RASCAL ARF ASSEMBLY MANUAL

INTRODUCTION:

Congratulations on your purchase of the SIG Rascal ARF kit! The R/C Rascal kit quickly became very popular with modelers because of its great looks and truly classic flying characteristics. SIG is pleased to now be able to offer this fine design in an Almost Ready to Fly format! The ARF version not only retains all of the same great characteristics of the original but also offers superb workmanship in its construction and a beautifully unique covering job. The covering material used on your Rascal ARF is Oracover®. This means that it is easily repairable and easy to work with. Assembly is quick and simple when following the detailed instructions contained in this manual.

The Rascal ARF is very light and therefore well matched to the included geared electric Speed 400 power system. This motor and gear drive system allows you to swing the recommended APC 8 x 6E propeller - a very efficient and powerful combination! Also included with your Rascal ARF is the new SIG 20 Amp proportional electronic speed controller (ESC). Read on for further information on this unit.

We suggest using a 7-cell battery pack for this model. We have used the Sanyo KR-600AE 1.2 volt Nickel-Cadmium (Ni-Cad) cells for our battery packs, with good results. These cells deliver great power and are both small enough and light enough to work well with the Rascal design. 8-cell battery packs (9.6 volts) will certainly fit in the model and will provide good power. However, be aware 8-cell flight packs provide more power than the motor is rated for. Because of this, 8-cell packs will likely burn out the motors' brushes within 15 to 30 flights. To get the most out of your flight packs, we suggest using a good quality AC/DC "Peak Delta" charger, such as the Astro Flight #115D charger.

The assembly and flying of this model will only be successful if you follow these instructions carefully. Deviating from these instructions has the potential to cause problems later in the assembly process or during flight. The successful assembly and flying of this model is *your* responsibility so take your time and enjoy the process.

RADIO EQUIPMENT:

The Rascal ARF derives its performance from several factors. Two of these are its light weight and generous wing area. This combination makes for a very favorable wing loading that allows the airplane to perform nicely with Speed 400 power. Since the Rascal ARF is factory built, you can only control the final ready to fly weight by choosing the most appropriate airborne radio equipment. In short, the performance of this model will be great with the right equipment but will be less so by choosing inappropriate, oversize and/or unnecessarily heavy airborne radio equipment. This is a simple reality that has to be addressed. Fortunately, after-market receivers and servos, appropriate for this model, are not only readily available and of very good quality, they're now very reasonably priced.

In flight testing our Rascal ARF models, we've used a wide variety of airborne radio equipment. For servos, we have used and can highly recommend Hitec #HS-55 servos and the Maxx Products MX-50 units. Similar servos are also usable, provided they are the right dimensions and can deliver between 14 to 18 in/oz of torque. One of the most appropriate receivers for this model would be the great little Hitec Micro 555 unit. Again, other receivers are certainly usable but make sure they are small enough and light enough! For best performance, avoid excess weight.

The Electronic Speed Controller (ESC), included with your Rascal ARF kit (SIG Part Number SIGESC20), has been specifically designed for use in Speed 400 powered electric models. This unit is quite sophisticated for its small size and light weight of only 12 grams. Its solid state integrated circuitry is capable of supplying up to 20 amps of continuous current to the motor. It is fully proportional and features a Battery Elimination Circuit (BEC) and an effective propeller brake. In addition, the SIG ESC features automatic temperature shut-off and an integrated safety feature that prevents accidental motor start-ups when initially powering up the airborne system. Note that this ESC is supplied with a receiver connector that is compatible with Hitec, Airtronics (Z-connector only), Futaba, and JR equipment. Specifications are as follows:

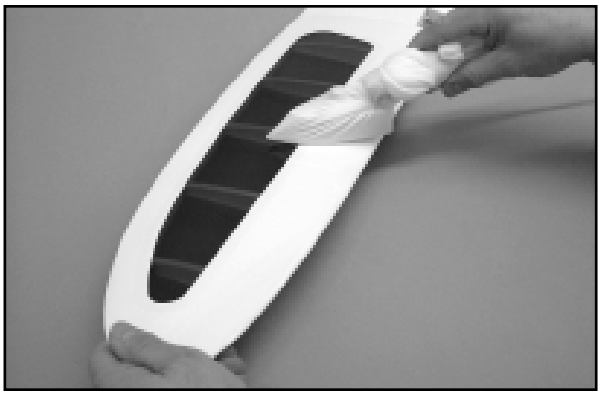
WORKING VOLTAGE:	**5-10 1.2V NiCad Cells**
CONTINOUS LOAD CURRENT:	**20 Amps**
SURGE CURRENT:	**200 Amps**
WEIGHT:	**12 Grams**
BEC:	**5V/1Amp**
LOW BATTERY CUT-OFF:	**5V**
DIMENSIONS:	**1" x 5/8" x 1/4"**

COVERING MATERIAL:

Your Rascal ARF has been professionally covered using Oracover®. This material is world famous for its ease of application, light weight, and consistency of color. If you live in a dry climate, you may notice that some wrinkles might develop after removing the covered parts from their plastic bags. This is perfectly normal in low humidity climates. The model was covered in a part of the world with relatively high humidity and therefore the balsawood was carrying a fair amount of moisture. When exposed to drier air, the wood typically loses this moisture, dimensionally "shrinking" in the process. This is what may cause some wrinkles. However, wrinkles are easy to correct by simply using a heat iron.

We suggest covering the shoe of the iron with thin cotton cloth, such as an old T-shirt, to prevent scratching. The iron should be set to about 280° - 300° F. Use the heated iron over the wrinkle to lightly shrink the material - do not press on it. Then lightly iron the material back down to the wood. You can also use a hobby-type

heat gun to re-shrink the covering but you must be very careful around any seams or joints. Re-heating seams will cause them to "creep", making them unsightly. This is especially true with the Rascal's inset style of trim scheme. You must also be careful when using a heat iron or heat gun when working around the window and windshield areas - heat will distort these plastic pieces.



A very easy way to avoid damaging seams and joints when reshrinking the covering is to protect the seams with wet paper towels rolled into strips. These are arranged directly onto the joints or seams and their coolness protects the seam from shifting or "crawling" under heat.

