The wire then goes through the hole in the steering arm, then back through the crimp. Use a crimping tool to secure the wire. Secure each end to the steering arm at this time.

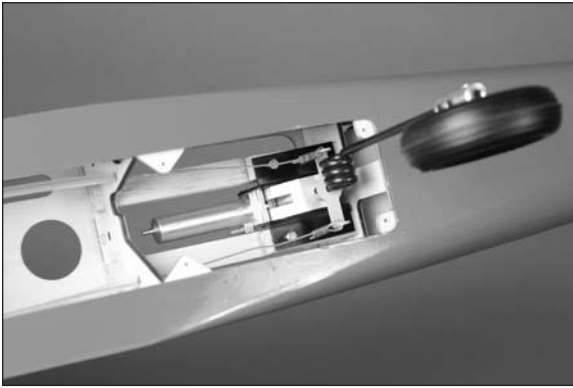


**Hint:** If it is difficult to fit the wire through the crimp, use pliers to slightly flatten the crimp to make it an oval shape when viewed from the end.

- 15. Secure the loose end of the cable to the steering arm as described in Step 13. Use side cutters to cut the cable so equal portions of the wire extend from the steering arm.



- 16. Mount the nose gear assembly in the fuselage using four #6 x 1-inch sheet metal screws. Tighten the screws using a #2 Phillips screwdriver. Insert the steering cables into their respective tubes in the fuselage.



- 17. Use 2–3 drops of thin CA in each of the holes for the screws to harden the surrounding wood. Use six 1.5mm x 6mm sheet metal screws to attach the retract gear fuselage plate to the fuselage. Use a #1 Phillips screwdriver to tighten the screws.

**Important:** Make sure the nose gear is in the down and locked position before connecting the cables to the rudder servo. If the gear is up, the cables will not be installed correctly and your nose gear retract will not operate properly.



- 18. Prepare the cables to connect to the rudder servo by sliding a copper crimp on the wire, then a pull-pull fitting. The cable then goes back through the copper crimp. DO NOT crimp the cable, as it must be adjusted before securing the crimps.

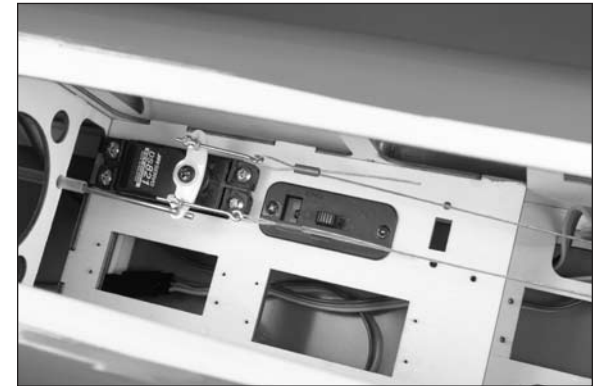


- 19. Insert the pull-pull fittings in the brass pushrod connectors. With the end of the pull-pull fitting extending 1/4-inch (6mm) through the connector, use a #1 Phillips screwdriver to lightly tighten the screw in the connector to hold the fitting in place.



- 20. Adjust the cables so there is light and equal tension on both cables. Check to make sure that when the rudder servo is centered, the nose wheel is parallel to the fuselage center line.

**Hint:** Use needle nose pliers or hemostats to tension the cables.



□ 21. Slide the crimp as close to the pull-pull fitting as possible. This will keep the setting on the cables. Carefully remove the fittings from the pushrod connector and use crimping pliers to secure the position of the crimps. Trim any excess cable using side cutters. Place the fittings back in the connector and tighten the screw in the connector to secure the fittings. Use threadlock on the screw to prevent it from vibrating loose.

**Important:** It may be necessary to check the tension of the cables periodically as they can stretch over time. Also use the connectors and fittings to adjust the steering if you find your model does not taxi straight down the runway.

## ***Main Gear Installation - Fixed Gear***

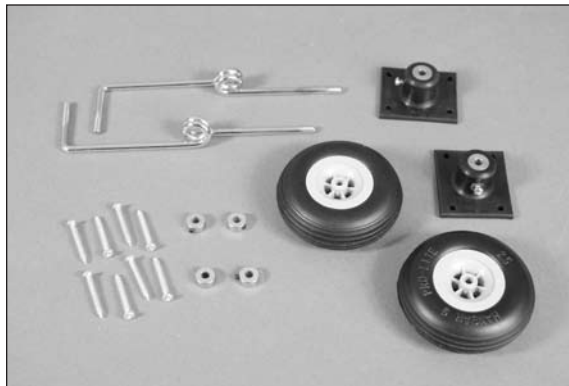
### **Required Parts**

Wing panel (right and left)  
 Landing gear base with setscrew (2)  
 Main wheel, 2<sup>1</sup>/<sub>2</sub>-inch (63.5mm) (2)  
 4mm wheel collar with setscrew (4)  
 Main gear strut (right and left)  
 #6 x 1-inch sheet metal screw (8)

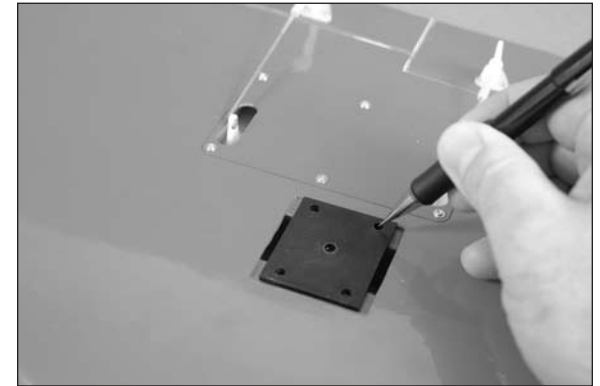
### **Required Tools and Adhesives**

Phillips screwdriver: #2	Drill
Drill bit: 3/32-inch (2.5mm)	Pencil
Thin CA	Threadlock
Flat file	Light machine oil
Hobby knife with #11 blade	Ruler
Hex wrench: 1.5mm	

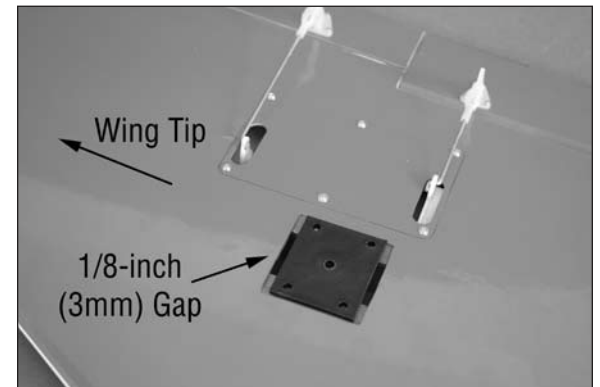
□ 1. Locate the items necessary to install the main fixed gear in the wing panels. You will also need the right and left wing panels from your model.



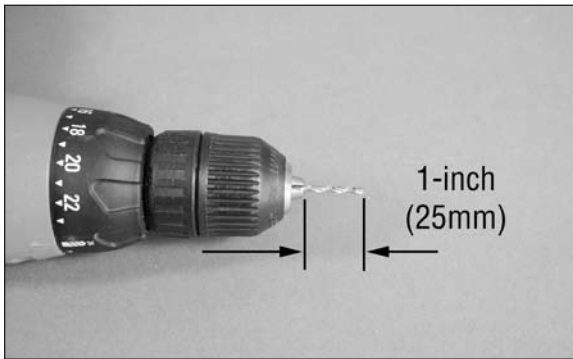
□□ 2. Place the landing gear base in the wing. Use a pencil to transfer the mounting locations for the base on the landing gear rails.



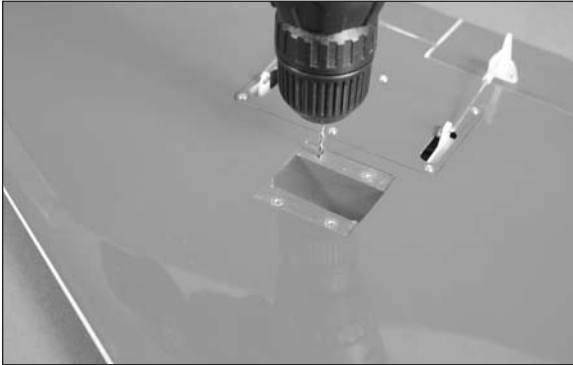
**Important:** If you plan on installing the recommended retracts in the future, set the base so there is a 1/8-inch (3mm) gap between the base and edge of the opening near the wing tip as shown.



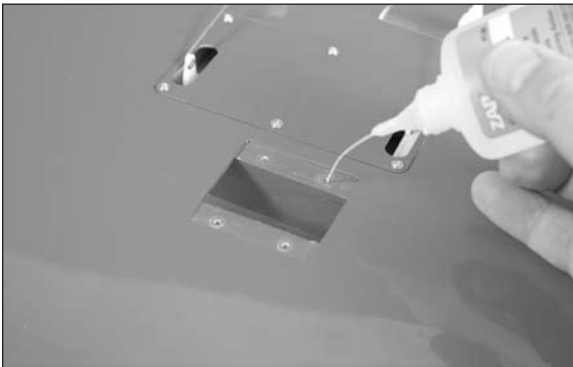
□□ 3. Place the 3/32-inch (2.5mm) drill bit in the drill. Set the drill so it is 1-inch (25mm) from the chuck to prevent accidentally drilling through the top of the wing.



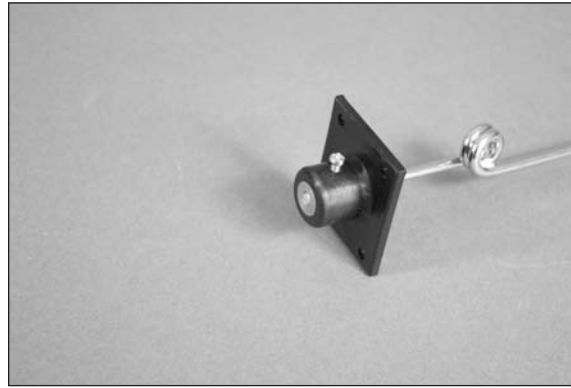
□□ 4. Drill the four mounting holes for the landing gear base using the drill and drill bit prepared in the previous step.



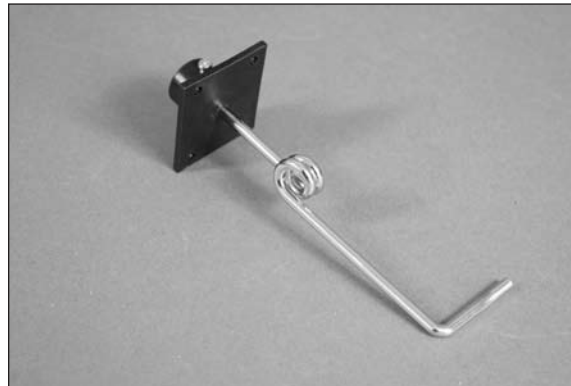
□□ 5. Place 2–3 drops of thin CA in each hole to harden the surrounding wood. This makes it difficult for the screw to pull loose on hard landings.



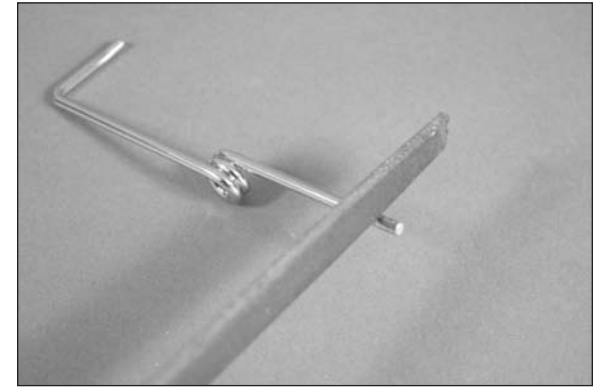
□□ 6. Slide the main gear into the landing gear base. The top of the gear will be flush with the top of the base.



□□ 7. Place the gear and base on a flat surface. The wheel axle will rest flat on the surface when the base is resting flat. This will position the wheel straight forward when installed.

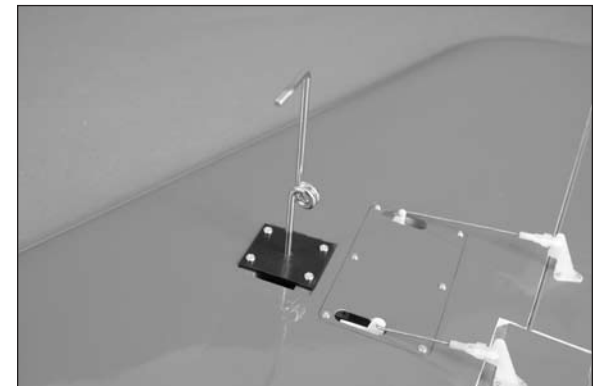


□□ 8. Use a #2 Phillips screwdriver to tighten the screw in the base on the wire. This will leave a mark on the wire where you will need to file a flat area for the screw. This will prevent the gear from rotating during takeoff and landing. Use a flat file to make the flat on the wire.

