HANGAR 9™

WE GET PEOPLE FLYING

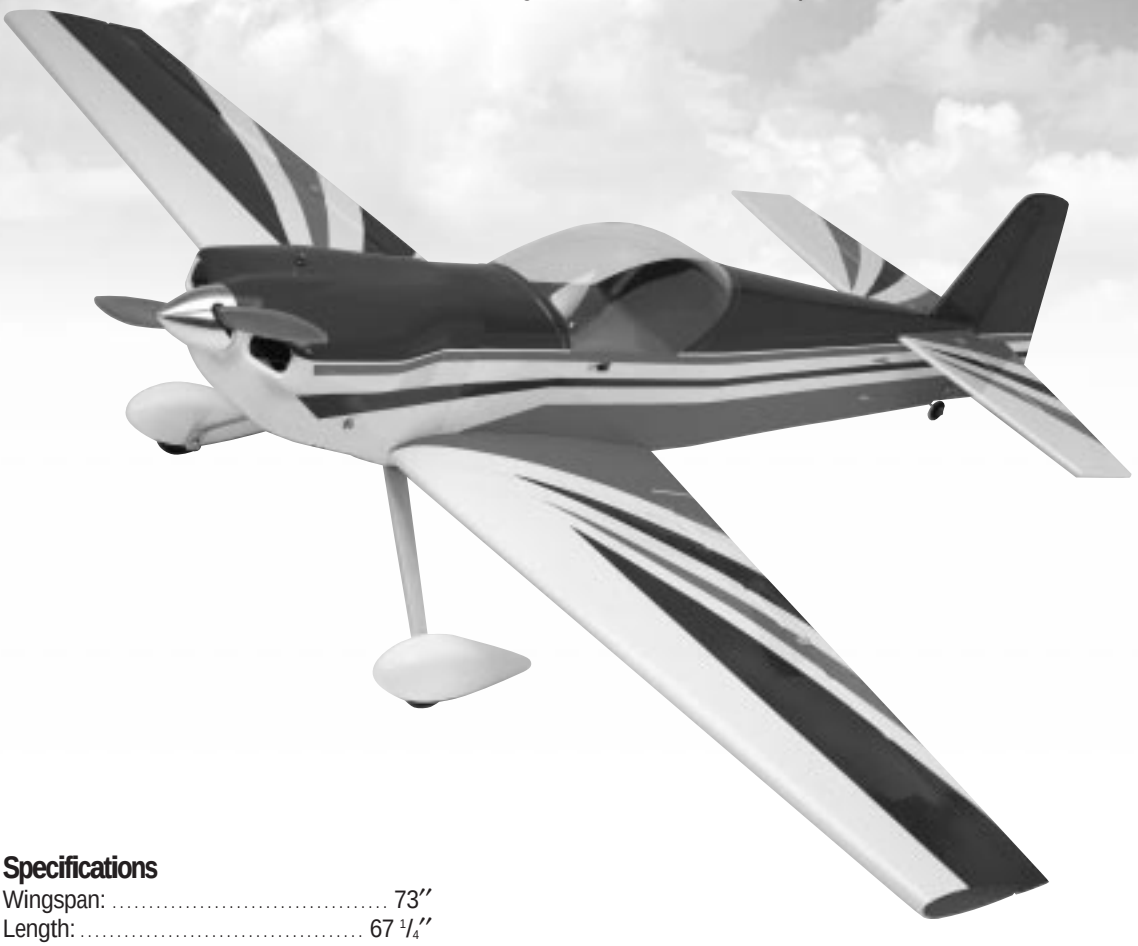
CAP 232

Ultra Aerobatic 1.20 ARF

INSTRUCTION MANUAL

ULTRA SERIES

- 90% pre-built
- Highest quality Du-Bro and Sullivan hardware included
- Pre-covered in genuine UltraCote® featuring Matt Chapman's full scale trim scheme
- Pre-finished fiberglass cowl and wheel pants



Specifications

Wingspan: ..... 73″
Length: ..... 67 1/4″
Wing Area: ..... 1031 sq. in.
Weight (Approx.): ..... 11–12 lbs.
Recommended Engines: 1.08 –1.20 2-Stroke
1.20 –1.50 4-Stroke

90% PRE-BUILT ARF

ALMOST READY-TO-FLY

Table of Contents

Introduction

Congratulations on your purchase of one of the finest ARFs to be produced! The Hangar 9 CAP 232 is a high-performance aircraft best suited for the more experienced flyer and modeler. Although this is an ARF (Almost-Ready-to-Fly) kit, it does have some construction features that can be challenging for a new modeler. If you encounter difficulty in any construction sequence, please feel free to contact one of our technicians—we stand ready to provide any assistance we can concerning the construction of your CAP. You can contact us at 217-355-9511.

Warning

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

Additional Equipment Required

Radio Equipment

4 Channels (minimum)
5 Standard Servos
Standard 600–1000 mAh Receiver Battery Pack
Y-Harness (if a non-computer radio is used)

Recommended JR Systems

JR XF642
JR XP783
JR XP8103
PCM10SxII

Engines

1.08-1.2 2-Cycle Engines
1.20-1.50 4-Cycle Engines

Recommended 2-Cycle Engines

Webra 1.20

Recommended 4-Cycle Engines

Saito 1.20 - 1.50
Saito 1.20GK - 1.50GK

Parts

Aileron Extension (2) (JRPA114, 12″ silver)
3″ Tru–Turn Spinner (TRU3002)
Propeller
Fuel Filter
Foam for Cushioning Tank
Fuel Tubing
Tru–Turn Adaptor (for appropriate engine)
Dubro Kwik Fueler Valve

Tools and Supplies Required

Adhesives

Thin CA (cyanoacrylate) glue
Thick CA (cyanoacrylate) glue
6-minute epoxy
12-minute epoxy
30-minute epoxy
Blue Locktite 242
Canopy glue (R/C 56)
Silver solder (Stay Brite)

Tools

Drill
Drill bits: 1/16″, 5/32″, 1/4″, 1/8″
Soldering iron
Small Phillips screwdriver
Medium Phillips screwdriver
Z-bend pliers
Pliers
$^{1}/_{16}$″ hex wrench
Small round file
Moto-Tool with sanding drum
Hobby knife with #11 blade
Mixing stick
Epoxy brush
90-degree triangle
Sanding stick (medium or fine)
Medium sandpaper
Masking tape
Straight edge
Measuring device (e.g., ruler, tape measure)
Scissors
Paper towels
Wax paper
Rubbing alcohol
Felt tipped pen

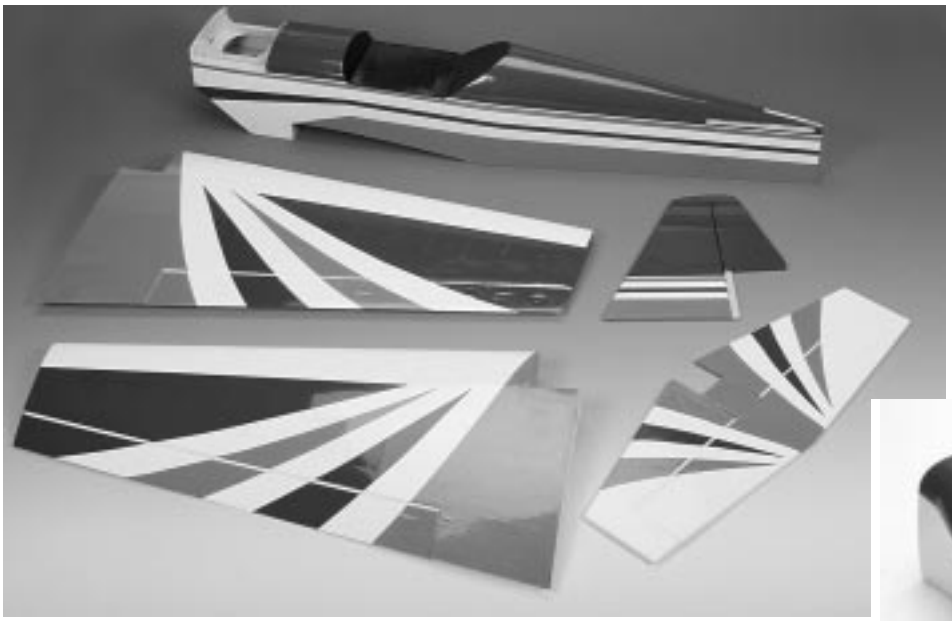
Optional Equipment

Radio packing foam
Antenna tube

Contents of Kit

Large Parts

A. Fuselage
B. Left wing half with aileron
C. Right wing half with aileron
D. Vertical stabilizer with rudder
E. Horizontal stabilizer with elevators
F. Cowl
G. Wheel pants (2)



Other Parts

1. Pushrod & accessories
2. 1/8″ plywood die-cut parts
3. Main landing gear
4. Hardware bag
5. Wheels
6. Fuel tank and hardware
7. Trim sheet
8. Metal motor mounts
9. Canopy
10. Tail wheel

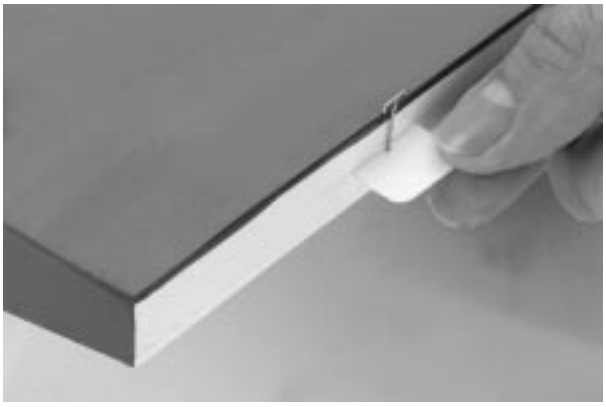
Section 1. Hinging the Ailerons

Parts Needed	Tools and Adhesives Needed
• Right wing panel with aileron and hinges • Left wing panel with aileron and hinges	• Instant thin CA glue • CA remover/debonder • Paper towels • T-pin (one for each hinge)

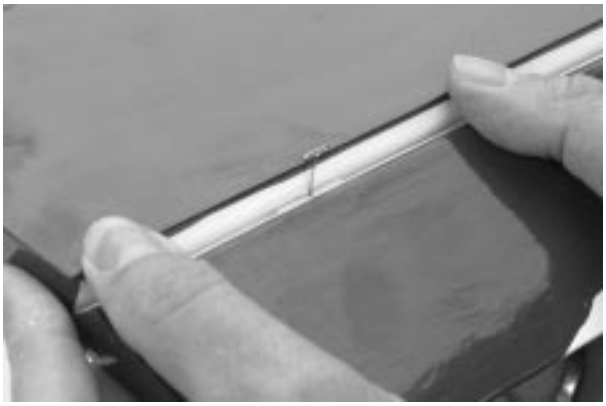
Note: The control surfaces, including the ailerons, elevators and rudder, are pre-hinged with the hinges installed, but the hinges are **not** glued in place. It is imperative that you properly adhere the hinges and ailerons in place per the steps that follow using a high quality thin CA glue.

