

# CAP – 232/120

## ARF

### ASSEMBLY MANUAL



This Manual is the sole property of Kangke Industrial USA, Inc. Reproducing any part without the consent of Kangke Industrial USA, Inc. is a lawful violation.

**Kangke Industrial USA, Inc. 65 East Jefryn Blvd. Deer Park NY 11729**

**<http://www.kangkeusa.com>    E-mail: [info@kangkeusa.com](mailto:info@kangkeusa.com)**

**1-877-203-2377    fax 1-631-274-3296**

# Congratulations!

Kangke Industrial USA, Inc. brings you one of the finest ARF Cap 232 models available. Skilled craftsmen combined with top grade materials and precision jigs have all come together to produce an aircraft with outstanding flight qualities. If you follow the directions carefully the performance of this aircraft will surely please you.

**WARNING!** As model aircraft get larger and more powerful, the risk for injury increases. Kangke's extensive testing procedures insure a high quality kit that has gone through many steps to provide you with a safe reliable airframe. Nothing we can do however will make up for poor assembly or irresponsible behavior at the field. A model of this size traveling at 80 MPH contains enough energy that if it were to contact another person, the injuries would be extensive possibly fatal. The safe operation of this model is your responsibility and yours alone. If you are a beginner or have never flown a model of this size and power, you should not make the attempt without the help of an experienced pilot.

## Specifications:

Length	68 in.
Wing Span	74 in.
Wing Area	882sq. in.
Surface Area	1201sq. in.
Weight	11-13.5 lbs.
Engine	120-140 2
Cycle	140-180 4Cy 1.6-2.4 Gas

## Kit Contents:

Fuselage	1
Wing panel	2
Ailerons	2
Cowling	1
Canopy	1
Main Gear	1

## PACK 1

Stabilizer	1
Elevator	2
Fin	1
Rudder	1

## PACK 2

Dihedral brace	1
----------------	---

## PACK 3

Fuel tank	1
Wheels	2
Tail gear	1
Tail wheel	1
Control horn	6
Control wire	6
Control rod	2
Motor mount	1
Hardware pack	1

## PACK 4

Manual	1
Decal kit	1
Cockpit trim	1
Wheel pants	

The following additional items will also be needed to build the CAP-232

## HOBBY ITEMS:

4 oz. 30 min. epoxy  
Popsicle sticks  
Hobby knife  
Thin CA .5 oz.  
Med. CA 1 oz.  
Paper towels  
Alcohol  
Masking tape  
Ruler  
Felt tip pen  
Radio 4-channel min.  
Screwdrivers  
5-6 servos

## HOUSEHOLD ITEMS:

Pliers  
RTV silicone  
Sewing thread  
Fuel line 20-inches  
5/32 drill  
Motor  
1/8 drill  
Muffler  
Clothes pins  
Spinner

***Read each step of the instructions carefully. Be sure you understand what is required and what the procedure is before you glue or cut anything. How well you assemble this model will have a direct effect on its flight characteristics.***

## WING ASSEMBLY

Remove the tape holding the servo wire pull string from the center of the wing, work the string through the holes in the upper wing surface and secure to the top surface.



Trial fit the dihedral brace in its box in both wing panels. The “V” shape of the brace points down to produce positive dihedral. The brace should have a snug fit, sand lightly if necessary.



*The following steps must be done quickly before the epoxy has time to set up. Read the procedure and gather the materials before starting.*

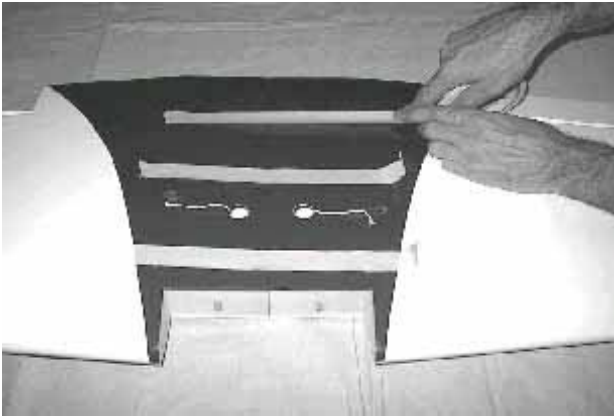
Mix a small amount of 30-minute epoxy. Spread the epoxy in the dihedral box top, bottom, and sides about 1 inch in. The snug fit of the brace will push it down the box.



Spread epoxy on both sides of one half of the dihedral brace and slide it into the box. Spread the epoxy that oozes out over the entire surface of the wing rib mating surface and on the other half of the dihedral brace, as well as the other wing box adding more as necessary. Slide the two wing halves together. Wipe off any excess epoxy with a paper towel moistened with alcohol.



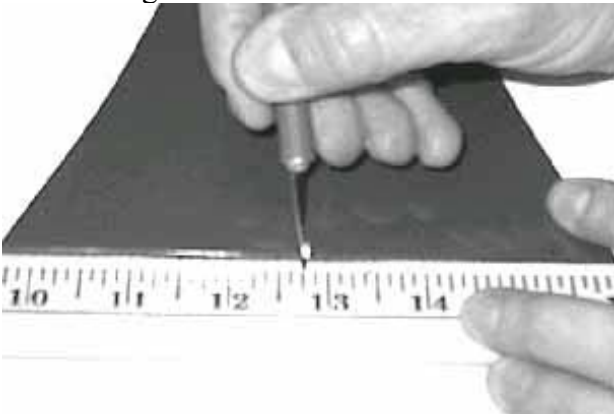
Stretch masking tape across the seam on both sides of the wing so the tape applies pressure to the joint. Stand the wing in a safe place and do not disturb till the epoxy has fully cured. Mix a small amount of epoxy and thin it 25% with alcohol, Paint the bare wood with a thin coat to fuel proof and strengthen the dowel pin area.