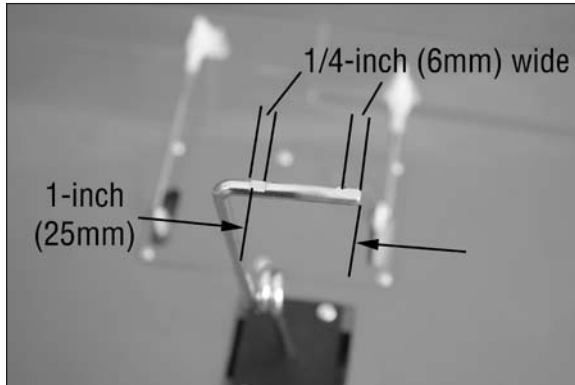


□□ 9. Once the flat is on the main gear wire, insert it back into the base and tighten the screw. Check the alignment to make sure the flat is in the correct location. Once complete, use threadlock on the screw and tighten it to secure the landing gear wire.

□□ 10. Place the block in the wing. Check that the spring faces the rear and the wire for the wheel faces the wing root. If not, you will need to prepare the opposite landing gear wire for this particular wing panel. Use four #6 x 1-inch sheet metal screws and a #2 Phillips screwdriver to secure the landing gear block in the wing.



□□ 11. Use a flat file to make two flat areas on the wire for the wheel. The first will cover the first 1/4-inch (6mm) of the wire at the end, the other will be 1/4-inch (6mm) wide, centered 1-inch (25mm) from the end of the wire.



□□ 12. Place the first 4mm wheel collar on the wire. Apply 2–3 drops of light machine oil to the axle so the wheel will roll freely when installed.



□□ 13. Slide the wheel on the axle. Use a second 4mm wheel collar to secure the wheel. Apply threadlock on the setscrews and use a 1.5mm hex wrench to tighten the setscrews on the flat areas made in Step 11. Check to make sure the wheel rolls freely. If not, reposition the collars so they are not causing binding.



□□ 14. Repeat Steps 2 through 13 to prepare and install the remaining main landing gear.

## Main Gear Installation - Mechanical Retracts

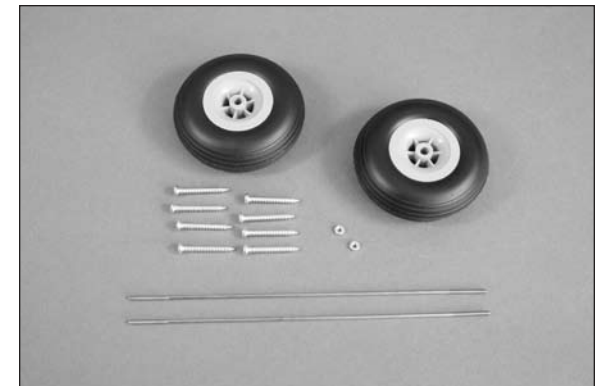
### Required Parts

Wing panel (right and left)	Main gear retracts
Nylon washer (2)	Axle adapter (2)
Axle (2)	Transmitter
#4 washer (2)	2-56 nut (2)
Fuselage assembly	Aluminum wing tube
2-56 ball link (2) (not included)	
4-40 x 1-inch socket head screw (2)	
Main wheel, 2.5-inch (63.5mm) (2)	
2-56 x 6 1/2-inch pushrod, threaded both ends (2)	
#6 x 1-inch sheet metal screw (8)	

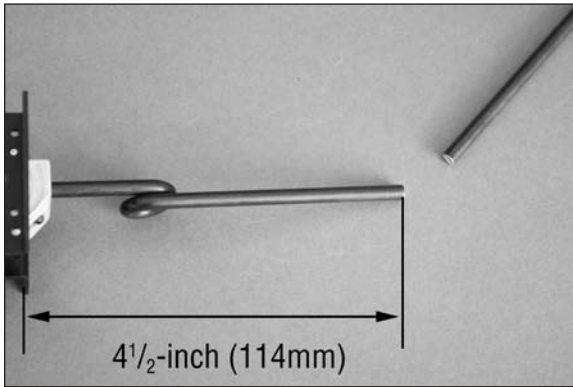
### Required Tools and Adhesives

Rotary tool	Cutoff wheel
Hobby knife with #11 blade	Covering iron
Sealing iron	Ruler
Felt-tipped pen	
Phillips screwdriver: #2	Drill
Pencil	Thin CA
Threadlock	Flat file
Light machine oil	Hex wrench: 5/64-inch
Drill bit: 3/32-inch (2.5mm), 3/16-inch (5mm)	

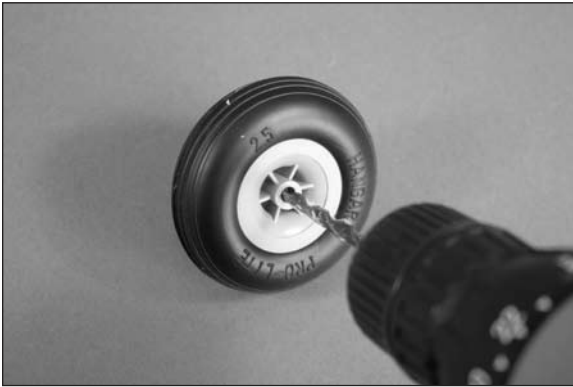
□ 1. Locate the items necessary to install the main mechanical retracts in the wing panels. You will also need the right and left wing panels from your model as well as the retract mechanism and axles for both wing panels.



□□ 2. Use a rotary tool and cutoff wheel to cut the main gear strut so it is 4½-inch (114mm) when measured from the top edge of the retract mounting flange as shown.

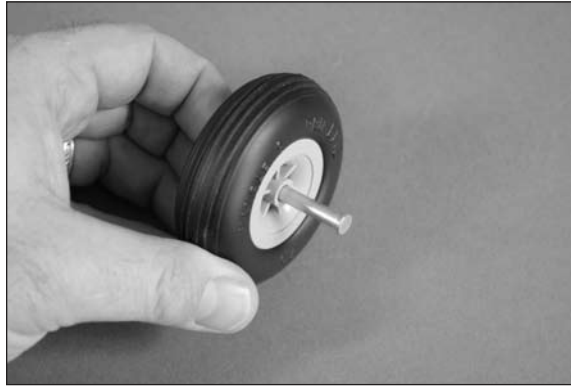


□□ 3. Use a drill and 3/16-inch (5mm) drill bit to enlarge the hole in the wheel.



**Note:** We recommend the use of a drill press to enlarge the hole in the wheel so it is straight.

□□ 4. Slide the axle through the hole in the wheel. Slide two nylon spacers on the axle from the opposite side.



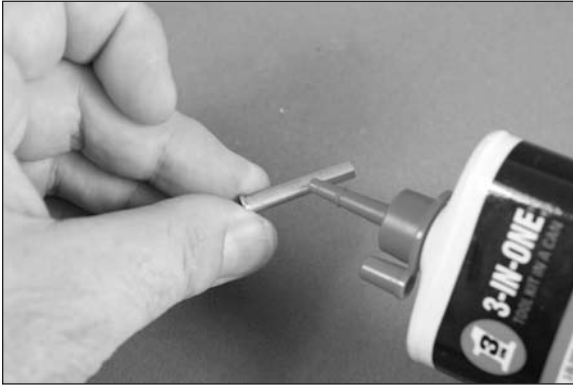
□□ 5. Slide the adapter on the axle. Use a felt-tipped pen to mark the location for the setscrew and the outside edge where the axle will need trimmed.



□□ 6. Use a rotary tool and cutoff wheel to trim the length of the axle. Use a flat file to make a ¼-inch (6mm) wide flat where the setscrew from the adapter will rest.



□□ 7. Place a drop of light machine oil on the axle before sliding it into the wheel so it rolls smoothly during takeoff and landing.

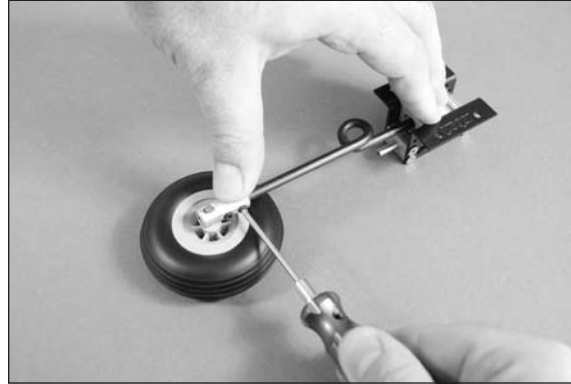


□□ 8. Assemble the axle and wheel as shown. Use threadlock on the setscrew before tightening it on the flat area made in the previous step.



□□ 9. Tighten the wheel assembly to the main gear strut. Use the setscrews provided with the axle adapters and a 5/64-inch hex wrench to tighten the setscrews. The setscrews will leave a mark on the strut where you will file in the next step.

**Hint:** With the retract mechanism in the up position, hold the retract frame and wheel flat on your work surface. This will set the wheel to the correct alignment.

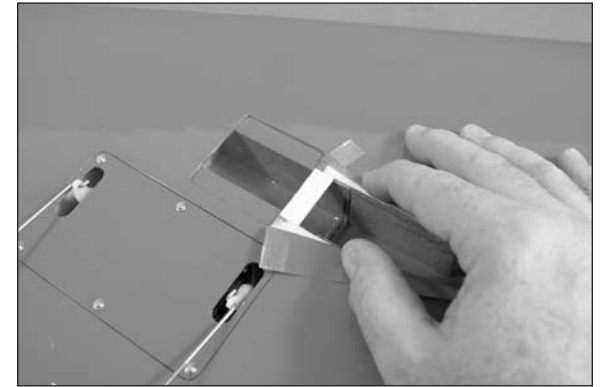


□□ 10. Use a flat file to make a flat on the strut for the setscrews. This will provide an area for the setscrews to be tightened on, and prevent the wheel from rotating during take-off and landing.

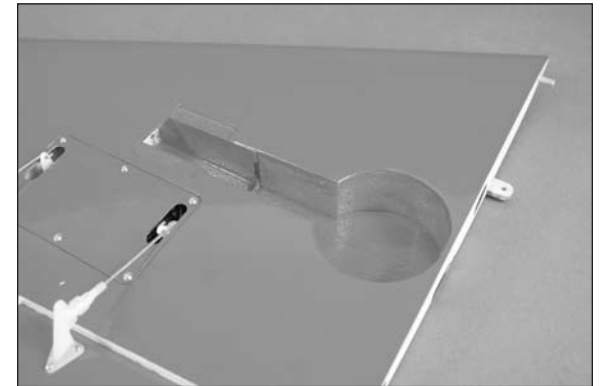


□□ 11. You can now attach the wheel assembly to the strut using the setscrews and a 5/64-inch hex wrench. Make sure to use threadlock on the setscrews to prevent them from vibrating loose. Make sure the wheel is perpendicular to the retract actuator before tightening the setscrews.

□□ 12. Use a hobby knife to cut the covering down the center of the opening in the wing for the retract. Peel the covering back to expose the balsa brace near the opening for the mechanism.

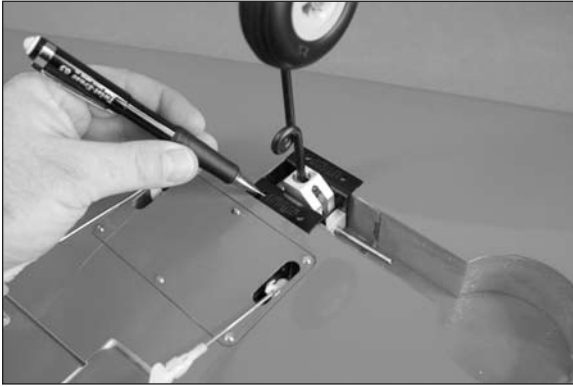


□□ 13. Use a hobby knife to carefully remove the brace. Trim the covering so you will have roughly 1/8-inch (3mm) of covering that will be ironed into the wheel well. Use a covering iron or trim seal tool to iron the covering, completing the retract wheel well.

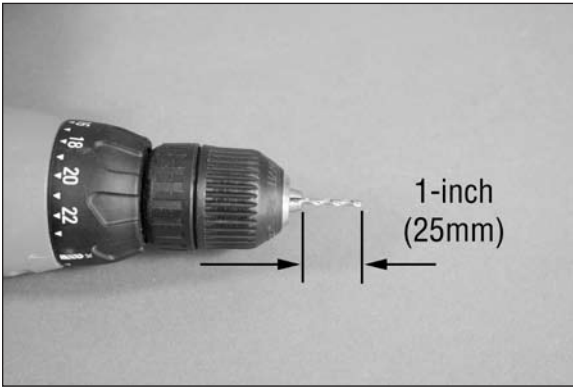




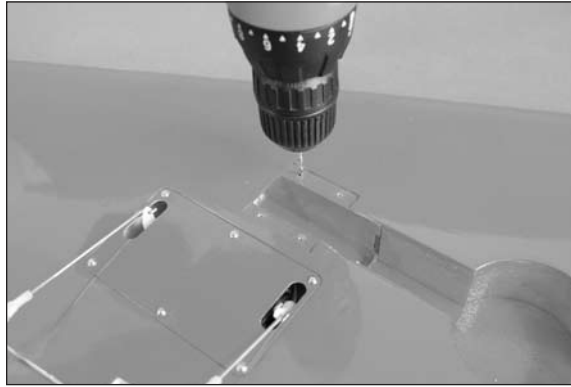
□□ 14. Place the retract mechanism in the wing. Use a pencil to transfer the mounting locations for the screws on the landing gear rails.