For part number reference, your Rascal ARF was covered in Oracover® film with the following part numbers:

#10	White and
#21-58	Transparent Green or
#21-75	Transparent Violet

REQUIRED TOOLS:

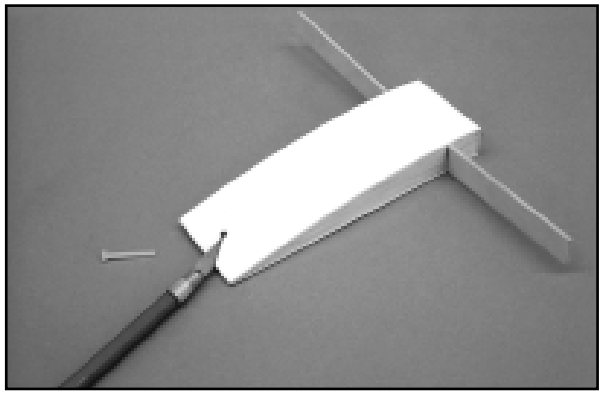
For proper assembly, we suggest you have the following tools and materials available:

- A selection of glues - SIG Thin and Thick CA and SIG Kwik-Set 5-Minute Epoxy
- Threadlock compound, such as Loctite® Blue
- Selection of hand tools, such as;
  - Screwdriver Assortment
  - Pliers - Needle Nose & Flat Nose
  - Small Allen Wrench Assortment
  - Pin Vise for small dia. drill bits
  - Sandpaper
  - Hobby Knife with sharp #11 blades
  - Paper towels
  - Small Power Drill with selection of bits

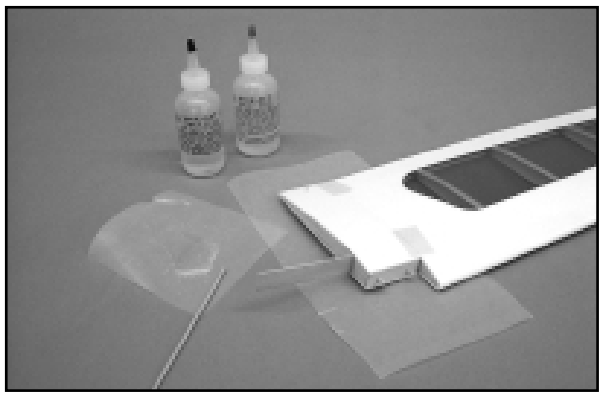
You will also be required to make a few solder connections. We suggest that you have a good soldering iron and good quality solder and flux. For the pushrod connections, we use and like the Stay-Brite® Silver Solder products. For electrical connections, use solder specifically for that purpose.

WINGS:

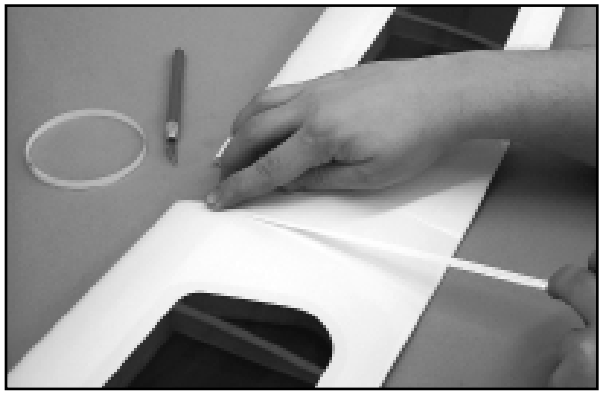
❑ 1) Start by using a hobby knife with a #11 blade to clear out the rear wing bolt holes on the top and bottom of the wing center section. Test fit the wing center section to the fuselage and secure with the provided nylon 4-40 wing bolt. The fit will be good, with the center section well centered on the fuselage.

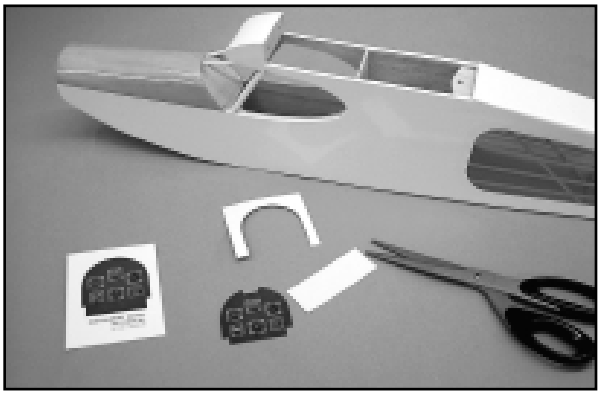


❑ 2) Remove the center section from the fuselage and test fit the wing panels onto the exposed plywood dihedral brace ends. The fit should be firm. Use 5-minute epoxy to join one of the wing panels to the wing center section. Apply glue to the correct side of the exposed rib on the center section and also apply a thin coat onto the plywood brace. Slide the center section plywood brace into the slot in the appropriate wing panel. Press the wing panel firmly in place to the center section. Wipe off all excess glue with acetone or alcohol and tape the panel securely to the center section - top and bottom. Allow the epoxy to set and glue the remaining wing panel in place.



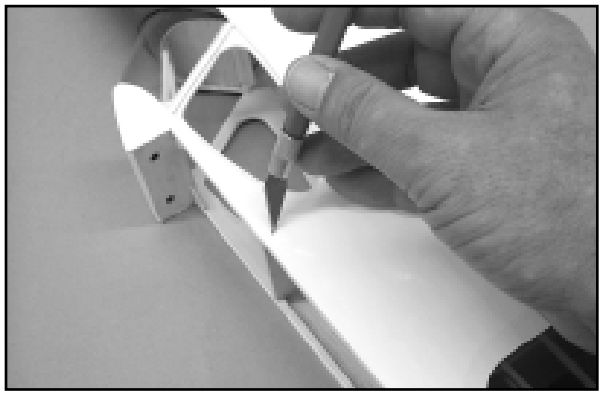
❑ 3) After the glue has set, use the four provided 1/4" x 10" self-adhesive strips of white Oracover® film to cover the bottom and top wing joints, centering the covering over each joint. Save the excess strip material. Check the fit of the completed wing to the fuselage. Remove the wing and set it aside for now.

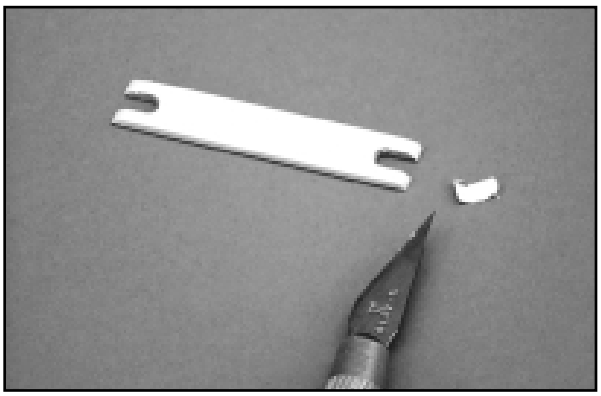




FUSELAGE:

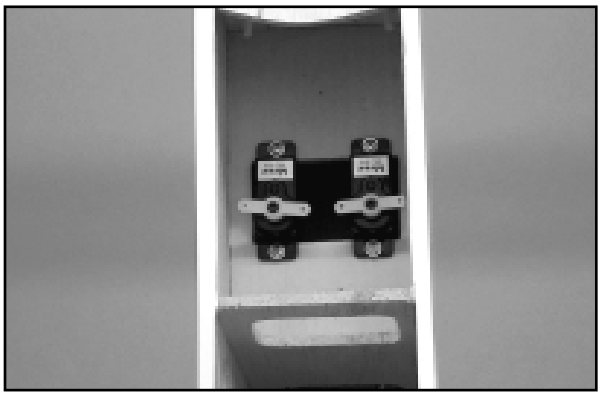
❑ 1) Using a hobby knife and a sharp #11 blade, clear-out and open up the various required holes in the fuselage covering; the rear rudder and elevator control cable exits, the antenna exit hole on the right fuselage side at the top just behind the window location and the on/off switch slot on the left fuselage side, beneath the side window. Also cut the covering away from the slots on each side of covered plywood landing gear spreader.



