The Ultimate ARF

INSTRUCTIONS

Welcome to the world of **Ultimate** flying! Now that you're an experienced R/C pilot, you're ready to step up to a higher level of aerobatic flying. And we've made sure this ARF version won't disappoint. With just the same flight characteristics as the kitted version, you'll soon know why the **Carl Goldberg Products Ultimate** has been America's favorite sport biplane since 1990.

WARNING

A radio-controlled model is not a toy and is not intended for persons under 16 years old. Keep this kit out of the reach of younger children, as it contains parts that could be dangerous. A radio-controlled model is capable of causing serious bodily injury and property damage. It is the buyer's responsibility to assemble this aircraft correctly and to properly install the motor, radio, and all other equipment. Test and fly the finished model only in the presence and with the assistance of another experienced R/C flyer. The model must always be operated and flown using great care and common sense, as well as in accordance with the Safety Code of the Academy of Model Aeronautics (www.modelaircraft.org). We suggest you join the AMA and become properly insured prior to flying this model. Also, consult with the AMA or your local hobby dealer to find an experienced instructor in your area. Per the Federal Communications Commission, you are required to use only those radio frequencies specified "for Model Aircraft."

LIMITED WARRANTY

Carl Goldberg Products, Ltd. has inspected and certified the components of this aircraft. The company urges the buyer to perform his own inspection, prior to assembly, and to immediately request a replacement of any parts he believes to be defective for their intended use. The company warrants replacement of any such components, provided the buyer requests such replacement within a period of 90 days from the date of purchase and provided the defective part is returned, if so requested by the company.

No other warranty, expressed or implied, is made by the company with respect to this kit. The buyer acknowledges and understands that it is his responsibility to carefully assemble the finished flying model airplane and to fly it safely. The buyer hereby assumes full responsibility for the risk and all liability for personal or property damage or injury arising out of the buyer's use of the components of this kit.

CARL GOLDBERG PRODUCTS, LTD.

P.O. Box 818 Oakwood GA 30566 Phone #678-450-0085 Fax # 770-532-2163 www.carlgoldbergproducts.com

PT. #2045 6/03

ITEMS NEEDED TO COMPLETE THIS AIRCRAFT

- ☐ 1 RADIO GUIDANCE SYSTEM (4 CHANNEL MINIMUM REQUIRED)
- ☐ 2 12” AILERON SERVO EXTENSION WIRES
- ☐ 1 Y-HARNESS
- ☐ 1 ENGINE .60-.90 2-CYCLE, .90-1.20 4-CYCLE AND MUFFLER
- ☐ 1 2 OZ. BOTTLE CA GLUE
- ☐ 1 1/2 OZ. BOTTLE CA GLUE
- ☐ 1 EPOXY
- ☐ 1 8 x 12 FOAM RUBBER

OPTIONAL:

- ☐ 1 PILOT FIGURE
- ☐ 1 SWITCH HARNESS

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NOTE: The Ultimate ARF covering matiches Bright Yellow(#872), Deep Blue(#873) UltraCote®.

UltraCote® is a registered trademark of Horizon Hobby Distributors

TOOLS AND SUPPLIES FOR ASSEMBLY.

- ☐ MODELING OR UTILITY KNIFE
- ☐ WORK SURFACE (24" X70")
- ☐ ELECTRIC DRILL
- ☐ 1/16”, 3/32”,1/8", 3/16”, 5/32”, 1/4”, 5/64” 7/32” DRILL BITS
- ☐ SMALL STANDARD & PHILLIPS SCREW-DRIVERS
- ☐ MASKING TAPE
- ☐ NEEDLE NOSE PLIERS
- ☐ MOTO TOOL
- ☐ 24” RULER
- ☐ FLEXIBLE STRAIGHT-EDGE
- ☐ 30-60-90° x 6" TRIANGLE
- ☐ SOFT PENCIL
- ☐ A FEW STRAIGHT OR "T" PINS
- ☐ ADJUSTABLE WRENCH
- ☐ WIRE CUTTER (DYKES)
- ☐ OPTIONAL HEAT GUN/COVERING IRON
- ☐ ACID BRUSH
- ☐ ELECTRICAL TAPE
- ☐ SOLDERING IRON, FLUX, SOLDER
- ☐ PIECE OF MEDIUM SANDPAPER
- ☐ 5 FT. LENGTH OF STRING

INTRODUCTION

USING THIS INSTRUCTION MANUAL

Before you begin assembling your **ULTIMATE ARF**, take some time to read through this entire instruction book. It is designed to take you step-by-step through the process and to give you added information on engine and radio selection and set-up, balancing your aircraft, and flying your model. The time you spend will speed the assembly process and help you avoid problems.

PREPARING FOR ASSEMBLY

You will need a work area of approximately 24 x 70" which has been covered to protect it from adhesive, as well as cuts and other damage. Many people cover their work area with a sheet of dry wall (sheet rock) and/or waxed paper to prevent CA glue and Epoxy from ruining the work surface.

CONSTRUCTION TIPS

IMPORTANT: ALWAYS READ A FEW STEPS AHEAD. This will alert you to coming instructions and will help you plan accordingly.

Using the Parts Identification section, familiarize yourself with the various items included in your kit box.

As you work, CHECK OFF EACH STEP in the box provided, so that you are sure you do not forget anything.

Do not hesitate to ask questions. Your local hobby dealer and area flyers will most likely by happy to help, as they want you to have a successful flying experience. You may also receive technical assistance from Carl Goldberg Models via e-mail (questions@carlgoldberg-products.com) or by telephone 1-678-532-0085.

tCAUTION

Some people may experience an allergic reaction when exposed to fumes from CA glue or epoxy. As with paints, thinners, and solvents, it is always important to use glues only where there is adequate ventilation to carry fumes away. A fan is recommended. Also, special care must be taken when using CA, as it will bond skin as well as other surfaces. Before using any CA, carefully read all label precautions. When using CA, protective eye-wear and care in keeping the glue away from the face is highly recommended. If CA does happen to get into the eye, hold lid open and flush with water only. Seek immediate medical attention.

COVERING

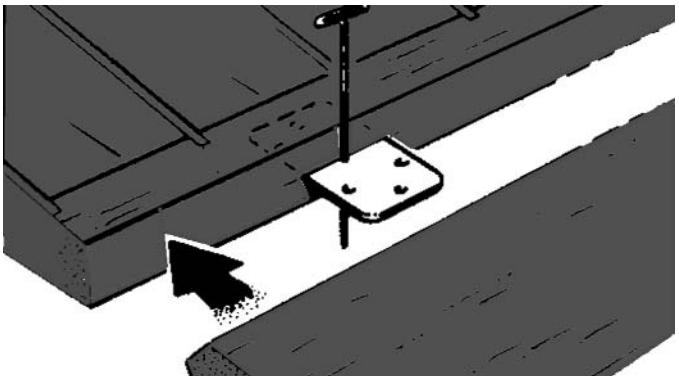
The Ultimate ARF is covered in genuine a premium polyester film chosen by many of the world's top flyers for its beauty, toughness, and ease of application and repair. It is not uncommon for ARF's to develop a few wrinkles in transit. If this is true of your model, the situation is easily corrected. Before you begin putting the pieces together, run over the surface of each section with an iron (either specially designed for airplane use or the more cumbersome household iron) or use a modeling heat gun. Apply the heat (set at about 350° F), following along with a soft cloth and pressing down on the covering as you go around. This will more firmly set the covering adhesive into the wood and keep your aircraft covering tight and smooth in the future.

WING CONSTRUCTION

Aileron Installation

1. ☐ Collect the following parts:

(1) Top Wing
(1) Bottom Wing
(4) Ailerons
(16) Jet Hinges



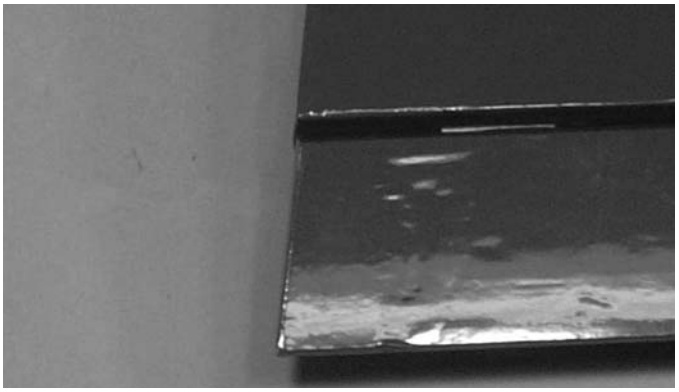
2. ☐ Locate the pre-cut aileron hinge slots in both the top and the bottom wings. Using a hobby knife (#11 blade), slide the blade into each of the slots to make sure they are cleanly cut.

☐ Repeat this process with the ailerons, making sure all hinge slots are clean.

3. ☐ Place a straight pin into the center of each of four Jet Hinges.

3. ☐ Slide four hinges into the hinge slots on one side of a wing The straight pin will prevent the hinges from going further than halfway into the wing.

4. ☐ Select one of the ailerons and insert the exposed half of each hinge into the aileron slots. Slide the aileron toward the wing until no gap remains between the aileron and the wing.



5. ☐ Carefully check the alignment of the aileron, making sure it is flush with the end of the wing.

☐ When satisfied with the alignment, remove the straight pins, being sure to keep the aileron tight to the wing. You may wish to apply a few pieces of masking tape to keep the pieces in place.

6. ☐ Keeping the aileron and wing in position, apply 3 or 4 drops of Instant thin CA to the small exposed area of each hinge.

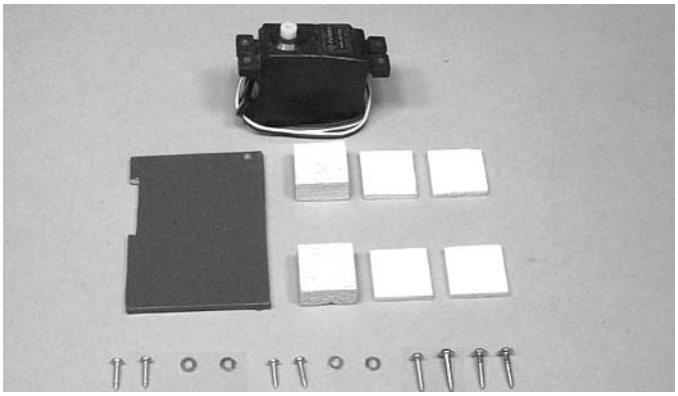
☐ Turn the wing assembly over and again apply 3 or 4 drops of thin CA to the exposed hing surface.

☐ Allow to dry for 10 minutes before flexing the aileron.

7. ☐ Repeat the above steps for each of the other ailerons.

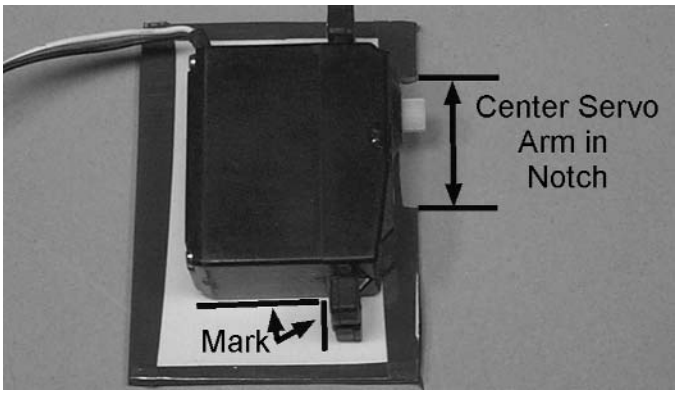
NOTE: Remember that the following pictures may not exactly match the hardware you are using. Always check the manufacturer's instructions when installing radio equipment.

Aileron Servo Installation (Bottom Wing)

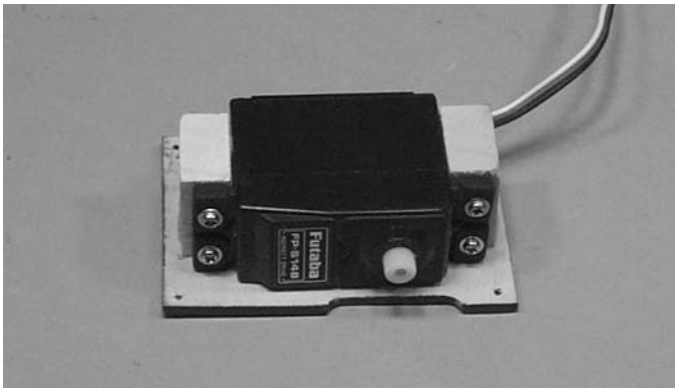


1. ☐ Collect the following parts:

(1) Aileron servo door
(2) 3/8 x 3/4 x 3/4"servo mounting block
(4) 1/8 x 3/4 x 3/4 aileron door mounting plate
(4) Servo mounting screw (supplied with radio)
(4) #2 Washer
(4) #2 x 3/8" screw
(1) Servo with rubber grommet



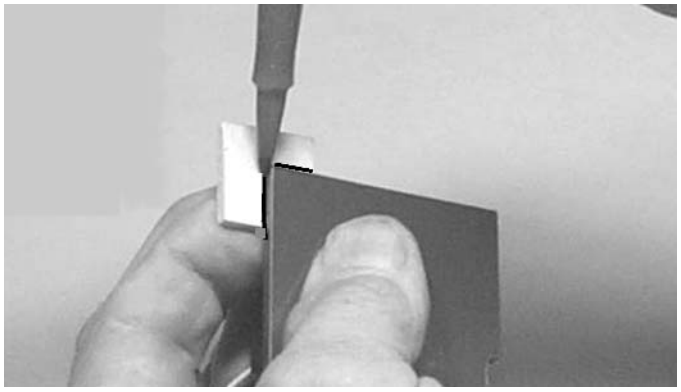
2. ☐ With the servo door upside down on the work surface, place the servo on top of the door with the servo arm post centered vertically and horizontally with the servo door notch. Mark the location of the servo, as above.



3. ☐ Remove the servo from the door. Spread epoxy on the servo mounting blocks and glue them in place along the line just drawn, making sure the wood grain runs vertically.

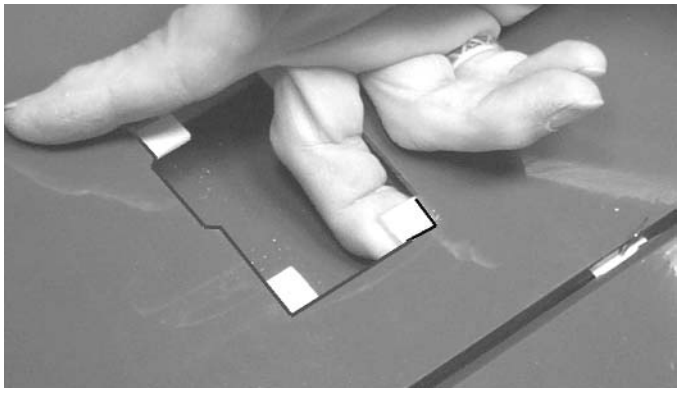
4. ☐ When the epoxy is dry, drill 1/16" holes and mount the servo onto the blocks with the mounting screws supplied with the radio.

☐ Repeat these steps to mount the other aileron servo.



6. ☐ Hold one of the servo plates in place against one corner of the servo door, locating it in such a way that the tab does not interfere with the servo.

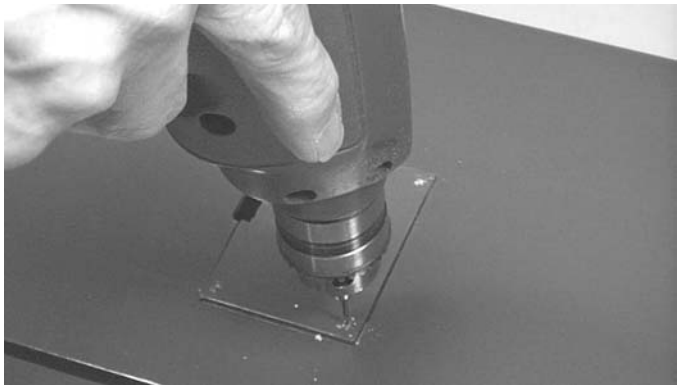
☐ Mark the servo door-edge location on the plate.



7. ☐ CA glue the plate to the corresponding corner of the servo hole in the wing.

☐ Follow the same procedure with each of the other three plates.

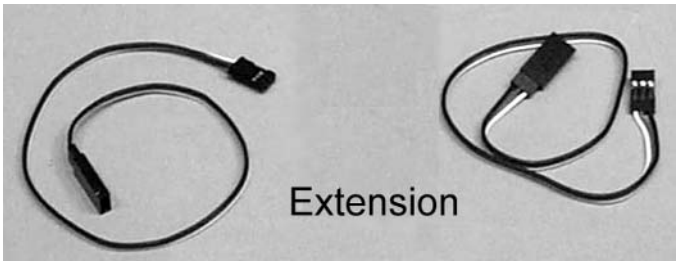
NOTE: Plates will fit into the corner differently, depending on the servo used.