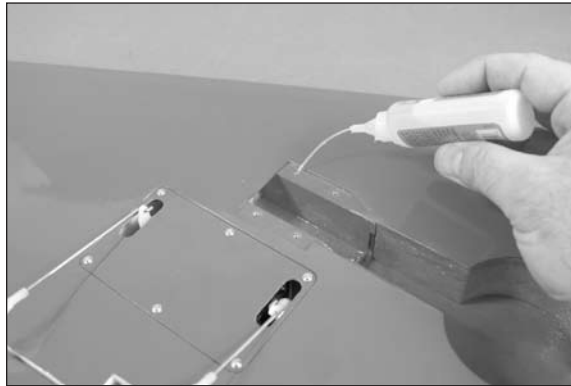
□□ 15. Place the 3/32-inch (2.5mm) drill bit in the drill. Set the drill so it is 1-inch (25mm) from the chuck to prevent accidentally drilling through the top of the wing.



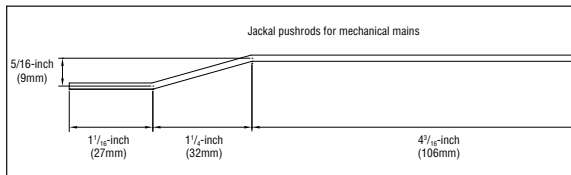
□□ 16. Drill the four mounting holes for the landing gear base using the drill and drill bit prepared in the previous step.



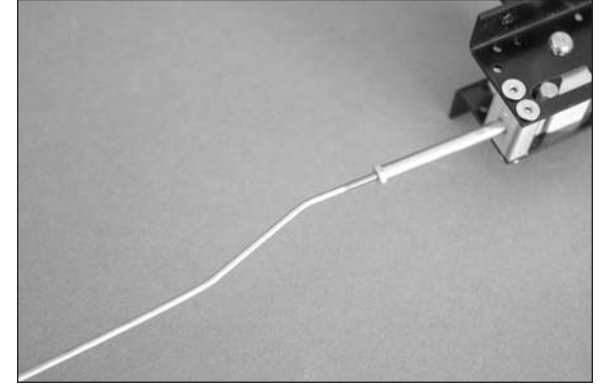
□□ 17. Place 2–3 drops of thin CA in each hole to harden the surrounding wood. This makes it difficult for the screw to pull loose on hard landings.



□□ 18. Bend the retract linkage using the drawing. This will allow the linkage to clear the wheel when the retract is in the up position.

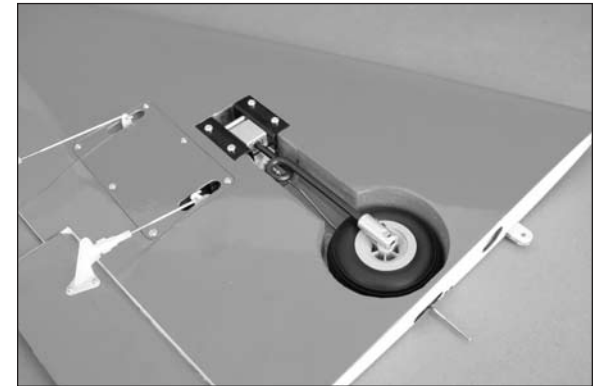


□□ 19. Thread the 2-56 nut on the threads of the short bent end of the pushrod. The pushrod is then threaded into the actuator for the retracts. With the pushrod positioned so the bend is toward the top of the retract, use needle nose pliers to tighten the nut against the actuator to keep it from rotating. Use threadlock to prevent the pushrod from vibrating loose.

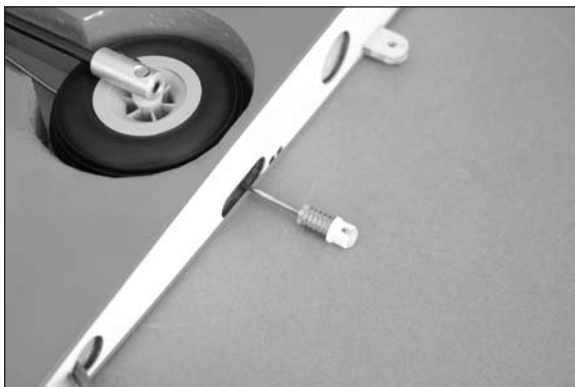


□□ 20. Repeat Steps 2 through 19 to prepare the opposite retract mechanism.

□□ 21. Place the retract mechanism in the wing. The spring faces toward the trailing edge of the wing as shown. Use four #6 x 1-inch sheet metal screws and a #2 Phillips screwdriver to secure the landing gear block in the wing.

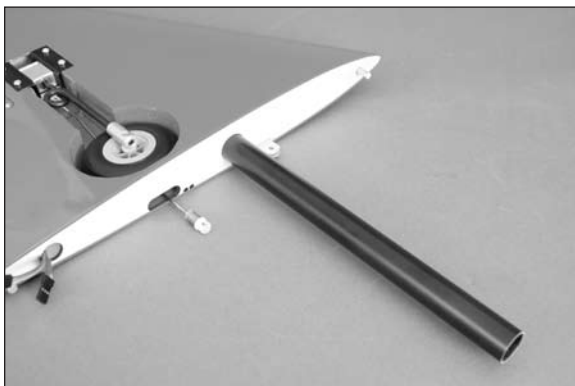


- 22. Thread the ball end on the pushrod wire. The position will be adjusted in the next few steps.



**Important:** The wing installation in this section is only for adjusting the retracts. Please follow the procedure in “Wing Installation” for the complete details for the wing installation.

- 23. Slide the wing tube into the wing panel.



- 24. Slide the wing panel into position in the fuselage. Use a 4-40 x 1-inch socket head screw and #4 washer to hold the wing in position. You don't need to tighten the screw, it is just holding the wing in position.

**Note:** Setting the linkage correctly will take some time and patience. Work slowly and make small adjustments to the linkage so the main gear retract operates correctly.



- 25. Use the radio system to move the retract servo to the up position. Move the linkage so the main gear is in the up and locked position. Connect the ball end to the ball on the servo arm. You may need to adjust the length of the linkage to get the ball end to align with the ball on the servo horn.



- 26. Use the radio system to move the retract servo to the down position. Check that the gear is down and locked at this time. If not, adjust the length of the linkage as necessary to make sure the gear is down and locked.

**Note:** Check to make sure the nose gear and main gear are moving up and down together. If you find the nose gear up when the main gear is down, remove the servo horn from the nose gear retract servo and rotate it 180-degrees so the gears move in unison.

- 27. Use the radio to cycle the gear a number of times, checking that the length of the linkage is correct. Although it is important the gear locks in both the up and down positions, it is most critical it is fully locked when down or it may collapse on the runway during takeoff or landing. Also make sure the servo is not binding at either position, as this will quickly drain the receiver battery. Take your time to set the linkage perfectly. Once complete, tighten the 2-56 nut against the retract actuator to prevent it from changing position.

- 28. Repeat Steps 21 through 26 to prepare and install the remaining main landing gear retract.

## Main Gear Installation - Pneumatic Retracts

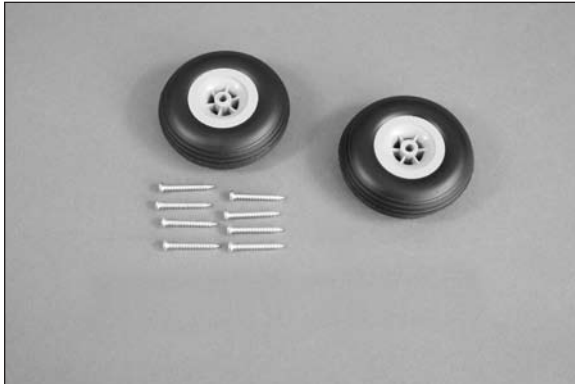
### Required Parts

Air line	Quick disconnect (2)
Wing panel (right and left)	
Main wheel, 2.5-inch (63.5mm) (2)	
#6 x 1-inch sheet metal screw (8)	

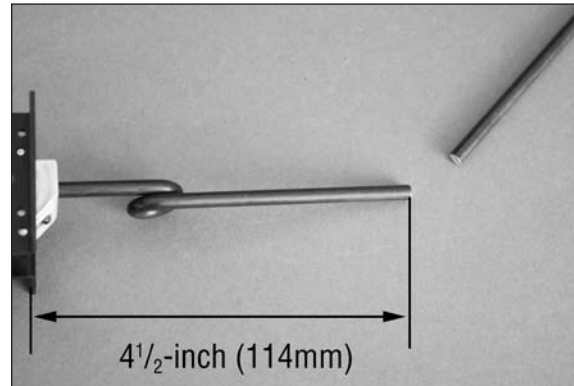
### Required Tools and Adhesives

Rotary tool	Cutoff wheel
Hobby knife with #11 blade	Covering iron
Sealing iron	Ruler
Felt-tipped pen	
Phillips screwdriver: #2	Drill
Pencil	Thin CA
Threadlock	Flat file
Light machine oil	Hex wrench: 5/64-inch
Drill bit: 3/32-inch (2.5mm), 3/16-inch (5mm)	

□ 1. Locate the items necessary to install the main pneumatic retracts in the wing panels. You will also need the right and left wing panels from your model as well as the retract mechanism, axles and air line kit for both wing panels.



□□ 2. Use a rotary tool and cutoff wheel to cut the main gear strut so it is 4½-inch (114mm) when measured from the top edge of the retract mounting flange as shown.

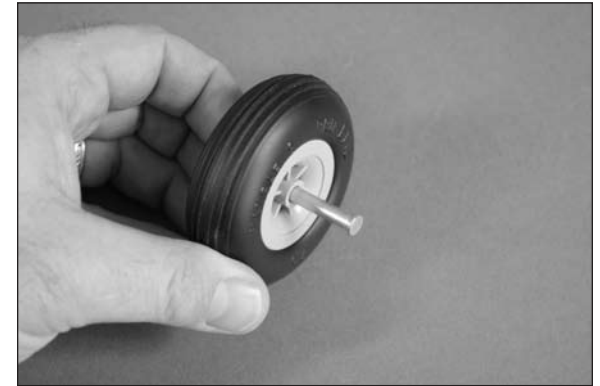


□□ 3. Use a drill and 3/16-inch (5mm) drill bit to enlarge the hole in the wheel.



**Note:** We recommend the use of a drill press to enlarge the hole in the wheel so it is straight.

□□ 4. Slide the axle through the hole in the wheel. Slide two nylon spacers on the axle from the opposite side.



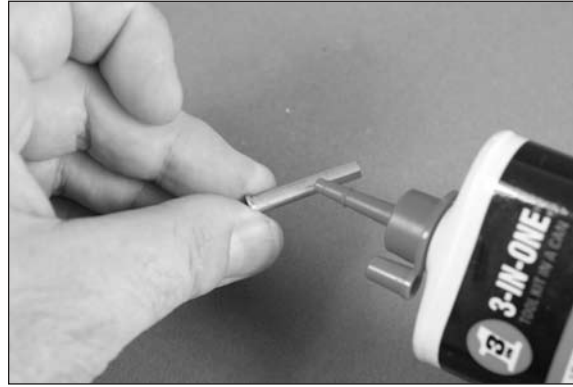
□□ 5. Slide the adapter on the axle. Use a felt-tipped pen to mark the location for the setscrew and the outside edge where the axle will need trimmed.



□□ 6. Use a rotary tool and cutoff wheel to trim the length of the axle. Use a flat file to make a 1/4-inch (6mm) wide flat where the setscrew from the adapter will rest.



□□ 7. Place a drop of light machine oil on the axle before sliding it into the wheel so it rolls smoothly during takeoff and landing.



□□ 8. Assemble the axle and wheel as shown. Use threadlock on the setscrew before tightening it on the flat area made in the previous step.

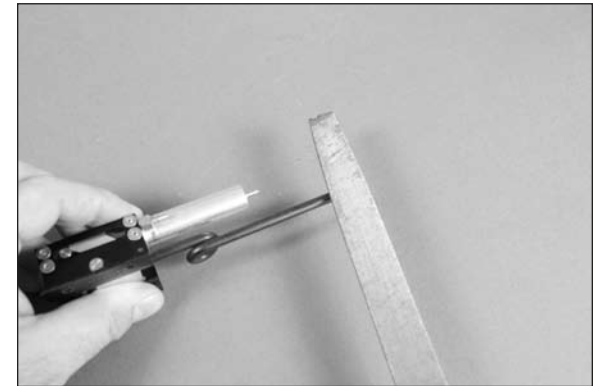


□□ 9. Tighten the wheel assembly to the main gear strut. Use the setscrews provided with the axle adapters and a 5/64-inch hex wrench to tighten the setscrews. The setscrews will leave a mark on the strut where you will file in the next step.

**Hint:** With the retract mechanism in the up position, hold the retract frame and wheel flat on your work surface. This will set the wheel to the correct alignment.

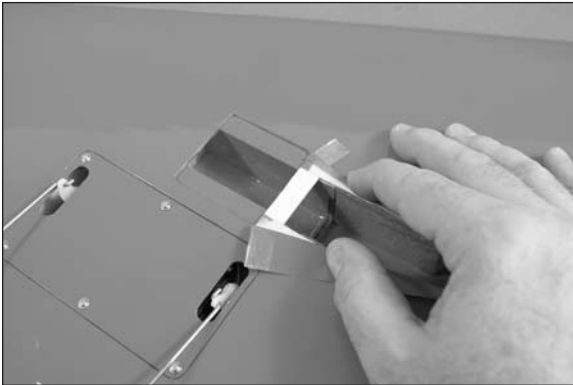


□□ 10. Use a flat file to make a flat on the strut for the setscrews. This will provide an area for the setscrews to be tightened on, and prevent the wheel from rotating during takeoff and landing.