Step 1. Carefully remove the aileron from one of the wing panels. Note the position of the hinges. The CAP comes with high quality CA-type hinges.

Step 2. Remove each hinge from the wing panel and place a t-pin in the center of each. Slide each hinge into the wing panel until the t-pin is snug against the wing.



Step 3. Slide the aileron onto the wing until there is only a slight gap. The hinge is now centered on the wing panel and aileron. Remove the t-pin and snug the aileron against the wing panel. This will ensure that the hinges are centered.



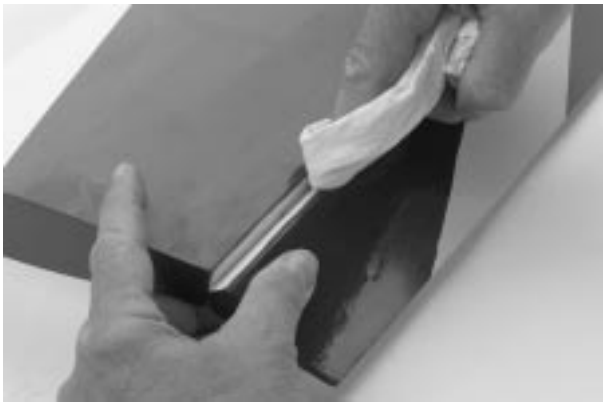
Step 4. Deflect the aileron and completely saturate the hinge with thin CA glue. The aileron's front surface should lightly contact the wing during this procedure. Ideally, when the hinge is glued in place, a 1/32″ gap or less will be maintained throughout the length of the aileron. The hinge is constructed of a special material that allows the CA to wick or penetrate and distribute throughout the hinge, securely bonding it to the wood structure.

Section 1. Hinging the Ailerons

CONTINUED

Step 5. Turn the wing panel over and deflect the aileron in the opposite direction and from the opposite side. Apply thin CA glue to each aileron hinge, making sure that the CA penetrates into both the aileron and the wing.

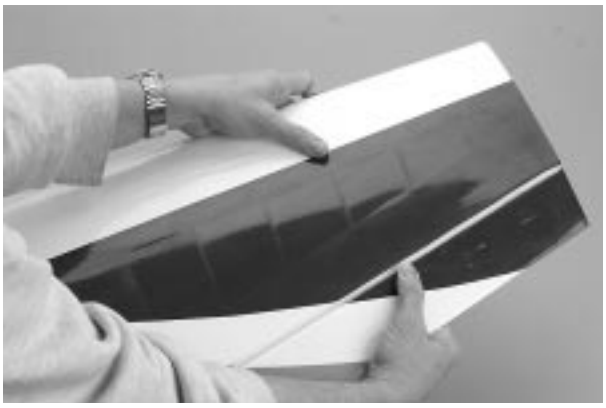
Step 6. Using CA remover/debonder and a paper towel, remove any excess CA glue that may have accumulated on the wing or in the aileron hinge area.



Step 7. Repeat this process with the other wing panel, securely hinging the aileron in place.

Step 8. After both ailerons are securely hinged, firmly grasp the wing and aileron to check that the hinges are securely glued and cannot be pulled out. Do this by applying medium pressure, trying to separate the aileron from the wing. Use caution that you do not crush the wing structure.

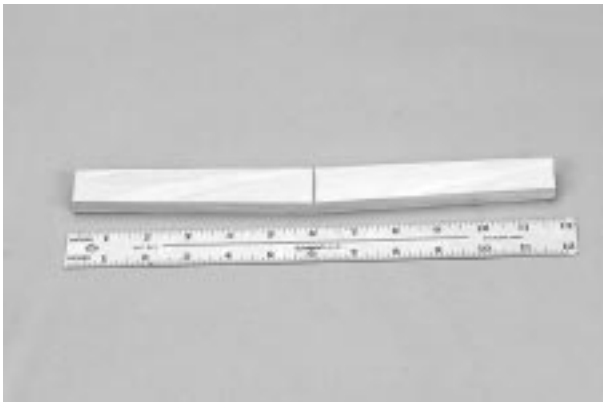
Note: Work the aileron up and down several times to "work in" the hinges and check for proper movement.



Section 2: Joining the Wing Halves

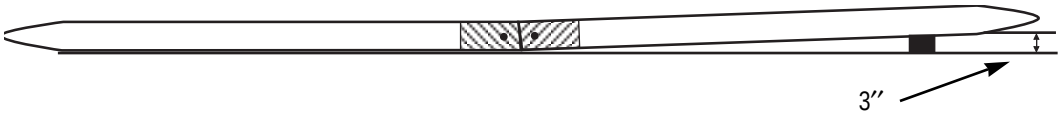
Parts Needed	Tools and Adhesives Needed
• Right/left wing panels • Dihedral brace • Plywood wing dowel plate • Wooden dowels • Wing bolt plates • Wing trim tape (white)	• 30-minute epoxy • 6-minute epoxy • Epoxy brush • Masking tape • Hobby knife • Rubbing alcohol • Paper towels • Wax paper • Ruler • Pencil • Medium sandpaper • Mixing stick

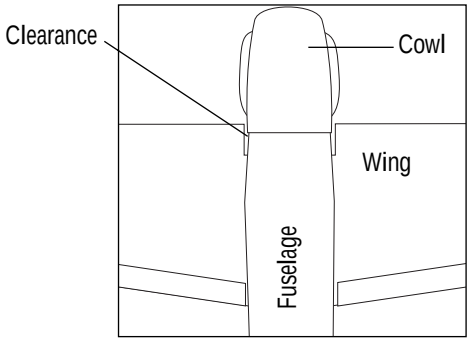
Step 1. Locate the dihedral brace (also called the wing joiner). Using the ruler, determine the center of the brace and mark it with a pencil.



Step 2. Trial fit the dihedral brace into one of the wing panels. It should insert smoothly up to the center line marked in Step 1. Now slide the other wing panel onto the dihedral brace until the wing panels meet. If the fit is overly tight, it may be necessary to sand the dihedral brace.

Step 3. Check for the correct dihedral angle. Place the wing on a large, flat surface with one wing panel resting on the flat surface. The opposite wing tip should be at 3″ in height from the surface (see illustration below). If necessary, sand the dihedral brace until this is achieved. There should be no gaps in the wing center.





Step 4. To check for adequate clearance of the cowl between the wing's leading edge and the fuselage, trial fit the wing together and temporarily install on the fuselage with the cowl installed. If the clearance is not adequate, install the extra plywood center wing rib to provide the necessary clearance (see diagram at left).

Section 2: Joining the Wing Halves

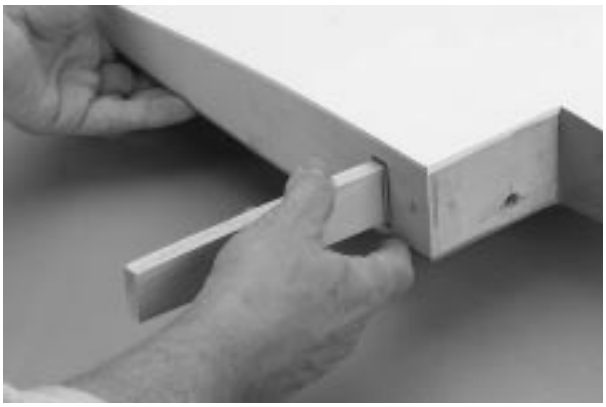
CONTINUED

Step 5. Mix up approximately 1 ounce of 30-minute epoxy.

Note: It is extremely important to use plenty of epoxy when joining the wing halves.

Step 6. Using a scrap piece of wood or an epoxy brush, smear a generous amount of epoxy into the wing dihedral brace cavity in one wing panel.

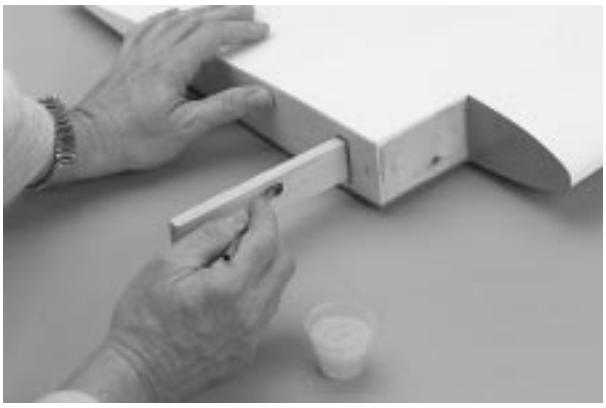
Step 7. Coat one half of the dihedral brace with epoxy up to the pencil line drawn in Step 1. Note the orientation of the wing brace — the "V" points to the top of the wing, or faces up. Install the epoxy-coated side of the dihedral brace into the wing joint cavity of the wing half, up to the center line, making sure the "V" side of the dihedral brace is orientated correctly.



Step 8. Apply a generous amount of epoxy into the wing brace cavity of the other wing panel.

Note: You will need to mix up additional epoxy to complete the joining process.

Step 9. Now apply epoxy to all sides of the exposed area of the dihedral brace and uniformly coat both wing roots with epoxy.



Section 2: Joining the Wing Halves

CONTINUED

Step 10. Carefully slide the two wing halves together and firmly press them together, allowing the excess epoxy to run out. There should not be any gap in the wing halves. Use rubbing alcohol and a paper towel to clean up any excess epoxy.

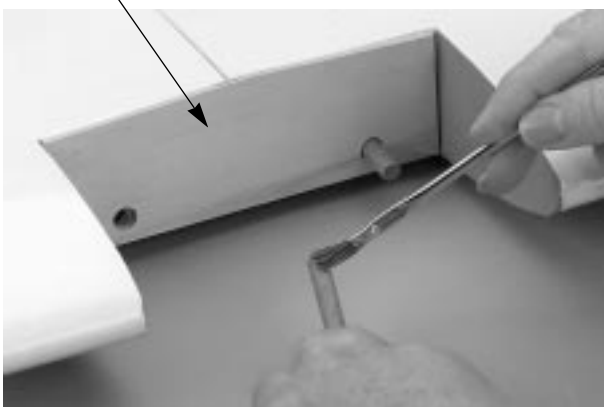
Step 11. Apply masking tape at the wing joint to hold the wing halves together securely. Place the wing on a flat surface. With one wing panel lying flat on the surface, the opposite wing tip should be propped up so it is 3″ from the surface. Apply more masking tape to the center wing joint and recheck the 3″ measurement. Allow the wing joint to dry overnight.

Note: It is helpful to use wax paper underneath the wing center while the epoxy is curing so the excess epoxy does not adhere to the work area's surface.

Step 12. Allow the wing center joint to completely cure, then remove the masking tape.

Step 13. Locate the plywood wing dowel plate and use 6-minute epoxy to epoxy it in place on the front of the wing. When installing the plywood dowel plate, care should be given to line up the holes in the wing and the plate as closely as possible. The holes will need to be trimmed out to allow the dowels to fit.

Step 14. Using 6-minute epoxy, epoxy the two wood dowels in place such that 1/2″ is exposed.