8. ☐ Place the servo door on the wing and drill a 1/16" hole on each corner. Screw the door to the plate, using the #2 x 3/8" screw and the #2 washer supplied with the kit.

☐ Repeating the above steps, mount the second aileron servo.

Aileron Extension Installation

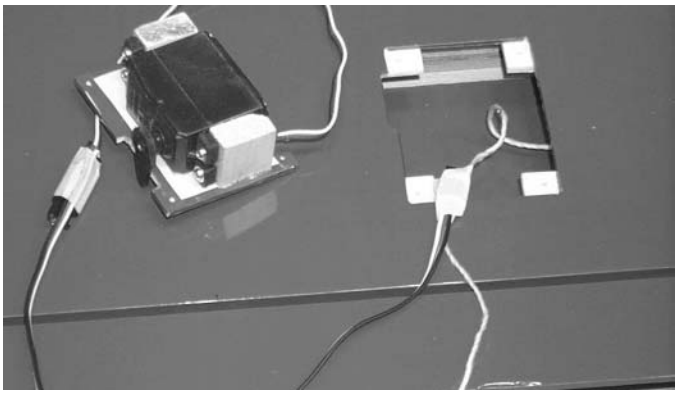


1. ☐ Gather the following items.

(2) 12” extension wires

NOTE: Before starting, remove the servo door and make sure the length of one servo wire, when plugged into the 12” extension, is long enough to reach to the center of the wing. If necessary, add an additional extension to reach the center of the wing.

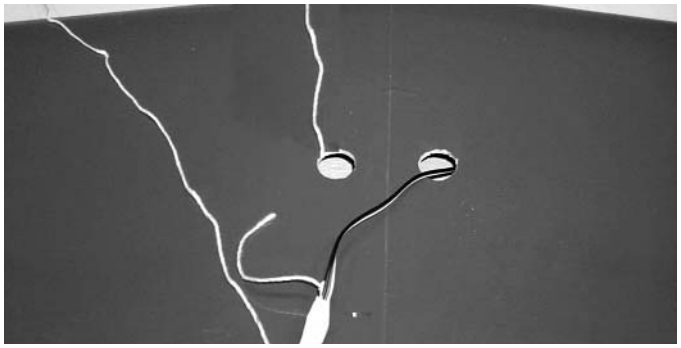
IMPORTANT! To ensure that any connections located inside the wing will not come loose, either when the wires are pulled, or during flying, always tape them securely together with electrical tape.



2. ☐ Remove servo door and, making sure to use the correct servo for the opening, attach the servo wire to the12” extension and securely tape connection.

NOTE: Before continuing, make sure the other end of the string inside the wing, next to the second aileron hole, is taped firmly to the wing, so that it is not pulled out by mistake. (If it becomes necessary to reinsert this string into the wing, tie a 6-32 nut to the end of the string and feed it back into the wing. The nut will easily fall through the wing rib holes.

☐ Tie the other end of the extension to the string that exits the servo opening and tape this connection, also.



3. ☐ Grasping the string in the hole in the center of the wing, **SLOWLY** pull until the end of the 12” extension comes out of the hole. Work the string back and forth to get the extension plug to go through the cutouts in each rib. **Pull gently** and have patience.

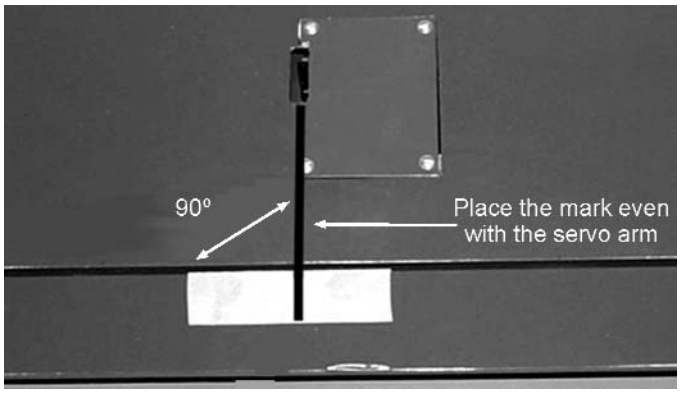
4. ☐ Tape the extension securely to the wing, so that it will not slide back in while you are working.

☐ Repeat these steps for the other half of the wing, so that both servo extensions are exiting the holes in the center of the wing..

Control Horn Installation

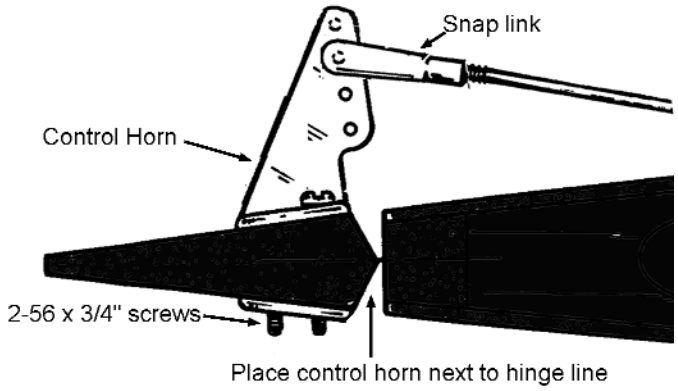
1. ☐ Collect the following items:

(2) Large control horn with back plate
(4) 2-56 x 3/4” screw
(2) 1/16 x 7” threaded wire
(2) Snap-link
(2) Nylon snap nut (molded 6-up - see photo in Engine Pushrod Installation)



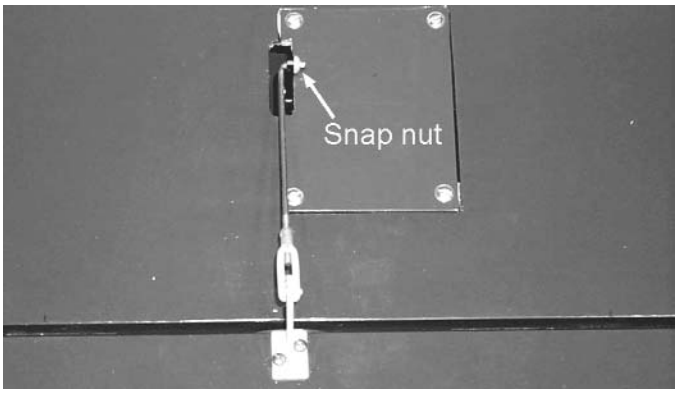
2. ☐ Replace the servo door and screw it down onto the wing.

3. ☐ Make a mark at a 90º angle to the trailing edge and in line with the servo arm.



4. ☐ Position the control horn so that the snap link holes are right next to the hinge line.

☐ Using a 3/32” drill bit, make a pilot hole in each screw location, and then mount the control horn, using the 2-56 x 3/4” screws.



5. ☐ Thread a snap-link on the end of one of the 1/16 x 7” threaded rods.

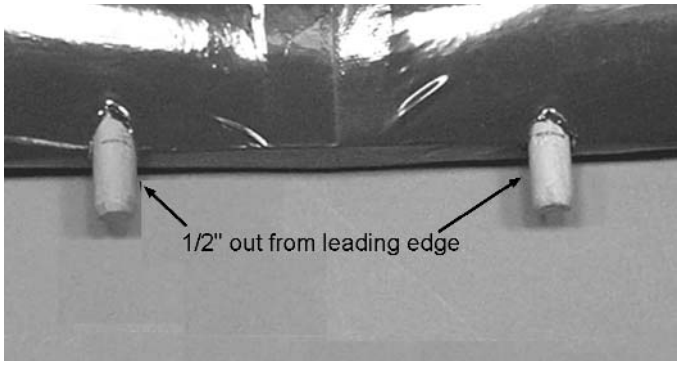
☐ Place the snap-link in the second-from-the-top hole on the control horn.

6. ☐ Making sure the aileron is in neutral position, mark where the wire meets the hole on the servo arm.

☐ Put a 90º bend (or a z-bend, if preferred) in the wire, as shown above, and then attach the wire to the servo arm with a snap nut. Finally, put a drop of glue on the snap nut.

☐ Repeat these steps for the other aileron.

Wing Dowel Installation

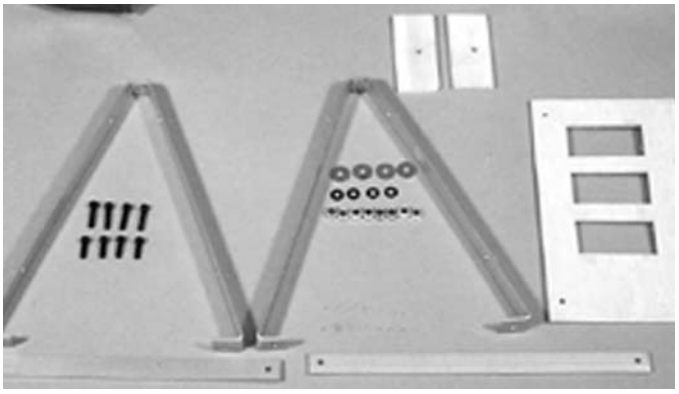


1. ☐ Using epoxy, mount the 5/16 x 1-3/4” dowels into the holes in the leading edge of the bottom wing. Make sure to leave about 1/2” of dowel sticking out of the front of the wing. You may wish to slighly taper the exposed dowel ends for ease of insertion into the fuse holes.

Now set the bottom wing aside until later.

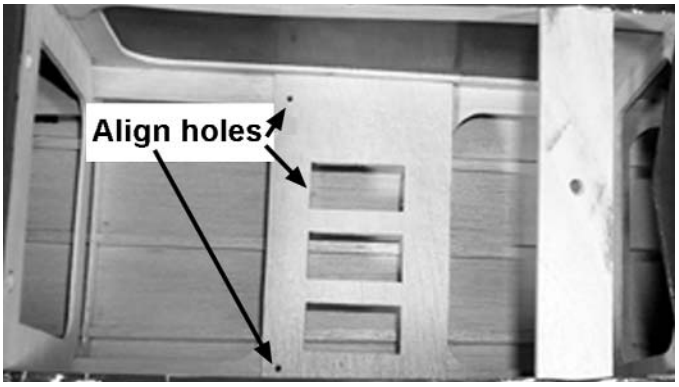
FUSELAGE ASSEMBLY

Cabane Installation

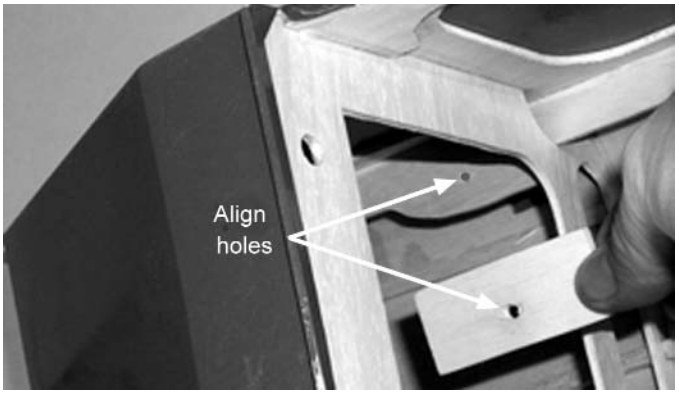


1. ☐ Collect the following parts.

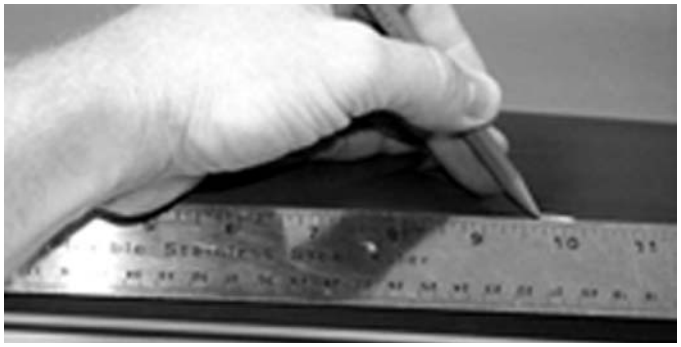
(1) Fuselage
(1) Servo tray
(2) Front cabane doubler
(2) Cabanes
(2) Cross brace
(4) 4-40 x 1/2” Socket head screw
(4) 4-40 x 3/8” Socket head screw
(4) #4 x 7/16” washer
(4) #4 washer (smaller)
(8) 4-40 lock nut



2. ☐ Being careful to align the holes and the servo cutouts, CA glue the servo tray doubler into the fuselage.



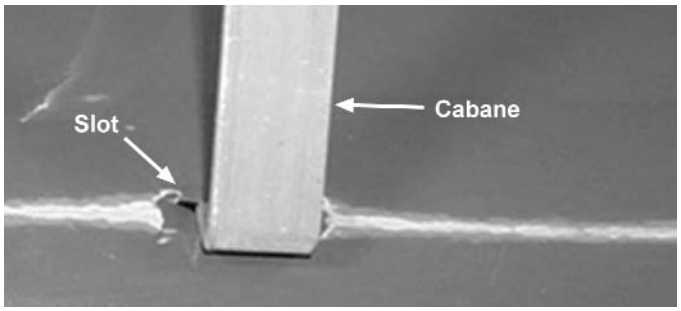
3. ☐ Glue the front cabane doublers over the holes in front of the fuselage former. Again, make sure the holes in both the doubler and the fuselage are aligned.



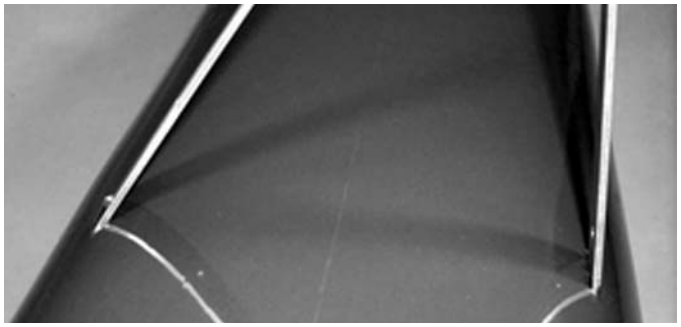
4. ☐ Beginning at the front of the fuselage, make a mark at 5” and at 9-3/4”. This will help locate the pre-cut cabane slots on the curved top of the fuse, behind the firewall.

5. ☐ Using a hobby knife, make a horizontal slit from front to back, in the middle of the cutout, as shown.

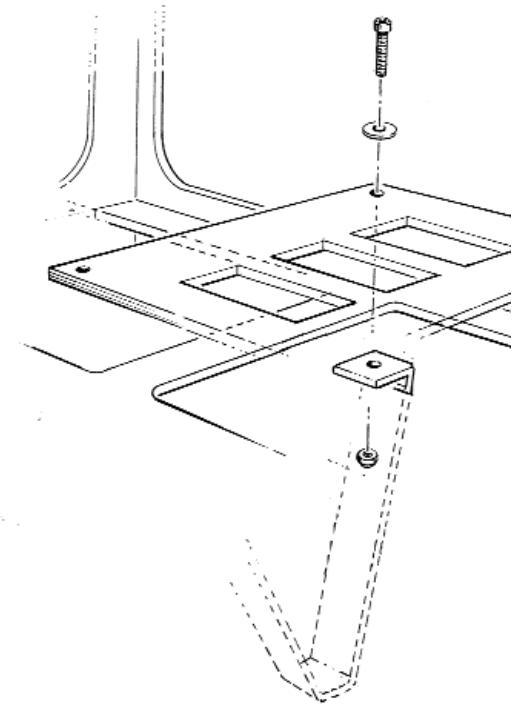
☐ Slit all four cutouts in the same way.



6. ☐ Gently push one side of the cabane into the front fuselage slot, until it falls inside.



7. ☐ Slip the other side of the cabane into the cut on the opposite side of the fuselage.



8. ☐ Turn the fuselage over and, working from the inside, insert a 4-40 x 1/2” screw with a #4 x 7/16” washer into the fuselage hole in the cabane doubler and then through the cabane hole. This is somewhat tricky, so have patience.

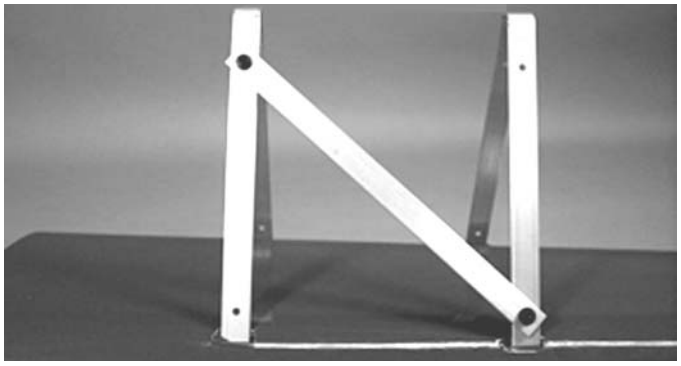
☐ When the screw protrudes through the cabane hole, cap it with a 4-40 locking nut and tighten.