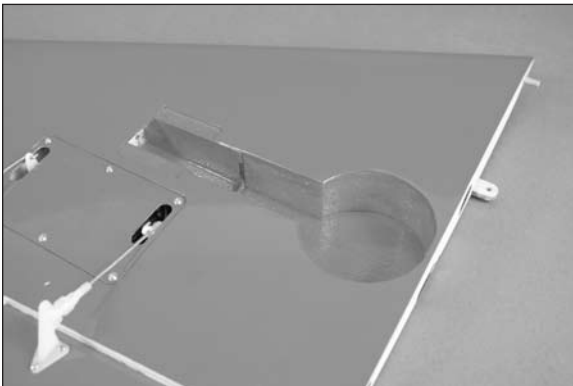


□□ 11. You can now attach the wheel assembly to the strut using the setscrews and a 5/64-inch hex wrench. Make sure to use threadlock on the setscrews to prevent them from vibrating loose. Make sure the wheel is perpendicular to the retract actuator before tightening the setscrews.

□□ 12. Use a hobby knife to cut the covering down the center of the opening in the wing for the retract. Peel the covering back to expose the balsa brace near the opening for the mechanism.

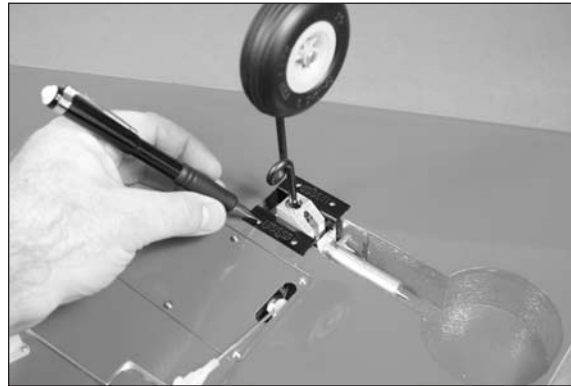


□□ 13. Use a hobby knife to carefully remove the brace. Trim the covering so you will have roughly 1/8-inch (3mm) of covering that will be ironed into the wheel well. Use a covering iron or trim seal tool to iron the covering, completing the retract wheel well.

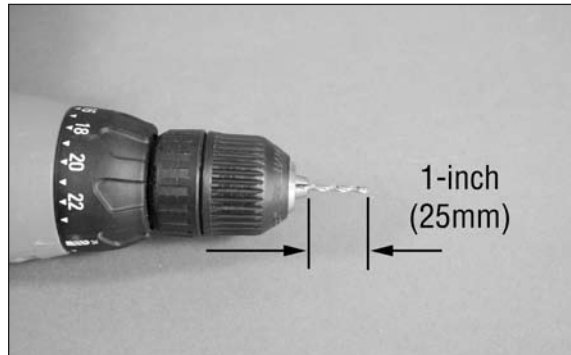


□□ 14. Repeat Steps 2 through 13 to prepare and install the remaining main landing gear retract.

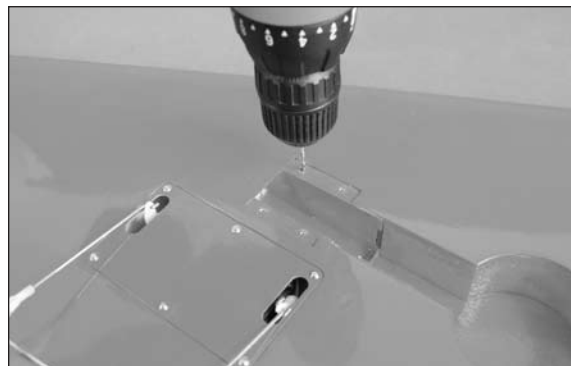
□□ 15. Place the retract mechanism in the wing. Use a pencil to transfer the mounting locations for the screws on the landing gear rails.



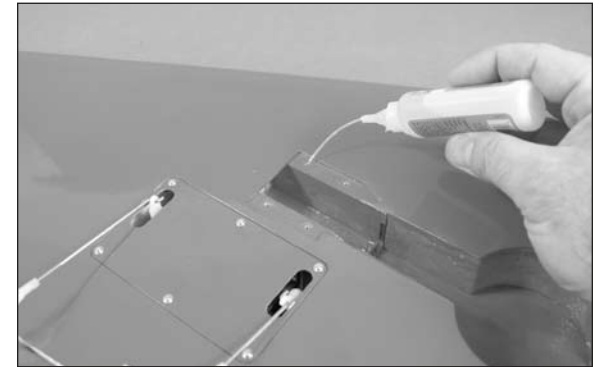
□□ 16. Place the 3/32-inch (2.5mm) drill bit in the drill. Set the drill so it is 1-inch (25mm) from the chuck to prevent accidentally drilling through the top of the wing.



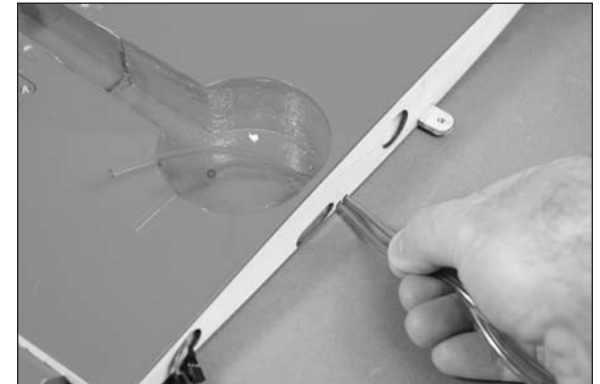
□□ 17. Drill the four mounting holes for the landing gear base using the drill and drill bit prepared in the previous step.



□□ 18. Place 2–3 drops of thin CA in each hole to harden the surrounding wood. This makes it difficult for the screw to pull loose on hard landings.



□□ 19. Cut two 8-inch (230mm) pieces of air line (one of each color) using scissors or a hobby knife and #11 blade. Insert the air lines through the holes in the root of the wing from the outside of the wing. You may need to use a hobby knife and #11 blade to trim the holes through the foam of the wing.

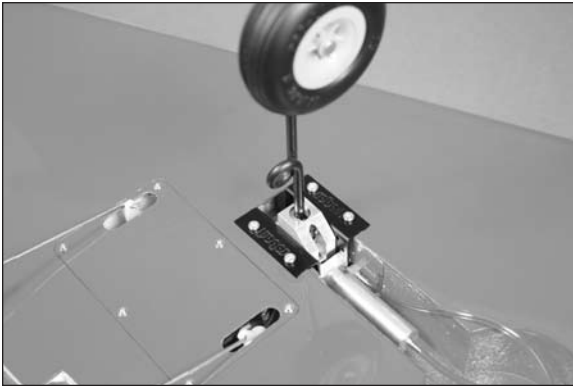


**Note:** We recommend Robart air line with a 1/16-inch inside diameter and 1/8-inch outside diameter for connecting your retracts. Use two different colored lines to differentiate the air line for Up and Down actuation of the retract. Use the drawing on Page 53 for more information regarding the routing of the air lines for your model.

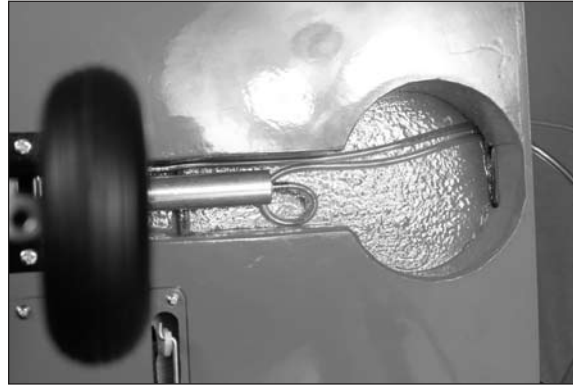
□□ 20. Attach the air lines to the retract air cylinder. Use the instructions included with the retracts to connect the lines.



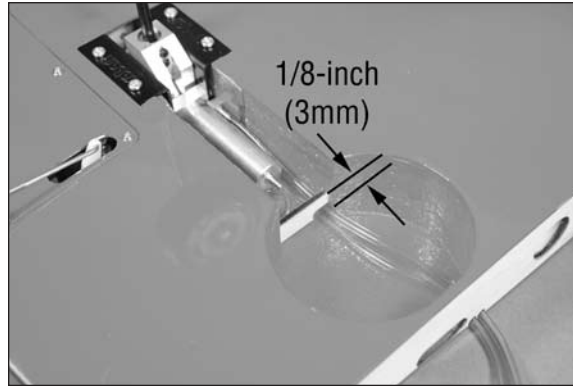
□□ 21. Place the retract mechanism in the wing. The spring faces toward the trailing edge of the wing as shown. Use four #6 x 1-inch sheet metal screws and a #2 Phillips screwdriver to secure the landing gear block in the wing.



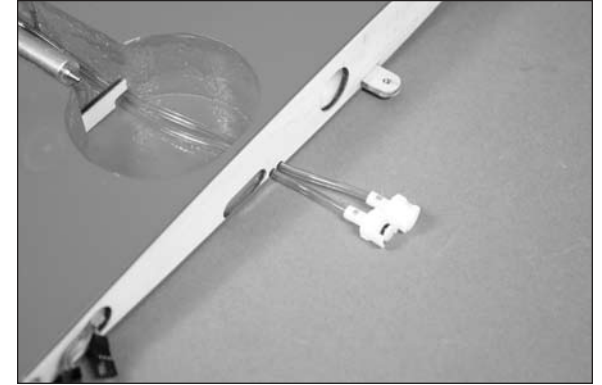
□□ 22. Loop the air line from the end of the air cylinder back under the cylinder. This will keep it from kinking when installing the air line brace.



□□ 23. Use 30-minute epoxy to glue the air line brace into the wing. Set the brace back 1/8-inch (3mm) from the wheel well so it does not interfere with the wheel when the gear is in the up position.



□□ 24. Use side cutters to trim the tubing 1 1/2-inch (37mm) from the end of the wing root. Install the air line quick connect fittings on the tubes according to the Robart instructions.



**Hint:** We install opposing fittings to make sure the up and down air lines are not connected incorrectly when assembling the model at the field.

□□ 25. Repeat Steps 15 through 24 to prepare and install the remaining main landing gear retract.

## Engine Installation

### Required Parts

Fuselage assembly	Engine mount rails (2)
#8 washer (4)	#6 washer (4)
6-32 locknut (4)	Nylon clevis, small
Silicone clevis retainer	Spinner cone
Spinner backplate	Spinner adapter
2mm x 787mm pushrod	Transmitter
Fuel tank	Hook and loop strap
2mm x 31-inch (787 mm) pushrod	
Clear cowling template	
Painted cowling	
Brass pushrod connector	
10-32 x 5/8-inch socket head machine screw	
Nylon pushrod connector backplate	
8-32 x 3/4-inch socket head machine screw (4)	
6-32 x 1-inch socket head machine screw (4)	
3mm x 4mm machine screw	
4-40 x 3/8-inch button head screw (4)	

### Required Parts (not included)

Servo with hardware	Engine
Muffler	

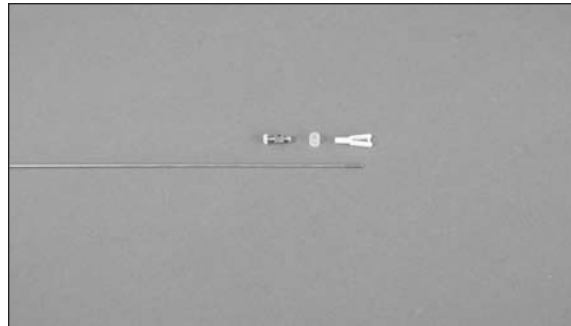
### Required Tools and Adhesives

Low-tack tape	Drill
Nut driver: 5/16-inch	Hobby scissors
Threadlock	Pin vise
Felt-tipped pen	Phillips screwdriver: #1
Ruler	Open end wrench: 12mm
Side cutter	Thin CA
Pencil	
Rotary tool with sanding drum	
Drill bit: 5/64-inch (3mm), 9/64-inch (3.5mm)	
Ball driver or hex wrench: 5/64-inch, 7/64-inch, 1/8-inch, 4mm or 5/32-inch	

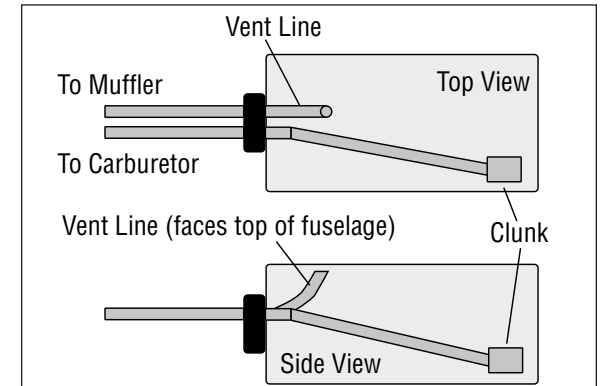
1. Locate the items necessary to install the engine. You will also need the fuselage assembly, which includes the fuel tank.



Don't forget the pushrod linkage and other items to connect the throttle servo to the carburetor.