## STABLIZER ASSEMBLY

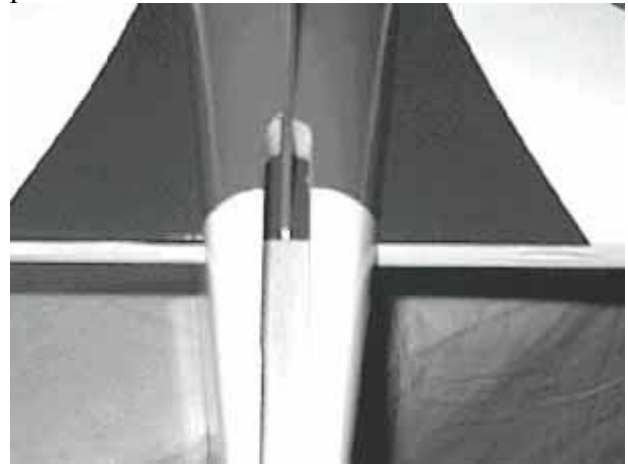
*Care must be taken during the installation of both the stabilizer and the fin. Misalignment of the tail components will make the aircraft difficult to trim in flight.*

Begin by locating the center of the stabilizer. Measure its width at the trailing edge of the tips, remove a small notch of covering in the center using a razor knife.



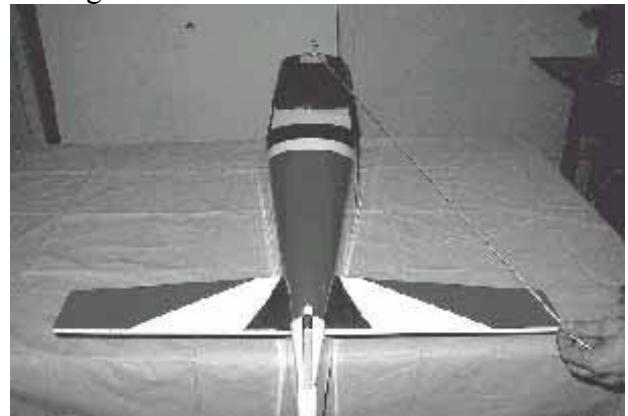
Use the same procedure to locate the center of the firewall. This line will be used to insure the stabilizer is square to fuselage

Slide the stabilizer through the slot in the rear of the fuselage. Use care not to split the wood. Looking in through the rudder slot adjust the stabilizer till the notch on its center is positioned in the center of the rudder slot.

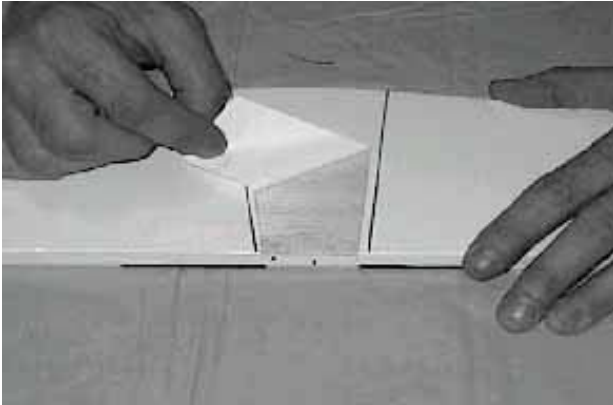


Insert a pin in the top of the firewall directly over the centerline drawn.

Tie a piece of string around the pin and pull it to the rear corner of the stabilizer. Using the string to measure, go back and forth between the corners until both sides are equal and the notch on the stabilizer is still centered in the rudder slot. Using a felt tip pen trace the outline of the fuselage on both the top and bottom of the stabilizer. Remove the stabilizer from the fuselage.



Lay the stabilizer on a flat surface. Using a sharp razor knife and a straight edge slit the covering about 1/4 inch inside the fuselage outline on both the top and bottom surfaces. Try to cut only through the covering, not into the wood surface, as that would weaken the stabilizer. Remove the covering from the center. If necessary, use a covering iron to secure the edge of the remaining covering to the stabilizer.

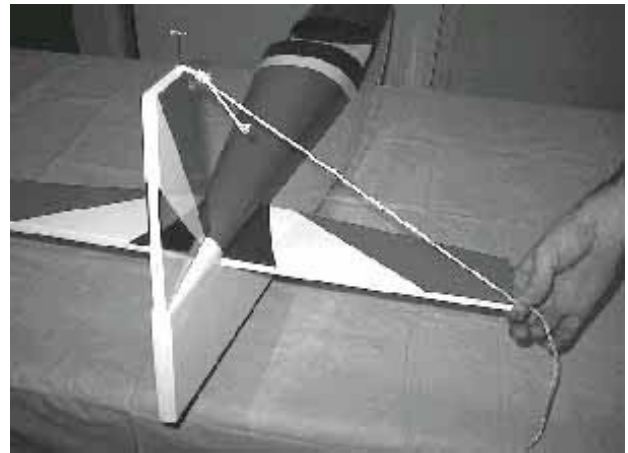


Slide the stabilizer into the fuselage slot exposing about 3/8 inch of bare wood. Apply epoxy to the top and bottom of the wood. Slide the stabilizer through the fuselage to expose the wood on the other side, apply epoxy and center the stabilizer using the outline of the fuselage as a guide. Verify the alignment using the string as before, correct if necessary. Wipe off excess epoxy with a paper towel moistened with alcohol and allow curing.