☐ Repeat these steps at each of the three mounting points to complete the cabane installation.

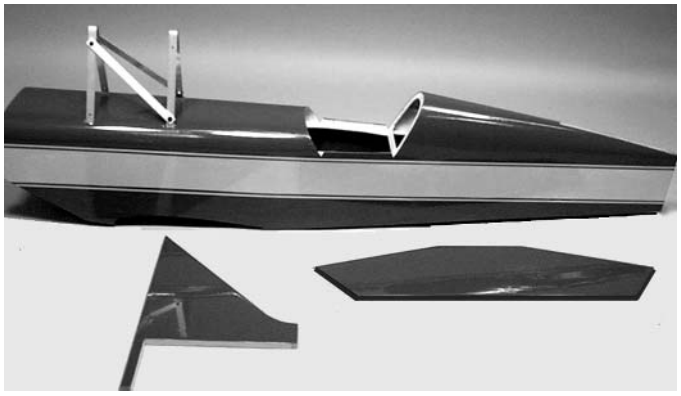
9. ☐ Insert a 4-40 x 3/8” screw and washer into the cross brace in the top side hole of the front cabane and secure with a 4-40 locking nut.

☐ Then, mount the other end of the cross brace into the rear cabane, as shown below.

☐ Repeat with the other cross brace.

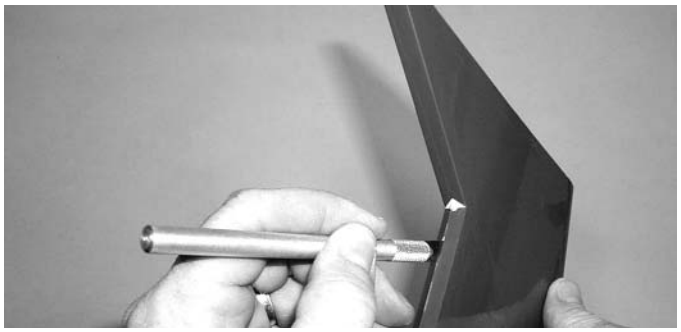


Stabilizer/Fin Installation



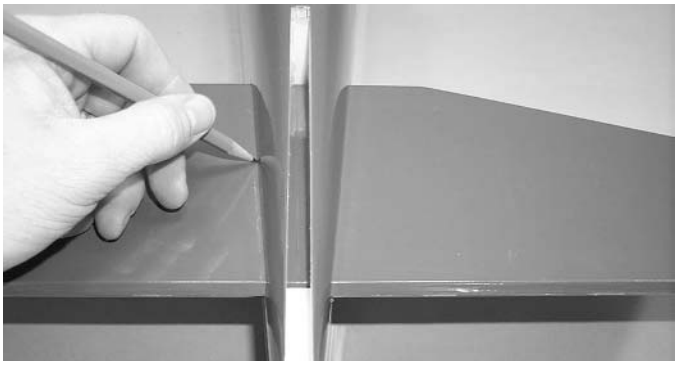
1. ☐ Collect the following items.

(1) Fuselage
(1) Horizontal stabilizer
(1) Vertical fin
(2) Elevators
(1) Rudder
(1) 5ft. Length of string (not included in kit)



2. ☐ Locate the pre-cut hinge slots and, using a hobby knife, make sure all slots in the stabilizer, elevators, rudder, and fin are cleanly cut.

☐ Test the size of each slot by sliding a hinge halfway into the opening. Then set the rudder and elevators aside until later.



3. ☐ Locate the pre-cut stab cutout by feeling along the fuse side in the area where the stab should go.

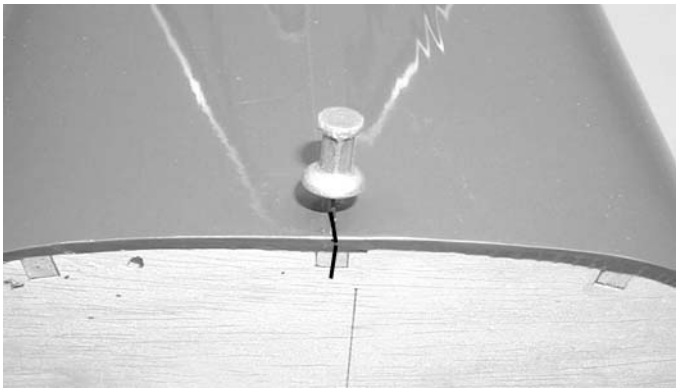
☐ Remove the covering over the stab slot on both sides of the fuselage.

4. ☐ Mark the center of the stab on both the trailing and leading edge.

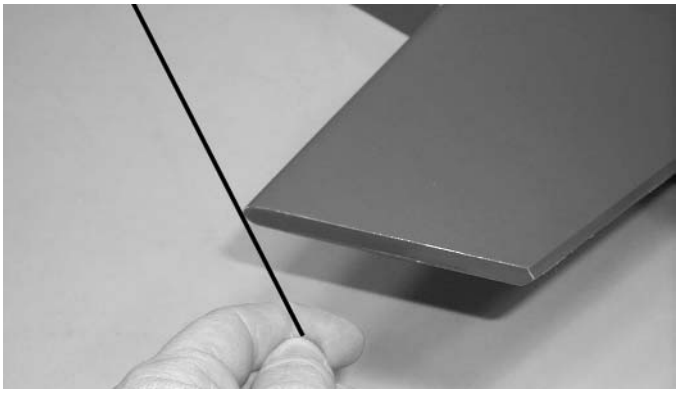
5. ☐ Slide the stab into the back of the fuselage, using the center marks as a guide. Measure the stab, as shown, to make sure it is properly centered.

NOTE: It is also possible to see the centermarks through the fin cutout.

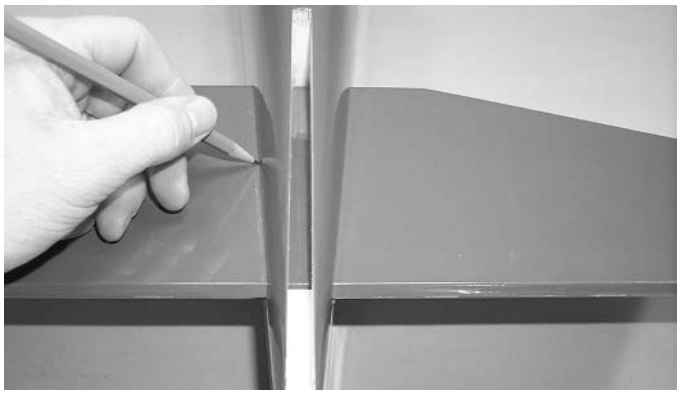
6. ☐ Turn the fuse around, and determine the vertical centerline of the fuse top front. Measure to the center point on the top of the fuselage. DO NOT CENTER ON THE FIREWALL THRUST LINE.



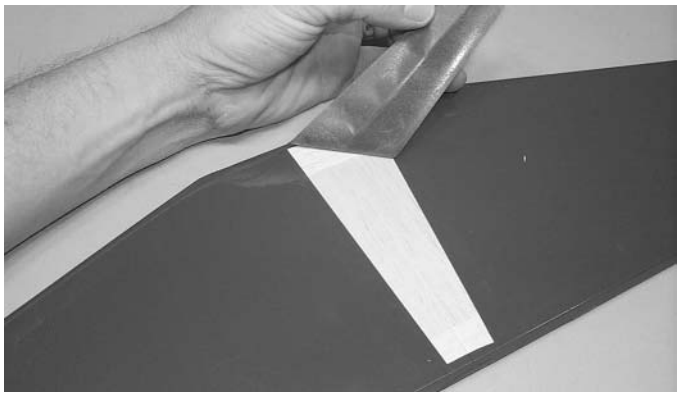
7. ☐ Place a pushpin on the center mark and tie a string around the pushpin.



8. ☐ Stretch the string back until it touches the outer tip of the stabilizer leading edge. Mark the string and then measure back to the other outer L.E. tip, making sure the distance is the same.



9. ☐ When the stab is correctly aligned, outline on both the top and bottom of the stab where it meets the fuse, as shown.

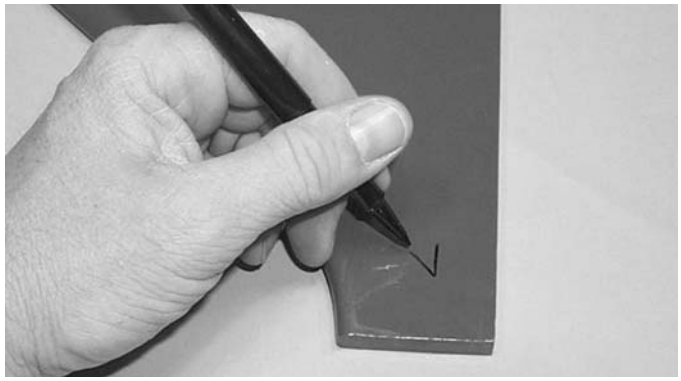


10. ☐ Remove the stab from the fuselage. **Being careful to not cut into the wood,** and working about 1/8" inside the outline on the stab, lightly cut away the covering on both the bottom and top of the stab.

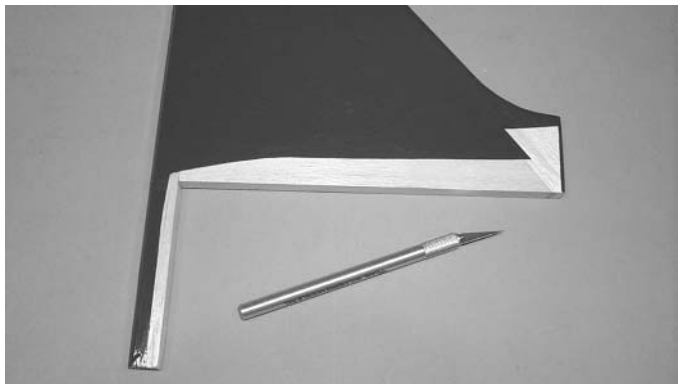
☐ Replace the stab on the fuselage, but DO NOT GLUE AT THIS TIME.

11. ☐ Slide the fin into the back slot and push the fin front down into the top slot.

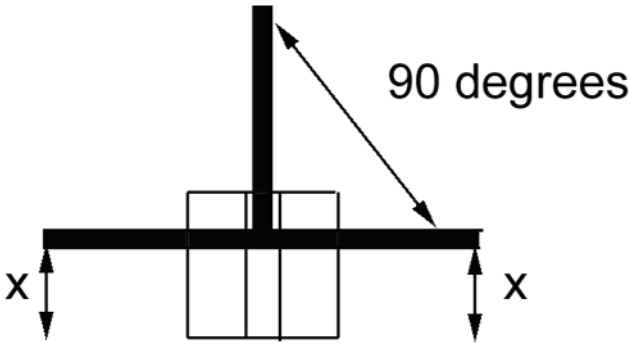
☐ When the fin is all the way down and flush to the fuselage, mark a line on both sides of the fin where it meets the fuselage.



12. ☐ Locate the solid wood area under the covering and place marks on the line where the wood ends. Make sure not to mark any open frame areas.



13. ☐ Staying at least 1/4" away from the open frame, carefully remove the covering on those areas of the fin (both sides) that are inside the fuselage.



14. ☐ Replace the fin on the fuselage and check to see that the fit is good and the alignment square.

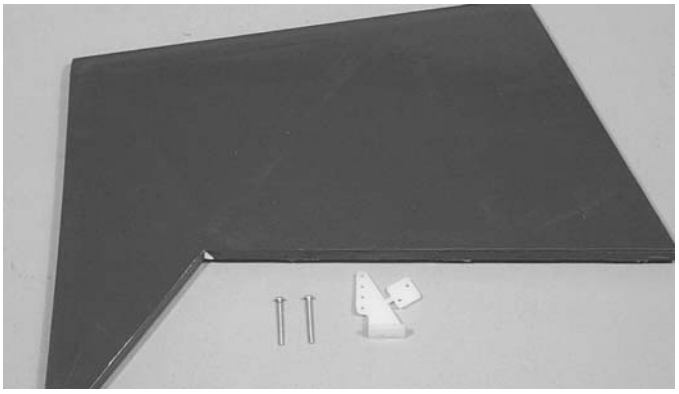
☐ When you are satisfied with the fit, remove the fin.

☐ Mix 2-3 tablespoons of epoxy and, using a stick or an acid brush, spread epoxy down inside the fin slot, along the walls of the slot, and on top of the stab.

☐ Glue the stabilizer and the fin to the fuselage and, using the measuring string and a 90º triaangle, check to see that the tail assembly is square. Allow to dry thoroughly.

15. ☐ When dry, turn the fuse over and wick a few drops of thin CA gluet along the stab/fuse joint.

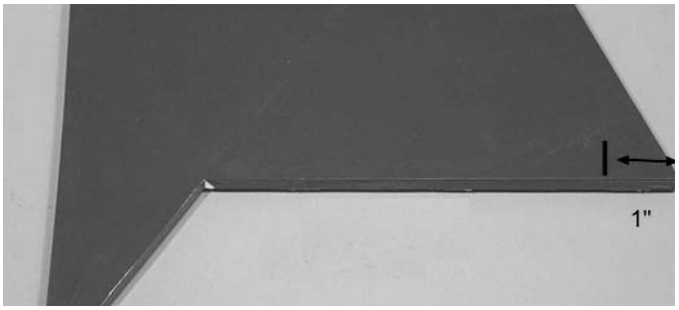
Control Horn Installation



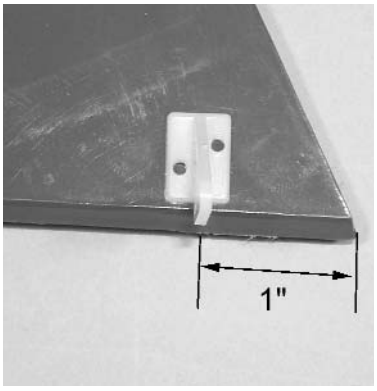
1. ☐ Collect the following parts:

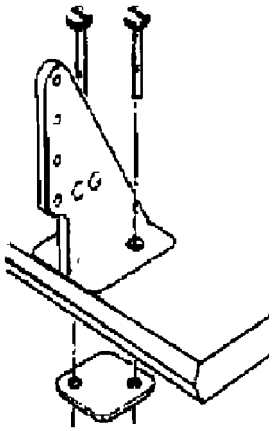
(2) Elevator
(2) Large control horn with backplate
(4) 2-56 x 3/4" Pan head screw
(1) Rudder
(1) Double-sided control horn
(1) 2-56 x 1/2 Phillips head screw

NOTE: You will be making both a LEFT and a RIGHT elevator.



2. ☐ Mark 1" in from the inside edge along the hinge line of the elevator.

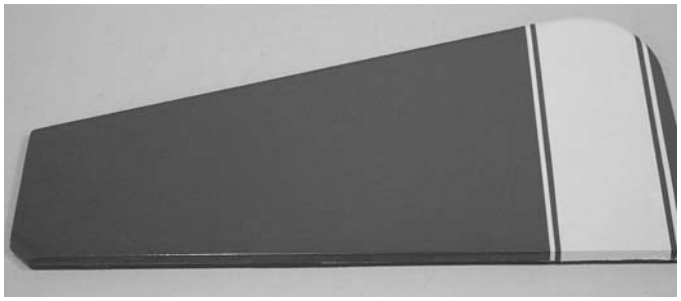




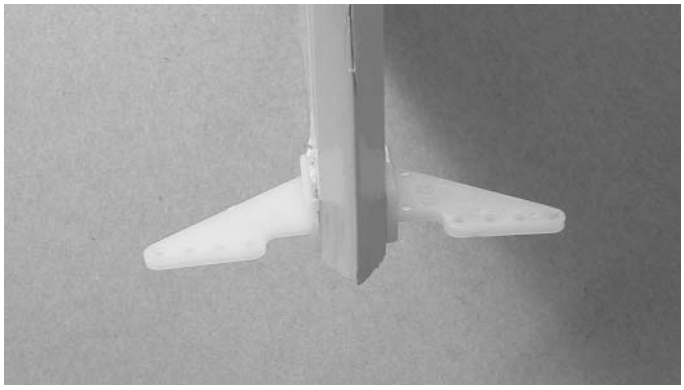
3. ☐ Place the control horn as shown, with the center aligned on the 1" mark and the snap-link holes directly above the hinge line.

☐ On the elevator, mark the location of the mounting holes on the base of the control horn and drill, using a 3/32" bit. Then mount the control horn as shown, using 2-56 x 3/4" screws.

☐ **Remembering that you are making both a left and a right elevator,** repeat the previous steps to mount the control horn on the other elevator.



NOTE: The double-sided control horn is two control horns screwed together back to back.



4. ☐ Place the control horn on the rudder as shown. The control horn must be even with the hinge line. When you are satisfied with the fit, mark the location of the screw hole and drill, using a 3/32" bit through the rudder.