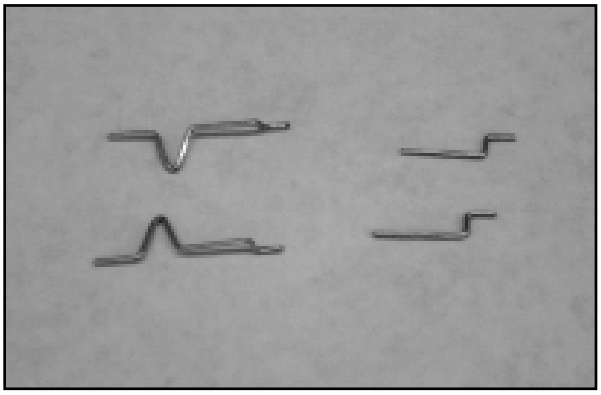


❑ 2) From the kit contents, locate the printed instrument panel. Use scissors to cut out the instrument panel including a recess at the top, allowing clearance for the forward cockpit supports. Test fit the instrument panel in place. Trim as needed for a good fit. Glue panel to front fuselage cabin former using a little white glue.

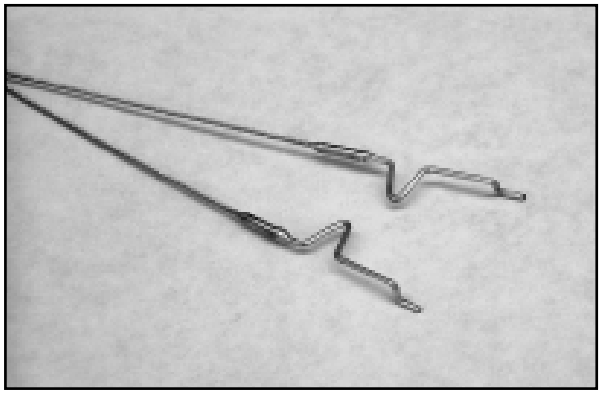
❑ 3) The rudder and elevator servos are now installed into fuselage. Position the servos in place and pre-drill small guide holes for the servo screws. Mount the servos into the servo tray using the hardware provided with your servos.

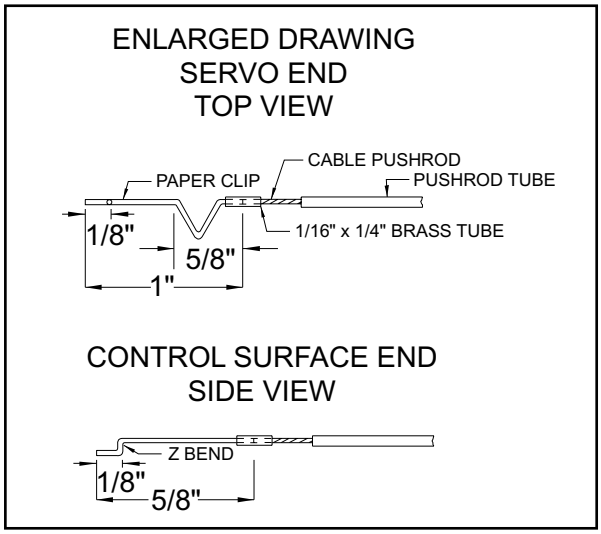


❑ 4) From the kit contents, locate the two paperclips provided in the hardware package. These will be used to make the rudder and elevator linkage connections. Straighten the paperclips and use pliers to bend the two required control linkages for the servos and the two control linkages for the rudder and elevator control horns. Use the diagram below for reference. The two servo end wire linkages (with the "V") are mirror images of each other and will be used at the servo-ends of the control cables. The "V" bend allows you to make small trim adjustments by simply bending it to a more open or more closed position.



Use a soldering iron and solder to connect the servo linkage ends with each of the two control cables. This is done by using the 1/16" x 1/4" brass tubes, provided in the kit, to couple the wire ends to the cable ends. Use just a small amount of solder to "sweat" these joints.

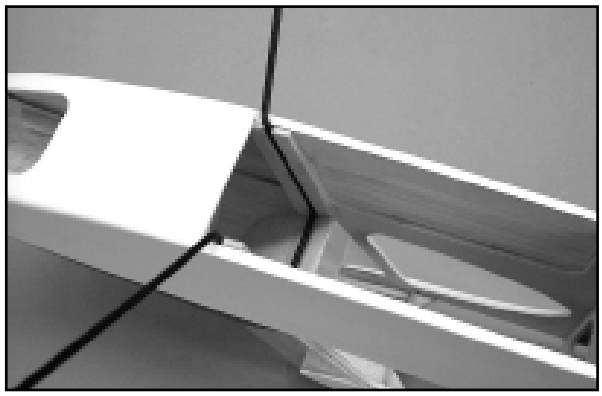




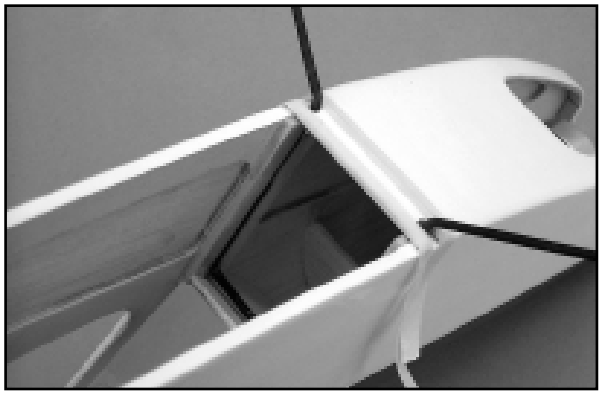
❑ 5) Use a small screwdriver to remove the servo control arms from the servos. Install the wire linkage "Z-bend" ends of the control cables onto the servo control arms. Install the two control cables into the two plastic tube ends in the servo compartment.

Run the cables through the tubes until they exit the fuselage at the rear. Position the servo arms squarely to the servos and reinstall them back onto the servos.

❑ 6) The main landing gear is now glued in place in the fuselage using 5-minute epoxy. First check the fit by sliding the landing gear in place into the two slots at the bottom, front of the fuselage. Carefully slide the gear all the way up into place inside the fuselage to get a feel for the fit. Remove the gear from the fuselage and use sandpaper to sand the wire, where it contacts the fuselage sides. Apply 5-minute epoxy into each landing gear slot on the inside of the fuselage - just enough to fill the slots. Once again slide the landing gear wire in place into the fuselage. Carefully wipe off any excess glue with alcohol and allow the glue to set.



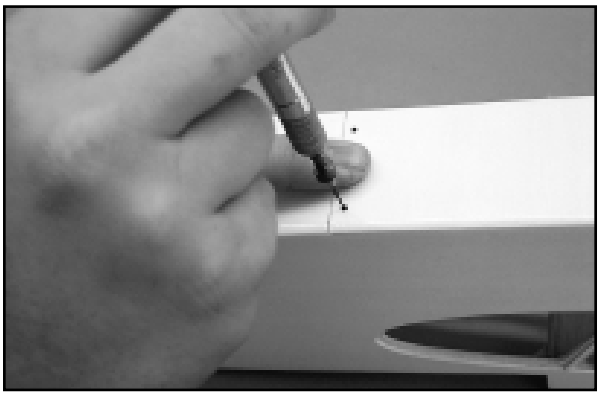
❑ 7) Fit the covered plywood landing gear spreader in place over the wire landing gear legs and onto the bottom of the fuselage. Trim as needed for a good fit. Remove the spreader and apply 5-minute epoxy to its bottom outside edges, where it contacts the fuselage bottom. Also apply a little glue along the front edge of the spreader where it butts against the bottom forward fuselage sheeting. Press the spreader in place, wipe off any excess glue with alcohol. Tape firmly and allow the glue to set.