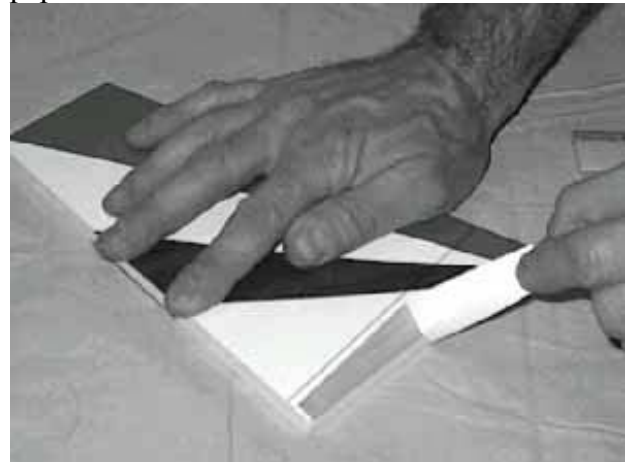


## FIN ASSEMBLY

Trial fit the fin in the fuselage. Use a pin stuck in the center of the top and a string to verify its alignment. Use a felt tip marker and mark the outline of the fuselage on the fin.

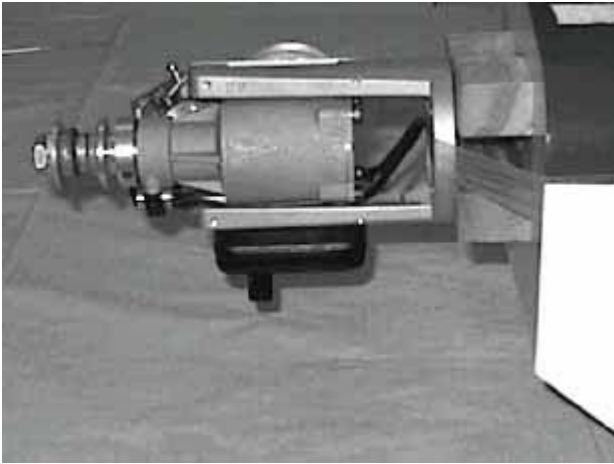


Using the same procedure as was used with the stabilizer, remove the covering where the wood will be glued. Apply epoxy to both sides of the fuselage slot as well as both sides of the fin. Slide the fin in place using the fuselage outline as a guide. Wipe off the excess epoxy with a paper towel moistened with alcohol.

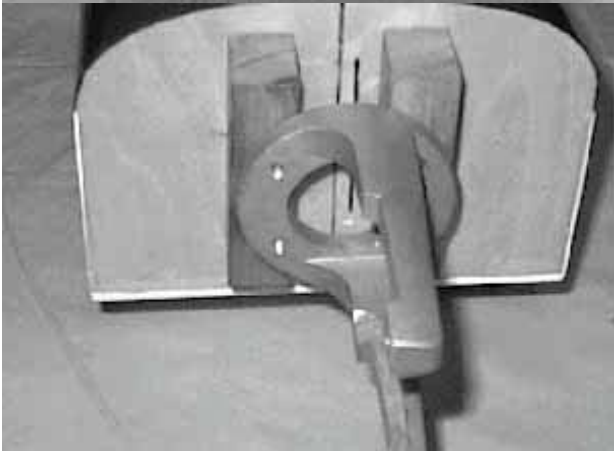
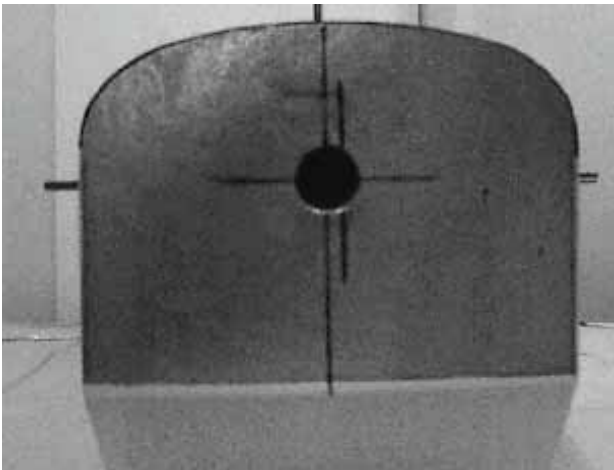


## ENGINE MOUNT

Because of the variety of engines and mounts that can be used in this aircraft, the following instructions are only a guide and must be tailored to your specific installation. The distance from the propeller flange to the firewall must be 7-7 3/4-inches. Use hard wood spacers if necessary.



The center of the fuel tank opening is the correct height for the crankshaft horizontal centerline. However because the firewall has 1.5-degrees of right thrust built in, to get the spinner to properly line up with the cowl, shift the mount  $\frac{1}{4}$ -inch to the left of the vertical center.



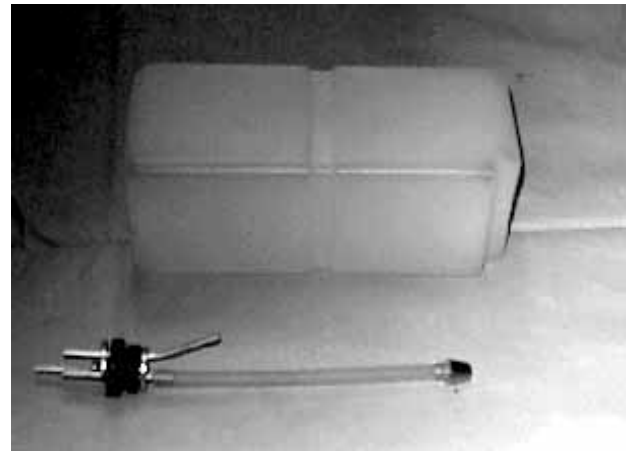
Install the engine mount if the mount is separate from the engine. If the engine and mount are one piece it may be necessary to install the fuel tank first. When installing a gas

engine follow the manufacture instructions for the installation of the electronics.