☐ Place the two control horns together and mark the bolt location on the second control horn base.

☐ Drill the second control horn using a 1/16" bit.

☐ Mount the control horn, using the 2-56 x 3/4" screw.

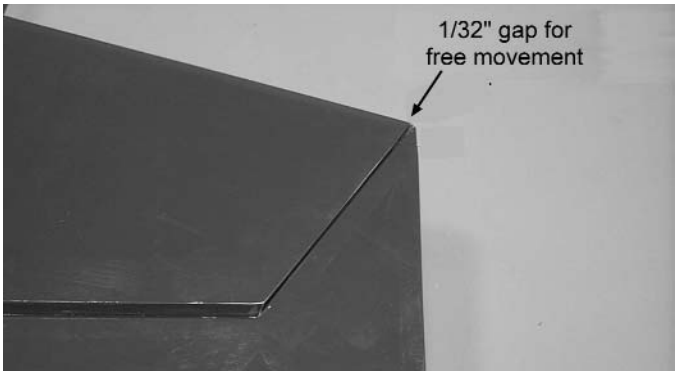
Elevator/Rudder Hinge Installation

1. ☐ Collect the following items.

(1) Fuselage/Tail Assembly
(2) Elevators
(1) Rudder
(9) Jet hinges

2. ☐ Take three hinges and, as with the aileron hinge installation, insert the hinge into the elevator, using straight pins to ensure the hinge stays centered between the stabilizer and the elevator.

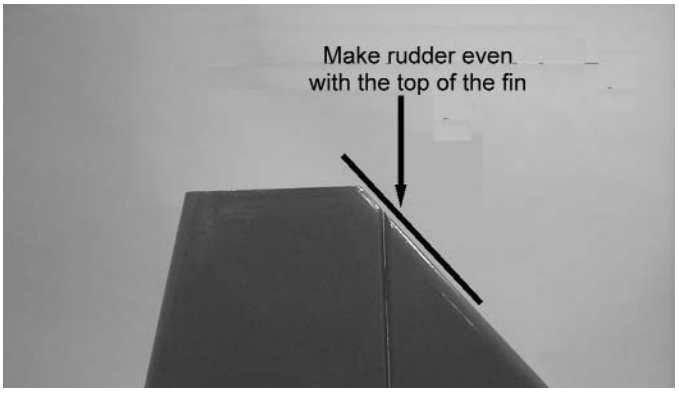
☐ Slide the exposed side of the hinge into the slots in the stab until the pins touch both the stab and the elevator.



3. ☐ Holding the elevator and stab together, place a straight pin between the stab and the elevator, at the elevator tip. This pin will create a 1/32” gap between the elevator and the stab.

☐ Remove the pins in each hinge and, keeping the elevator/stab assembly in position, apply 3 or 4 drops of thin CA to each hinge, on both the top and bottom sides of the stab.

☐ Allow ten minutes for the CA to cure before flexing the elevator. Then install the second elevator.



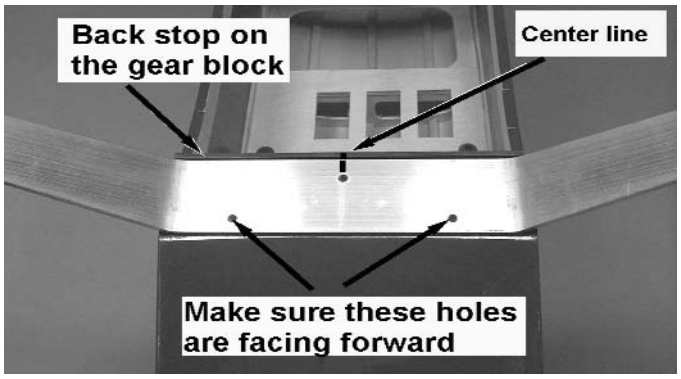
4. ☐ When the elevators have cured, install the hinges and mount the rudder, using the same techniques used for the other hinged surfaces.

NOTE: Before gluing, make sure the top of the rudder is even with the top of the fin.

Landing Gear Installation

1. ☐ Collect the following items:

(1) Landing gear
(3) 6-32 x 3/4” socket head screws
(3) 6-32 blind nuts
(3) #6 washers
(1) Fuselage

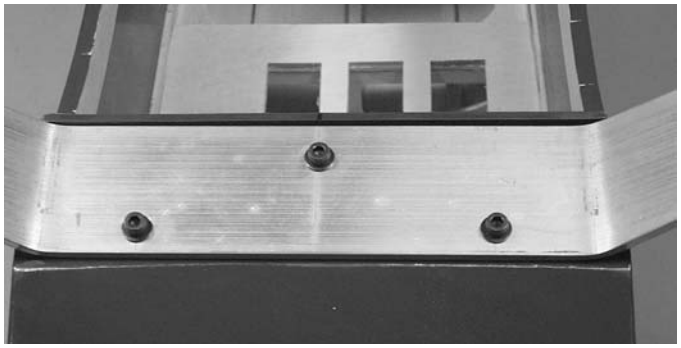


2. ☐ Place the main gear on the bottom of the fuselage, as shown.

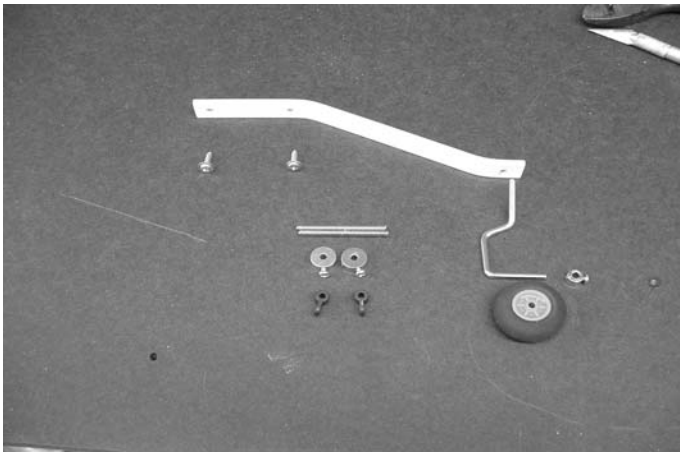
☐ Locate the center of the fuselage and mark it. Then mark the center of the gear and line up both center marks.

3. ☐ Move the gear back until it touches the stop on the back of the gear block. Then mark the hole locations and drill a 5/32” hole at each location.

4. ☐ With the screws and the washers through the gear, pull the blind nuts up tight inside the fuselage.



Tailwheel Installation

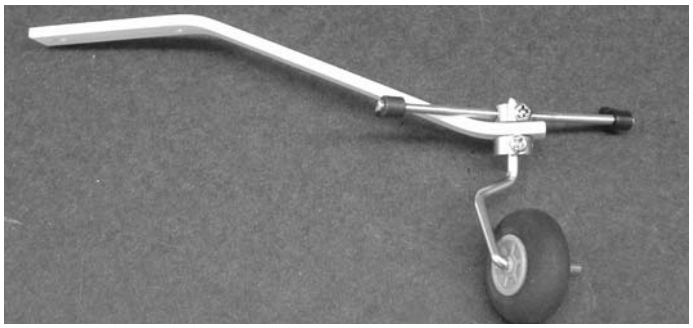


1. ☐ Collect the following items:

(1) Tailwheel bracket
(1) Tailwheel
(2) Springs
(2) 2-56 x 1/2” Philips head screw

2. ☐ Locate the three holes under the covering on the bottom rear of the fuselage. Remove the covering from all three holes.

NOTE: The hole nearest to the nose of the model is the exit hole for the receiver antenna. The other two holes are for the tailwheel assembly.



5. ☐ One of the bracket collars has two holes threaded into it, one on each side. This one is the top one.

☐ Put the bottom bracket collar on the axle and insert it through the spring bracket.

☐ Put the top collar bracket on top and tightened the two set screws.

6. ☐ Screw one of the two threaded rods on eachside of the top bracket collar.

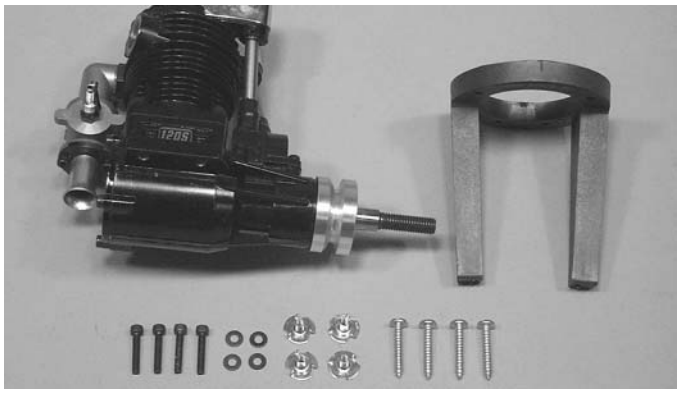
☐ Screw the nylon horn fittings on each end of the threaded rod.

7. ☐ Put the tail wheel on the axle and retain with the wheel collar.

9. ☐ Mount the tail wheel assembly on the rear of the fuselage using the two 4-40 screws.

3. ☐ Mount the tailwheel using the 4-40 x 1/2” phillips head screws, as shown above. Hook the springs between the rudder control horn and the tailwheel bellcrank. It may be necessary to open the end of the springs in order to connect them to the control horns and the bellcrank.

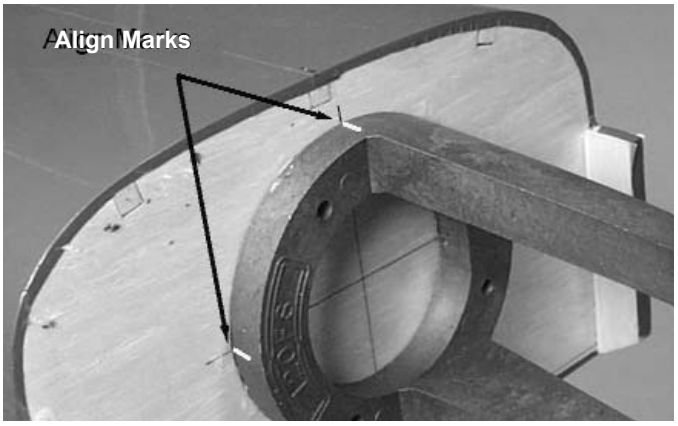
Motor Mount/Engine Installation



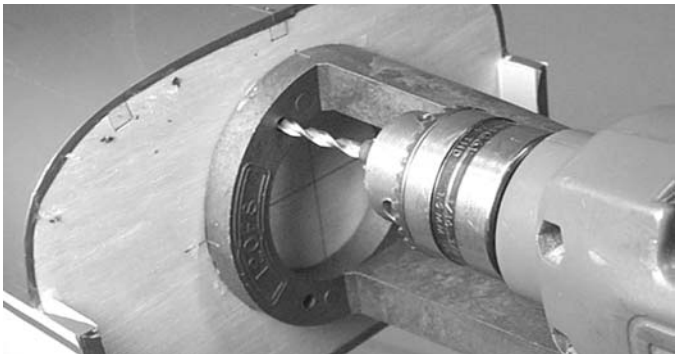
1. ☐ Collect the following items:

(1) Engine
(1) Motor mount
(4) 6-32 x 3/4” socket head screw
(4) 6-32 blind nut
(4) #6 washer
(4) #8 x 1” pan head screw

REMEMBER, the following pictures and instructions may vary slightly, depending on the equipment you are using.

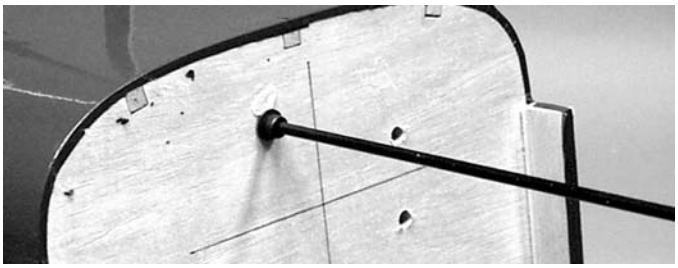


2. ☐ Using the alignment marks, center the motor mount on the firewall and tack glue.



3. ☐ Drill a pilot hole through the motor mount, using a 1/8” drill bit.

☐ Remove the motor mount and re-drill the holes, using a 5/32” drill bit.

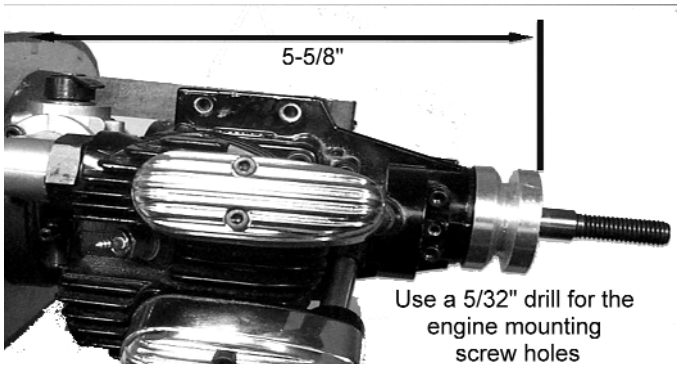


4. ☐ Install the motor mount blind nuts into the the back of the firewall with the 6-32 x 3/4” socket head screws and the #6 washer.

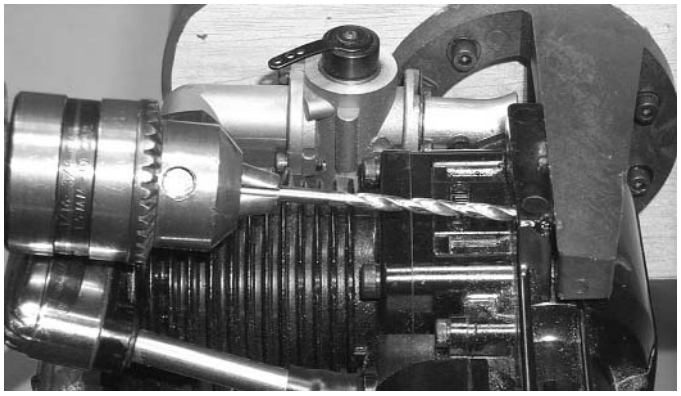
NOTE: The top left blind nut may rub on the horizontal former. When the motor mount is installed, tighten this blind nut down last.

5. ☐ Using the 6-32 x 3/4” socket head screws, install the motor mount onto the firewall. Check to see that all of the alignment marks on the motor mount match the marks on the firewall.

☐ You may wish to put thread lock on the screws at this time.



6. ☐ Place the engine on the motor mount, making sure the propeller drive plate is 5-5/8” away from the firewall.



7. ☐ Using the drill, lightly mark the locations of the engine mounting holes.

☐ Set the engine aside and, using the 5/32” drill bit, finish drilling the holes.

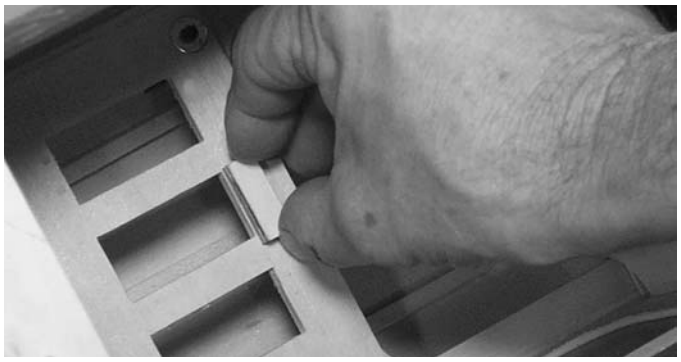
8. ☐ Replace the engine on the motor mount and install the engine using the #8 x 1” screws.

Elevator Servo Installation

1. ☐ Collect the following items:

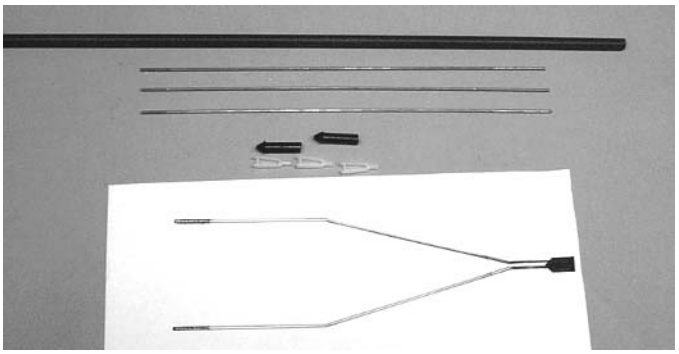
(2) 2-1/4 x 3/8 x 1” servo block
(3) Radio servo
(12) Servo mounting screw

2. ☐ Make sure the servos fit snuggly in the servo tray.