❑ 8) Locate the pre-covered battery hatch from the kit contents. This hatch has a plywood "lip" at one end, and two pre-drilled holes at the other end. The end with the lip is the front. The hatch fits into the bottom of the fuselage and is removable for ready access to the battery pack. Install the front lip of the hatch into the fuselage, beneath the landing gear spreader, pressing it firmly up to the back edge of the spreader. Now press the rear of the hatch in place to the fuselage.

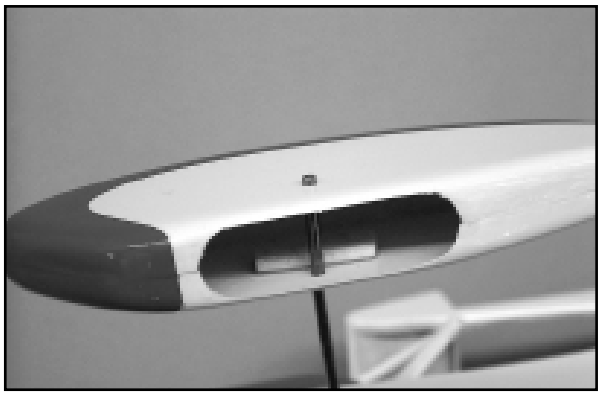
Hold the hatch in place and use your pin vise and a .046" dia. drill bit (#56 numbered drill) to drill two holes through the hatch retention block, directly beneath the two pre-drilled hatch holes. The hatch can now be secured to the fuselage using the two

#2 x 3/8" sheet metal screws provided. Do not over-tighten the screws, just snug them in place.

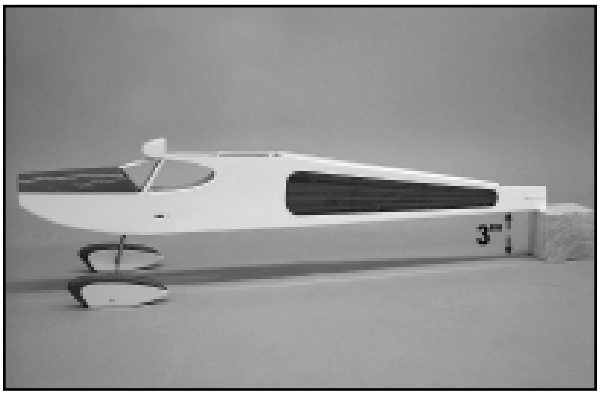


WHEEL PANTS:

❑ 1) Position the wheel pants in place onto the wire landing gear axles. Note that the inside faces of the pants - the sides facing the fuselage - can be identified by looking inside and observing the plywood mounting pads. Correctly in place, these pads should be located against the upright landing gear wire. From your parts bag, locate the two nylon landing gear clips and four #2 x 1/4" screws.

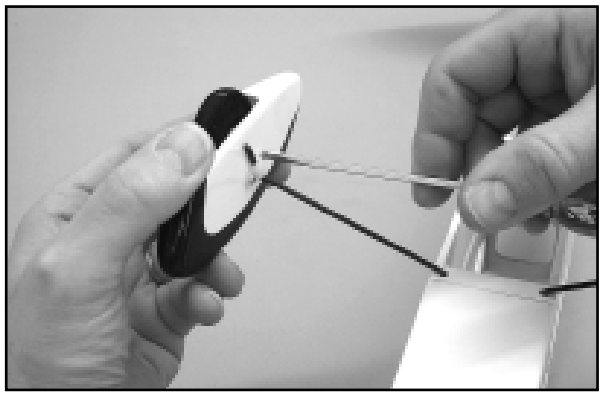


❑ 2) The wheel pants must first be correctly aligned to the landing gear wire and the fuselage, before mounting. This is done by slipping the wheel pants in place over the landing gear wires - without installing the wheels - and then propping the rear of the fuselage up 3" off of a flat surface. This provides the correct side view alignment for mounting the wheel pants.



❑ 3) Press one of the nylon landing gear clips onto the upright wire leg of the landing gear, immediately next to the wheel pant. Slide the clip up or down on the wire until the boltholes are approximately 3/8" above the axle hole. Use a sharp pencil to mark the clip's two bolthole centers onto the wheel pant. After making these marks, remove the wheel pants from their axles. Use a pin vise and a .046" dia. drill bit (#56 numbered drill) to drill guide holes through the wheel pants and the inside plywood pads, at the marks just made.

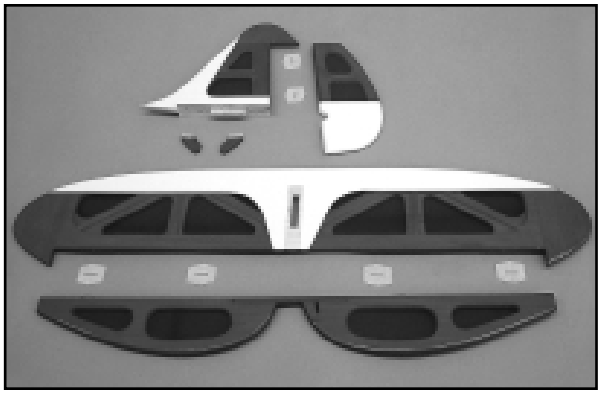
❑ 4) Slip a wheel pant onto its appropriate axle and then insert one of the wheels into the pant and onto the axle. Continue pushing the axle through the wheel hub and through the outer wheel pant hole. Mount the pant and wheel to the landing gear using the #2 screws through the clip and into the pre-drilled holes on the side of the pant. Do not over-tighten the screws, just snug them in place. Repeat this process for the remaining pant and wheel. Test the wheel pant/wheel relationship, making sure that the wheels roll freely with little or no friction. Adjust as needed to achieve free movement.



MOUNTING THE TAIL GROUP:

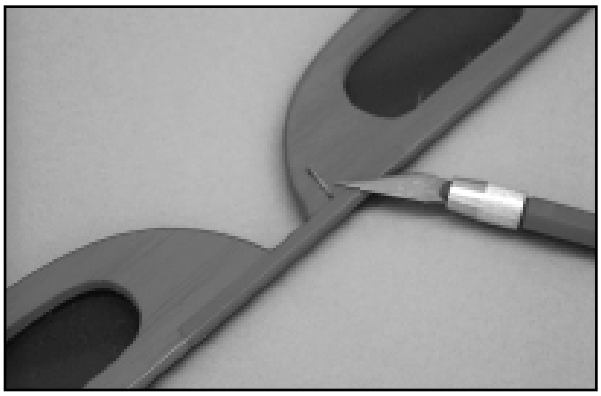
❑ 1) From the kit contents, locate the bags containing the horizontal stabilizer and elevators and the vertical fin and rudder. Also locate the two plywood control horns. Note that the elevators

and rudder are only temporarily attached to the stabilizer and fin with unglued CA hinges in their pre-cut slots. Remove the elevators from the stabilizer and the rudder from the fin. Remove the CA hinges from the slots.