## FUEL TANK

*If you have decided to use a gas engine it will be necessary to convert the tank from its intended use of glow fuel. To do this replace the stopper and fuel lines with gas compatible parts. These parts can be purchased from you local hobby store.*

Because the motor and carburator are completely enclosed by the cowling it will be necessary to ad a fill/drain line to eliminate the need to remove the cowl to refuel the aircraft. Insert the three tubes through the rubber stopper. Install the inner and outer cap plates and the center screw, do not tighten the screw. Slide the long and one short tube in allowing  $\frac{3}{8}$ -inch to protrude to the outside. The second short tube [fill/drain] should be  $\frac{1}{8}$ -inch beyond the inner plate. Bend the long tube as shown to the tank top. Insert the flop weight in the end of the supplied flop tube. Cut the flop tube just short enough so the flop weight cannot touch the tank end when assembled.



Lube the rubber stopper lightly with cooking oil, align the vent tube with the tank top and carefully insert into the tank. Tighten the screw just enough to expand the stopper and seal the tank.



With the fuel tank assembled apply a generous bead of RTV silicon around the stopper, slide the tank in place and allow the silicon to cure. After it has cured pack around the outside of the tank with foam rubber.

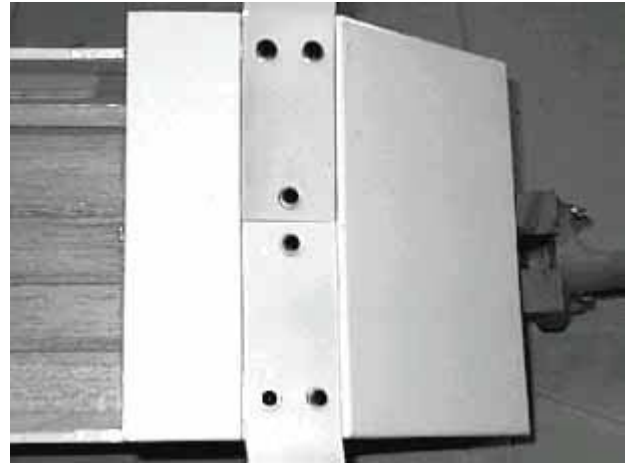
## LANDING GEAR



Drill one hole in each wheel pant for the axles; be sure to make a right and a left. Slide the axle through the wheel, slide on the spacer, thread on the nut until it bottoms on the threads. Place a washer next to the nut, spread the wheel pant and pass the assembly through the hole in the pant. Repeat the process for the other side.

Locate the main gear halves; note that there is a right and left. The gear should be swept forward slightly when assembled correctly. Install the gear with the supplied screws and washers.

Install the pant/wheel assembly on the main gear. Snug the nut but do not tighten.



Level the fuselage by propping up the tail until



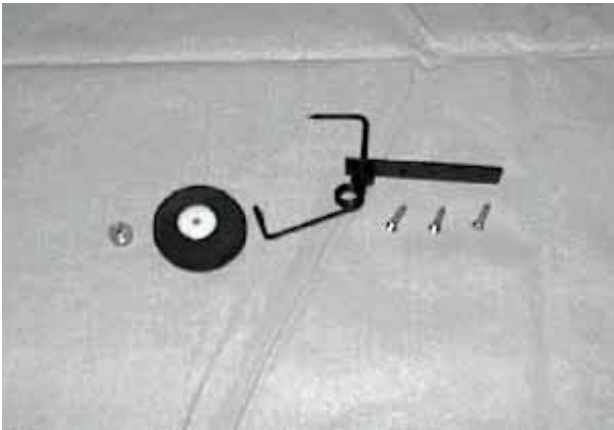
level. Adjust the wheel pants level with the table and drill the small hole using the gear as a guide.



Remove the wheel assemblies and install the anti-rotation screw washers and lock nuts. Reinstall the wheel assemblies and tighten.



To install the tail wheel on the gear, slide the wheel on the gear and secure with the wheel collar.



Line the gear up with the center of the rear of the fuselage and secure with the provided screws.

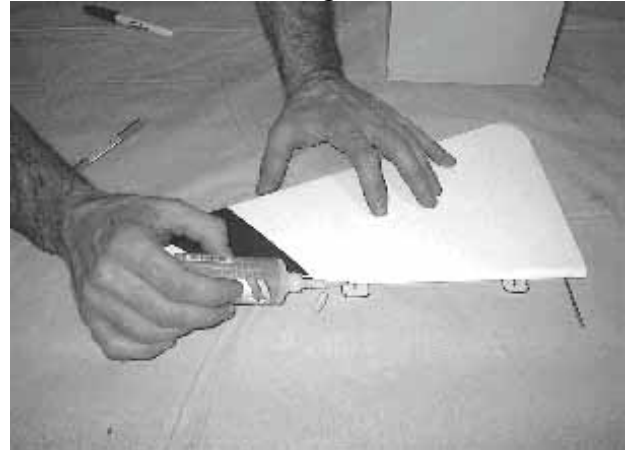


## CONTROL SURFACE HINGES

Begin with the rudder. Place the tail wheel on a box to level the fuselage. Insert the hinges  $\frac{1}{2}$  way into the rudder. Hold the rudder next to the fin and using a felt tip marker locate the slot for the lower hinge as well as the hole for the tail wheel tiller arm.



Place one drop of thin CA on each hinge. Drill a  $\frac{1}{8}$ -inch hole straight into the rudder centerline for the steering tiller.



Install the rudder on the fin and steering tiller, line up the top and apply one drop of thin CA to each side of the hinges. Repeat this process for the elevators and ailerons. Be sure to line up the edges before gluing.