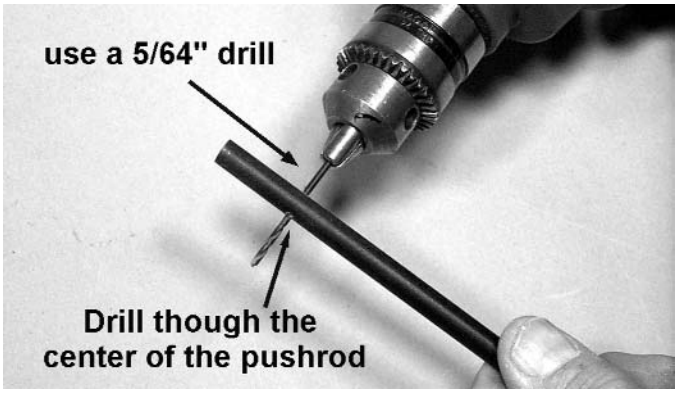
3. ☐ Glue the servo blocks at each end of the middle servo hole.

Elevator Pushrod Installation



1. ☐ Collect the following items:

(3) .072 x 10” threaded wire
(3) Nylon snap link
(1) Single-hole pushrod plug
(1) Double-hole pushrod plug
(1) 36” fiberglass pushrod tube
(2) 1/8 x 24” nylon guide tube
(1) Elevator wire drawing(Back of booklet)

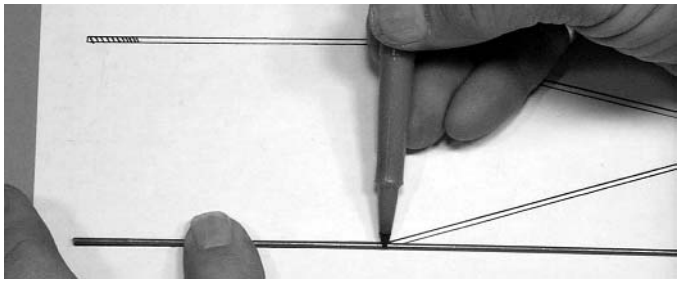


2. ☐ Using a fine-tooth saw or modeling knife, cut the fiberglass pushrod to a length of 16-1/2.” This may be accomplished by rolling the tube under the blade.

3. ☐ Measure 1” back from one end of the pushrod and drill a 5/64” hole completely through both sides. This hole will hold the elevator wires.

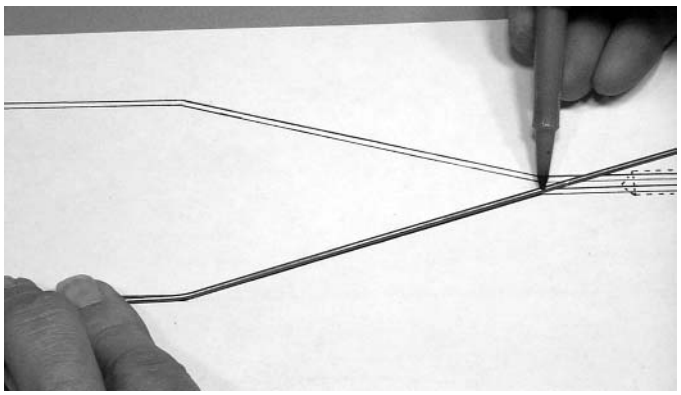
4. ☐ Measure 1” from the other end of the pushrod and drill a 5/64” hole **HALFWAY THROUGH** the pushrod. TAKE CARE TO DRILL ONLY THROUGH ONE SIDE.

5. ☐ Using the 5/64” drill, and holding a pushrod plug, as shown, drill out the center of the plug to form a tube. Repeat for the other plug.



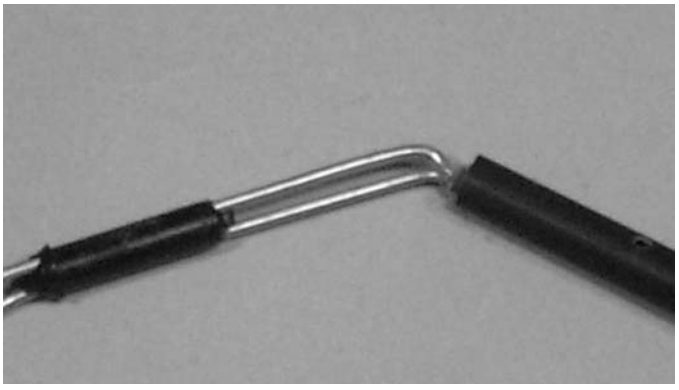
6. ☐ Using the Elevator Wire Drawing, place a threaded 10” wire over Drawing #1, as shown.

☐ Starting at the threaded end, measure back to the first bend and mark the wire. Then, carefully bend the wire to match the drawing.



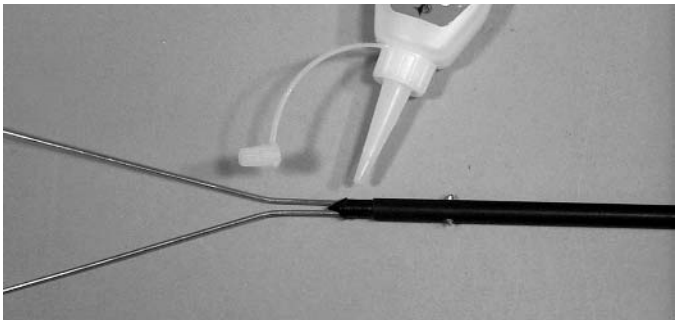
7. ☐ Mark the second bend and then bend the wire accordingly.

☐ Repeat this process for a second threaded wire.



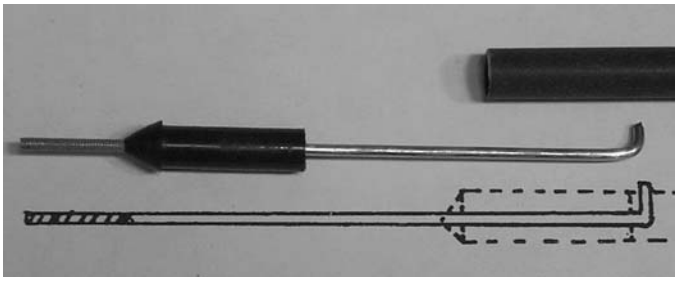
8. ☐ With the pointed end of the plug facing the threaded end of the wired, slide the double-hole plug onto the non-threaded end of the wires.

☐ Measure 2-3/8” down from the second bend and make a 90º bend. Then, cut the wire after the bend, so that it will fit in the pushrod.



9. ☐ Insert the two wires into the double-hole end of the pushrod until the bent ends slide into the holes.

☐ Slide the plug as far as it will go down into the pushrod. Then, CA glue the plug to the pushrod.

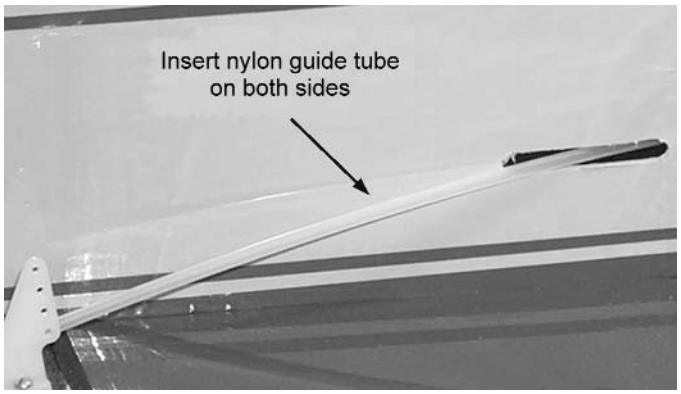


10. ☐ Using Drawing #2 as a template, mark the location of the bend on the third threaded wire.

11. ☐ Place the single-hole plug onto the wire and then bend the wire, as shown.

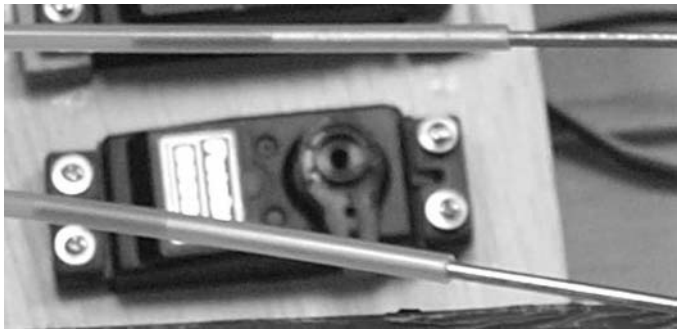
☐ Referring to the drawing, cut the wire after the bend and slide the end of the wire into the single-hole end of the pushrod.

12. ☐ When the bent tip is exiting the hole in the pushrod and the plug tightly meets the pushrod, apply CA glue to the joint.



13. ☐ Insert both of the nylon guide tubes into the exit holes located closest to the stab on each side of the model.

☐ Look through the cockpit to see the guide holes in the former. Then, thread the guide tubes through the guide holes.



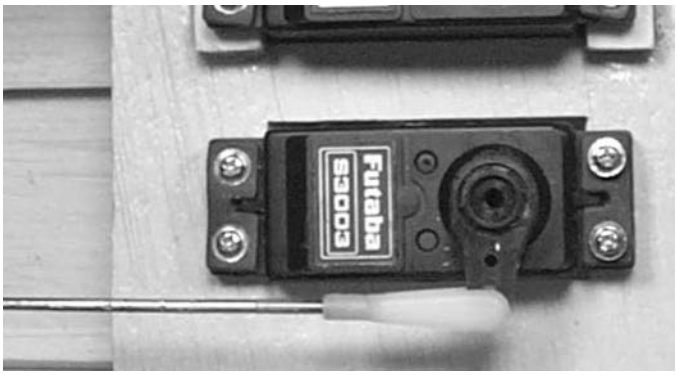
14. ☐ When the nylon tubes have been pushed through the fuselage, insert the two wires from the end of the pushrod into the tubes.

☐ Then, slide the pushrod back down through the fuselage, allowing the nylon tubes to guide the way until the two ends of the pushrod come out of the exit holes on either side of the airplane.

15. ☐ Once the wire has exited the fuselage, remove the nylon tubing from the end of the wires.

16. ☐ Thread the snap-links onto each of the wires, until the the wire shows in the middle of the snap-link.

17. ☐ Connect the snap-link to the second hole of control horn.

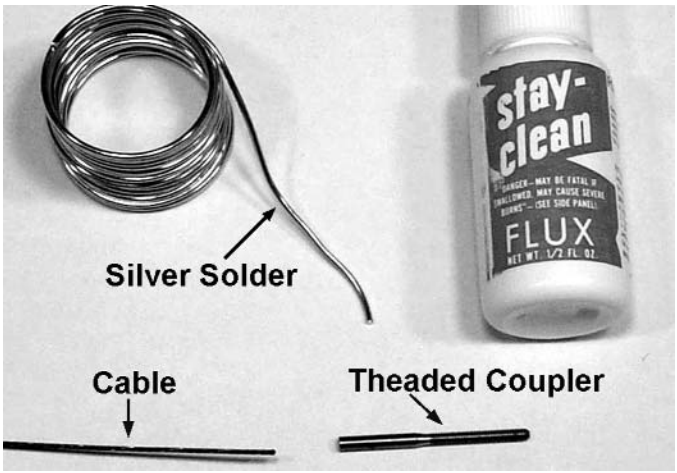


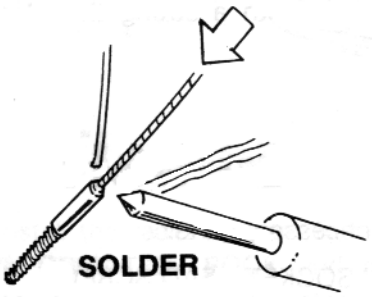
18. ☐ Thread a snap-link onto the servo-end of the pushrod and attach to the elevator servo.

Rudder Cable Installation

1. ☐ Collect the following items:

(2) 34” stranded cable
(4) 1/16 threaded couplers
(4) Snap-links
)2) 1/8 x 24” nylon tubing





2. ☐ Using flux and silver solder, solder a threaded coupler onto the end of the cable.

3. ☐ From the coupler end, and including the coupler itself, measure 30 inches and mark the cable. Then cut it with a wire cutter.

☐ Now, making sure the cable is all the way into another threaded coupler, solder it to the cut end. The total length of the finished cable should be 31”.

☐ Repeat the above steps to make a second cable to the same length.

4. ☐ Install the cables by using the guide tubing and threading them through the fuselage, as was done with the elevator pushrod.

☐ Wash the soldered coupler/cable assembly with soap and water.

5. ☐ Place a snap link on each end of each cable.

6. ☐ Connect two snap links to the center servo, as shown, and the other two snap links to the rudder control horn.

☐ Make sure the cables are tight and that the rudder does not move without moving the servo.

NOTE: This servo works best if it has ball bearings.

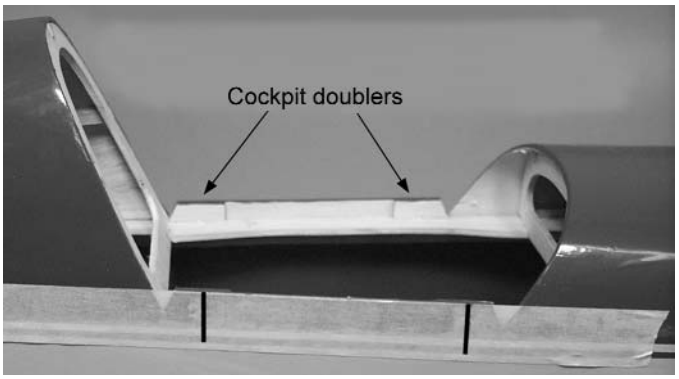
Canopy & Cockpit Installation

1. ☐ Collect the following items:

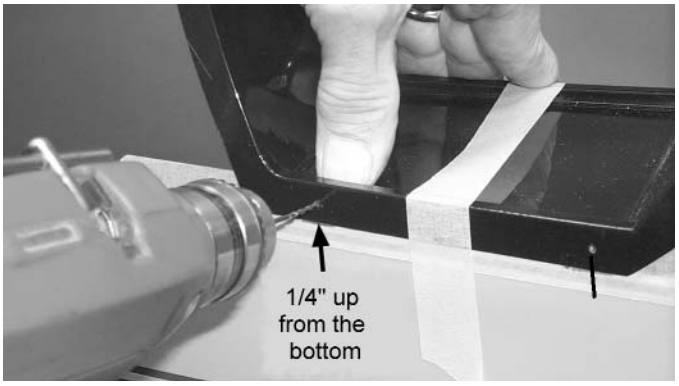
(1) Cockpit insert
(1) Canopy
(4) #2 x 3/8" sheeet metal screw
(4) # 2 washer

2. ☐ Carefully cut the cockpit along the scribe line.

3. ☐ Place a strip of masking tape along both sides of the fuselage cockpit opening.



4. ☐ Find the center of the cockpit doubler and make a mark on the tape at the center point.



5. ☐ Place the cockpit insert on the fuselage and, while pressing down on the insert, tape the cockpit insert down.

6. ☐ Using a 1/16" bit, drill four holes 1/4" up from the cockpit bottom and along the centerline that extends from under the insert.

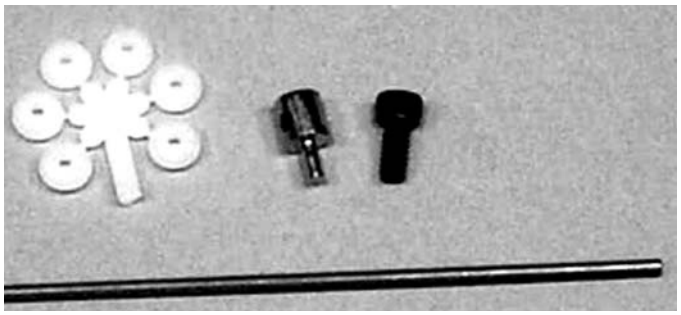
7. ☐ Place the canopy over the cockpit insert and, making sure it is straight on the fuselage, tape it securely.

☐ Drill four holes in the canopy at the same locations as those drilled in the cockpit insert.

8. ☐ Remove both the canopy and the cockpit insert, and then remove the tape from the side of the fuselage.

☐ Replace the insert on the fuselage and put the canopy in place over it. Screw down both parts with the #2 x 3/8" screws and #2 washers.