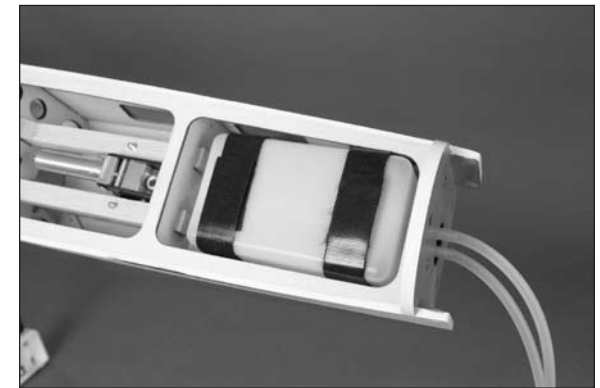


2. Inspect the fuel tank to determine the correct orientation before installing it into the fuselage.

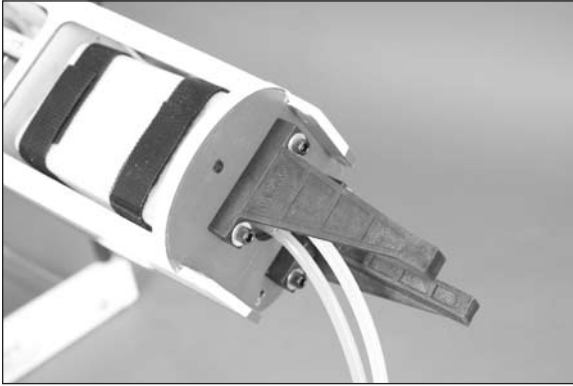


3. Place the fuel tank in the fuselage, securing it with the hook and loop straps.

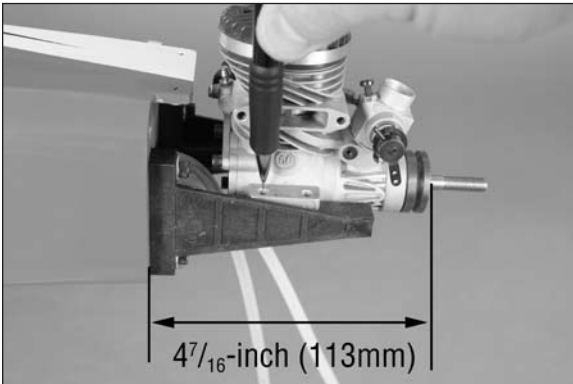
**Note:** You will be required to drill the engine mount for the engine. If you will NOT be using a drill press, make sure to use threadlock on the screws that attach the engine mount rails to the firewall in the following step.



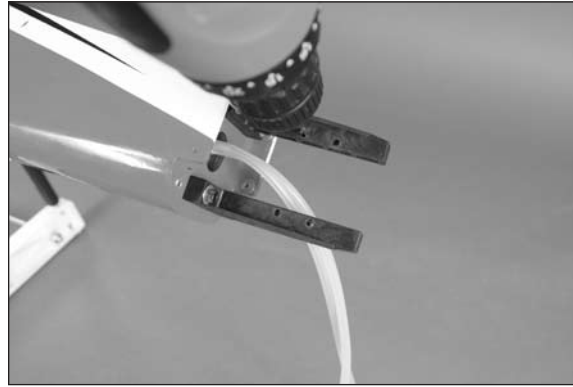
□ 4. Attach the engine mount rails to the firewall using four 8-32 x 3/4-inch socket head machine screws and four #8 washers. Use a 1/8-inch hex wrench or ball driver to tighten the screws. Make sure to use threadlock on the screws so they don't vibrate loose in flight.



□ 5. Position the engine on the rails. Measure the distance from the firewall to the front face of the drive washer. Adjust the engine so this measurement is  $4\frac{7}{16}$ -inch (113mm). Mark the engine mount rails for the engine mounting screws using a pencil.

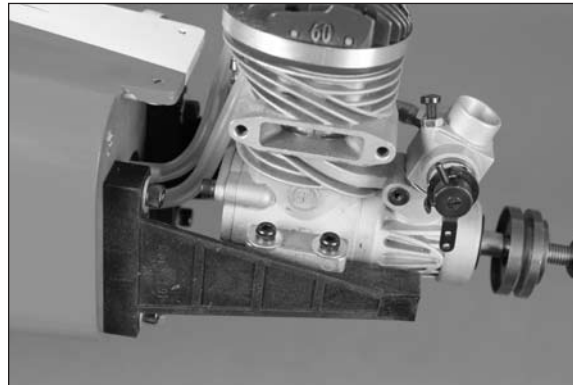


□ 6. Use a drill and 9/64-inch (3.5mm) drill bit to drill the four holes in the engine mount rails for mounting the engine.

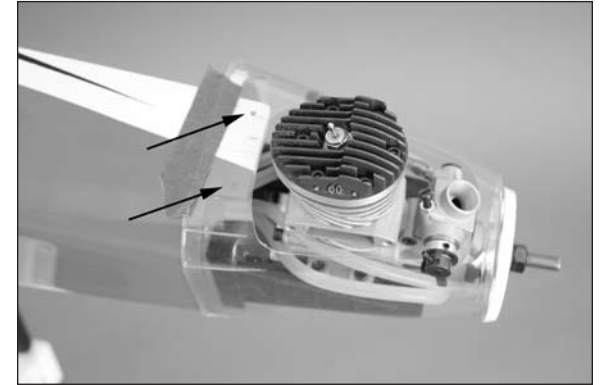


**Hint:** It is recommended to use a drill press for drilling the holes in the engine mount rails. This will make them nice and straight in the rails. Make sure to use threadlock on the screws that attach the rails to the firewall when installing the rails back on the firewall.

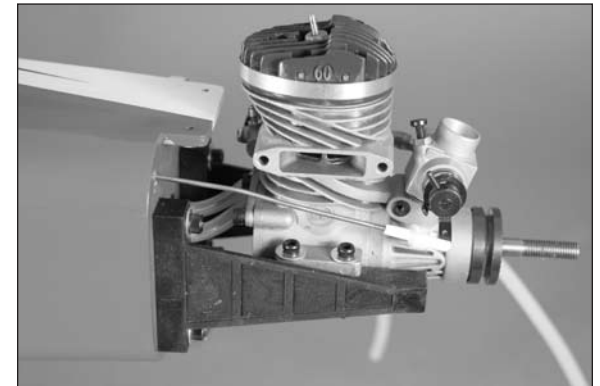
□ 7. Use four 6-32 x 1-inch socket head machine screws, four #6 washers and four 6-32 locknuts to attach the engine to the mounting rails. Use a 5/16-inch nut driver and 7/64-inch hex wrench or ball driver to tighten the hardware.



□ 8. Trim the clear cowling to fit the engine. We placed the spinner backplate on the engine crankshaft to help locate the clear cowling while trimming. Use low-tack tape to hold the cowling in position on the fuselage. Use a felt-tipped pen to mark the locations for the cowl mounting screws on the clear template. This will help when aligning the clear template to the painted cowl.

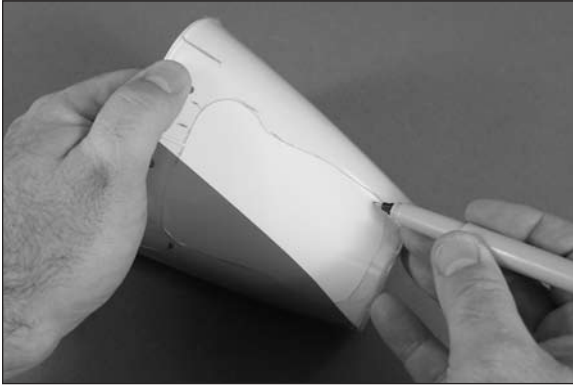


□ 9. Slide a silicone clevis retainer over the small nylon clevis. Thread the clevis on the throttle pushrod and slide the pushrod into the tube in the firewall. Connect the clevis to the outer hole of the carburetor arm and slide the clevis retainer over the forks of the clevis to prevent it from opening accidentally. Bend the pushrod slightly so it does not bind when the carburetor is opened or closed.

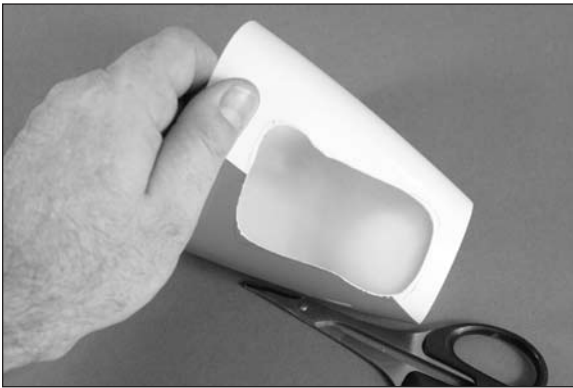




□ 10. Slide the clear cowling over the painted cowling. Align the marks made on the clear cowl in Step 8 for the cowl mounting screws to align the clear cowl and painted cowl. Use a felt-tipped pen to transfer the opening from the clear cowling to the painted cowling. Make the marks on the painted cowling roughly 1/8-inch (3mm) inside the opening in the clear cowling to allow some material to remove when making the final fit of the painted cowling.



□ 11. Use hobby scissors to rough the opening for the engine. Cut the cowling along the paint line behind the engine so it can be installed and removed easily.



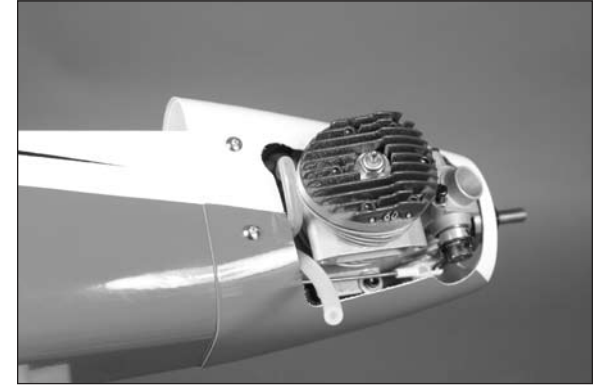
□ 12. Use a rotary tool and sanding drum to fit the cowl to the engine. Work slowly removing small amounts of material. Use the spinner backplate and cowl mounting holes to help in aligning the cowling while trimming. The cowl only needs to fit over the engine at this time. Final adjustments can be made once the cowl is secured to the fuselage.



□ 13. Check that there is a gap of 1/16-inch (1.5mm) between the spinner backplate and cowling. If not, slightly oval the mounting holes in the cowl so there is a small gap to prevent the backplate from rubbing on the cowl.



□ 14. Attach the cowling to the fuselage using four 4-40 x 3/8-inch button head screws. Use a 5/64-inch hex wrench or ball driver to tighten the screws. Trim and connect the fuel line connected to the fuel tank clunk line to the carburetor fuel inlet nipple.



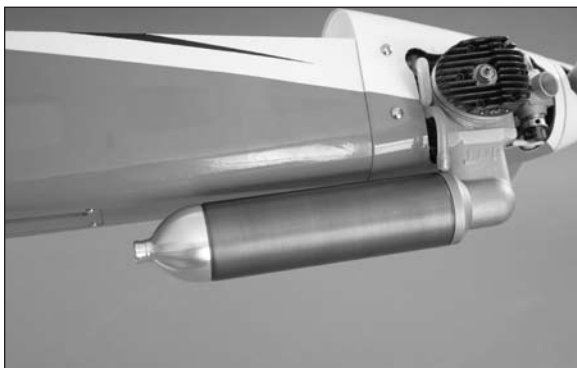
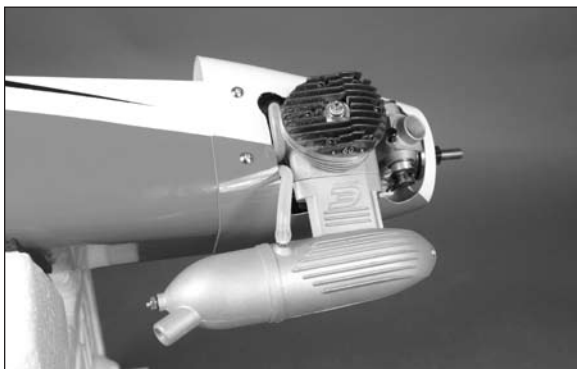
□ 15. Attach the propeller and spinner backplate to the crankshaft using the washer included with the engine and the adapter included with the model. Use a 12mm open end or box wrench to tighten the nut. Do not use pliers as this will not tighten the nut and will round the corners so a box or open end wrench won't fit.



- 16. Place the spinner cone on the backplate so the openings for the propeller in the cone are not touching the propeller. Use a 4mm hex wrench or ball driver to install the spinner mounting screw.

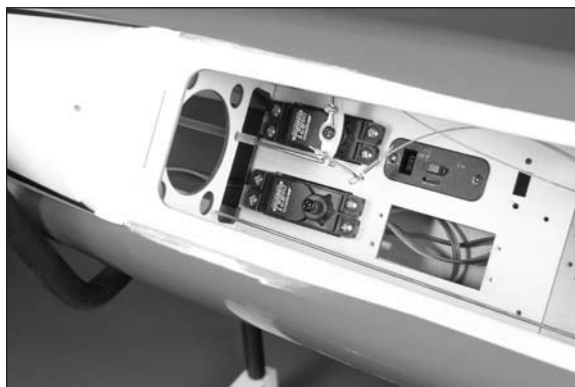


- 17. Attach the muffler to the engine using the hardware included with the muffler. Connect the line from the fuel tank vent to the muffler. Trim the line so it won't interfere with the operation of the engine. Use a small amount of threadlock on the screws to prevent them from vibrating loose.