## SERVO INSTALATION

Just as with the engine, the large number of control systems makes it impossible to cover every possibility. The airframe is designed to accept the two most common, center servos with push rods and tail servos with pull-pull rudder control. Center servos work well for general sport flying and are simple to fabricate however, for precision flying and 3-D they lack the stiffness and precise movement required. KANGKE/Super-Kraft therefor recommends the use of tail servos and pull-pull control. As such we will cover this system in greater detail. The materials for the push rods are included in the kit and employ standard fabrication techniques. You will need to purchase the pull-pull system that fits your preference; they are available in a variety of weights and materials. SERVO SELECTION

Because of the weight and speed of your Cap 232-120 as well as the size of the control surfaces, standard servos do not contain enough torque to safely control the aircraft. Use the following information as a guide to your servo selection. The servos listed are those used in the prototype.

*Throttle:* Standard servo such as the Hitec HS-303

*Ailerons:* require at least 60 oz-in of torque each such as the Hitec HS-625MG.

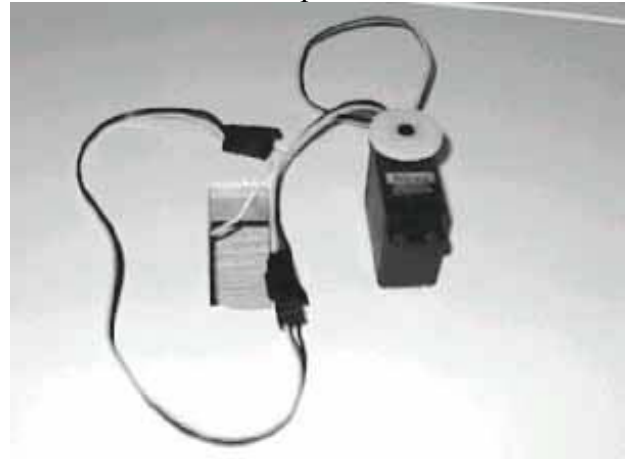
*Elevator:* For the push rod system at least 100 oz-in such as the Hitec HS-645MG. For the twin elevator system, 60 oz-in each such as the Hitec HS-625MG.

*Rudder:* Both systems require at least 100 oz-in such as the Hitec HS-645MG.

Test fit all servos in their openings before wiring. Servos come in different sizes and some fitting may be required.

## AILERON:

Check the length of your servo lead on the wing, if necessary add an extension. Be sure to tape or tie the extension to prevent it from disconnecting in the wing. Tie the extension to the pull string and work it through the wing. Install the servo in the wing following the manufacture instructions. The output arm on the servo should be to the rear to keep the control rod as short as possible.



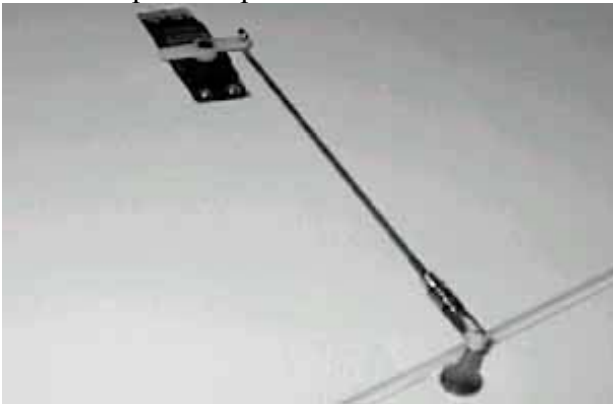
Locate the control horn parts as shown in the photo. The horns come in three different lengths; the ailerons use the shortest.



Place the top ring of the control horn on the front edge of the aileron in a straight line back from the servo as shown. Use a felt tip pen to mark the location for the screw hole. Drill the hole and install the control horn. Screw the clevis link on the top of the horn until threads appear through the top.

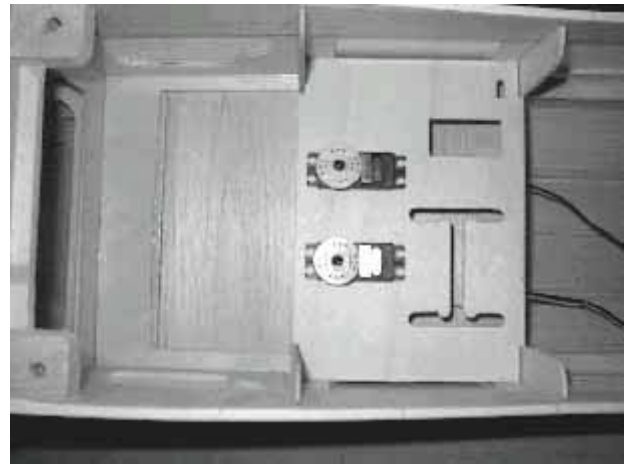


Install the clevis in the clevis link. Mark the control rod at the servo arm hole with a felt tip pen. Make a "Z" bend in the control wire and install. Repeat the process for the other side.

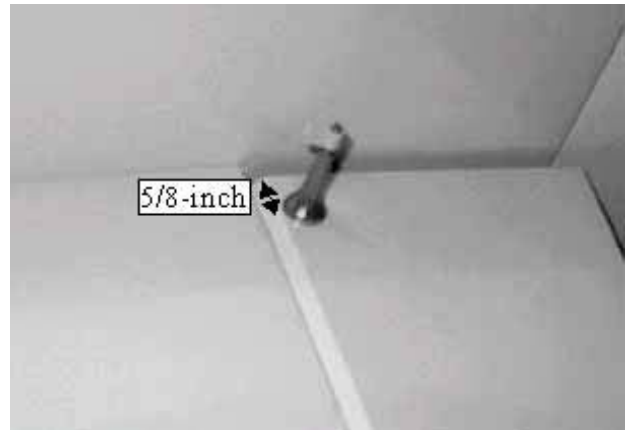


*For dual elevator servos and pull-pull rudder skip this step and proceed to control horn installation.*