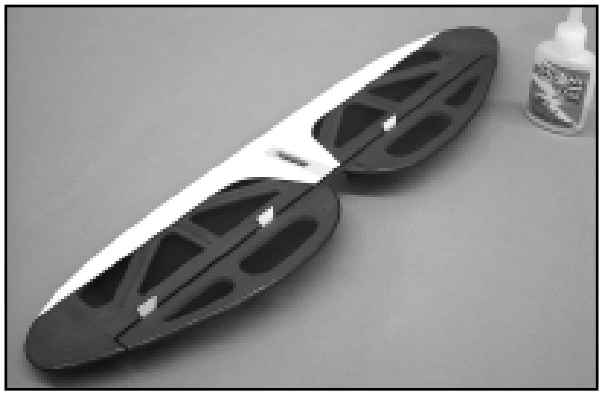
❑ 2) Before hinging the elevators to the horizontal stabilizer, glue the elevator control horn in place first. Make sure the three (3) drilled holes are cleared out. Use a pin or small diameter drill to do this.

The elevator control horn will be glued into the slot in the bottom of the right elevator half. Use a hobby knife to cut the covering away from this slot on the bottom (only) of the right elevator half. Test fit the horn in place into the bottom side of the right elevator half. Trim if needed for a good fit. Mix a small amount of 5-minute epoxy and apply it to the base of the control horn and glue the horn in place into the elevator horn slot, with the horns holes facing toward the hinge line.



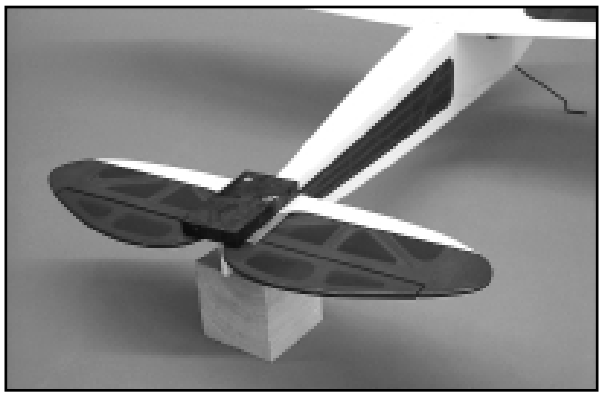
❑ 3) The elevators can now be hinged in place to the horizontal stabilizer. The supplied hinges are the CA type. Instant or "thin" CA glue is used to install these hinges.

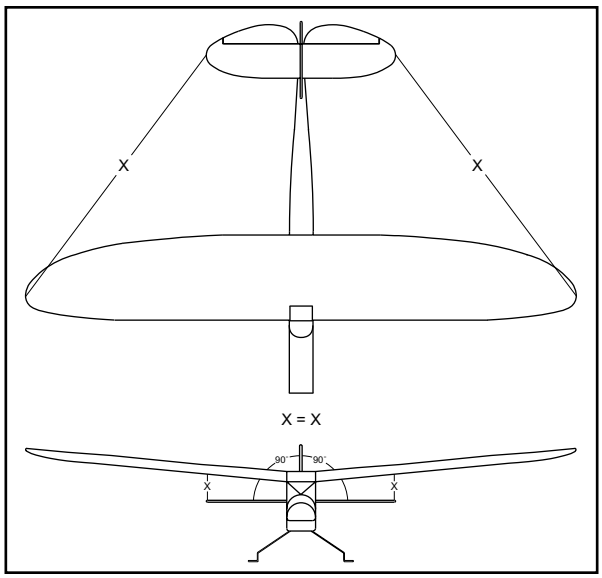
Begin by inserting the four CA hinges into the four slots in the trailing edge of the stabilizer, aligning their center slots along the trailing edge. Using four thin pieces of wood or cardboard (business card thickness is about right), insert these into the slots in the hinge. Now mount the elevators to the exposed hinge halves, pushing the elevators up to the scrap wood or cardboard hinge inserts. Remove one of the hinge insert scraps, flex the elevators downward, exposing the center of the hinge. Apply 3 or 4 drops of thin CA glue to the hinge, at the centerline. Turn the stabilizer over and repeat this process on the same hinge. Repeat the same procedure for the remaining three elevator hinges. Any excess glue can be easily removed with a little SIG CA Debonder and a paper towel. Because it takes a little time for the CA to fully "wick" its way all through the hinge and into the surrounding wood, leave the stabilizer/elevator assembly alone for at least 10 minutes before moving the elevators. Flex the elevators firmly up and down to make them supple and easy to move.



❑ 4) With the elevators in place, the horizontal stabilizer is now glued in place to the top rear of the fuselage. Use SIG 5-minute epoxy for this operation.

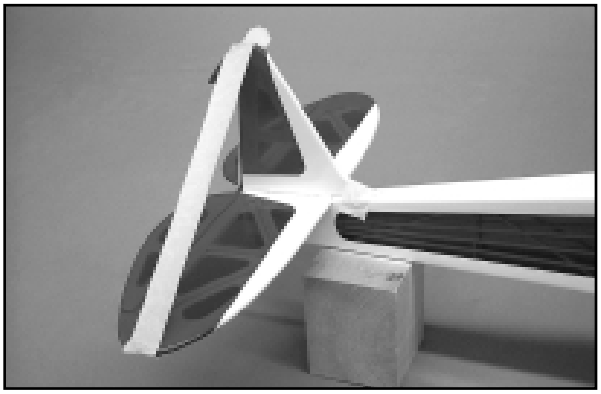
Begin by mounting the wing to the fuselage. Place the model on a flat surface, allowing you to view it directly from the front. Prop up the rear of the fuselage with a scrap piece of wood approximately 3". Apply epoxy glue to the fuselage stabilizer saddle area and carefully place the stabilizer onto the saddle, centered as closely as possible. Use pins or small weights to hold the stabilizer firmly to the fuselage. Carefully view the airplane from the front to see if the stab is squarely in place in relationship to the wing/fuselage, without tilting to one side or the other. Make any adjustments needed to position and hold the stabilizer in this position. Allow the glue to set completely.



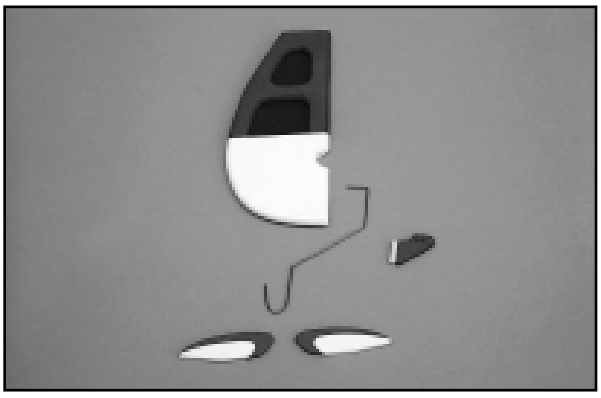


❑ 5) The vertical fin, without the rudder hinged in place, is now glued in place to the top of the stabilizer, again using SIG 5-minute epoxy.