Section 2: Joining the Wing Halves

CONTINUED

Step 15. After the wing dowels and plywood wing dowel plate have dried, you can mount the two white covered wing bolt plates.

Note: The covering will have to be trimmed away from the area of the bottom of the wing so the pieces can be epoxied to the wing.

Trial fit the pieces, marking their location. Use a sharp hobby knife to trim away the covering.

Caution: Be careful not to cut into the wood as this will weaken the structure.

Step 16. Mix up 1 ounce of 6-minute epoxy and epoxy the wing bolt plates to the bottom of the wing. The wing bolt plate holes will be drilled out in Section 5.

Step 17. Locate the white and teal wing center tapes. Apply a portion to the bottom of the wing after the epoxy has cured from Step 15.

Section 3: Installing the Aileron Servos

Parts Needed	Tools and Adhesives Needed
• Left/right wing halves • Standard size servos (2) • Servo extension(s) — (12″ recommended) (2) • Music wire (36″) • Y-harness (if using a non-computer radio)	• Hobby knife • Phillips screwdriver (medium) • Drill • 1/16″ drill bit • Masking tape • Pencil or felt tipped pen • Needle nose pliers

Step 1. Locate the servo opening in one of the wing halves. Install the recommended servo hardware supplied with your radio system onto your servos (grommets and eyelets). Install a servo extension lead to the servo as well (a 12″ extension is recommended). Secure the connectors with either masking tape or a commercial connector that prevents the servo connectors from becoming disconnected.

Hint: It's always a good idea to tape the servo connections and extension together to prevent the wires from becoming unplugged in the wing.

Step 2. Trial fit the servo into the servo opening. Some trimming may be required, depending on the type of servo installed.

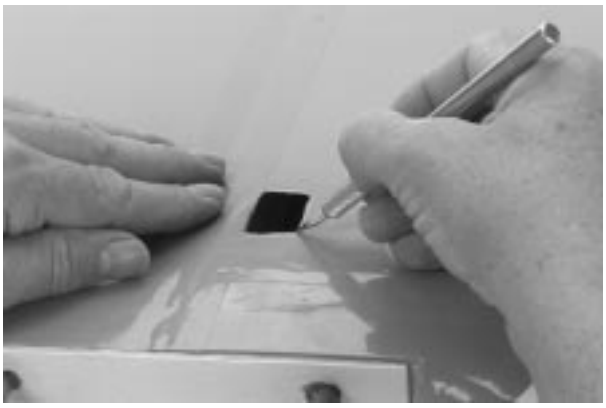
Step 3. With the servo in place, mark the location of the servo screws that are used to mount the servo to the plywood rail inside the servo opening in the wing.

Step 4. Using a 1/16″ drill bit, drill the servo screw locations marked in the previous step.

Section 3: Installing the Aileron Servos

CONTINUED

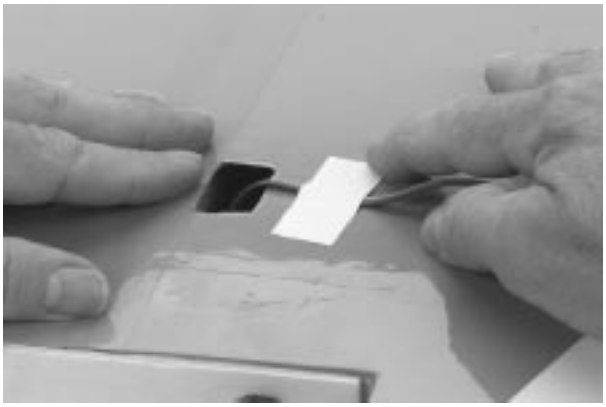
Step 5. Before mounting the servo, it would be wise to run the servo lead and extension through the wing and out the opening provided near the wing center. The servo lead exit is located on the top of the wing. Turn the wing half over and look carefully for a square opening near the center of the wing close to where the wing joiner slot is. You will have to trim away the covering to expose the opening. Using a sharp hobby knife, remove the covering over the opening.



Step 6. Using a small diameter piece of music wire (36″), thread the music wire through the servo opening. You will have to guide the wire as you thread it through the wing openings. Use care to make sure you do not crush any of the wing structure. Once you see the end of the music wire, a needle nose pliers can be used to grasp the wire and pull it out of the opening.

Step 7. Once you have the music wire threaded through the wing, make a small hook on one end and tape it to one end of the servo wire/extension. Carefully thread the wire and lead through the wing.

Step 8. To prevent the lead from falling back inside the wing, use masking tape to temporarily hold it in place by taping the lead to the wing top.



Step 9. Repeat the procedure for the other wing half.

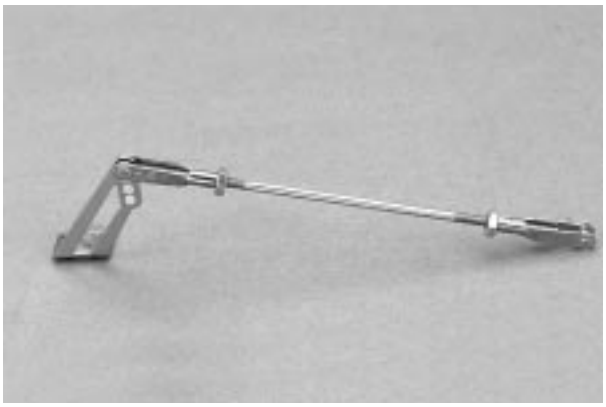
Note: If using a non-computer radio, it will be necessary to use a Y-harness to connect both aileron servos to the aileron channel.

Section 4: Installing the Aileron Linkage

Parts Needed	Tools and Adhesives Needed
• Wing assembly from Section 2 • Left control horn • Right (reversed) control horn • Plastic plate (2) • Screws (8) • Short (4′′) threaded rod (both ends) (2) • Clevis (4) • 4/40 nuts (4)	• Medium Phillips screwdriver • Drill • Drill bits: 1/16′′, 3/32′′ • Felt tipped pen • Moto-Tool

Step 1. For this assembly, you will be using a short (4”) threaded rod, two clevis and a regular and reverse control horn. Use the 4/40 nuts as locking devices to keep the clevis from turning. There is also a locking clip that keeps the clevis from opening. The reverse control horn has an “R” marked on its base; the standard horn has no marking. For illustration purposes, we will describe the hookup of the linkage on the right wing panel.

Step 2. Thread a 4/40 nut and clevis on each end of the threaded rod. Next locate the standard horn. The mounting hole plate should point toward the wing center. The link assembly goes on the outer servo arm or the one pointing to the wing tip.



Step 3. To establish the length needed, trial fit the horn and linkage to the servo arm. Adjustments in length are made by screwing one or both clevis in or out. The control horn should be positioned so the holes are over the center line of the hinge line.

Step 4. Once satisfied with the horn location (it should be a straight line from the servo arm to the horn), mark the location with a felt tipped pen. You will note the servo is positioned at an angle to the wing, but is 90 degrees to the aileron hinge line.

Section 4: Installing the Aileron Linkage

CONTINUED

Step 5. Using a 3/32″ drill bit, drill the screw holes for mounting the control horn. Since the aileron balsa is soft, we recommend applying thin CA into the aileron through the drilled holes to saturate and stiffen the balsa in the mounting area.

Step 6. Attach the control horn to the aileron using four screws and the plastic plate. Be careful not to accidentally puncture the covering with the screwdriver.

Step 7. Repeat the process for the other aileron on the other wing panel

Note: The control horn mounting screws may be excessively long on some control surfaces, and you may wish to cut off the excess length using a Moto-Tool, leaving a minimum of 1/8″ of mounting screw above the plastic plate.

Section 5: Mounting the Wing to the Fuselage

Parts Needed	Tools and Adhesives Needed	
• Wing • Fuselage • Plywood wing dowel supports (2) • Wing hold down hardware	• 30-minute epoxy • 12-minute epoxy • Epoxy brush • Rubbing alcohol • Paper towels • Mixing sticks • Felt tipped pen or pencil	• Pliers • Ruler • Drill • 1/4″ drill bit • Round file

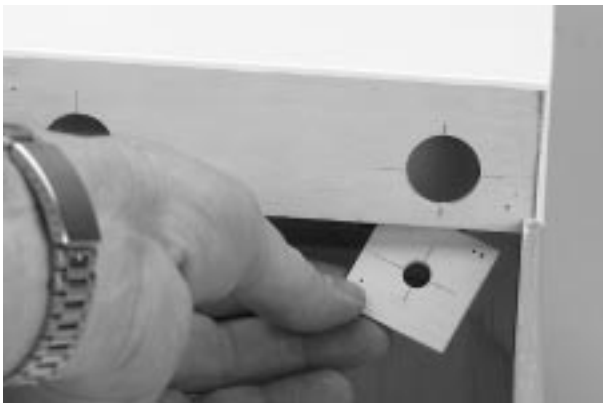
Step 1. Insert the wing into the fuselage so that the wing dowels project into the open area (holes) in the fuselage bottom. The wing dowel supports are then slipped in place on the dowels by putting them on through the fuel tank compartment.

Step 2. Center the wing so that the same space is on each side of the fuselage between the forward wing section and the side of the fuselage. Equal thickness spacers can be temporarily put in these spaces to make sure the spacing is maintained.

Step 3. The wing dowel supports are lightly tack glued in place by applying a small amount of epoxy or thick CA to a couple of places along the top edge of the wing dowel supports. This will have to be done by reaching through the fuel tank compartment.

Step 4. After the glue has dried, the wing can be removed and the wing dowel supports' exact location can be marked by drawing alignment marks from the bulkhead onto the dowel supports from inside the wing compartment.

Step 5. Remove the wing dowel supports by breaking them loose from the tack gluing (be careful not to mix them up). Mix up 1/2 oz. of 12-minute epoxy and glue the wing dowel supports in place. Allow the epoxy to cure completely before attempting the next steps.



Step 6. After the epoxy has cured, you are ready to install the wing hold-down bolts.

Section 5: Mounting the Wing to the Fuselage

CONTINUED

Step 7. Press the blind nuts into position below the rear wing hold-down block in the rear portion of the fuselage wing area. Use pliers with an adjustable opening to squeeze the blind nuts so the "teeth" penetrate the wood and stay in place.

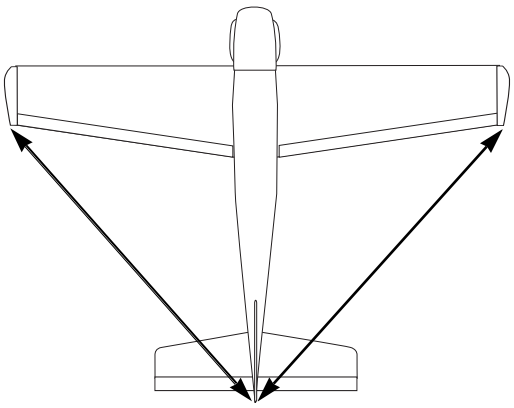
Note: It is important that the blind nuts be fully pressed in against the bottom of the wing hold-down block to make sure they are properly aligned. This sets the alignment angle of the wing bolts.

Note: It's a good idea to place a piece of wood on the top side of the wing bolt hold-down block to keep from crushing the wood.