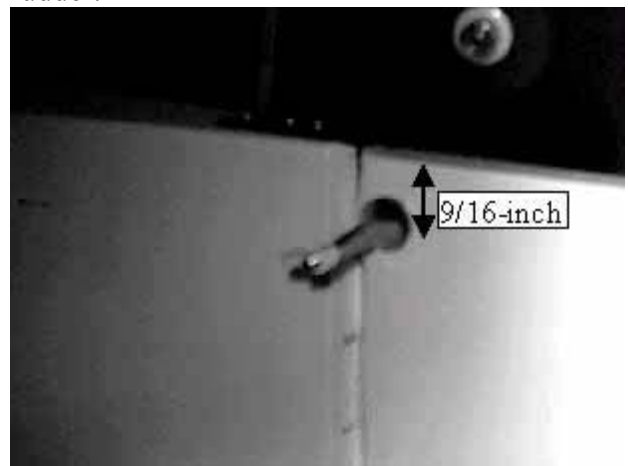
If you are going to use the push rod system install two servos in the rear of the servo tray. Be sure each servo has at least 100 oz-in torque.



The elevator horns are the middle length. Install the elevator control horns as before. The screw hole should be 5/8-inch from the inside edge of the elevator as shown.

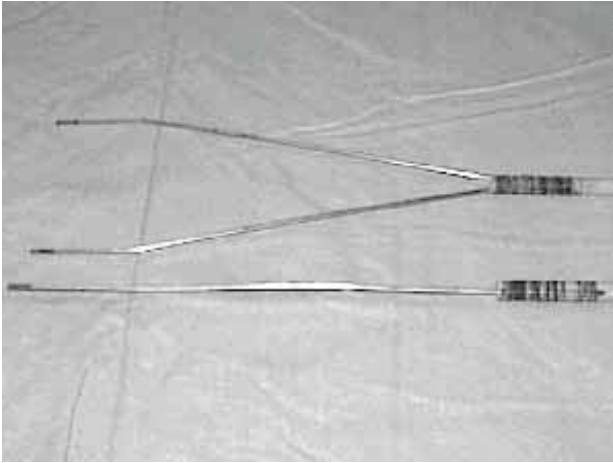


The Rudder horns are the longest. Install the rudder control horn with the screw center 9/16-inch up from the bottom of the rudder.



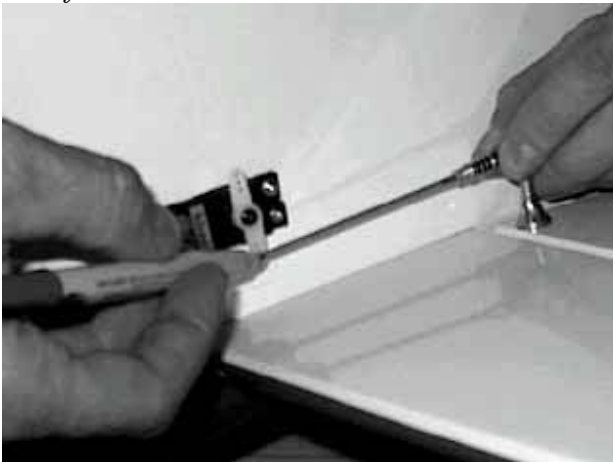
*For dual elevator servos and pull-pull rudder skip this step and proceed to next step.*

Fabricate the two push rods by inserting a short 90-degree bend in the hole in each dowel. Wrap the dowel with thread and soak with thin CA. Note the elevator push rod has two wires on one end. Open holes in the fuselage sides, install the push rods, install the clevises and attach to the bell cranks. Mark the servo end and install with a “Z” bend as was done with the ailerons.



## DUEL ELEVATOR SERVOS

*NOTE: When installing dual elevator servos one will need to be reversed. If your radio does not have this capability a servo reverser is available as a separate unit and will allow the use of a “Y” harness.*



Open the covering over the two servo bays in the rear of the fuselage. Install servo extension leads or “Y” harness and secure them as was done with the wing. Mount the servos following the manufacture instructions. Attach

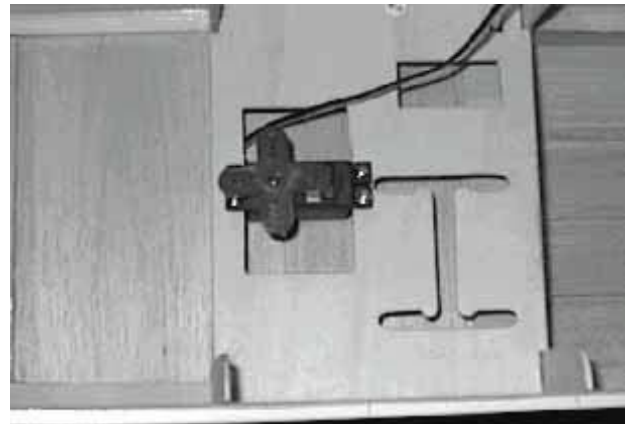
a rod and clevis to the elevator horn. Mark the rod at the servo horn centerline.

Make a “Z” bend in the rod and attach as was done with the aileron.



## RUDDER PULL-PULL

Remove the section of wood between the two rear servo bays in the servo tray. Install the rudder servo in the center following the manufacture instructions.