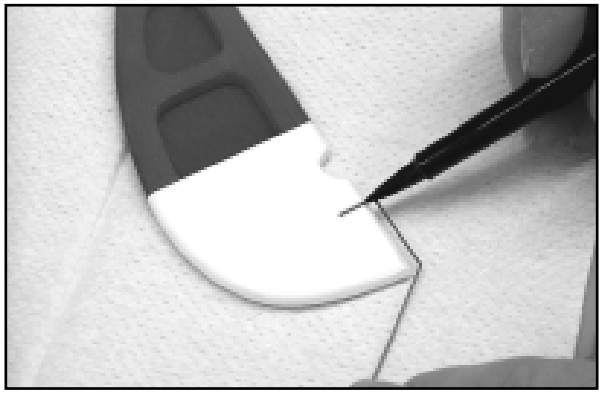
Begin by first test fitting the vertical fin in place into the slot in the top of the stabilizer, without using any glue. Trim if needed to achieve full contact with the stabilizer and top rear of the fuselage. Once again mount the wing to the fuselage and prop up the rear of the fuselage about 3" with the airplane on a flat surface. Apply glue to the bottom of the fin and the sides of its locating tab. Carefully press the fin in place onto the stabilizer and fuselage. Wipe off any excess glue, using alcohol and a cloth. Again view the airplane from the front, making sure the fin is in place at 90° to the stab. Use tape as needed to hold the fin in this position and allow the glue to set. After the glue sets, remove the tape and the wing.

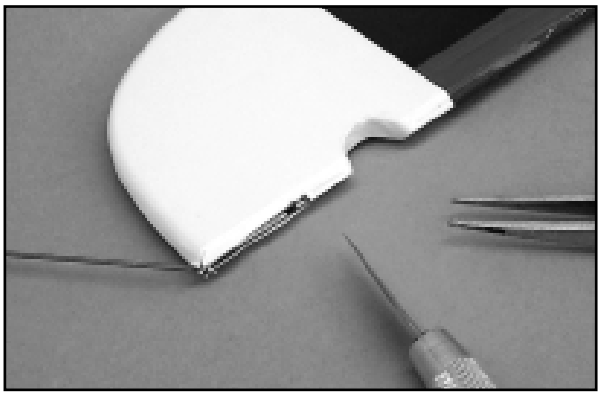


❑ 6) Before hinging the rudder to the vertical fin, it must first be prepared. There are three steps that must be done: a) mount the tailskid wire to the rudder b) glue the rudder control horn in place and c) glue the tailskid wheel pant halves to the tailskid. Locate the rudder, the rudder control horn, the tailskid wire, and the two wheel pant halves.

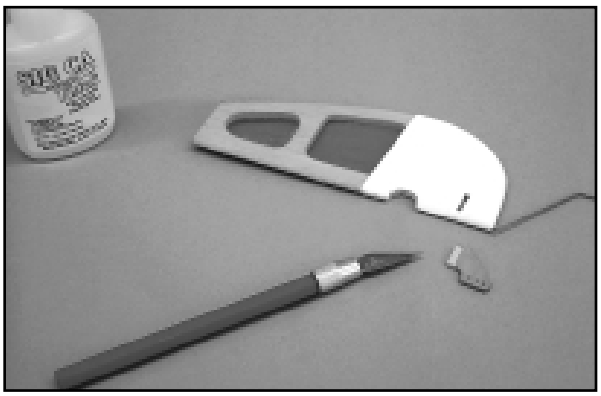


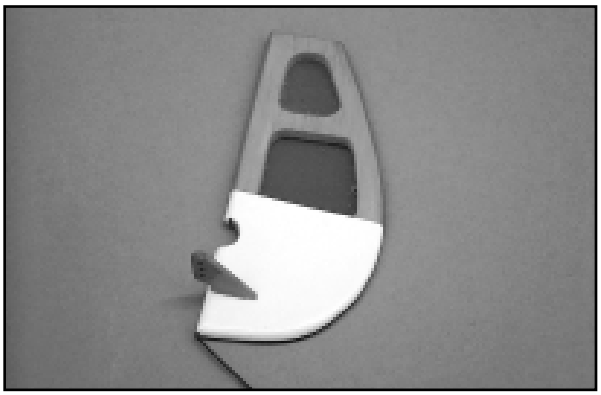
a) Lay the wire in place at the bottom, front of the rudder. The correct position for the wire is to place it where the rearward bend meets the bottom of the rudder. Use a marker pen to mark the position of the top of the wire, where it enters the rudder. Use a long pin or thin drill to make the necessary 1/2" hole into the rudders' leading edge, exactly in the center, at the mark just made. Use a sharp hobby knife to remove a thin sliver of the covering from the hole location, directly down to the bottom of the rudder, directly along its leading edge. Remove just enough covering to expose the wood. Use your hobby knife to now indent the leading edge just enough to accept the wire into the wood. Using SIG 5-minute epoxy, glue the wire in place into the rudder at the hole and into the indention at the rudders' leading edge. Wipe off any excess glue and allow it to set. Cover the bottom front of the rudder with a scrap piece of self-adhesive white material used on the wing joints.



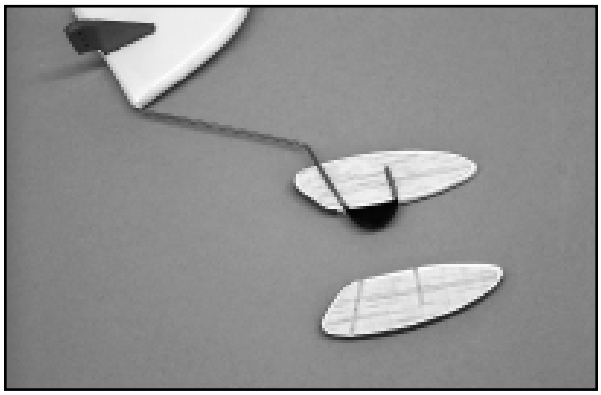


b) Like the elevator control horn, the rudder horn is glued into the pre-cut slot at its bottom leading edge on its' left side, as shown. First, find the slot location beneath the covering - approximately 5/8" above the bottom edge of the rudder. Use a hobby knife to cut through the covering, exposing the slot. Use 5-minute epoxy to glue the horn into the slot and allow the glue to cure.