Step 8. Thread the wing hold-down bolts into the bottom side of the blind nuts so the ends of the bolts extend 1/8″ above the wing seat.

Step 9. Carefully fit the wing into position on the fuselage, sliding the leading edge dowels into the fuselage front wing dowel support bulkhead.

Step 10. Before drilling the wing hold-down bolt holes, check the wing alignment by measuring from each wing tip to the tail of the fuselage. Be sure to use the same point on each wing tip exactly the same distance on each side from the center of the wing. Use a point at the tail of the fuselage bottom at the exact center.



Section 5: Mounting the Wing to the Fuselage

CONTINUED

Step 11. Once you're satisfied with the alignment, press down slightly but firmly on the rear section of the wing. The protruding wing bolts will make an indentation in the top wing covering. By comparing the wing top and wing bottom you can see the slight angle required when drilling the holes in the wing for the wing hold-down bolts.

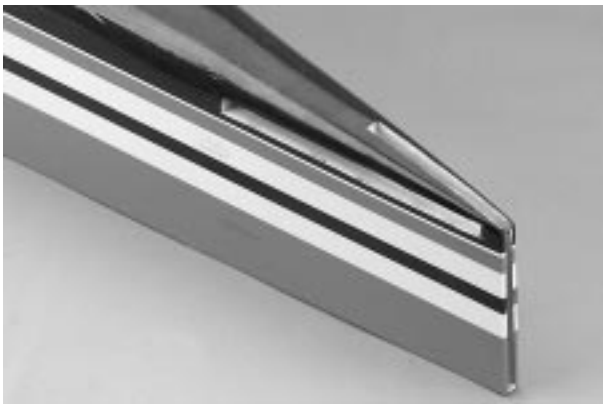
Step 12. Using a 1/4″ drill bit, drill the exact center of the wing indentations on the top of the wing, through the wing and wing bolt plates. Use special care to note the angle of the bolts and transfer that angle into the holes being drilled.

Step 13. Trial fit the wing into position on the fuselage. Thread the wing hold-down bolts into the wing and loosely tighten. Check the alignment of the wing by measuring the alignment as you did in Step 10. It may be necessary to slightly enlarge the holes with a small round file to obtain proper alignment.

Section 6: Installing the Tail

Parts Needed	Tools and Adhesives Needed	
• Fuselage • Wing • Horizontal stabilizer with elevators • Vertical stabilizer with rudder	• Instant thin CA glue • CA remover/debonder • 30-minute epoxy • Epoxy brush • Hobby knife with #11 blade • Straight edge • Pencil • Felt tipped pen • Masking tape	• Rubbing alcohol • Paper towels • 90-degree triangle • Ruler

Step 1. On the rear of the fuselage, slots are pre-cut in the wood structure for the horizontal stabilizer and the vertical stabilizer. You will need to trim away the covering with a sharp hobby knife.

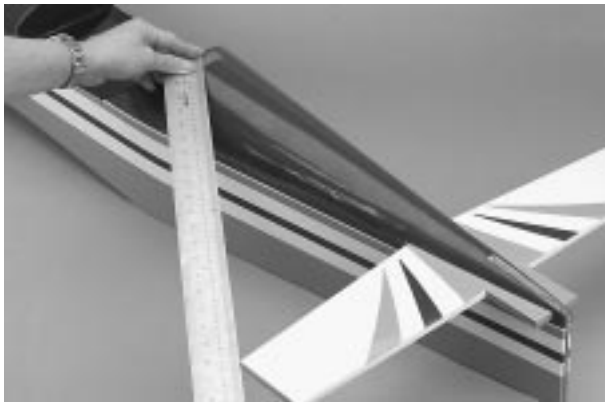


Step 2. We will begin with mounting the horizontal stabilizer first. Remove the elevators and, using a ruler, locate the center line of the horizontal stabilizer. This line will serve as a reference line when installing the horizontal stabilizer on the fuselage.

Step 3. Slide the horizontal stabilizer carefully into the slot provided in the fuselage. You may have to trim the opening to allow the horizontal stabilizer to be inserted. By noting the center line you marked, position the horizontal stabilizer so that it's centered in the fuselage.

Step 4. Locate the center line of the fuselage and put a reference mark there. Then, using a long straight edge, measure from the reference point on the fuselage to the tip of the horizontal stabilizer. Adjust the stabilizer position until both right and left measurements are the same.

Now you can install the wing and sight the horizontal stabilizer alignment from the rear of the aircraft. Make sure the horizontal stabilizer is level with reference to the wing.

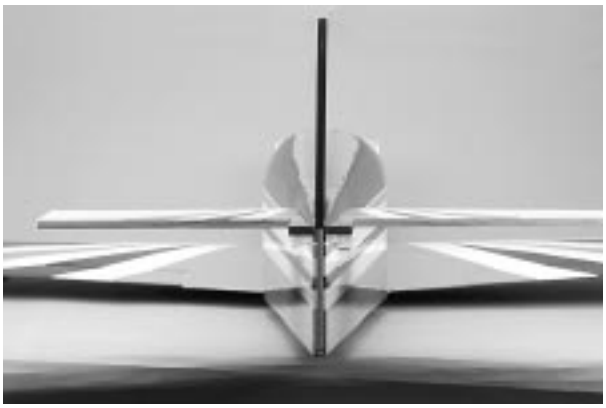


Section 6: Installing the Tail

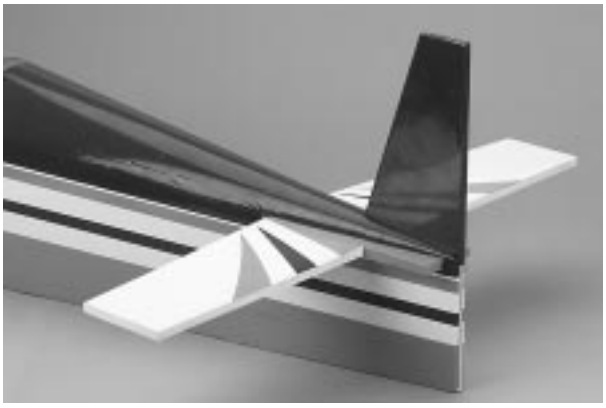
CONTINUED

Step 5. Trial fit the vertical fin in position. Make sure the fin is inserted completely. Some slight trimming to the bottom of the fin may be required. Carefully check the fin to be sure it's aligned 90 degrees to the horizontal stabilizer. A 90-degree triangle is helpful in this step.

Hint: When installing the vertical fin, use the rudder to check for proper fin height. It may be necessary to cut off a small amount from the bottom of the fin to get the rudder to drop down to the proper position so the trim between the rudder and and fuselage will line up.



Step 6. Double check the horizontal stabilizer and vertical fin alignment. It may be necessary to slightly trim the balsa wood on the fuselage or fin with a sharp hobby knife to achieve exact alignment.



Step 7. When you're satisfied with the alignment, carefully mark the position with a pencil at the junction where the horizontal stabilizer meets the fuselage top and bottom and where the vertical fin meets the fuselage. The pencil should make a light indentation in the covering.

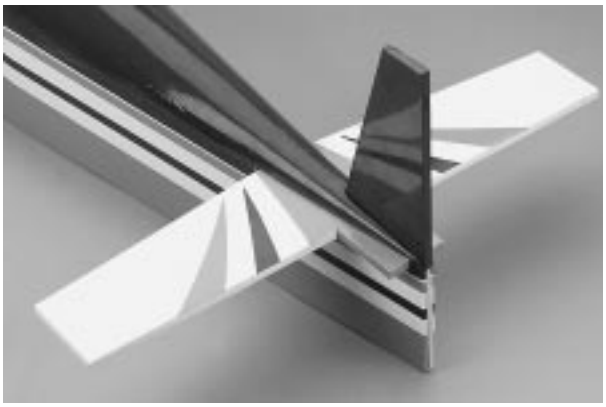
Step 8. Remove the horizontal stabilizer and vertical fin and carefully cut away the covering with a sharp hobby knife. Cut approximately 1/8″ inside the line of the horizontal stabilizer so that when the stab is repositioned in place, no bare wood shows. On the vertical fin, cut the covering away from the bottom of the fin and 1/8″ from the reference line marked with the pencil. Again, make sure no bare wood shows when the fin is repositioned.

Section 6: Installing the Tail

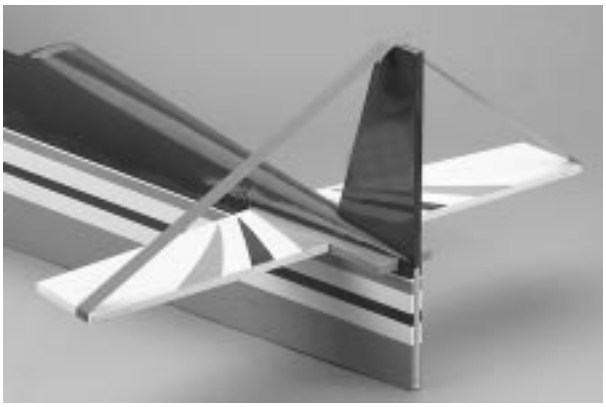
CONTINUED

Step 9. Mix up approximately 2 ounces of 30-minute epoxy. Slide the horizontal stabilizer into the opening of the fuselage. Use an epoxy brush to apply epoxy to the horizontal stabilizer. By sliding the stabilizer back and forth slightly, epoxy can be applied on the top and bottom. Then reposition it to the reference marks and clean off the excess epoxy with rubbing alcohol and a paper towel. Allow the epoxy to cure completely.

Step 10. Apply 30-minute epoxy to the vertical fin where the fuselage contacts the fin. Also, apply epoxy to the base of the fin where it mounts into the fuselage and horizontal stabilizer. Insert the fin into the fuselage and wipe away any excess epoxy with a paper towel and rubbing alcohol.



Step 11. Precisely align the horizontal stabilizer and the vertical fin as before, using masking tape to hold the components in proper alignment. Double check the alignment and allow the epoxy to cure completely.



Section 7: Hinging the Horizontal Stabilizer and Elevator

Parts Needed	Tools and Adhesives Needed
• Fuselage • Elevators (2)	• Thin CA glue • CA debonder • Paper towels • T-pins

Step 1. Locate the two elevator halves. Trial fit each into their proper position using the same hinging techniques learned in Section 1.

Step 2. With one elevator half properly aligned (left and right), apply thin CA glue to the hinges on both sides. Wipe away any excess CA with CA debonder and a paper towel.

Step 3. After the hinges are dry, check to be sure they are securely in place by trying to pull the elevator from the horizontal stabilizer. Use care not to crush the structure.

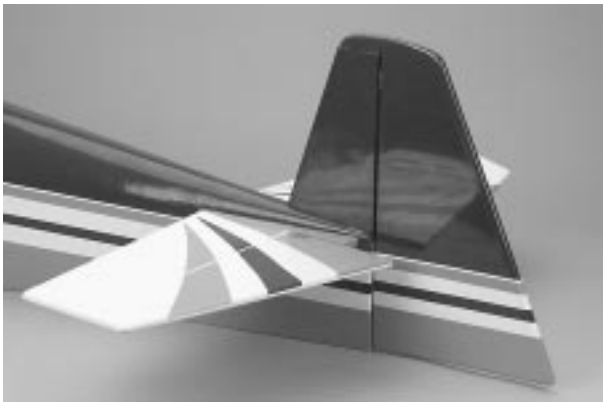
Step 4. Repeat the previous procedure for the other elevator half.