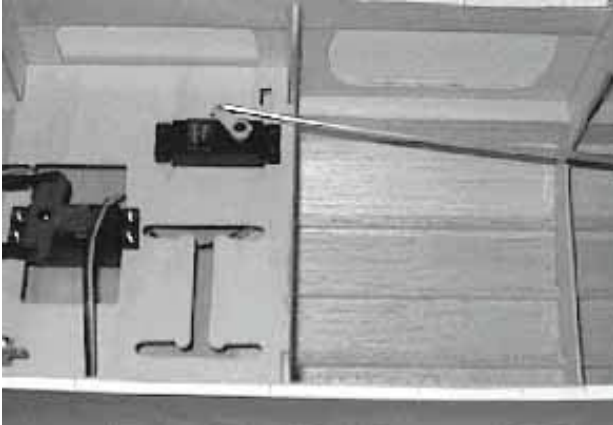
Open the exit slots on both sides of the fuselage. Follow the manufacture instructions for fabricating the cables. The cables should cross each other in the fuselage, with the left side rudder hooked to the right side servo, right rudder to left servo. This will prevent the cables from rubbing on the fuselage internal formers. Tighten the cables only enough to eliminate free play any more will put too much stress on the servo bearings.



## THROTTLE SERVO

*Glow engine only.*

Install the engine. Install the servo in the forward hole on the servo tray.

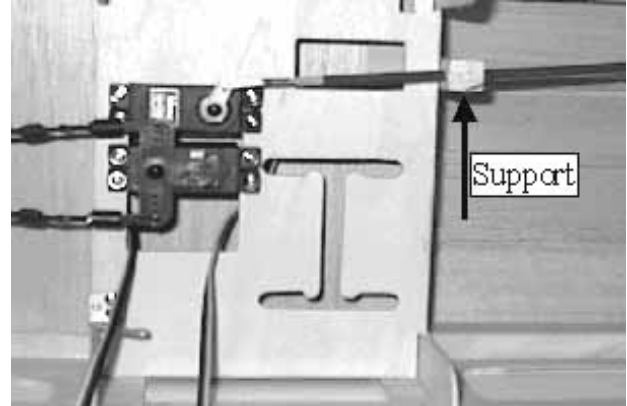


Drill a hole through the firewall and forward fuselage bulkhead in as straight a line as possible to the servo arm. Be very careful not to drill into the fuel tank. Sand one end of the supplied outer throttle casing, coat with epoxy and pull through the firewall allowing 1/4-inch to stick out in the engine compartment. Using "Z" bends as before install the supplied throttle wire.

*Gas engine.*

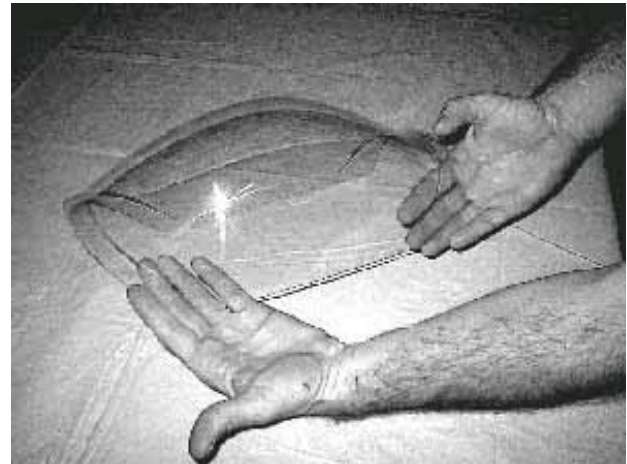
Because the ignition system of a gas engine emits Radio Frequency Interference {RFI}, all radio gear must be kept as far away as possible. Mount the servo next to the rudder servo on the side that gives best access to the throttle on the engine. The supplied steel throttle wire cannot be used as this would act as an antenna and transmit the RFI. Use one of the available plastic or nylon push rods available at your

local hobby store. Epoxy the outer casing to the firewall and fabricate a small support for the inside as shown.

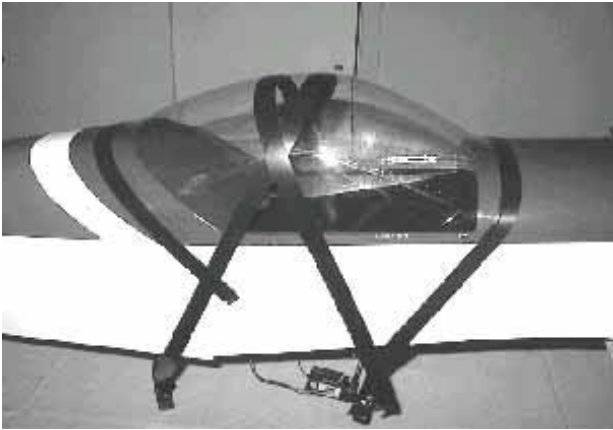


## CANOPY

Trim the canopy carefully along the scribed lines. Sand the edge smooth, be careful not to scratch the surface. If you are using a glow engine use the back piece of scrap to fabricate a hatch to cover the fuel tank and install with RTV.



Locate the canopy for best fit; tape securely. Drill two 1/8-inch holes in each side of the canopy only then secure with the supplied screws. Remove the screws and harden the



threads with CA. An alternative method, if you don't want the canopy removable, it may be glued on using canopy adhesive. If you detail the pilot compartment be sure to do so before final installation.

## COWLING

Open the bottom of the cowl as shown to allow engine heat to exit.



With the spinner back plate installed, carefully align the cowl and securely tape in place.



Locate and install the attach screws. Feel inside the fuselage to be sure the screws penetrate the

wood structure. Open the necessary holes for exhaust, needle valve, glow plug, and ect.

At this point its time to prepare for final assembly. All radio equipment except the battery should be installed as per the manufacture instructions. The location of the battery may be used to aid in final balance.



## FINAL ASSEMBLY

Install the fuel line to the carb, vent line to the muffler and allow the fill line to exit the opening in the cowl bottom *{the fill line will need to be plugged any time fuel is in the tank, a correctly sized screw will work or a plug may be purchased from your local hobby store}*.