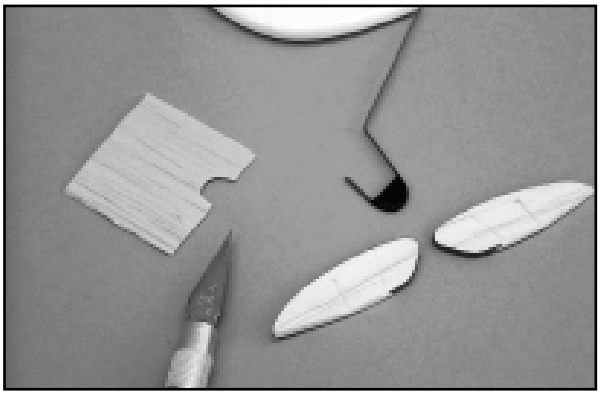




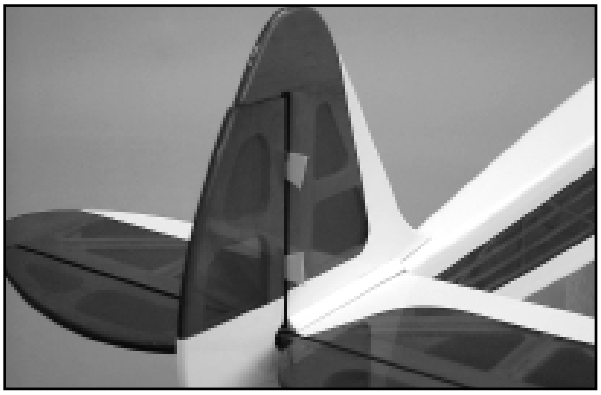
c) The tailskid wheel pant halves are glued to each side of the tailskid wire. Hold the pant halves in place with the tailskid wire between them. Pinch the halves hard to leave the wires' impression on the inside faces of the pant halves. Use a hobby knife to open up the impressions just a little, allowing the wire to "nest" in place between the pant halves. The pant halves are now glued in place, sandwiching the tailskid wire between them. Use SIG thick CA or 5-minute epoxy for this step.



MODELER'S TIP: The overall look of the tailskid/wheel pant assembly can be easily enhanced by filling in the exposed "wheel" part of the wire with a small scrap piece of 1/32" balsa. Use thin CA to glue the wood in place, sand the sides smooth to the wire and paint with flat black paint. The finished product will look just like a tail wheel!



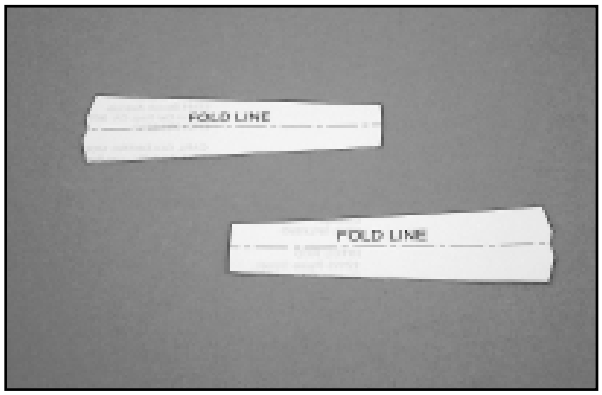
❑ 7) The rudder is now ready for hinging to the vertical fin with two CA hinges. The procedure is exactly the same as those for hinging elevators back in Step 3. Insert the two hinges into the vertical fin, with their center slots aligned with the trailing edge of the fin. Insert thin scrap wood or cardboard into these slots to keep them centered and from being pushed further into the fin. Slide the rudder onto the exposed hinge edges, up to the scrap



inserts. Remove one of the spacers, flex the rudder over to one side and apply 3 or 4 drops of thin CA glue to the exposed center of the hinge. Turn the fuselage over and apply another 3 or 4 drops of glue to the other side of the hinge. Repeat this operation on the remaining rudder hinge. Allow about 10 minutes before flexing the hinges.

OPTIONAL LANDING GEAR FAIRINGS:

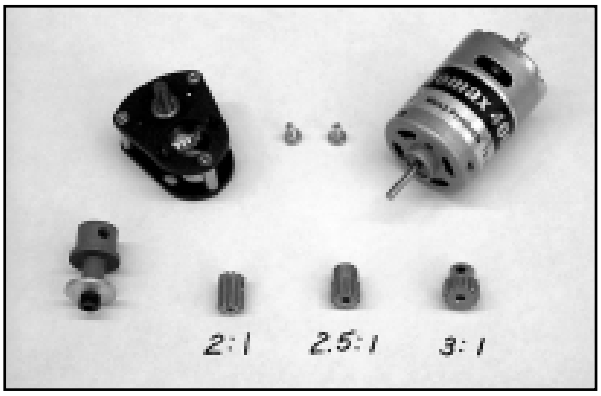
Included with your kit is a card sheet measuring 2-1/2" x 4-1/4". This is the material used to make the optional landing gear fairings. Use the patterns provided in this manual. First, remove the wheel pants. Cut-out two landing gear fairings from the card stock and bend them in two sharply at their leading edges. Mix a small amount of 5-minute epoxy and spread it on the inside surface of the fairing. Place the fairing onto the wire landing gear legs and clamp or tape securely at the trailing edge. Align them accurately with the fuselage and allow the glue to set.

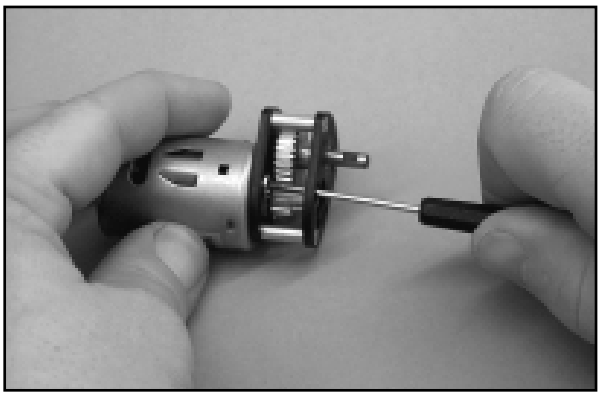


Use light sandpaper (#400 or so) to lightly sand the trailing edges smooth and sharp. The fairings can now be finished in either paint or covered with Oracover® film. Remount the wheel pants.

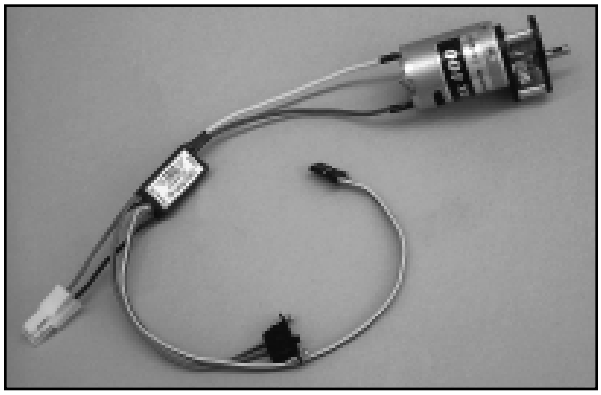
MOTOR AND RADIO INSTALLATION:

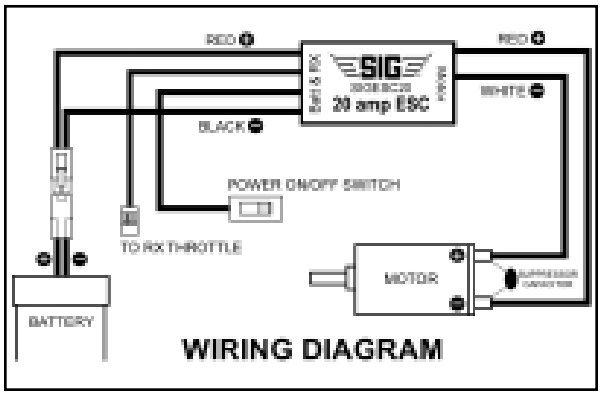
❑ 1) The motor and gearbox are now assembled. Install the 12-tooth 2.5:1 primary brass gear to the motor. Use threadlock compound on the setscrew. Assemble the gearbox to the motor using the two provided bolts, again using threadlock compound on the bolt threads. Before tightening the bolts, position the gears together with just the slightest amount of "play" or gear lash. Do not assemble the gearbox to the motor with these two gears too tightly meshed or too loose.