Step 5. Be sure to wipe away any excess CA with CA debonder.

Section 8: Hinging the Rudder and Installing the Tail Wheel

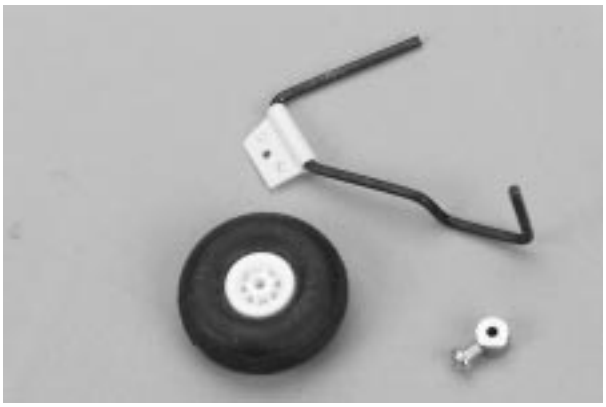
Parts Needed	Tools and Adhesives Needed
• Rudder • Fuselage • Tail wheel assembly	• Instant thin CA glue • CA remover/debonder • Blue Locktite 242 • 30-minute epoxy • Drill • Drill bits: 1/16″, 3/32″ • Needle nose pliers • Hobby knife with #11 blade • Felt tipped pen • Paper towels • Rubbing alcohol

Step 1. Trial fit the rudder in position on the vertical fin with the hinges in place. Note that three hinges attach the rudder to the fin and two attach the rudder to the fuselage.

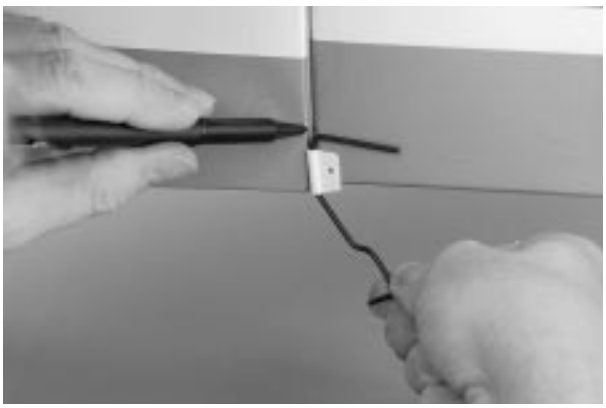


Step 2. Insert the tail wheel wire into the pivot bushing. With the pivot bushing resting against the bend in the tail wheel wire, use a needle nose pliers to make a 90 degree bend in the direction shown below, 1/8″ above the top of the pivot bushing.

Note: The part of the tailwheel wire which inserts into the rudder must go into the wood block in the rudder. To insure adequate strength, the bend of the wire must be kept as low as possible, or the wire will miss the hardwood.



Step 3. Hold the tail wheel assembly up to the fuselage in a position where it's flush with the fuselage bottom. Note where the wire rests in reference to the rudder. Using a felt tipped pen, mark the position where the hole is to be drilled into the rudder. Also mark the position of the slot where the pivot bushing will fit into the back of the fuselage.

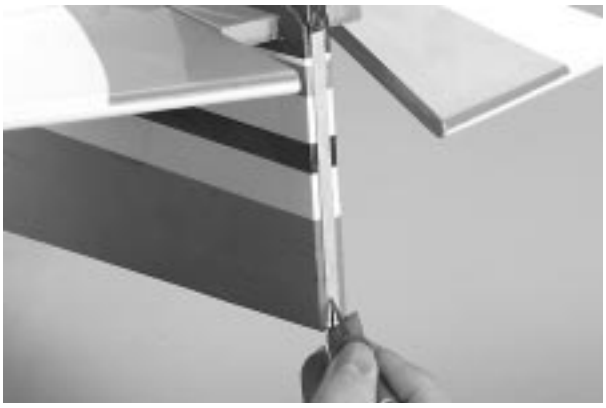


Step 4. Remove the rudder from the vertical fin. Using a 3/32″ drill bit, drill into the exact center of the rudder as marked to accept the tail wheel wire as shown. You can also drill a 1/16″ pilot hole first.

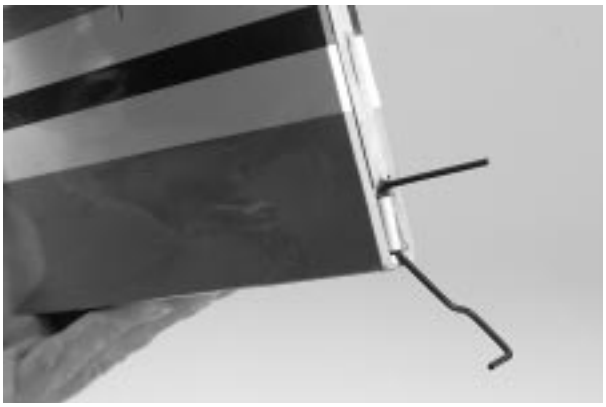
Section 8: Hinging the Rudder and Installing the Tail Wheel

CONTINUED

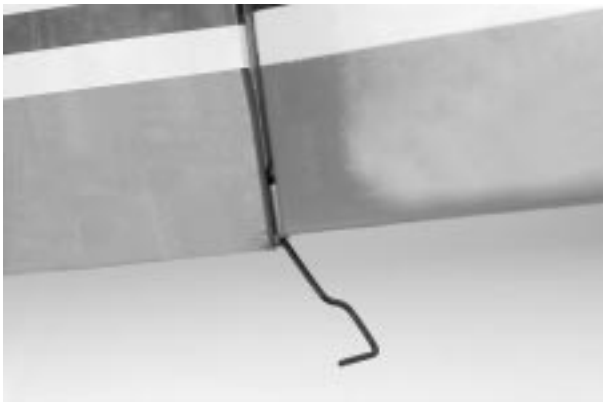
Step 5. Using a hobby knife, cut a slot or groove into the back of the fuselage vertical stabilizer as marked to accept the tail wheel pivot bushing.



Step 6. Trial fit the tail wheel assembly and rudder into place. Deflect the rudder, making sure the tail wheel turns freely with the rudder.



Step 7. When you're satisfied with the fit, disassemble the rudder and tail wheel assembly. Mix up approximately 1/4 ounce of 30-minute epoxy and apply it both to the pivot bushing where it goes into the fuselage and to the hole in the rudder. With the hinges in place, reassemble the tail wheel assembly and the rudder, wiping away any excess epoxy with alcohol and a paper towel. Allow the epoxy to cure completely before hinging the rudder.



Step 8. With the rudder aligned (up and down), apply thin CA glue to the rudder hinges on both sides, using the same technique learned in Section 1. Wipe away any excess CA with CA remover/debonder. After the hinges are dry, check to be sure they are securely in place by trying to pull the rudder from the vertical stabilizer and fuselage. There should be a minimal gap between the rudder and the vertical stabilizer.

Step 9. Work the rudder right and left. Check for free movement and ensure that the tail wheel tracks accordingly.

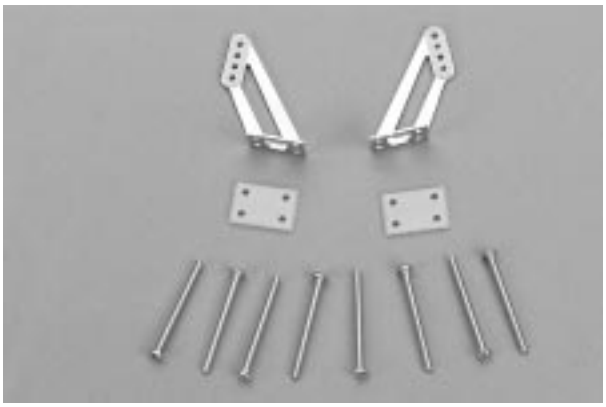
Step 10. Once you're satisfied the tail wheel wire is correctly aligned, slide the tail wheel itself onto the wire. Next, slide the wheel collar onto the wire and tighten the screw in the wheel collar. Use Blue Locktite 242 to secure the collar in place.

Note: The wheel must rotate freely with only a small amount of side play. It may be necessary to drill out the tail wheel slightly so the wheel will spin freely on the axle.

Section 9: Installing the Control Horns

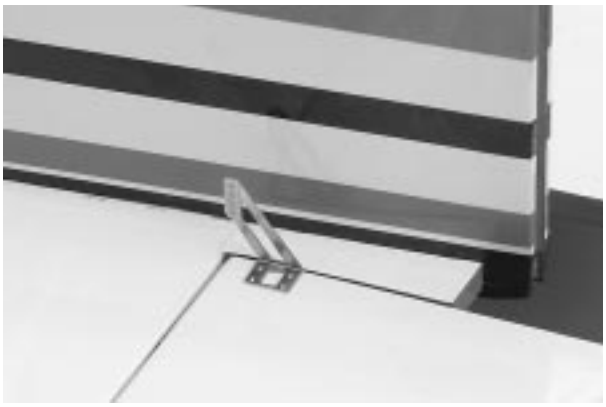
Parts Needed	Tools and Adhesives Needed
• Standard/reverse control horns (2 each, 4 total) • Plastic plates (3) • Screws (12) • Fuselage with rudder and elevator	• Phillips screwdriver • Drill • Drill bits: 1/16″, 3/32″ • Ruler • Felt tipped pen • Masking tape

Step 1. Locate a standard and reverse control horn and the associated hardware. Note that on the bottom of the control horns, the one with no markings is the standard horn and the one with the "R" is the reverse control horn. The right (as relates to the pilot sitting in the cockpit) elevator uses the standard horn, the left elevator uses the reverse horn.

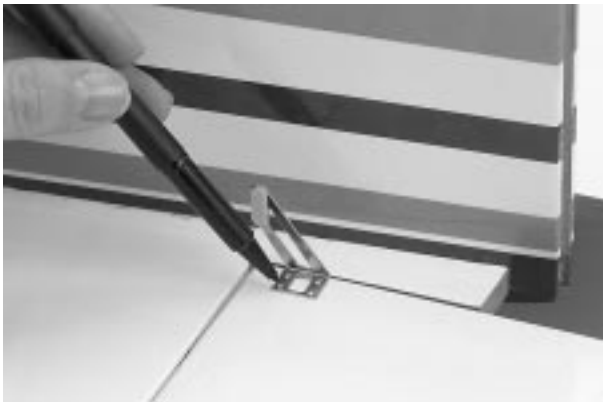


Step 2. It will be helpful to turn the aircraft upside down. For illustration purposes we will describe installing the control horn on the right elevator first (as relates to pilot sitting in cockpit). Measure 1/2″ back from the hinge line of the elevator and make a mark with a felt tipped pen.