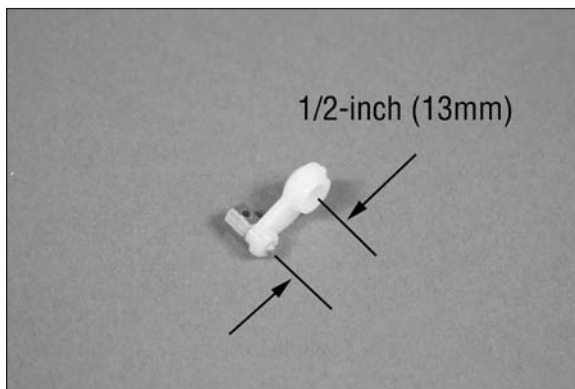


**Hint:** The installation of the optional EVOM1 muffler will increase the speed of the engine over 1500 rpm on an APC 10 x 7 propeller.

- 18. Place 2–3 drops of thin CA in the holes for the throttle servo mounting screws. Remove the horn from the throttle servo and use the hardware included with the servo and a #1 Phillips screwdriver to mount the throttle servo in the fuselage. Route the lead from the servo under the tray and plug it into the throttle port of the receiver.



- 19. Prepare the servo horn for the throttle by enlarging a hole that is 1/2-inch (13mm) from the center of the horn using a pin vise and 5/64-inch (2mm) drill bit. Insert the brass pushrod connector in the hole of the servo horn that is 1/2-inch (13mm) from the center of the horn. Use the connector backplate to secure the connector to the horn. Use side cutters to remove any arm on the horn that will interfere with the operation of the radio system.



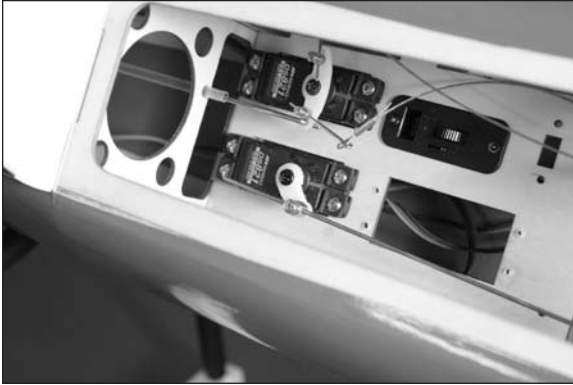
- 20. Center the throttle servo using the radio system. Slide the pushrod wire through the hole in the brass pushrod connector and attach the servo horn to the throttle servo so it is perpendicular to the servo center line. This provides equal throw to both low and high throttle. Secure the horn using the screw removed from the servo and a #1 Phillips screwdriver.



- 21. Move the throttle servo to the low-throttle position using the radio system. Use the linkage to close the carburetor then use the 3mm x 4mm machine screw to secure the pushrod to the brass pushrod connector. Use threadlock on all metal-to-metal fasteners to prevent them from vibrating loose.



□ 22. Use the radio system to move the carburetor to the high-throttle position. If the servo binds, use the setting in the radio to reduce the throw. If the carburetor is not fully open, use the radio setting so the carburetor opens fully.



## ***Pneumatic Retract Valve and Air Line Installation***

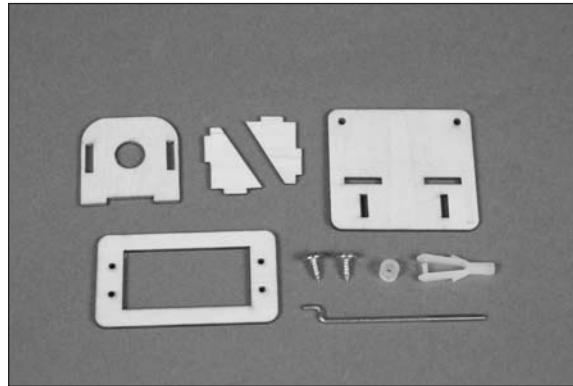
### **Required Parts**

Fuselage assembly	Air valve mount
Air valve mount base	2-56 x 2-inch pushrod
Air valve mount support (2)	Silicone clevis retainer
Nylon clevis	
Plywood servo adapter plate	
3mm x 8mm sheet metal screw (2)	
Retract air valve kit	

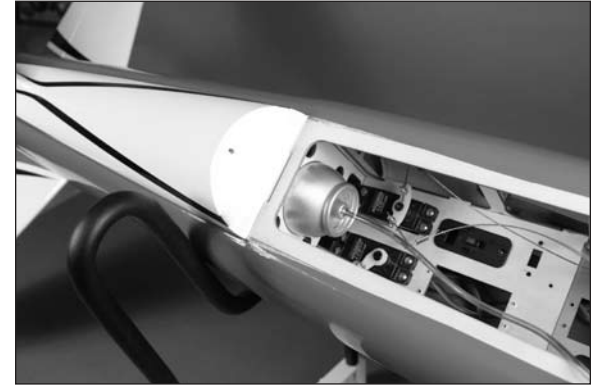
### **Required Tools and Adhesives**

Phillips screwdriver: #1	Pin vise
Medium CA	Pin vise
Drill bit: 1/16-inch (1.5mm), 5/64-inch (2mm)	
Zap-A-Dap-A-Goo similar or flexible adhesive	

□ 1. Locate the items necessary to install the air valve in the fuselage. You will also need to have the fuselage, along with the appropriate air control kit for your model.



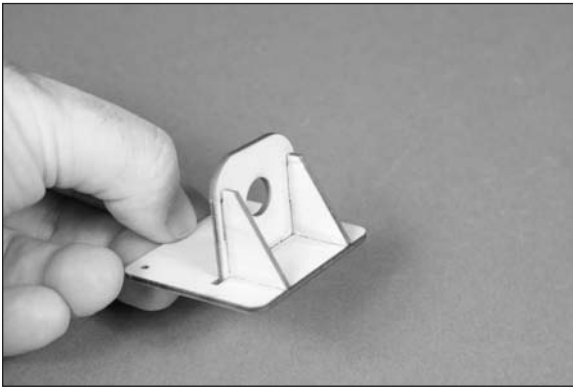
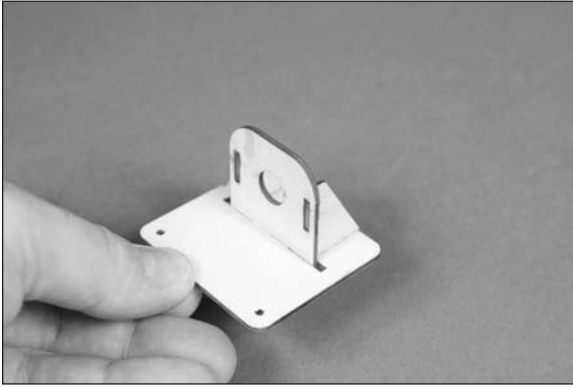
□ 2. Attach an appropriate colored line to the air tank. Use a very small amount of flexible adhesive to secure the air tank in the fuselage as shown.



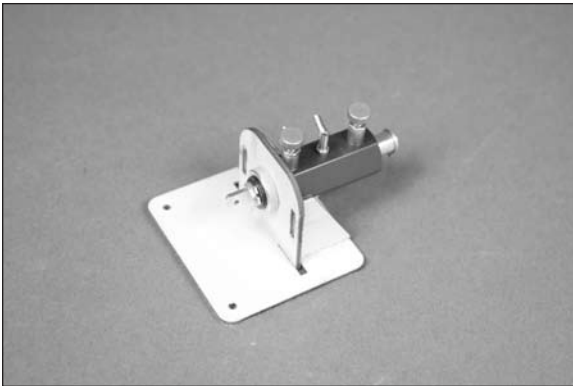
□ 3. Use a small amount of medium CA to glue the plywood servo adapter plate in the fuselage. Make sure to center the adapter plate over the existing retract servo opening in the servo tray as shown.



□ 4. While the adhesives from the first few steps cure, you can build the retract valve mount using medium CA. Make sure all the joints are tight when assembling the mount.



□ 5. Attach the retract valve to the mount. Make sure to position the valve so the mount does not interfere with the air lines when they are connected to the valve.



□ 6. Use a pin vise and 1/16-inch (1.5mm) drill bit to drill the holes through the plywood servo adapter plate and into the radio tray. Apply 2–3 drops of thin CA in each hole to harden the surrounding wood.



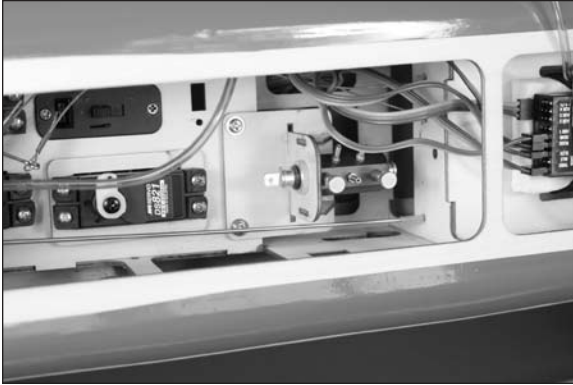
□ 7. Use the screws provided with the servo and a #1 Phillips screwdriver to secure the retract servo in the fuselage. Make sure the output of the servo faces the rear of the fuselage. Route the lead for the servo under the servo tray and plug it into the retract port of the receiver.



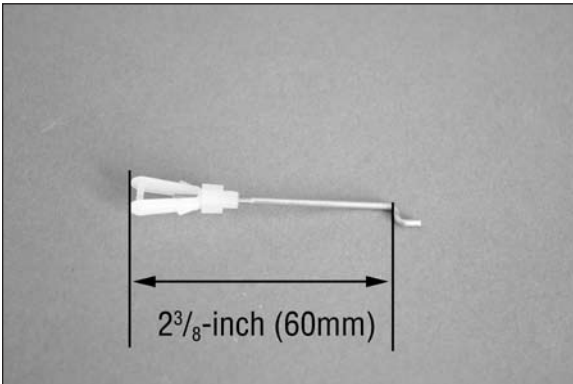
□ 8. Prepare a servo horn by enlarging the hole in the arm that is as close to the center of the arm as possible using a pin vise and 5/64-inch (2mm) drill bit. Use the radio to set the throw for the retract servo to 0% in both directions. This will center the servo and allow you to set the throw for the retract valve without causing damage to the servo, valve or airframe by having more throw than necessary.



□ 9. Place 2–3 drops of thin CA in each of the two retract valve mounting holes in the radio tray. Use two 3mm x 8mm sheet metal screws to attach the retract valve mount in the fuselage. Tighten the screws using a #1 Phillips screwdriver.



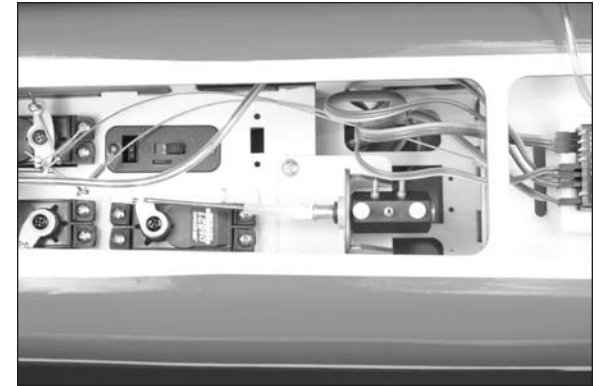
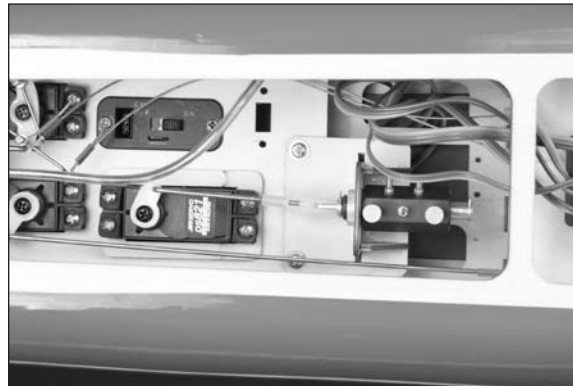
□ 10. Assemble the linkage for the retract valve using a silicone clevis keeper, nylon clevis and the 2-56 x 2-inch pushrod. Thread the clevis on the pushrod so the overall length of the linkage is 2<sup>3</sup>/<sub>8</sub>-inch (60mm).



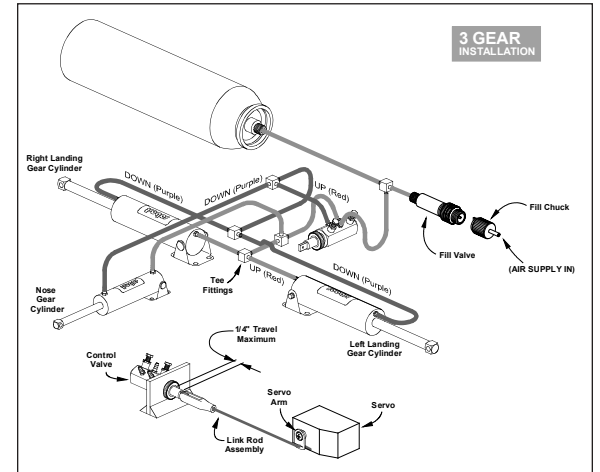
□ 11. Center the retract servo using the radio system by setting the ATV (or endpoint) values to 0%. Install the linkage by inserting the bend in the linkage in the hole of the servo horn. The clevis is then connected to the retract valve. Check that the valve is in the center of the throw. Adjust the clevis as necessary. Slice the retainer over the forks of the clevis to keep it from opening accidentally.



□ 12. Use the ATV (or endpoints) in the programming of your radio system to properly operate the retract valve. It will only take a few percents in both directions to operate the valve.