Additional paint and exterior trim such as decals and numbers may be added. Whatever details you add keep in mind that weight is the enemy of a high performance aircraft **KEEP IT LIGHT.**

## WEIGHT AND BALANCE

*Nothing affects the way a plane flies more than weight and balance. Failure to perform this procedure may result in an aircraft that is at best difficult to control and at worst impossible to fly. Even small changes in the balance point make large changes in stability. For your first flights we recommend using a balance point at the forward end of the center of gravity {C.G.}*

*range, this location will provide the most stability. As your comfort and skill increase slowly move the C.G. aft to increase the control response.*

The recommended starting range for the C.G. is 4 3/4 inches to 5 1/4 inches back from the leading edge of the wing measured against the side of the fuselage.

Turn the aircraft upside down and support it at that location. Slide the battery pack to a position where the plane will balance level to slightly nose heavy. Mount the battery inside the fuselage at the determined location. Install the on off switch in a convenient location per the manufactures instructions. Reinstall the wing and check the C.G. again. If necessary add weight to the nose or tail.



## CONTROL THROWS

With your radio on, center all trims and adjust the clevises so all control surfaces are straight. Measure the control surface movement at the widest part of each surface. Use the servo horns and bell crank holes to adjust the control throw. For your first flights the control throws should be set to the following:

Elevator 11/16-inch up / down

Rudder 1 3/4- inch right / left

Aileron 1/2-inch up / down

Double check all controls move in the proper direction.

## MOTOR SET UP

Be sure the motor is properly broken in using the manufacture instructions. Set the throttle throw to shut the motor off when the trim is pulled down and idles reliably with the trim up. After the motor is set, run one tank of gas at full throttle, measure how much time it takes to run the tank dry.

*CONGRADULATIONS you are now ready for test flights.*

Before leaving for the field be sure your batteries are fully charged and you have all the required support equipment {fuel, starter, glow driver, ect.}.

Although the CAP 232 will fly well in wind, wait for a nice day.

At the field have a helper hold the airplane, following the radio manufactures instructions perform a range check of the radio. Do this with the motor off, start the motor and do it again. *Perform this test EVERY TIME YOU GO TO FLY!*

## TRIMING BASIC FLIGHT

*The CAP 232 is NOT a trainer. A true aerobatic aircraft, it goes only where you point it and will not recover to level flight without control input. If you do not have high performance experience seek the help of someone who does.*

Line up on the center of the runway and slowly open the throttle, using the rudder to maintain directional control. Once the tail is up apply a little up elevator and allow the plane to gently lift off the runway. Keep the climb angle and turns shallow until you reach a safe altitude. Reduce the throttle to about 60% power. With the airplane flying away from you adjust the radio aileron trim tab till the wing stays level. Turn and line up the plane with the runway. Adjust the elevator trim till the plane maintains level flight. Once again with the airplane flying away from you adjust the rudder trim till the fuselage tracks straight {it may be necessary to correct the aileron trim after this procedure}.

Continue to fly and trim until the aircraft is tracking well, land before the fuel runs out. Carry a little power on final approach until over the end of the runway, then cut power to idle, hold the plane just off the runway till the airspeed bleeds off and the plane settles on. If the landing is too long add power go around and try again, don't try to force it to the ground. Now its time to zero out the trims. To do this measure the control location, center the trim tab on the radio and adjust the servo horn for large changes, the control clevis for small changes. For example if after the flight the rudder is 3/16 inch to the right, center the radio trim and adjust the clevis till the rudder once again measures 3/16 right. By doing this whenever you fly, setting the radio trims at center will result in a well-trimmed plane. Increase the control travel, as you become more familiar with the flight characteristics until loops take about 50 feet and knife edge can be maintained with 80% stick deflection. Final roll rate should be 300-360 degrees per second.

*If you have followed the procedures in this Manuel you will now be rewarded with one of the finest flying sport models available. All primary aerobatic maneuvers are at your fingertips and the aircraft will perform them with ease. No further trim work will be required until you are ready for unlimited and advanced 3-D flight. Before attempting any of the ADVANCED FLIGHT TRIM procedures you must be completely comfortable with inverted and knife-edge flight. The following trim sequence is very time consuming and you may not be able to complete it in one day. Every change made during this procedure will affect all others so it will be necessary to start the procedure from the beginning after each adjustment.*

## ADVANCED FLIGHT TRIM

*All the following tests should be performed at 80% power unless noted.*

### C.G. Fine Tuning:

Roll inverted, neutral elevator to two clicks of down trim, if the model descends move the C.G. aft. If the model climbs move the C.G. forward. C.G. movement should be no more than 1/4-inch at a time.

### Engine Thrust Angle Right/Left:

On a low pass 50% power directly into the wind, go to 80% power and pull to a vertical line at the same time. As the model slows do not correct the path with rudder. If the model yaws right add 1/16-inch shims under the right side motor mount bolts at the firewall. If the model yaws left place the shims under the left side.

### Main Wing Incidence:

Roll to knife-edge flight, if down elevator is required to maintain a straight line, shim the back of the main wing 1/8-inch at a time till the elevator is neutral. If up elevator is required shave the rear of the wing saddle 1/8-inch at a time.

### Engine Thrust Angle Up/Down:

On a low pass 50% power crosswind, go to 80% power and pull vertical at the same time. As the model slows do not correct path with elevator.

If the model tries to loop add 1/16-inch shims to the top motor mount bolts. If the model tries to push over to the wheel side, add 1/16-inch shims to the lower motor mount bolts.

### Wing Tip Weight:

Level flight into the wind, roll inverted neutral aileron. If one wing drops add weight to the other wing tip 1/8-ounce at a time.

### Elevator Surface Alignment:

Fly away from you directly into any wind, apply full throttle and pull two consecutive loops. Model rolls right, raise left elevator, model rolls left, raise right elevator.