Step 3. Locate the standard horn. Trial fit the horn on the elevator with the flat part pointing toward the tip of the elevator and the part that connects to the clevis being closest to the fuselage.



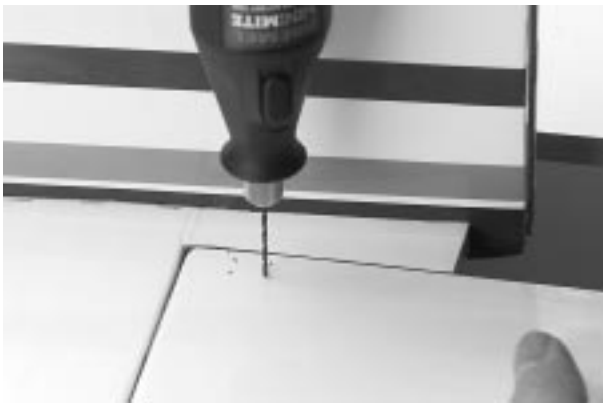
Step 4. Line up the front edge of the horns with the mark you made in Step 2 and make sure the horn is centered on the wood frame of the elevator. Mark the screw holes with a felt tipped pen.



Section 9: Installing the Control Horns

CONTINUED

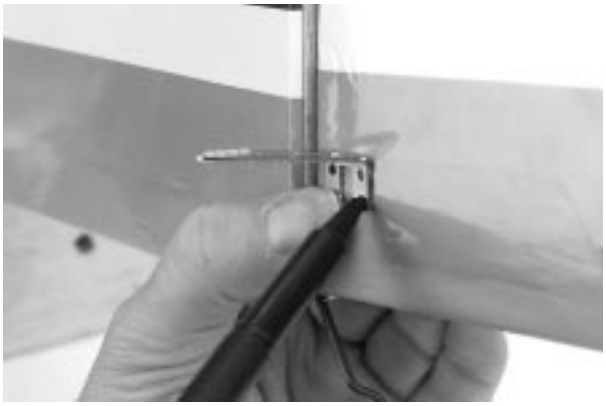
Step 5. Using a 1/16″ drill bit, drill four pilot holes for the horn. After the pilot holes are drilled, you can use the 3/32″ drill bit to complete the process.



Step 6. Trial fit the standard horn, using the four screws. Carefully screw in the screws and engage the plastic plate on the other side. We recommend covering the area around the horn with masking tape to help prevent damage to the covering in case the screwdriver slips. Once installed, repeat the process for the left elevator.

Step 7. Locate a standard and reverse control horn, four screws and one plastic plate. The reverse "R" control is installed on the right side of the rudder as if you were sitting in the cockpit. The standard control horn will be mounted on the left. The rudder pull-pull control horns will be located 7/16″ back from the hinge line of the rudder and approximately 3/8″ up from the bottom of the rudder. Mark the location with a felt tipped pen. Trial fit one horn and make sure the location does not interfere with the tail wheel wire that was inserted into the rudder.

Step 8. Once you are satisfied with the location, mark the screw holes with a felt tipped pen.

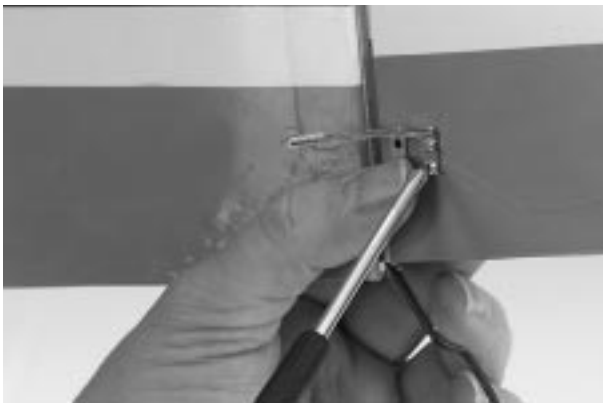


Step 9. Drill holes using the same procedure as described in Step 5. Again, use caution when drilling so the wood is not split.

Section 9: Installing the Control Horns

CONTINUED

Step 10. Mount the two horns on the rudder, one on either side, with the standard horn on the left side and the reverse horn on the right side. The plastic plate will be used as the retainer. Use caution when screwing in the screws so that the covering is not damaged if the screwdriver slips.



Section 10: Installing the Main Landing Gear

Parts Needed	Tools and Adhesives Needed
• Fuselage • Main aluminum landing gear • Mounting hardware	• Drill • 3/16″ drill bit • Hobby knife with #11 blade • Medium Phillips screwdriver • Felt tipped pen • Blue Locktite 242

Step 1. Locate the mounting holes for the landing gear on the forward part of the bottom of the fuselage. They are located immediately forward of the wing area. Using a hobby knife, cut the film covering the holes.

Step 2. Trial fit the aluminum main landing gear over the holes in the fuselage. If the holes do not line up exactly, use a 3/16″ drill bit to drill out the proper hole location. Use the main gear as the template.

Step 3. Using the hardware provided, mount the main landing gear to the fuselage. Apply Blue Locktite 242 to secure the nuts.

Section 11: Assembling and Mounting the Wheel Pants

Parts Needed	Tools and Adhesives Needed
• Wheel pants • 2-3/4′′ wheels (2) • Main landing gear • Hardware	• Medium Phillips screwdriver • Drill bits: 5/32′′, 1/8′′ • Drill • 12-minute epoxy • Felt tipped pen or pencil

Step 1. Locate the two wheel pants and associated hardware. Trial fit one wheel into the opening of a wheel pant. Using a felt tipped pen or pencil, mark the center location of the wheel in the pant. This mark will be used as a reference for marking the mounting holes for the landing gear on the wheel pant.

Step 2. Locate the hole for the wheel axle 5/16′′ up from the centerline marked on one wheel pant. Mark it with a felt tipped pen or pencil. Repeat the procedure for the other wheel pant, noting which is the correct side.

Step 3. Place the wheel pant on the landing gear and note the location of the main axle hole. Note that there is a smaller hole directly above the axle. Do not mark this yet as this will be done after the wheel is mounted. The purpose of this hole is to mount a smaller screw to hold the wheel pant in position.

Step 4. Drill the axle hole using a 5/32′′ drill bit. Trial fit the wheel pant to the landing gear. It's helpful to drill a 1/8′′ pilot hole first.

Step 5. Locate the two plywood square braces. These will be mounted inside the wheel pant as a brace for the mounting hardware. Using the landing gear as a template, mark the plywood braces, one for the axle hole and one for the brace hole. Use a 5/32′′ and 1/8′′ drill bit to drill out the holes. Use caution to make sure you do not split the wood.

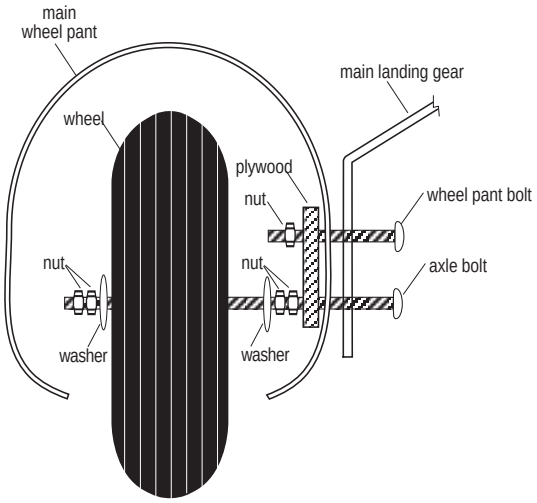
Section 11: Assembling and Mounting the Wheel Pants

CONTINUED

Step 6. Mix up approximately 2 ounces of 12-minute epoxy. Epoxy both plywood pieces to the wheel pant. Allow the epoxy to cure completely.

Step 7. Locate the wheel and axle hardware. Each axle will have the axle bolt, two washers, and 4 nuts. The brace screw and nut are also part of the mounting hardware.

Step 8. The axle bolt is inserted into the wheel pant, then two bolts are threaded on. Slowly insert the bolt until you can thread it through a washer and then the wheel. When the axle bolt passes through the wheel, insert a washer and then two bolts. The two bolts on either side of the axle provide a means of centering the wheel, as well as retaining it on the axle inside the wheel pant. If you need to adjust the center of the wheel more, you can use more washers (not provided).



Step 9. Repeat the wheel mounting process for the other wheel and wheel pant.

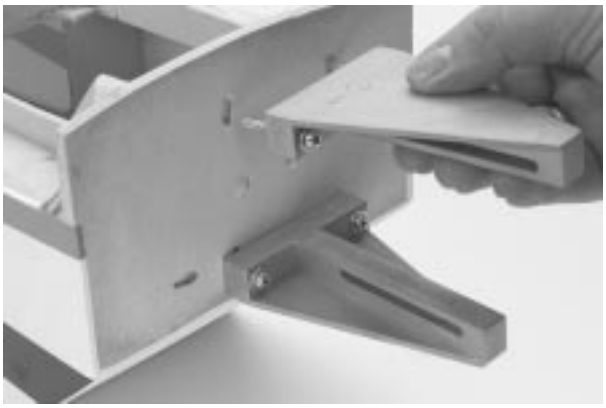
Step 10. After the wheels are mounted, you can now mark the smaller wheel pant bolt hole on both wheel pants. Make sure the wheel pants are parallel to the center line of the aircraft. Mount using the small wheel pant bolts and nuts provided.

Section 12: Installing the Engine

Parts Needed	Tools and Adhesives Needed
• Fuselage • Metal motor mounts • Mounting hardware • Engine	• Phillips screwdriver • Allen wrench • 30-minute epoxy • Epoxy brush

Step 1. Mix up approximately 2 oz. of 30-minute epoxy and brush it on the firewall to seal it. Allow the epoxy to dry.

Step 2. Locate the two metal motor mounts and associated mounting hardware. Note there are slots on the firewall, so the width of the engine can vary.



Step 3. Mount the metal motor mounts on the firewall using the hardware provided. Do not overtighten the bolts as the width of the mount will vary with the size and type of engine mounted.

Note: It may be necessary to cut off the bottom motor mount bolts flush with the nuts to insure that they do not puncture the tank.

Step 3. Trial fit your engine on the motor mount. Once the proper width has been determined, tighten down the motor mount bolts. You can then remove your engine while completing the following sections. Prior to installing the control linkages, you will want to remount your engine.

Section 13: Assembling and Installing the Fuel Tank

Parts Needed	Tools and Adhesives Needed
• Brass clunk (fuel pickup) • Brass tube, long (vent) • Brass tube, long (pickup) • Fuel tubing, small • Fuel tank • Plastic cap (2) • Rubber stopper • 3mm screw	• Hobby knife with #11 blade • Small Phillips screwdriver

Step 1. Locate the fuel tank parts.

Step 2. Locate the black rubber stopper. Insert one brass tube into one of the open holes in the stopper so an equal amount of tube extends from each side. This tube will be the fuel tank pickup tube that provides fuel to the engine.

Step 3. Locate the other brass tube and bend it using your fingers as shown. This tube will be the fuel tank vent tube.

Step 4. Slide the vent tube into the other open hole of the stopper as shown.