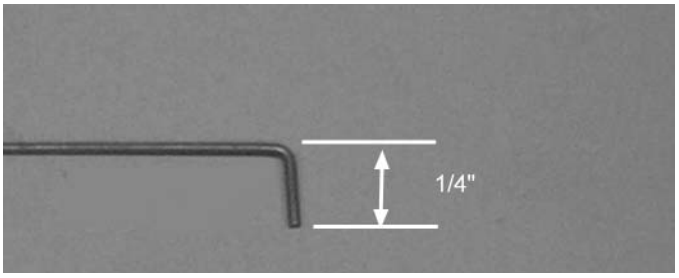
Engine Pushrod Installation



1. ☐ Collect the following items:

(1) .063 x 16-3/4" wire
(1) 1/8 x 24" nylon guide tubing
(1) Snap nut wheel
(1) Pushrod connector
(1) 4-40 x 1/4" socket head screw
(1) 20" length of fuel tubing

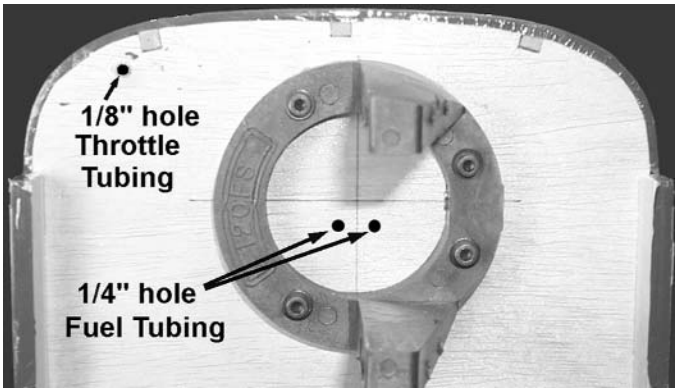
NOTE: The following photos and instructions are for mounting a 4-cycle engine. Other engines might require different steps for installations.



2. ☐ Mark 1/4” from the end of the .063 wire and make a 90º bend.

3. ☐ Cut the wire to a length of 12-3/8”.

4. ☐ Cut off a piece of nylon guide tube 9-1/2” long.



5. ☐ With the engine in place on the motor mount, mark the location for the throttle pushrod on the firewall.

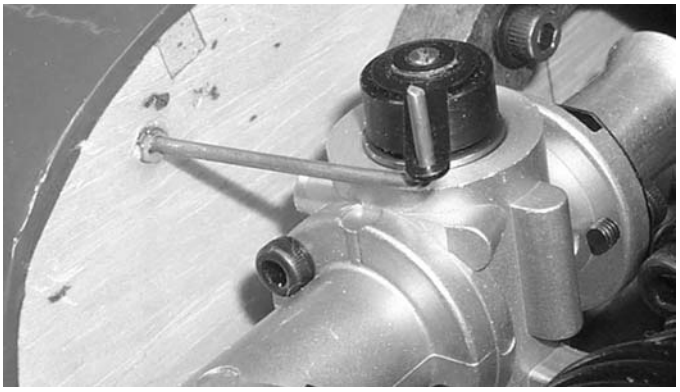
6. ☐ Remove the engine and drill a 1/8” hole for the pushrod in the firewall.

7. ☐ Next, drill two 1/4” holes for the fuel tubing.

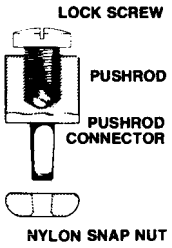
☐ Take the 20” length of fuel tubing and pass equal amounts of the tube into each of the holes, so that equal lengths of tubing are inside the fuselage.

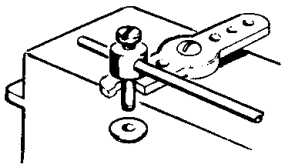
8. ☐ Insert the 9-1/2” guide tube through the front of the firewall back to the throttle servo. Make sure the tube goes through the hole in the former, as shown above.

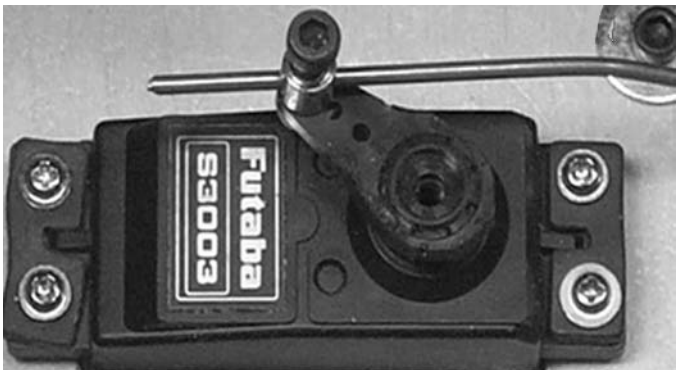
NOTE: A short length of guide tubing should extend out the front of the firewall.



9. ☐ Holding the engine in your hand, take the bent end of the .063 wire and place it on the throttle arm of the engine. Then, slide the other end of the wire into the guide tube. Make sure the throttle wire goes through the tubing in the fuselage and over the top of the throttle servo.







10. ☐ Place the throttle wire through the hole in the pushrod connector and slide the servo arm on the wire to the top of the servo, as shown.

NOTE: It may be necessary to bend the wire to prevent any binding.

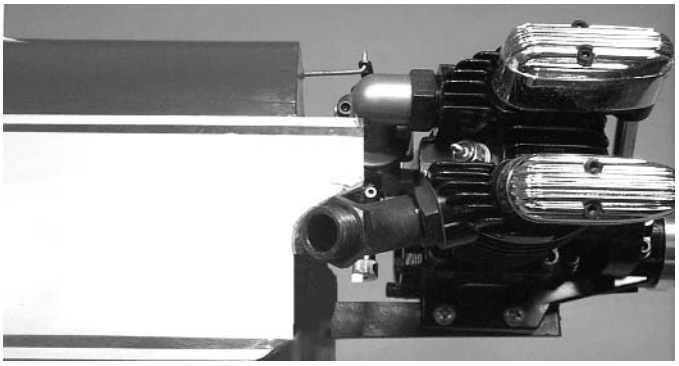
11. ☐ Twist the servo until the arm is pointing towards the engine and then push the wire forward until it stops moving.

☐ Tighten the setscrew on top of the pushrod connector. Final adjustment can be made later, when the rest of the radio is installed.

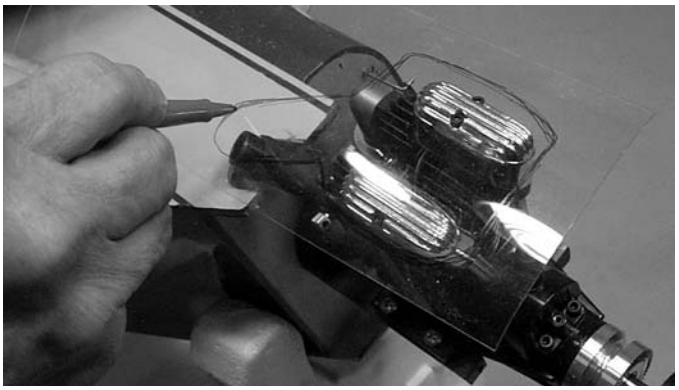
Cowl Installation

1. Collect the following items:

(1) Fiberglass cowl
(4) #4 x 3/8 sheet metal screws
(4) #4 washers
(1) 4 x 12” clear plastic



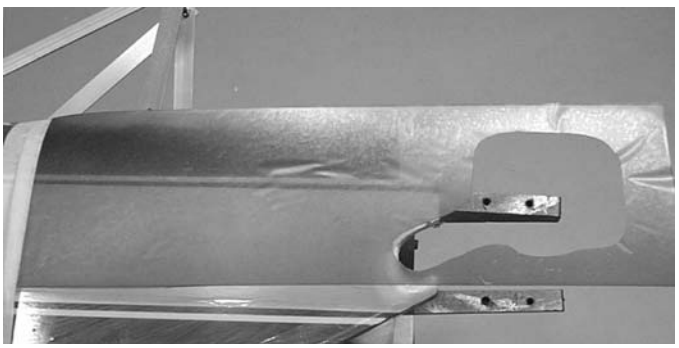
2. ☐ Check to see if any part of the engine muffler or exhaust header will interfere with the fuselage. If necessary to create clearance, remove a portion or the entire tab that extends beyond the firewall.



3. ☐ Place the piece of clear plastic over the top of the engine. The end of the plastic should extend just past the cylinder head.

4. ☐ Mark where the engine contacts the plastic.

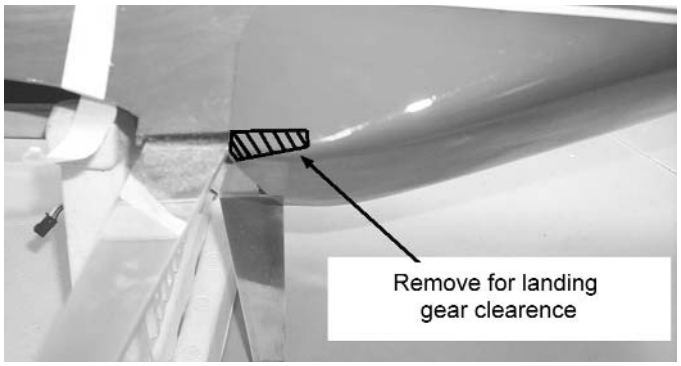
☐ Remove the plastic and, using the moto tool, cut out the engine area until the plastic fits over the top of the motor and lies flat on the fuse side. Then, tape the edges of the plastic to one side of the fuselage.



5. ☐ Lift up the untaped side of the plastic and remove the engine.

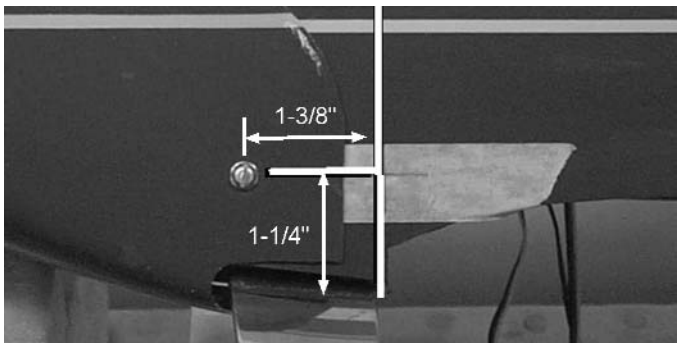
6. ☐ Slide the cowl under the plastic.

CAUTION! WHEN CUTTING THE COWL, ALWAYS WEAR PROTECTIVE EYE GEAR AND A LONG-SLEEVE SHIRT. CHANGE CLOTHES AND WASH AFTER CUTTING.



☐ Using the moto tool, cut away the bottom of the cowl at the point where it hits the landing gear. Take off small amounts at a time and keep measuring the cowl until it will slide back to a point that is 1/16” behind the engine drive washer.

NOTE: If using the engine pictured in these instructions, the measurement from the firewall to the front of the cowl will be 5-3/8”.



7. ☐ Securely tape the cowl to the fuselage, so that it will not move. Once taped, measure the cowl again to make certain its position has not shifted.

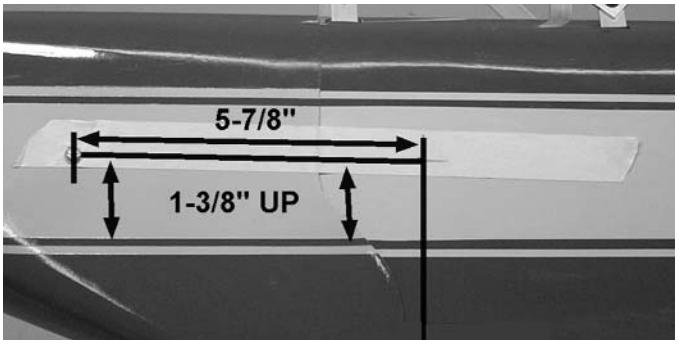
8. ☐ Place a piece of masking tape on the side of the fuselage just above the landing gear and long enough so that it extends 3” onto the cowl and behind the landing gear.

☐ Placing the plane on its side, measure 1-1/4 above the landing gear and make a mark on the tape.

☐ From the mark, on a plane parallel to the yellow striping, measure 1-3/8” and make a second mark.

☐ Drill a 1/16” hole on the second mark for the lower cowl screw.

☐ Turn the aircraft over and repeat the above steps, drilling a bottom hole on the other side.

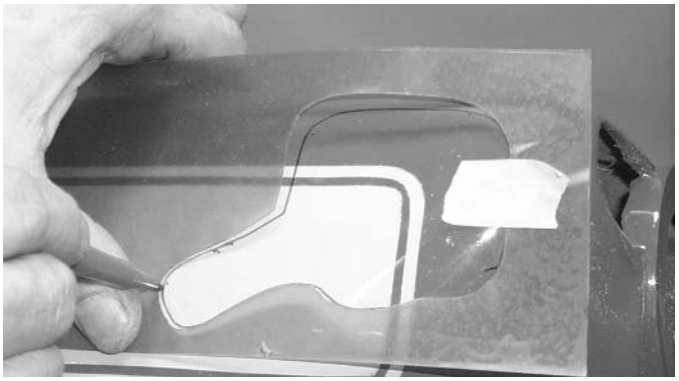


. ☐ Place a piece of masking tape down the center of the wide yellow trim stripe.

☐ Measuring up 1-3/8” from the bottom of the yellow stripe, make two marks and draw a line on the tape, parallel to the yellow stripe.

☐ Make a third mark on the tape, even with the back of the landing gear. From this point, measure forward 5-7/8”.

☐ Drill a 1/16” hole at this location for the top cowl screw.



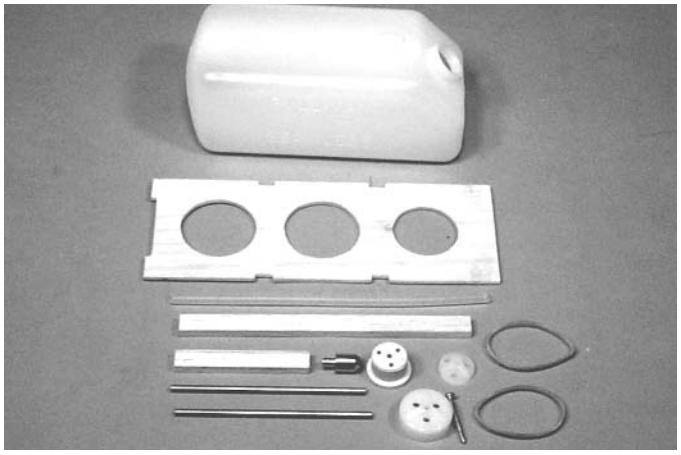
10. ☐ With the fuselage on its left side, trace the cutout for the engine onto the cowl.

☐ Remove the cowl and, with a moto tool, slowly remove the fiberglass INSIDE the cutout outline. Work slowly and carefully, until the cowl matches the clear plastic piece.

☐ Remember, if the fiberglass is damaged during this process, it can be repaired only with epoxy glue.

NOTE: You may wish to make a cutout in the front of the cowl, at the point where the engine prop washer sticks out, that is large enough to allow the engine to vibrate without touching the cowl.

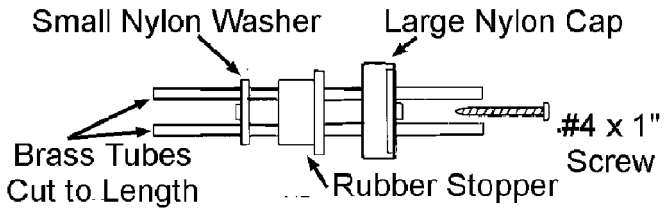
Fuel Tank Installation



1. ☐ Collect the following items:

(1) Fuel tank
(1) Fuel tank platform
(2) #30 rubber bands
(2) Brass tube
(1) Large nylon cap
(1) Small nylon washer
(1) Rubber stopper
(1) #4 x 1” screw
(1) Fuel tank klunk
(1) 6” length of white fuel tubing
(1) 1/4 x 3/8 x 2-1/2” fuel tank stop
(1) 1/4 x 3/8 x 5-1/2” fuel tank support

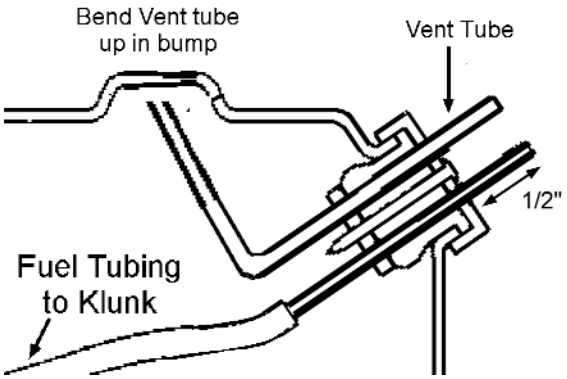
CAUTION! The white neprene stopper and the fuel tubing provided with this kit are **FOR GLOW FUEL ONLY**; DO NOT USE THESE PARTS FOR GASOLINE.



2. ☐ Insert both brass tubes through the wide end of the rubber stopper. Leave 1/2” extending out the front of the tank.

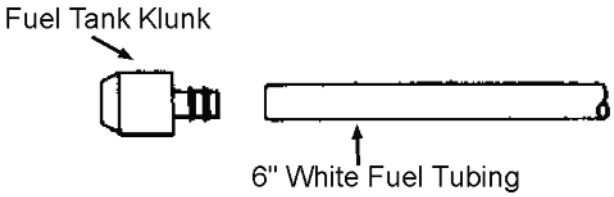
☐ Place the small nylon washer on both tubes, as shown, making sure that one of the tubes extends 1” past the washer. This tube will be for the klunk pickup.