□ 13. Route the airlines in the fuselage for the air tank, nose gear and main gear. Use the information provided with the retract instructions to route the lines correctly. Make sure that the fittings for the main gear are oriented correctly so they work in unison with each other and with the nose gear retract.



## Wing Installation

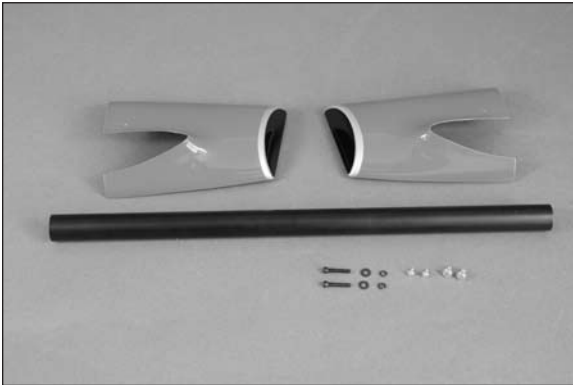
### Required Parts

Fuselage assembly #4 washer (2)  
#4 lock washer (2) Aluminum wing tube  
Wing assembly (right and left)  
4-40 x 1-inch socket head machine screw (2)  
Fiberglass inlet (right and left)  
3mm x 8mm sheet metal screw (2)  
1.7mm x 6mm sheet metal screw (2)  
9-inch (228mm) servo extension (4)  
Tie wraps (not included)

### Required Tools and Adhesives

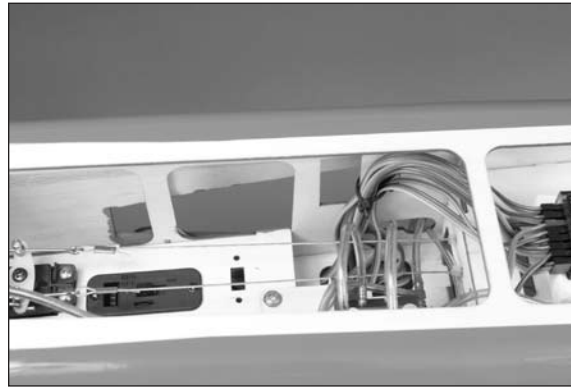
Phillips screwdriver: #1  
Hex wrench or ball driver: 3/32-inch

1. Locate the items necessary to install the wing to the fuselage. You will also need both wing panels and the fuselage for this section of the manual.

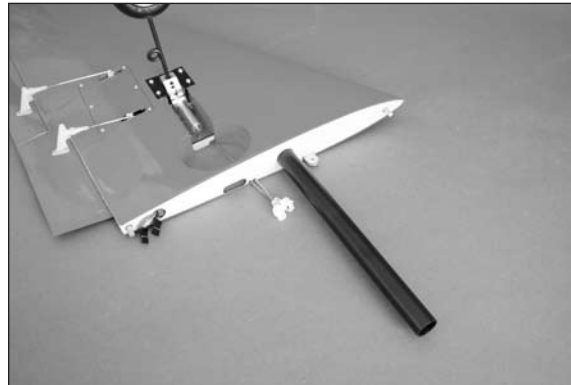


2. Plug the 9-inch (228mm) servo extensions into the receiver for the flaps and ailerons. Route the extensions out of the fuselage so the leads in the wing can be plugged in when the wing is installed.

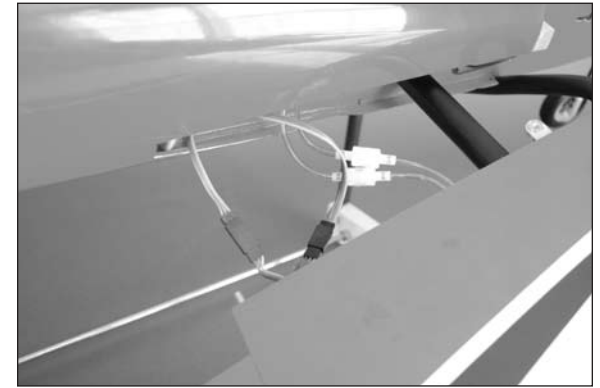
3. Use tie wraps to secure the servo leads inside the fuselage. This will prevent them from interfering with the operation of the radio system inside the fuselage.



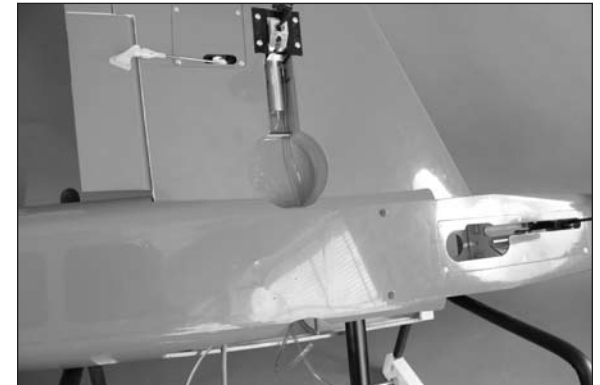
4. Slide the wing tube into one of the wing panels. The tube will slide in easily, so don't force it in farther than it will slide easily.



5. Insert the tube into the fuselage. Before sliding the panel tight against the fuselage, connect any extensions or air lines at this time.



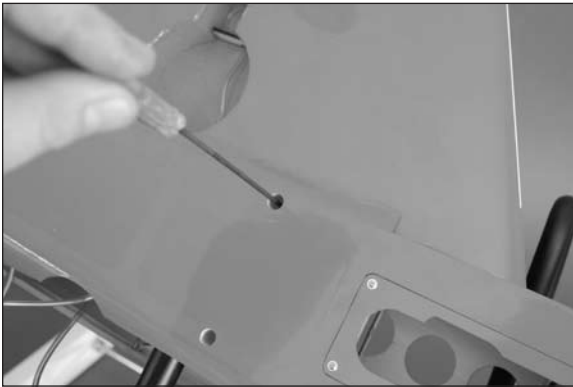
6. Guide the extensions (and air lines) into the fuselage while sliding the wing into position. The wing will fit tightly against the fuselage.



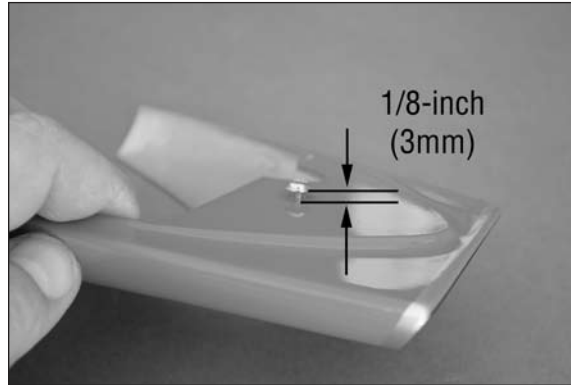
□□ 7. Slide a #4 lock washer, then a #4 washer on a 4-40 x 1-inch socket head machine screw.



□□ 8. Insert the screw into the hole in the bottom of the fuselage. The screw will thread into the blind nut installed in the wing. Use a 3/32-inch hex wrench or ball driver to tighten the screw.



□□ 9. Use a #1 Phillips screwdriver to thread the 3mm x 8mm sheet metal screw into the fiberglass inlet. Allow a gap of 1/8-inch (3mm) between the edge of the fairing and head of the screw.



□□ 10. The head of the screw will fit into the keyed opening in the fuselage. Slide the fairing rearward and against the leading edge of the wing. If the screw is too far in, it may be difficult to install the fairing. Loosen the screw slightly until the fairing can be installed.



□□ 11. Use a 1.7mm x 6mm sheet metal screw to secure the fairing in position. Use a #1 Phillips screwdriver to tighten the screw.



□□ 12. Repeat Steps 5 through 11 to attach the remaining wing panel to the fuselage.

□□ 13. Connect the linkages to the retract servo if you have installed mechanical retracts.

## Canopy Preparation and Pilot Installation

### Required Parts

Canopy hatch                      Cockpit floor  
1.5mm x 6mm sheet metal screw (6)

### Required Tools and Adhesives

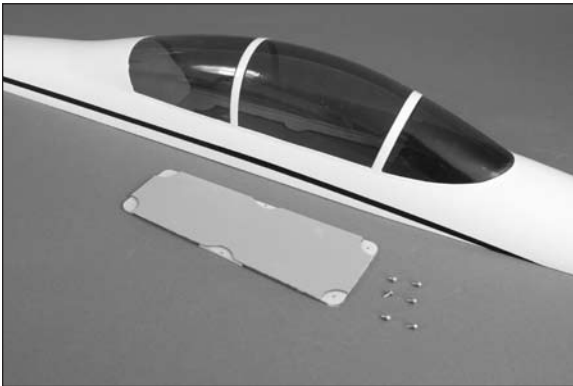
Phillips screwdriver: #1

### Optional Required Items

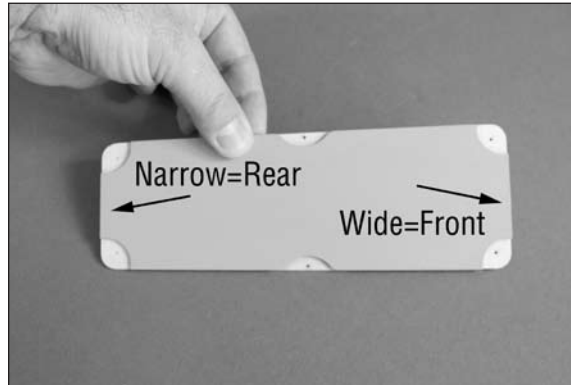
Pilot figure (2)                      Medium CA  
Drill bit: 1/16-inch (1.5mm)      Pin vise  
#2 x 1/2-inch sheet metal screw (2) (not included)

**Note:** This section covers the installation of two pilot figures (optional) in the canopy. If you choose not to install the pilots now, they can be added later. You will need to install the canopy floor as described in Step 6 and 7.

1. Locate the items necessary to attach the canopy floor to the canopy. If you are installing pilots, you will also need the items listed under the optional required items.



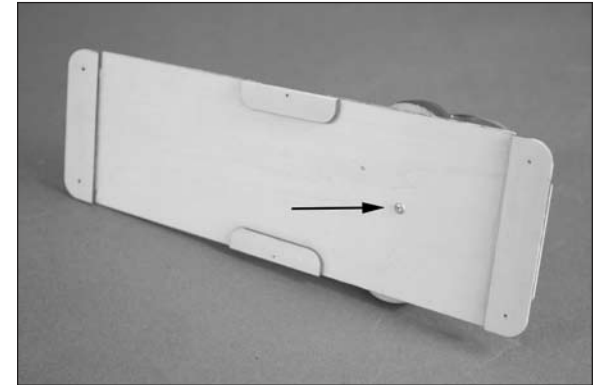
2. Before installing the pilots, make sure to determine the front and rear of the canopy floor. The front of the floor is wider than the rear as shown in the photo.



3. Use medium CA to glue the forward pilot figure to the canopy floor. Position the pilot about half-way between the front and center mounting holes. Make sure the shoulders of the pilot hang over the edge of the canopy floor equally.



4. Use a pin vise and a 1/16-inch (1.5mm) drill bit to drill a hole through the canopy floor and into the base of the pilot. Use a #2 x 1/2-inch sheet metal screw to secure the pilot to the canopy floor.



5. Use medium CA to glue the shoulders of the rear pilot to the canopy frame. Allow the CA to fully cure before proceeding.

**Note:** Do not use CA accelerator as it may damage the canopy material.





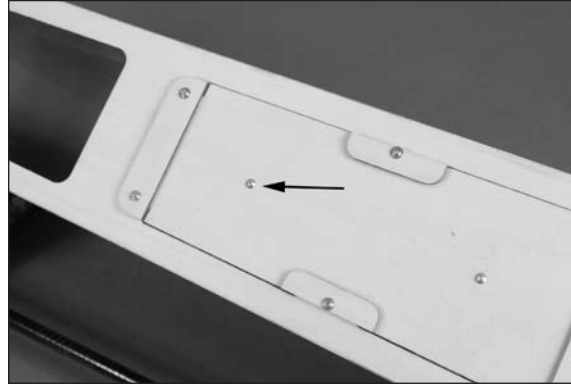
- 6. Position the canopy floor in the opening in the canopy hatch. If you installed a pilot, you will need to rotate the hatch to fit the shoulders of the front pilot.



- 7. Use six 1.5mm x 6mm sheet metal screws to secure the canopy floor. Use a #1 Phillips screwdriver to tighten the screws.



- 8. Use a pin vise and a 1/16-inch (1.5mm) drill bit to drill a hole through the canopy floor and into the base of the rear pilot. Use a #2 x 1/2-inch sheet metal screw to secure the pilot to the canopy floor.



- 9. Attach the canopy to the fuselage to complete the build of your model.



## Center of Gravity

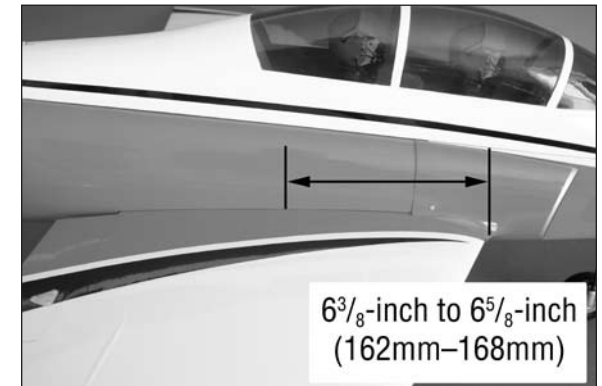
An important part of preparing the aircraft for flight is properly balancing the model.