Section 13: Assembling and Installing the Fuel Tank

CONTINUED

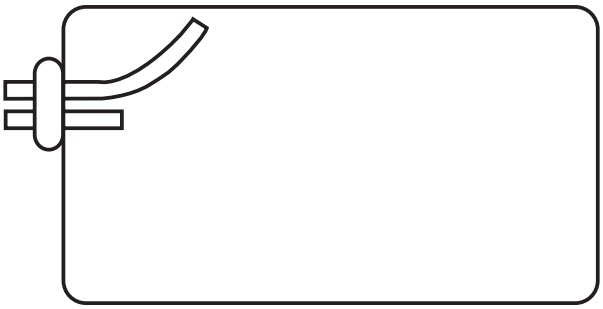
Step 5. Slide the two plastic caps over the brass tubes as shown. Note the orientation of the caps. The small inside cap and the "peg" faces away from the black rubber stopper. The large outside cap and the "raised center" faces away from the black rubber stopper.

Step 6. Locate the small diameter fuel tubing. This tubing will be used for the fuel pickup inside the fuel tank. Insert the clunk into one end of the fuel tubing.

Step 7. Install the open tube end of the tubing onto the pickup brass tubing.

Step 8. Insert the 3mm screw into the center hole of the stopper and tighten it until it just threads onto the black cap on the other side of the rubber stopper.

Step 9. Carefully insert the assembly into the fuel tank. Note the position of the vent tube. It must be at the top of the fuel tank to function properly. Be sure the vent is positioned at the top. The length of tubing can be shortened by cutting it with a sharp hobby knife.



Step 10. Tighten the 3mm screw. This will allow the rubber stopper to form a seal.

Important: Remember which tube is the fuel pickup and which is the vent so you can properly connect the fuel tank to the engine.

Step 11. Install fuel tubing onto the tubes and feed it through the holes in the firewall as you press the fuel tank into position. Foam in the tank compartment can be used to provide some vibration damping and help support the fuel tank (foam not included). Some trimming of the fuel tank location may be necessary to fit the tank into the fuselage. Bend the brass tube outside the tank to line up with the holes in the firewall.

Section 14: Installing the Radio

Parts Needed	Tools and Adhesives Needed
• 4 channel radio system with 5 servos and hardware (not included) • Radio packing foam (not included) • Antenna tube (optional, not included)	• Drill • 1/16″ drill bit • Small Phillips screwdriver • Hobby knife with #11 blade • Pencil or felt tipped pen • 6-minute epoxy • Rubbing alcohol • Paper towels

Step 1. Locate the plywood servo rails and the two "U" shaped plywood braces. Trial fit the servos on the rails. When you have determined the proper spacing, mark the location of the rails. Mix up 1 ounce of 6-minute epoxy. Apply the epoxy to the rails and braces and install them in the fuselage compartment. Allow the epoxy to cure completely.

Step 2. Locate three servos and install the grommets and eyelets in all three per the instructions included with the radio. Position the servos so there is ample room between the servo horns. The rudder servo will utilize a pull-pull type of control linkage, so leave ample room on either side of the servo horn.

Note: The rudder servo will be the center servo of the three mounted.

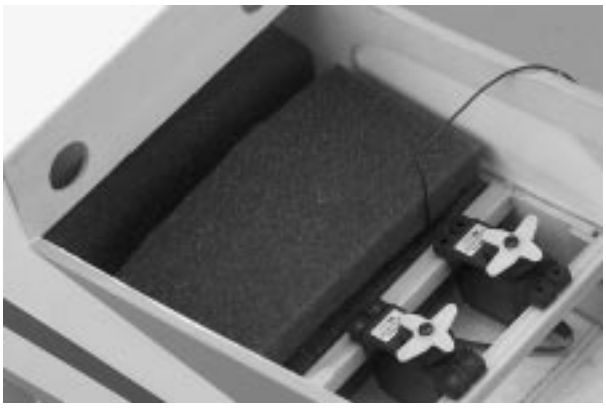
Step 3. Once you're satisfied with the servos' location, use a felt tipped pen or a pencil to mark the mounting holes of all three servos.

Step 4. Drill the 12 holes with a 1/16″ drill bit. Screw the servos in place using the 12 screws provided with the servos.

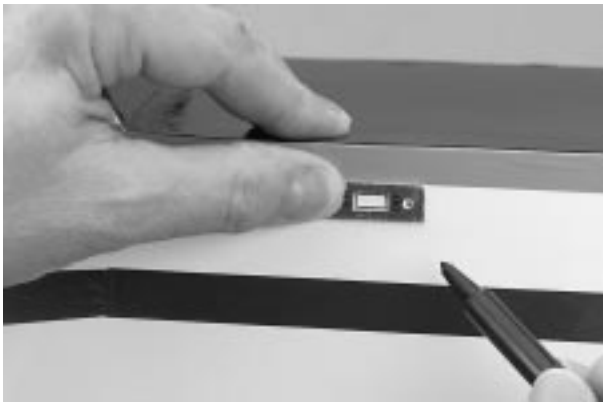
Section 14: Installing the Radio

CONTINUED

Step 5. Use radio packing foam (available at your local hobby shop) when you install the receiver and battery pack. There is ample room for the receiver and battery in the forward part of the fuselage, in the area below the fuel tank. Wrap the battery and receiver securely with foam and install them in the fuselage.



Step 6. Route the antenna back through the fuselage using an antenna tube (not included), or route it outside the fuselage back to the vertical fin. Install the switch on the left side of the fuselage (typical installation).

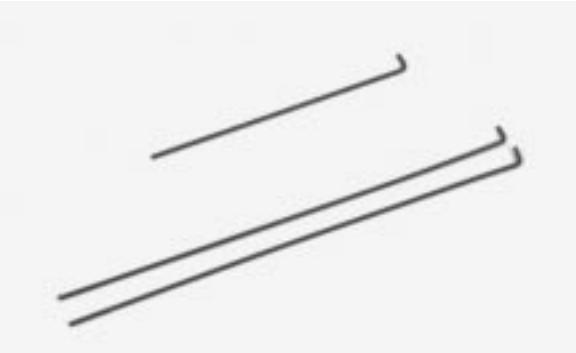


Step 7. Hook up the servos and switch harness to the receiver and battery pack as outlined in your radio's instruction. Turn on your transmitter and receiver to center the trims on your transmitter. Turn off the receiver, then the transmitter, in that order. Your servos should now be in their "electrical center" position.

Section 15: Installing the Control Linkages

Parts Needed	Tools and Adhesives Needed
• Fuselage • 12″ x 4-40 rod – threaded one end (2) • 6″ x 4-40 rod – threaded one end • 20” x 2mm rod – threaded one end w/nylon clevis • .020 music wire 36″ • 2-56 clevis w/clips (4) • 2-56 threaded couplers (4) • 2-56 lock (hex) nuts • Wood pushrod • 4-40 clevis w/clips (3) • Shrink tubing	• Soldering iron • Silver solder (Stay Brite) • Needle nose pliers • 12-minute epoxy • String or nylon thread • Rubbing alcohol • Paper towels • Drill • 1/8″ drill bit

Step 1. The elevator linkage will be the first described, however the construction sequence is up to the builder. Each linkage (i.e., elevator, rudder and throttle) is approached differently. The components for the elevator control linkage are made up of a wooden rod, three threaded music wires, clevis and locking nuts. Since the CAP 232 uses a split elevator, you will construct a pushrod that has two threaded wires on one end for the two elevators, and one shorter threaded rod to connect to the servo horn.



Step 2. Drill a 1/8″ hole 2″ from each end of the wood rod. Bend a 90 degree bend at the opposite end of each threaded rod. The bent section should only be 1/8″ to 3/16″ long. Cut off any excess material so the rods fit. Round out the holes so the rods fit flush against the wood pushrod. A groove should be cut to help secure the rods in place when applying the epoxy. Use string or nylon thread to wrap the wire.

Step 3. Trial fit the two long threaded rods into the hole on either side of the wood control rod. Cut a groove for both to help secure the rods. Once you're satisfied with the fit, mix 1/4 ounce of 12-minute epoxy and apply it to the hole and area the rods will fit into. Install the rods into the hole and wrap securely with nylon thread or string. Coat the joint with epoxy and allow it to cure. Slide a piece of heat shrink tubing over the end of the wooden pushrod and, using a heat gun, shrink into place.

Step 4. Once the epoxy has cured, install the short rod on the other end using the same proceed as described. Allow the epoxy to cure completely before attempting to attach the clevis.

Section 15: Installing the Control Linkages

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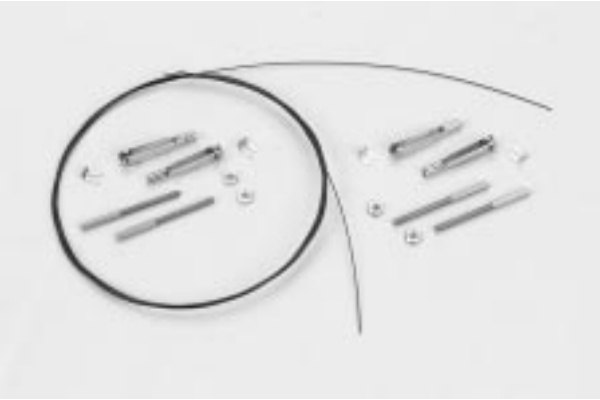
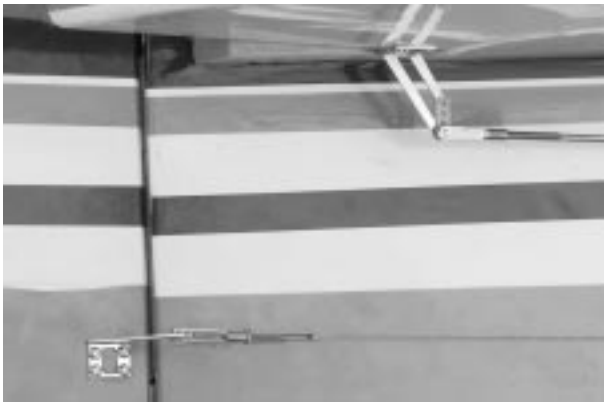
Step 5. The pull-pull type of linkage will be made up of music wire, two threaded couplers, two clevis and locking nuts. You will need to make two sets of linkages.



Step 6. Scrape or clean the ends of the wire. Using a soldering iron, silver solder one of the threaded couplers to one end of the music wire.

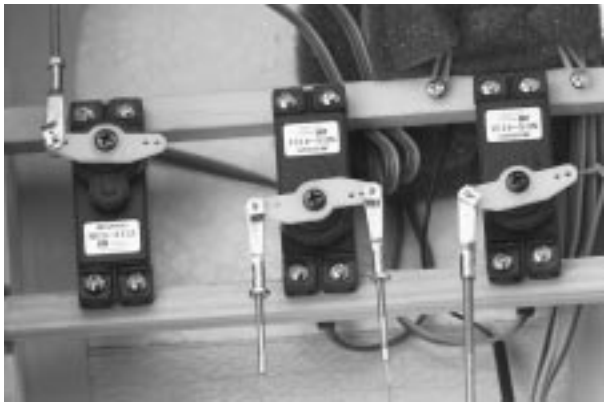
Note: It's important to bend over approximately 3/8″ of the music wire onto itself at the ends using a pair of pliers. This will give a more secure mechanical solder joint as the silver solder has more to "grab onto" than a straight end.