☐ Cut tube as necessary.



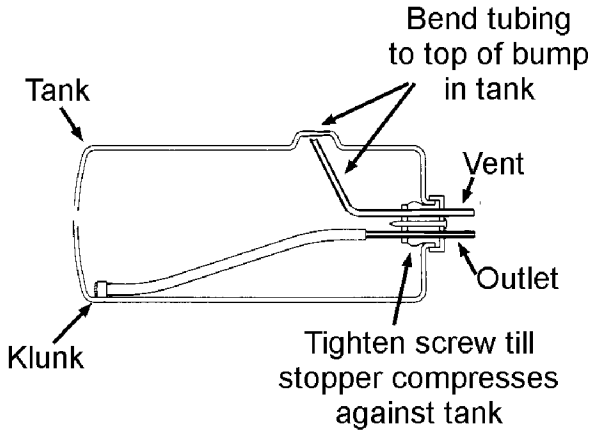
3. ☐ Bend the other tube, at the angle shown, until it nearly reaches to the fuel tank wall. This is the vent/overflow tube.

4. ☐ Insert the stopper assembly into the fuel tank until the vent tube is up inside the “bubble” in the fuel tank wall. Remove the assembly and trim the vent tube, if necessary.



5. ☐ Install the klunk on the white fuel tubing.

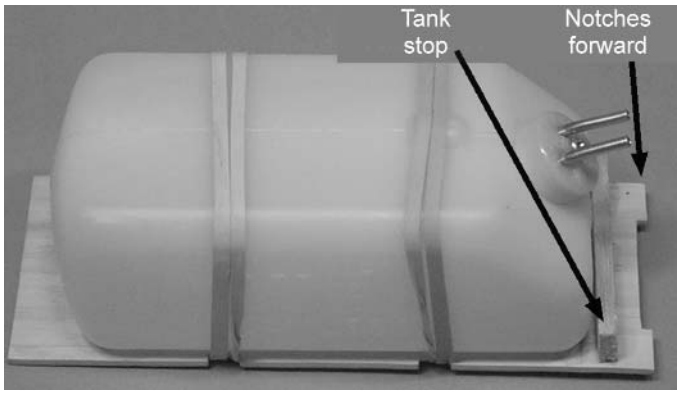
☐ Mount the other end of the fuel tubing onto the brass outlet tube in the stopper.



6. ☐ Again place the stopper assembly into the fuel tank. If the klunk is touching the back wall of the tank, trim it as needed.

7. ☐ Place the large nylon cap onto the two brass tubes.

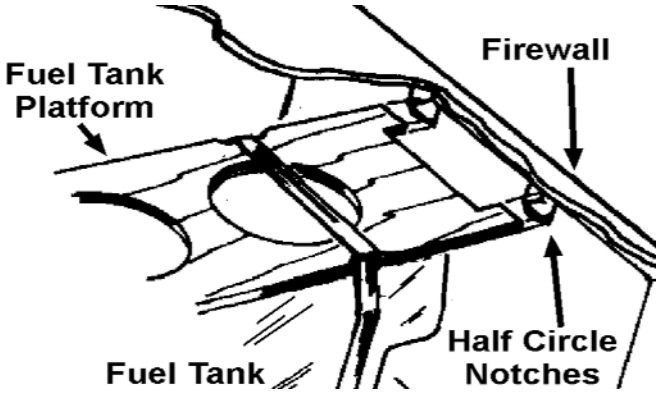
☐ When satisfied with the fit of the entire stopper assembly, tighten the #4 x 1” screw into the center of the stopper. Take care to not over-tighten the screw.

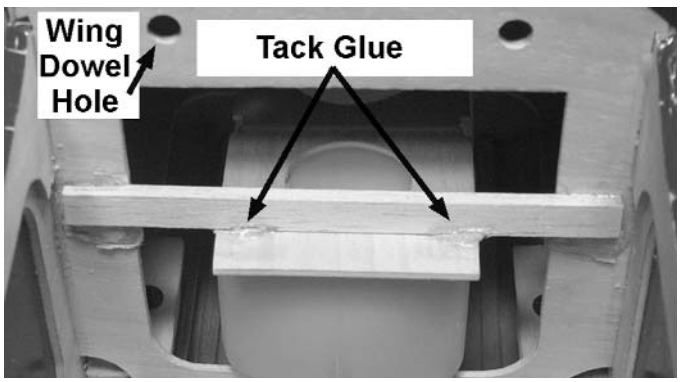


8. ☐ Referring to the above photo, place the fuel tank on the fuel tank platform.

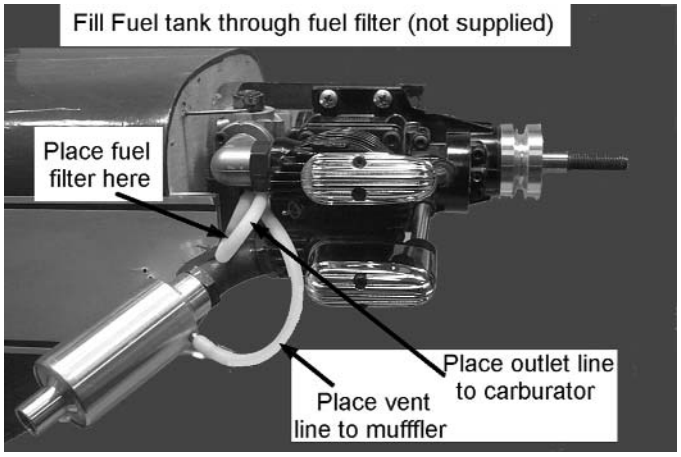
☐ Secure the tank to the platform with the rubber bands.

9. ☐ Glue the 1/4 x 3/8 x 2-1/2” balsa stop in front of the tank, as shown. When the glue has set, replace the rubber bands with electrial tape, so that the tank is well-secured to the platform.





10. ☐ Measure 2-7/8” from the landing gear block on both sides of the front former. Glue the fuel tank support stick across the opening the former.



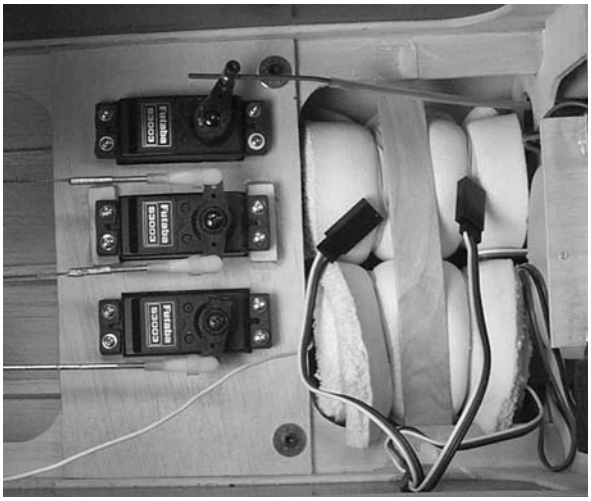
11. ☐ Reach into the fuselage and place the fuel tubing onto the brass fuel tank tubes. Note which tube is the vent and which is the outlet.

12. ☐ From the front of the firewall, pull on the fuel lines to remove any slack.

13. ☐ Complete the fuel tank installation by gluing the rear of the fuel tank platform onto the support stick.

Receiver Installation

1. ☐ Insert the Y-harness in the aileron plug in the receiver and then wrap both the receiver and the battery in the !/4" foam included in this kit. Secure with rubber bands.



2. ☐ Plug the switch into both the battery and the receiver.

☐ Next, plug the elevator, rudder, and throttle servo wires into the receiver.

3. ☐ Place the battery and the receiver into the compartment in front of the servos. Remember to keep the antenna and the Y-harness outside of the compartment so that the aileron servo wire can be easily plugged into the receiver.

☐ Place a piece of scrap wood across the receiver and battery pack to keep them in place.

4. ☐ Insert the receiver antenna into the pre-installed tube in the left side of the fuselage and slide the antenna down the tube until it exits out the hole at the rear of the fuselage, just in front of the tailwheel.

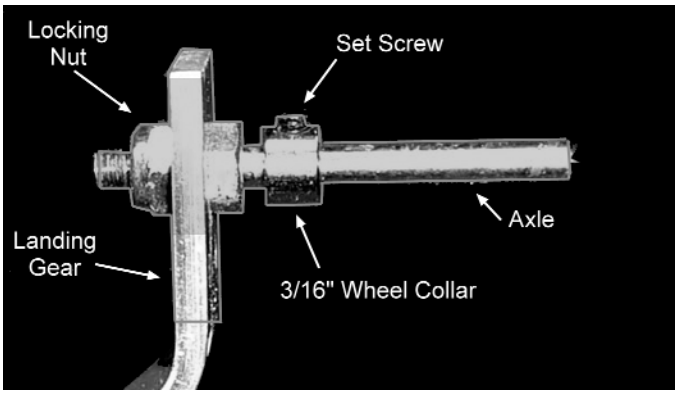
5. ☐ Turn on the receiver and transmitter and put all control surfaces in neutral position. Then insert the center screw into each of the servos.

CAUTION: Make sure all servo arms are tightened onto the servos.

Wheel & Wheel Pant Installation

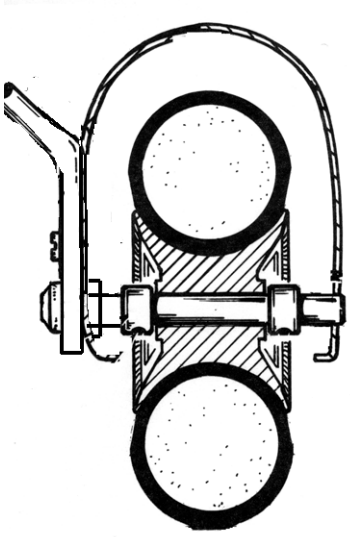
1. ☐ Collect the following items:

(2) 3" wheel
(2) Axle
(2) Axle locking nut
(4) 3/16" wheel collar
(4) 6-32 x 1/8" set screw
(2) Wheel pant (right and left)
(4) #2 x 7/16" sheet metal screw



2. ☐ Insert the threaded part of the axle through both sides of the landing gear and tighten the locking nut on each axle.

☐ Thread the 6-32 x 1/8” set screw into each of the four 3/16” wheel collars and place one wheel collar onto each axle.



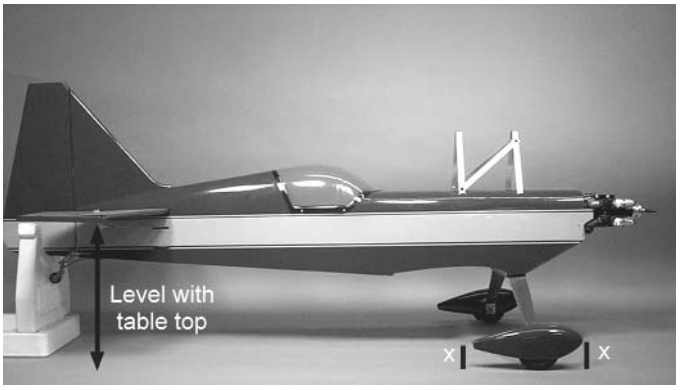
3. ☐ Slide the wheel pant over the axle and up against the landing gear. Make a mark on the wheel pant where it hits the axle.

NOTE: There are several ways to mount wheel pants. Following are two different methods.

4. ☐ Place the wheel pant against the back of the axle, next to the landing gear. Make a mark on the axle where the outside of the axle hits the wheel pant.

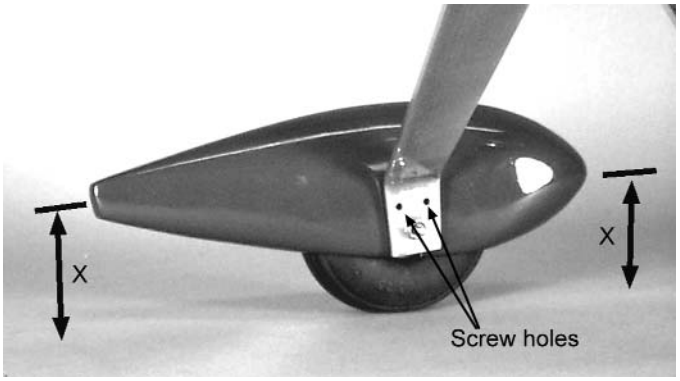
☐ Check to make sure that the wheel and both the inside and outside wheel collars will fit on the axle. If the fit is right, cut the axle at the point of the mark.

Alternatively, mark the wheel pant where the axle strikes the wheel pant and drill a 3/32” hole at that location on the outside of the wheel pant. Let the axle exit from inside the wheel pant through this hole. This will help support the wheel pant when flying off a grass or rough field.



5. ☐ When satisfied with the fit of all the components, mount the wheelpants, wheels and the remaining (outside) wheel collars onto the axle.

☐ Turn the aircraft right-side up and level the stabilizer.



6. ☐ Make sure the wheel pant is horizontal to the tabletop by measuring from center of the front tip and the center of the back tip, as shown above.

☐ When the wheel pant is level, drill a 1/16” hole through both of the landing gear holes and into the wheel pant.

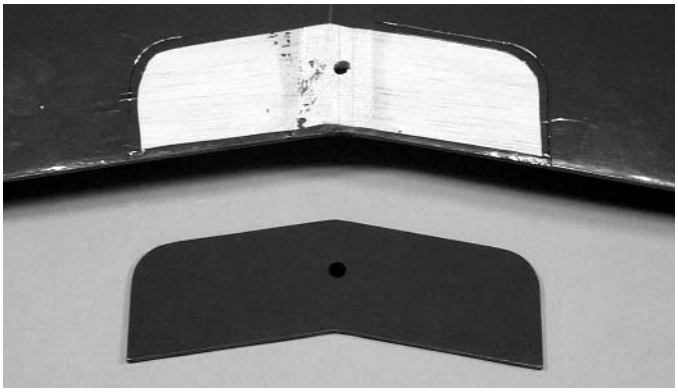
☐ Secure the wheel pant to the landing gear with #2x 3/8” sheet metal screws.

FINAL WING INSTALLATION

Wing/I-strut Installation

1. ☐ Collect the following items:

(1) Bottom wing
(1) Top wing
(1) Bottom wing bolt plate
(2) I-struts
(8) 4-40 x 1/2” sock head screw
(8) 4-40 blind nut
(8) #4 washer
(1) 6-32 x 1” socket head screw
(1) 6-32 blind nut
(1) #6 x 3/34” washer
(2) 4-40 x 1” socket head screw
(2) 4-40 locking nut
(2) #4 x 7/16” washer
(10) #4 washer



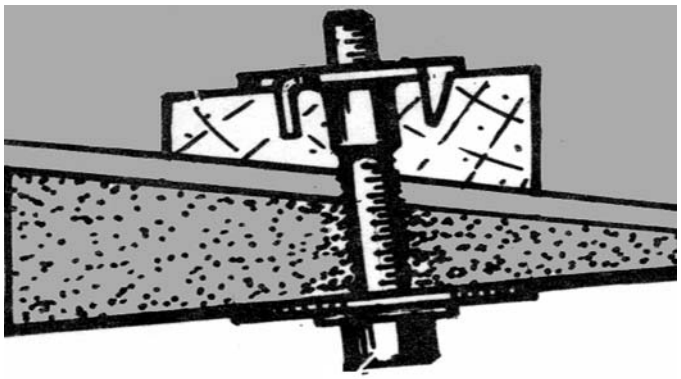
2. ☐ Take the bottom wing and locate the hole in the center of the wing close to the trailing edge. Carefully remove the covering from over the hole **on both the top and the bottom of the wing.**

☐ Next, find the hole in the center of the wing bolt plate and, again, remove the covering.

3. ☐ Align the hole in the wing bolt plate over the hole in the bottom of the bottom wing.

☐ Draw the outline of the plate on the wing and, **taking care to work 1/4” inside the outline**, remove the covering on the wing in the area where the plate will rest.

☐ Making sure the holes are aligned, CA glue the plate onto the wing bottom.



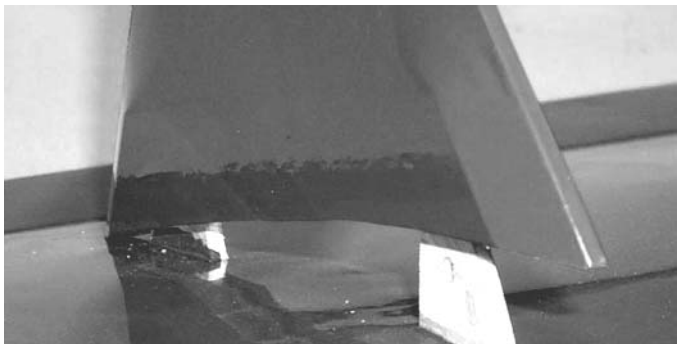
4. ☐ Working from inside of the fuselage wing opening, push the 6-32 blind nut in the hole in the center of the wing block until it will go no further.