**Caution: Do not inadvertently skip this step!**

The recommended Center of Gravity (CG) location for your model is  $6\frac{3}{8}$ -inch to  $6\frac{5}{8}$ -inch (162mm–168mm) back from the leading edge of the wing as shown with the battery pack installed. Mark the location of the CG on the top of the wing with a felt-tipped pen.

When balancing your model, support the plane inverted at the marks made on the wing with your fingers or a commercially available balancing stand. This is the correct balance point for your model. Make sure your model is assembled and ready for flight before balancing.

Adjust the motor battery as necessary so the model is level or slightly nose down. This is the correct balance point for your model. You should find the CG to be very close with the battery installed as shown in this manual. Mark the location of the battery on the battery tray using a felt-tipped pen so it can be returned to this position if it is removed from your model.



After the first flights, the CG position can be adjusted for your personal preference.

## Control Throws

1. Turn on the transmitter and receiver of your model. Check the movement of the rudder using the transmitter. When the stick is moved right, the rudder should also move right. Reverse the direction of the servo at the transmitter if necessary.

2. Check the movement of the elevator with the radio system. Moving the elevator stick toward the bottom of the transmitter will make the airplane elevator move up.

3. Check the movement of the ailerons with the radio system. Moving the aileron stick right will make the right aileron move up and the left aileron move down.

4. Use a ruler to adjust the throw of the elevator, ailerons and rudder.

### Aileron:

#### High Rate:

Up:	1/2-inches	13mm	18 degrees
Down:	1/2-inches	13mm	18 degrees

#### Low Rate:

Up:	5/16-inches	8mm	15 degrees
Down:	5/16-inches	8mm	15 degrees

### Elevator:

#### High Rate:

Up:	1-inches	25mm	22 degrees
Down:	3/4-inches	19mm	18 degrees

#### Low Rate:

Up:	3/4inches	19mm	18 degrees
Down:	1/2-inches	13mm	14 degrees

### Rudder:

#### High Rate:

Right:	1 <sup>3</sup> / <sub>8</sub> -inches	35mm	28 degrees
Left:	1-inches	25mm	20 degrees

#### Low Rate:

Right:	1-inches	25mm	20 degrees
Left:	7/8-inches	22mm	18 degrees

### Flap:

Mid:	23 degrees
Land:	42 degrees

### Flap Mix to Elevator:

Mid:	1 degrees (6%)
Land:	3 degrees (13%)

These are general guidelines measured from our own flight tests. You can experiment with higher rates to match your preferred style of flying.

**Note:** Travel Adjust, Sub-Trim and Dual Rates are not listed and should be adjusted according to each individual model and preference.

## Preflight

### Check Your Radio

Before going to the field, be sure your batteries are fully charged per your radio's instructions. Charge the transmitter and motor battery for your airplane. Use the recommended charger supplied with your particular radio system, following the instructions provided with the radio. In most cases, the radio should be charged the night before going out flying.

Before each flying session, be sure to range check your radio. See your radio manual for the recommended range and instructions for your radio system. Each radio manufacturer specifies different procedures for their radio systems. Next, run the motor. With the model securely anchored, check the range again. The range test should not be significantly affected. If it is, don't attempt to fly! Have your radio equipment checked out by the manufacturer.

Double-check that all controls (aileron, elevator, rudder and throttle) move in the correct direction.

Check the radio installation and make sure all the control surfaces are moving correctly (i.e., the correct direction and with the recommended throws).

Check all the control horns, servo horns, and clevises to make sure they are secure and in good condition.

### Range Test Your Radio

Before each flying session, and especially with a new model, it is important to perform a range check. It is helpful to have another person available to assist during the range check. If you are using a Spektrum transmitter, please refer to your transmitter's manual for detailed instructions on the range check process.

## ***Safety Do's and Don'ts for Pilots***

- Consult local laws and ordinances before choosing a location to fly your aircraft.
- Check all control surfaces prior to each takeoff.
- Do not fly your model near spectators, parking areas or any other area that could result in injury to people or damage of property.
- Do not fly during adverse weather conditions. Poor visibility can cause disorientation and loss of control of your aircraft. Strong winds can cause similar problems.
- Do not take chances. If at any time during flight you observe any erratic or abnormal operation, land immediately and do not resume flight until the cause of the problem has been ascertained and corrected. Safety can never be taken lightly.
- Do not fly near power lines.

## ***Daily Flight Checks***

- 1. Check the battery voltage of the transmitter battery. Do not fly below the manufacturer's recommended voltage. To do so can crash your aircraft.

**When you check these batteries, ensure you have the polarities correct on your expanded scale voltmeter.**

- 2. Check all hardware (linkages, screws, nuts, and bolts) prior to each day's flight. Be sure that binding does not occur and that all parts are properly secured.
- 3. Ensure all surfaces are moving in the proper manner.
- 4. Perform a ground range check before each day's flying session.
- 5. Prior to starting your aircraft, turn off your transmitter, then turn it back on. Do this each time you start your aircraft. If any critical switches are on without your knowledge, the transmitter alarm will sound a warning at this time.
- 6. Check that all trim levers are in the proper location.
- 7. All servo pigtails and switch harness plugs should be secured in the receiver. Make sure the switch harness moves freely in both directions.

## ***Warranty and Repair Policy***

### ***WARRANTY PERIOD***

Exclusive Warranty- Horizon Hobby, Inc., (Horizon) warrants that the Products purchased (the "Product") will be free from defects in materials and workmanship at the date of purchase by the Purchaser.

### ***LIMITED WARRANTY***

***Horizon reserves the right to change or modify this warranty without notice and disclaims all other warranties, express or implied.***

(a) This warranty is limited to the original Purchaser ("Purchaser") and is not transferable. REPAIR OR REPLACEMENT AS PROVIDED UNDER THIS WARRANTY IS THE EXCLUSIVE REMEDY OF THE PURCHASER. This warranty covers only those Products purchased from an authorized Horizon dealer. Third party transactions are not covered by this warranty. Proof of purchase is required for all warranty claims.

(b) Limitations- HORIZON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ABOUT NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF THE PRODUCT. THE PURCHASER ACKNOWLEDGES THAT THEY ALONE HAVE DETERMINED THAT THE PRODUCT WILL SUITABLY MEET THE REQUIREMENTS OF THE PURCHASER'S INTENDED USE.

(c) Purchaser Remedy- Horizon's sole obligation hereunder shall be that Horizon will, at its option, (i) repair or (ii) replace, any Product determined by Horizon to be defective. In the event of a defect, these are the Purchaser's exclusive remedies. Horizon 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. 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 Horizon. Return of any Product by Purchaser must be approved in writing by Horizon before shipment.

## ***DAMAGE LIMITS***

HORIZON SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCT, WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY. Further, in no event shall the liability of Horizon exceed the individual price of the Product on which liability is asserted. As Horizon 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.

Law: These Terms are governed by Illinois law (without regard to conflict of law principals).

## Warranty Services

### QUESTIONS, ASSISTANCE, AND REPAIRS

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 directly. This will enable Horizon to better answer your questions and service you in the event that you may need any assistance. 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 Product Support representative. You may also find information on our website at [www.horizonhobby.com](http://www.horizonhobby.com).

### INSPECTION OR REPAIRS

If this Product needs to be inspected or repaired, please use the Horizon Online Repair Request submission process found on our website or call Horizon to obtain a Return Merchandise Authorization (RMA) number. 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 is not responsible for merchandise until it arrives and is accepted at our facility. An Online Repair Request is available at [www.horizonhobby.com](http://www.horizonhobby.com) or <http://www.horizonhobby.com> under the Repairs tab. If you do not have internet access, please contact Horizon Product Support to obtain a RMA number along with instructions for submitting your product for repair. When calling Horizon, you will be asked to provide your complete name, street address, email address and phone number where you can be reached during business hours. When sending product into Horizon, please include your RMA number, a list of the included items, and a brief summary of the problem. A copy of your original sales receipt must be included for warranty consideration. Be sure your name, address, and RMA number are clearly written on the outside of the shipping carton.

**Notice: Do not ship batteries to Horizon. If you have any issue with a battery, please contact the appropriate Horizon Product Support office.**

### WARRANTY INSPECTION AND REPAIRS

**To receive warranty service, you must include your original sales receipt** verifying the proof-of-purchase date. Provided 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.

### NON-WARRANTY REPAIRS

**Should your repair not be covered by warranty the repair will be completed and payment will be required without notification or estimate of the expense unless the expense exceeds 50% of the retail purchase cost.** By submitting the item for repair you are agreeing to payment of the repair without notification. Repair estimates are available upon request. You must include this request with your repair. Non-warranty repair estimates will be billed a minimum of ½ hour of labor. In addition you will be billed for return freight. Horizon accepts money orders and cashiers checks, as well as Visa, MasterCard, American Express, and Discover cards. By submitting any item to Horizon for inspection or repair, you are agreeing to Horizon's Terms and Conditions found on our website under the Repairs tab.

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877-504-0233

*(All other products)*  
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## Compliance Information for the European Union



### INSTRUCTIONS FOR DISPOSAL OF WEEE BY USERS IN THE EUROPEAN UNION

This product must not be disposed of with other waste. Instead, it is the user's responsibility to dispose of their waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city office, your household waste disposal service or where you purchased the product.

**Age Recommendation: 14 years or over. Not a toy. Not intended for use by children without direct adult supervision.**

# 2010 Official Academy of Model Aeronautics Safety Code

## GENERAL

1. A model aircraft shall be defined as a non-human-carrying device capable of sustained flight in the atmosphere. It shall not exceed limitations established in this code and is intended to be used exclusively for recreational or competition activity.
2. The maximum takeoff weight of a model aircraft, including fuel, is 55 pounds, except for those flown under the AMA Experimental Aircraft Rules.
3. I will abide by this Safety Code and all rules established for the flying site I use. I will not willfully fly my model aircraft in a reckless and/or dangerous manner.
4. I will not fly my model aircraft in sanctioned events, air shows, or model demonstrations until it has been proven airworthy.
5. I will not fly my model aircraft higher than approximately 400 feet above ground level, when within three (3) miles of an airport without notifying the airport operator. I will yield the right-of-way and avoid flying in the proximity of full-scale aircraft, utilizing a spotter when appropriate.
6. I will not fly my model aircraft unless it is identified with my name and address, or AMA number, inside or affixed to the outside of the model aircraft. This does not apply to model aircraft flown indoors.
7. I will not operate model aircraft with metal-blade propellers or with gaseous boosts (other than air), nor will I operate model aircraft with fuels containing tetranitromethane or hydrazine.

8. I will not operate model aircraft carrying pyrotechnic devices which explode burn, or propel a projectile of any kind. Exceptions include Free Flight fuses or devices that burn producing smoke and are securely attached to the model aircraft during flight. Rocket motors up to a G-series size may be used, provided they remain firmly attached to the model aircraft during flight. Model rockets may be flown in accordance with the National Model Rocketry Safety Code; however, they may not be launched from model aircraft. Officially designated AMA Air Show Teams (AST) are authorized to use devices and practices as defined within the Air Show Advisory Committee Document.
9. I will not operate my model aircraft while under the influence of alcohol or within eight (8) hours of having consumed alcohol.
10. I will not operate my model aircraft while using any drug which could adversely affect my ability to safely control my model aircraft.
11. Children under six (6) years old are only allowed on a flightline or in a flight area as a pilot or while under flight instruction.
12. When and where required by rule, helmets must be properly worn and fastened. They must be OSHA, DOT, ANSI, SNELL or NOCSAE approved or comply with comparable standards.

## RADIO CONTROL

1. All model flying shall be conducted in a manner to avoid over flight of unprotected people.
2. I will have completed a successful radio equipment ground-range check before the first flight of a new or repaired model aircraft.
3. I will not fly my model aircraft in the presence of spectators until I become a proficient flier, unless I am assisted by an experienced pilot.
4. At all flying sites a line must be established, in front of which all flying takes place. Only personnel associated with flying the model aircraft are allowed at or in front of the line. In the case of airshows demonstrations straight line must be established. An area away from the line must be maintained for spectators. Intentional flying behind the line is prohibited.

5. I will operate my model aircraft using only radio-control frequencies currently allowed by the Federal Communications Commission (FCC). Only individuals properly licensed by the FCC are authorized to operate equipment on Amateur Band frequencies.
6. I will not knowingly operate my model aircraft within three (3) miles of any preexisting flying site without a frequency-management agreement. A frequency management agreement may be an allocation of frequencies for each site, a day-use agreement between sites, or testing which determines that no interference exists. A frequency-management agreement may exist between two or more AMA chartered clubs, AMA clubs and individual AMA members, or individual AMA members. Frequency-management agreements, including an interference test report if the agreement indicates no interference exists, will be signed by all parties and copies provided to AMA Headquarters.
7. With the exception of events flown under official AMA rules, no powered model may be flown outdoors closer than 25 feet to any individual, except for the pilot and located at the flightline.
8. Under no circumstances may a pilot or other person touch a model aircraft in flight while it is still under power, except to divert it from striking an individual.
9. Radio-controlled night flying is limited to low-performance model aircraft (less than 100 mph). The model aircraft must be equipped with a lighting system which clearly defines the aircraft's attitude and direction at all times.
10. The operator of a radio-controlled model aircraft shall control it during the entire flight, maintaining visual contact without enhancement other than by corrective lenses that are prescribed for the pilot. No model aircraft shall be equipped with devices which allow it to be flown to a selected location which is beyond the visual range of the pilot.

## ***Building and Flying Notes***

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