After the solder has cooled, check the security of the solder connection by pulling on the connection. Attach a locking nut and a clevis on the threaded coupler, and thread the other end through the fuselage. Trial fit the linkage to the servo arm of the rudder servo, compensating for the fact there will be a threaded coupler and clevis attached. Once you're satisfied with the length, silver solder the coupler to the music wire. After the solder has cooled, again check the security of the joint. Make up a second linkage using the previous procedures. Once both linkages have been constructed, trial fit in place by connecting to the control horns of the rudder and servo. Final length adjustments can be made at either or both ends of the linkage by screwing the clevises in or out as needed.



Step 7. Locate the threaded rod for the throttle (2mm). Trial fit the rod and note where it will pass through the fuselage formers. There is a slotted opening on the firewall in the approximate location of the carburetor arm, however you may have to make adjustments as to where the holes need to be located. Once you are satisfied as to the linkage path, drill the holes in the fuselage former and, if necessary, in the firewall. A 1/8″ hole should provide ample room for the linkage. Begin installing the throttle control rod by attaching the clevis to the threaded end of the rod. Thread the throttle control rod through the firewall and attach the clevis to the engine throttle control arm.

Step 8. Note where the throttle control rod is in relation to the throttle servo arm inside the fuselage. You will need to make a Z-bend at the end of the rod and attach it to the throttle servo arm. Make sure the engine carburetor barrel is in the $^1/_2$ open position. This will allow for minor adjustments to the carburetor opening by screwing the clevis in or out. Adjust so the throttle is at half throttle when the servo is electronically centered.



Section 16: Attaching the Cowling

Parts Needed	Tools and Adhesives Needed
• Fiberglass cowling • 4-40 button head screws (4) • 4-40 blind nuts (4) • Rubber grommets (4)	• Drill • 1/16″ drill bit • Masking tape • Moto-Tool with sanding drum • Carbide cutter • Sanding stick (medium/fine) • Ruler • Felt tipped pen • Thick CA • 1/16″ hex wrench

Step 1. Using a Moto-Tool, grind out the prop and cooling openings in the front of cowl. Cut out the large "U" shape in the bottom of the cowl so it will slide over the fuselage and landing gear.

Step 2. Trial fit the cowl to your engine. Note those areas that will have to be trimmed out, such as needle valve openings, external fill openings, etc.

Step 3. Mark the locations with a felt tipped pen. For illustration purposes we are showing the openings for the Saito 1.50 mounted in the CAP 232.

Step 4. Carefully cut out using a Moto-Tool.

Note: If you're using another type of engine, it will be necessary to carefully cut portions of the cowl that are located differently from where we show with the installation of the Saito 1.50.

Step 5. Slide the cowling onto the fuselage.

Note: It may be necessary to trial fit the cowl with and without the engine muffler attached.

Step 6. Tape the cowl securely in position and check that it fits correctly. There should be ample clearance (1/8″ around the engine and muffler). Also check that the prop hub is centered in the opening of the cowl and that the prop hub extends at least 3/16″ forward of the cowl. Locate the cowl hold-down screws so there are two on either side of the cowl. Do not locate in a trim area because the trim can be damaged as the screw is tightened down. The blind nut location should be in the fuselage area, near the bulkhead. Mark the four mounting holes with a felt tipped pen.

Note: Be sure its cowl is pulled down tightly and held securely prior to drilling a hole. a 1/16″ drill bit is used to drill the holes.

Section 16: Attaching the Cowling

CONTINUED

Step 7. Once the mounting holes have been marked, and you're satisfied with the location, drill two holes on each side of the cowl using a 1/16″ drill bit. Use masking tape to temporarily hold the cowl in position. It is important the cowl be held down tightly so there is a tight fit when the cowl is attached.

Step 8. Remove the cowling and enlarge the four holes in the cowling just enough to fit the rubber grommets in place.

Note: On some engines where the carburetor is not easily accessible, a removable fueling valve can be used. Dubro's DUB334 is an excellent choice and should be available at your local hobby shop.

Step 9. With the cowling not on the fuselage, insert the 4-40 button head bolts through the holes you drilled. From inside the fuselage, place a 4-40 blind nut on the bolt and pull on the button head bolt to "set" the blind nut into the fuselage.

Note: You may wish to put a small drop of thick CA on the flange of the blind nuts to help prevent them from coming off the fuselage when installing the button head bolt when attaching the cowling.

Step 10. Align the cowling on the fuselage and secure it with the button head bolts. Do not over-tighten the bolts by smashing into the rubber grommets as this will take away the vibration isolation of the grommets.

Note: Four pieces of self-adhesive trim tape are included for trimming the cowl.

Section 17: Attaching the Canopy

Parts Needed	Tools and Adhesives Needed
• Fuselage • Canopy	• Scissors • Canopy glue • Masking tape

Step 1. Locate the canopy and note the raised lines. You will need to trial fit the canopy before beginning to trim it.

Step 2. Carefully check the canopy fit to the fuselage periodically while trimming to make sure not too much material is removed.

Step 3. Trial fit the canopy to the fuselage

Step 4. After confirming the fit of the canopy, attach it to the fuselage using canopy glue, such as Pacer Formula 560. Use masking tape to hold the canopy in place. Allow the glue to dry at least 24 hours.

Note: After the canopy is set, apply the included trim tape around the canopy edges for a finished look.

Section 18: Balancing the CAP 232

An important part of preparing the aircraft for flight is properly balancing the model. Don't inadvertently neglect this step. The recommended C.G. (Center of Gravity) location for the first flights with the CAP 232 is 5-5/8″ from the leading edge of the wing, measured at the fuselage.

If necessary, add weight to either the tail or nose until the correct balance is achieved. Stick-on weights are available at your local hobby shop and work well for this purpose.

Section 19: Control Throw Recommendations

The following control throws offer a good place to start with for you first flights. If only one rate is available on your radio, set up the control throws for low rate for the first flights, then increase the throws to your liking.

The 3D rates allow the CAP to perform the new generation of aerobatic maneuvers, such as waterfalls, elevators and harriers. However, they also make the model very sensitive. It's recommended that the 3D rates be tried only after becoming familiar with your CAP. When using 3D rates, use 65% expo on elevators to keep the model controllable. Also, be sure that adequate mechanical advantage is maintained when adjusting the elevator linkages for 3D rates, or flutter can occur.

Aileron	Low Rate		High Rate		3-D Rate	
	Up	Down	Up	Down	Up	Down
measured furthest inboard:	$^1/_2$″	$^7/_{16}$″	$^3/_4$″	$^5/_8$″	$^3/_4$″	$^5/_8$″

Elevator	Up	Down	Up	Down	Up	Down
measured furthest inboard:	$1^1/_8$″	$1^1/_8$″	$1^3/_4$″	$1^3/_4$″	4″	4″

Rudder			
measured at the bottom of the rudder:	Right/Left	Right/Left	Right/Left
	3″	$4^1/_2$″	$4^1/_2$″

Pre-Flight at the Field

Range Test Your Radio

Step 1. Before each flying session be sure to range check your radio. This is accomplished by turning on your transmitter with the antenna collapsed. Turn on the radio in your airplane. With your airplane on the ground, you should be able to walk 30 paces away from your airplane and still have complete control of all functions. If not, don't attempt to fly! Have your radio equipment checked out by the manufacturer.

Step 2. Double check that all controls (aileron, elevator, throttle, rudder) move in the correct direction.

Step 3. Be sure that your batteries are fully charged per the instructions included with your radio.

Adjusting the Engine

Step 1. Completely read the instructions included with your engine and follow the recommended break-in procedure. At the field, adjust the engine to a slightly rich setting at full throttle and adjust the idle and low speed needle so that a consistent idle is achieved. Before you fly be sure that your engine reliably idles, transitions and runs at all throttle settings. Only when this is achieved should any plane be considered ready for flight.

AMA Safety Code

1994 Official AMA National Model Aircraft Safety Code
Effective January 1, 1994
Model flying must be in accordance with this Code in order for AMA liability protection to apply

General

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

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

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

4. At all flying sites a straight or curved line(s) must be established in front of which all flying takes place with the other side for spectators. Only those persons essential to the flight operations are to be permitted on the flying side of the line; all others must be on the spectator side. Flying over the spectator side of the line is prohibited, unless beyond the control of the pilot(s). In any case, the maximum permissible takeoff weight of the models is 55 pounds.

5. At air shows or model flying demonstrations a single straight line must be established, one side of which is for flying, with the other side for spectators. Only those persons accredited by the contest director or other appropriate official as necessary for flight operations or as having duties or functions relating to the conduct of the show or demonstration are to be permitted on the flying side of the line. The only exceptions which my be permitted to the single straight line requirements, under special circumstances involving consideration of side conditions and model size, weight, speed, and power, must be jointly approved by the AMA President and the Executive Director.

6. Under all circumstances, if my model weighs over 20 pounds, I will fly it in accordance with paragraph 5 of this section of the AMA Safety Code.

7. I will not fly my model unless it is identified with my name and address or AMA number, on or in the model. Note: This does not apply to models flown indoors.

8. I will not operate models with metal-bladed propellers or with gaseous boosts, in which gases other than air enter their internal combustion engine(s); nor will I operate models with extremely hazardous fuels such as those containing tetranitromethane or hydrazine.

9. I will not operate models with pyrotechnics (any device that explodes, burns, or propels a projectile of any kind) including, but not limited to, rockets, explosive bombs dropped from models, smoke bombs, all explosive gases (such as hydrogen-filled balloons), ground mounted devices launching a projectile. The only exceptions permitted are rockets flown in accordance with the National Model Rocketry Safety Code or those permanently attached (as per JATO use); also those items authorized for Air Show Team use as defined by AST Advisory Committee (document available from AMA HQ). In any case, models using rocket motors as primary means of propulsion are limited to a maximum weight of 3.3 pounds and a G series motor. Note: A model aircraft is defined as an aircraft with or without engine, not able to carry a human being.

10. I will not operate any turbo jet engine (axial or centrifugal flow) unless I have obtained a special waiver for such specific operations from the AMA President and Executive Director and I will abide by any restriction(s) imposed for such operation by them. (Note: This does not apply to ducted fan models using piston engines or electric motors.)

11. I will not consume alcoholic beverages prior to, nor during, participation in any model operations.

Radio Control

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

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

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

4. I will operate my model using only radio control frequencies currently allowed by the Federal Communications Commission. (Only properly licensed Amateurs are authorized to operate equipment on Amateur Band frequencies.) Further, any transmitters that I use at a sanctioned event must have a certified R/CMA-AMA gold sticker affixed indicating that it was manufactured or modified for operation at 20 kHz frequency separation (except 27 MHz and 53 MHz).

5. I will not knowingly operate an R/C system within 3 miles of a pre-existing model club flying site without a frequency sharing agreement with that club.