☐ Take the 6-32 x 1” screw and the #6 x3/4” washer and screw them through the block into the blind nut. Tighten until the blind nut is seated well up into the wing block.

5. ☐ Now, temporarily remove the 6-32 screw and washer and place the bottom wing onto the fuselage.

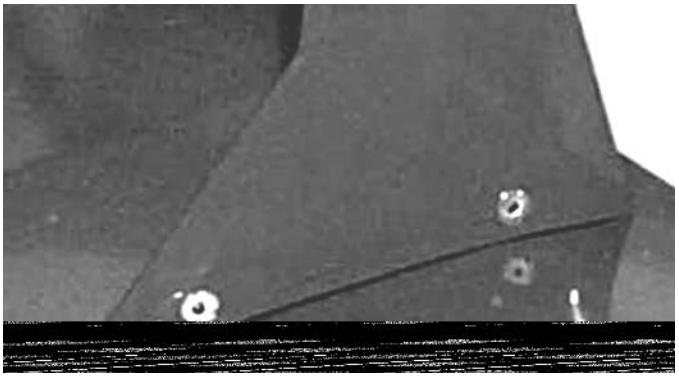
☐ Plug the servo extensions from the wing into the Y-harness.

☐ Insert the two front wing dowels into the bottom of the wing saddle. Then, using the 6-32 screw and washer, screw the back of the wing to the fuselage



6. ☐ With the plane right side up, place the cutout in the top wing onto the center cabanes.

☐ Next, slide the tabs on both the lower wing and the top wing into the slots of the I-struts. The curve of the wing will match the curve of the bottom of the I-strut.

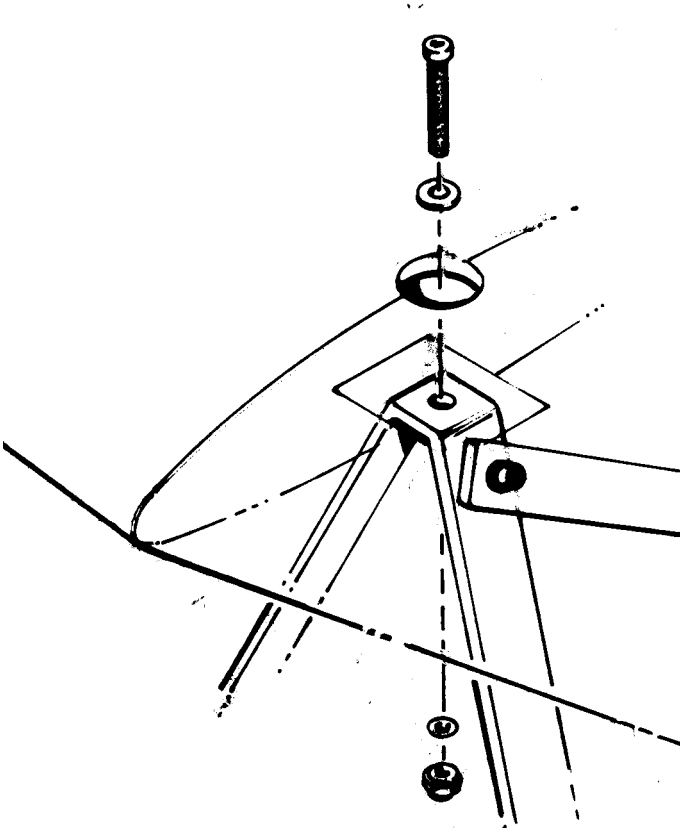


7. ☐ Working from the outside (towards the fuselage) insert the 4-40 x 1/2" socket head screws with #4 washers through the holes in the I-strut.

☐ Attach a 4-40 blind nut to the screw and tighten until the blind nut is flush with the back of the I-strut.

☐ Repeat with the other I-strut.

CAUTION: Do not over-tighten these screws, as doing so will crush the I-strut onto the tab and make it difficult to remove it from the wing.



8. ☐ Referring to the above drawing, bolt down the center and then the rear of the top wing.

Aileron Coupler Installation

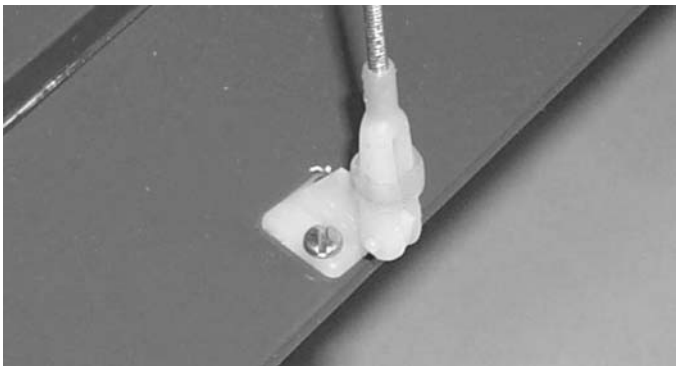
1. ☐ Collect the following items:

(4) Small control horn
(8) 2-56 x 1/2" pan head machine screw
(2) .072 x 10-1/2" double threaded wire
(4) Mini snap link

2. ☐ Mark locations for the control horns on the outer edge of each aileron (top and bottom wing) by measuring 8" in from the aileron tip.

☐ With a wire cutter, remove the top of the control horns, so that only one hole remains on each horn.

☐ Thread a mini-snap link to each end of the double-threaded wire.



3. ☐ Using the pan head screws, mount two control horns on the top of the bottom wing and two on the bottom of the top wing.

4. ☐ Connect the aileron coupler assembly to the aileron control horns, as shown.

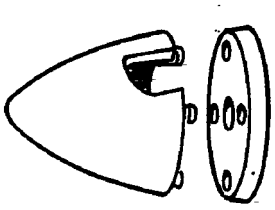
Decal Installation

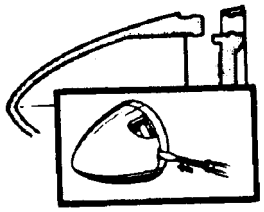
1. ☐ Clean model surfaces thoroughly before applying decals.

2. ☐ Cut decal sheets apart in sections, as needed.

☐ Fold decal in half, front to rear. Open at fold and lay decal out straight. The protective backing will bubble away from the decal at the fold. Using a scissors, cut the backing along the bubble, removing a strip of backing about 1" wide. Carefully position the decal on the model and stick in place. Then, working from the center, rub the decal down while peeling off the backing.

Spinner Assembly



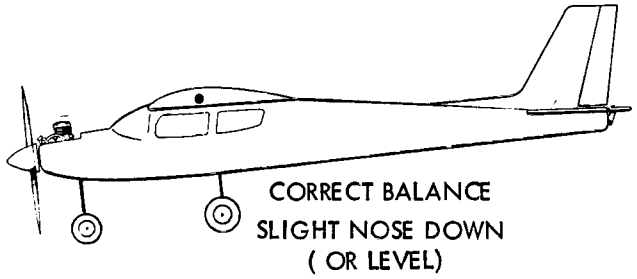


A 3" CGP 4-Pin Snap-On Spinner is included with your **Ultimate** ARF. It is a rugged precision molded spinner that does not require any special mounting nuts or screws. CAREFULLY READ THE SPINNER INSTRUCTIONS AND WARNINGS INCLUDED WITH THE SPINNER. Although a spinner helps reduce the chance of injury from a rotating prop, extreme caution always must be used when the engine is running.

Balancing the Model

IMPORTANT: NEVER NEGLECT THIS STEP WITH ANY AIRPLANE. If you try to fly a plane with the balance point behind the recommended range, you run the risk of having an unstable aircraft and the strong likelihood of a crash. **TAKE THE TIME TO PROPERLY BALANCE YOUR MODEL!**

To determine the Center of Gravity, measure back on the fuselage 2-3/8" from the leading edge of the bottom wing. The C.G. range for this aircraft is 1-7/8" to 2-7/8". It is recommended that you balance this model upside down. Add weight if necessary to achieve the proper balance.



Setting Control Surface Travels

SETTINGS

	Gentle	Aerobatic
AILERON:	10º	12º
ELEVATOR:	12º	14º
RUDDER:	15º	23º

When beginning to fly your **ULTIMATE**, we encourage you to start out with the gentle settings, regardless of your flying ability. Then, after you have become familiar with the aircraft, move to the aerobatic settings.

NOTE: Always use the furthest hole on all control surfaces and adjust at the servo for proper throw. Do not use the transmitter adjustment to set up the control travels. The transmitter should be used only for fine tuning.

It is not recommended that you fly this model with the dual rate control HIGH RATES set at the "aerobatic settings" and the LOW RATES set at the "gentle settings." The initial flights should be set up with the "gentle settings" at the HIGH RATE and the LOW RATES at 75% of the "gentle settings." The full F3A schedule can be flown very well with this setup. Once the model is trimmed out, if a more "hot dog" style of flying is desired, increase the control travels with the same percent of LOW RATE.

Field Kit Checklist

Fully-charged flight batteries

Radio transmitter

1 ½ volt starting battery & glo-plug clip

Fuel bulb or pump

Tools for tightening any parts that can vibrate and loosen

Paper toweling for clean up

Extra props and an extra spinner

Prop wrench

Bottle of CA glue

Pre-Flight Activities

Prior to going to the flying field, with radio batteries fully charged, turn on both receiver (Rx) and trans mitter (Tx) and actuate all controls many times until you are satisfied with all functions.

Before beginning each day's flying, make a range check of your equipment in accordance with the manufacturer's instructions. In general, with transmitter antenna collapsed to 6"-8", you should have an at least 100 foot range on the ground. To check this, turn on both the transmitter and the receiver switches, set the model heading away from you, and walk away while transmitting signals. Watch to see that no signals are missed until you are at least 100 feet away. Only if the equipment works perfectly should any flights be attempted. Again, be careful to not use your transmitter when anyone else at the field is flying or testing on the same frequency!

After the range check, stand behind the model and make sure the control responses are correct. Moving the control stick to the right should give right rudder (on a 3-channel set-up) or the right aileron should go up (on a 4-channel set-up). Moving the stick back or down on the Tx should move the elevator up, and vice versa.

Check also to see that your wheels operate properly Your throttle should open to permit full power when the stick or tab is moved forward or up. Finally, make sure that everything on your aircraft is neatly and firmly in place-motor fastened down, servos snugged down, receiver and battery wrapped in foam rubber, tank properly supported, etc. Prop and spinner must be tight. The receiver antenna must be extended, not coiled up inside the model. Nothing should be loose, or unfinished, or unchecked.

With everything ready, the engine should be started and broken in for a least a tank or two at no more than moderate speed. While the engine is running, make sure the control surfaces do not jitter or move until you command them and that the throttle also responds properly to your command.

Take-Off & Landing

Though the **ULTIMATE** is not difficult to control during take-off and landing, it is important to not overcontrol. Make small smooth corrections until you become familiar with the feel of your model. When taking off, you will need to add a bit of right rudder. Wait until there is plenty of airspeed and gently rotate (about 1/8-1/4 up elevator), keeping the wings level.

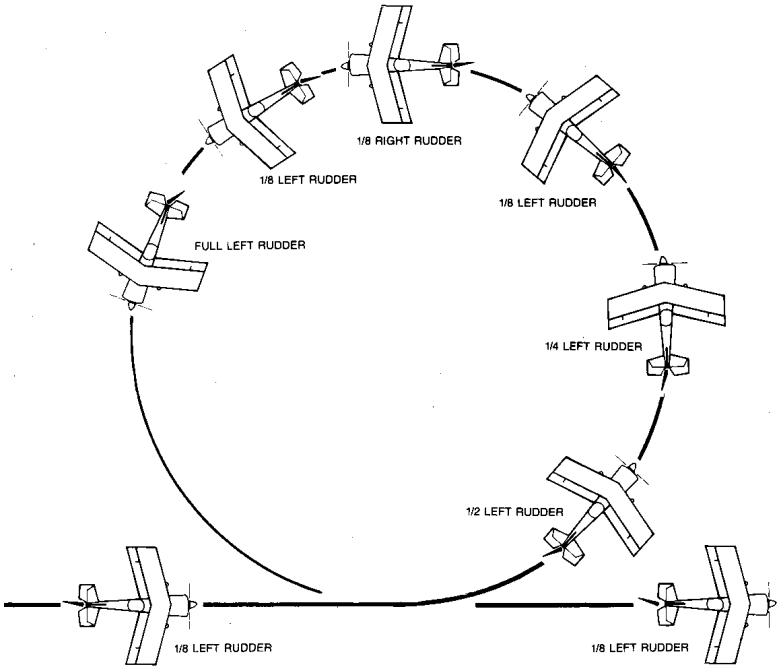
On landings, you will find that the **ULTIMATE** glides better than most bi-planes. However, no bipe glides as well do monoplanes. For the best landings, approach the runway at high idle and go to low idle about one foot above the ground, flaring to a 3-point landing as you gently touch done.

ADVANCED AEROBATICS

Developing your flying skills to include more varied maneuvers is exciting and rewarding.. The **ULTIMATE** is an extremely capable aircraft and is able to do advanced stunts. Here are a few you might try.

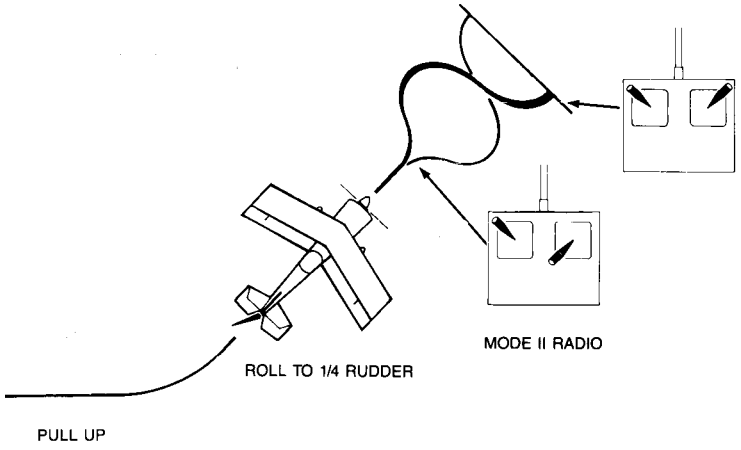
KNIFE-EDGE LOOP

This maneuver requires a powerful engine



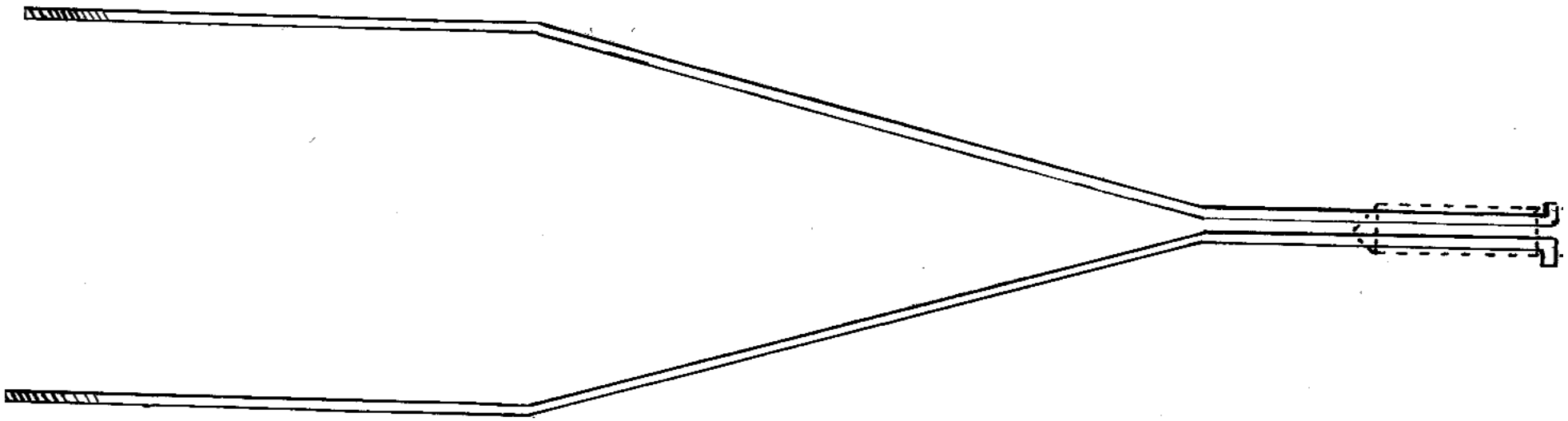
Roll to the left or right and hold a bit (10%) of top rudder. When ready to start the loop, add more rudder.

LOMCEVAC



Start out in a 45º climbing knife-edge. If you are using left rudder for the knife-edge, snap-roll left (full left rudder, left ailerons, and up elevator) 1-1/2 turns. Then, holding full left rudder, give full down and right aileron. Timing is the key, as well as power and climb angle. Try it and hold on!.

Elevator Pushrod Drawing #1



Drawing #2