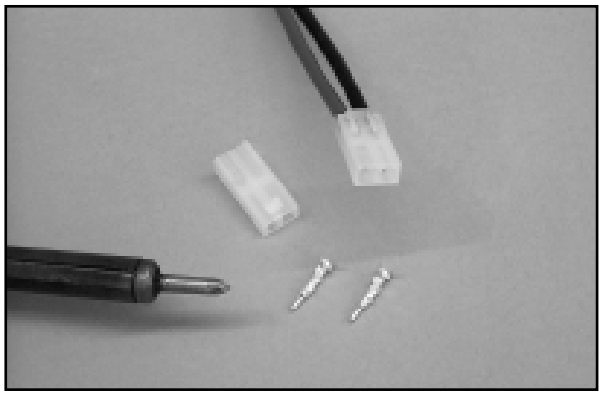


❑ 2) The SIG Electronic Speed Controller (ESC) has been factory soldered to the motor for your convenience. **NOTE:** The gearbox reverses the direction of rotation of the propeller shaft. Therefore the white wire (normally negative) has been soldered to the positive tab on the motor and the red wire has been soldered to the negative motor tab. This provides the correct direction of rotation for the propeller.



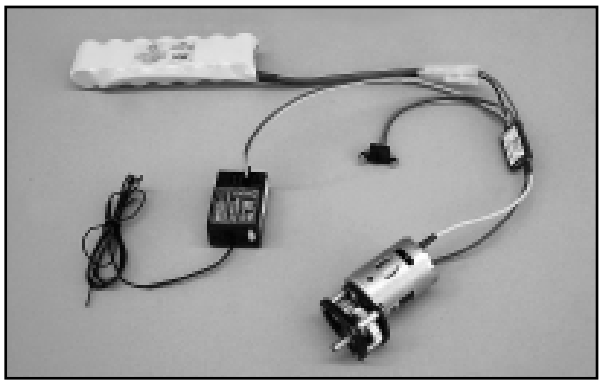


❑ 3) Included with the motor and ESC is a female Mini-Tamiya connector. This must now be soldered in place to your 7-cell battery pack. Carefully note the polarity of the red (positive) and black (negative) wires going into the male side of this connector on the ESC. The red (positive) and black (negative) wires going into the female connector on the battery side must match. ***NEVER*** make a reversed polarity connection from your battery pack to the ESC. Doing this will likely cause terminal damage to the ESC unit. Carefully crimp and solder one of the battery wires to one of the metal plugs and carefully insert the plug into the correct side of the female plug - double check the polarity from the male plug on the ESC before doing this - until it locks in place. Crimp and solder the second battery wire to the remaining metal plug and insert it into the remaining hole in the nylon connector body. The battery pack can now be charged.

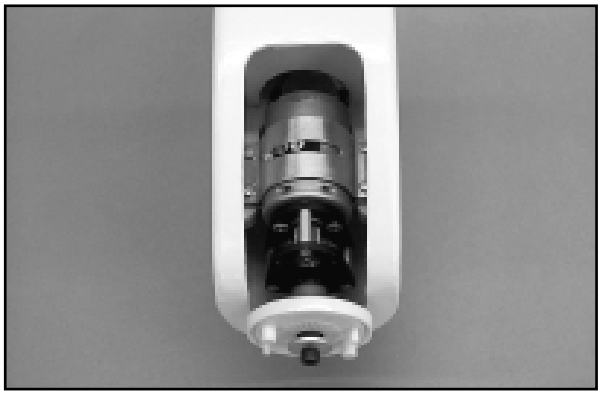


❑ 4) With the battery pack charged, the motor and ESC can be tested using your radio system. This test is to make sure the system works and is properly wired to produce the correct rotation of the propeller. **NOTE: This ESC device will not work with transmitters operating on PCM mode.**
NEVER PERFORM SUCH A TEST WITH THE PROPELLER ATTACHED TO THE MOTOR!

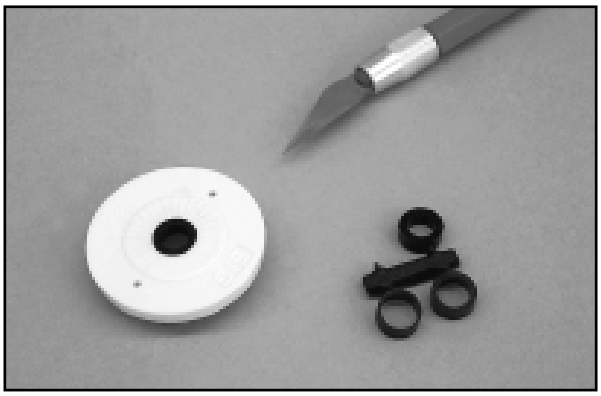
First, switch on your transmitter, making sure the throttle stick is all the way down in the low throttle position. Next, make sure the pre-wired switch on the ESC unit is in the "Off" position. Plug the ESC connector into the throttle receptacle in the receiver. Plug the battery pack into the connector from the ESC. Hold the motor in your hand and turn the ESC switch on. Nothing should happen because the ESC has a circuit that senses the transmitters low throttle position and assumes this to be the "motor off" position. Still holding the motor firmly in your hand, slowly advance the throttle stick on your transmitter. The motor should begin to turn in relationship to the stick movement. This means that the system is working. If the motor does not begin moving with transmitter stick movement this usually means that the transmitter servo-reversing switch is in the wrong position. Reverse this switch on the transmitter and again test the system. It should now work perfectly.



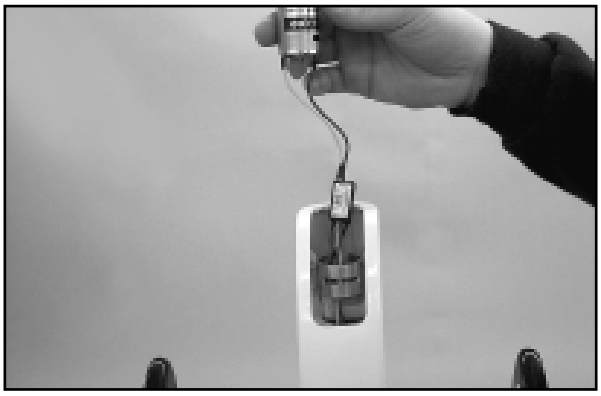
With the system now working, next check the direction of rotation of the propeller shaft at the front of the gearbox. Viewed from the rear, as if you were sitting in the cockpit of the airplane, the shaft should turn in a clockwise direction. If the shaft turns in the opposite direction, it means that the two "motor" wires from the ESC were soldered to the wrong motor tabs and need to be reversed. Turn off the system, unplug the battery pack and simply unsolder these two wires from the back of the motor, reverse their locations and solder them back in place to the motor. Once again, test the rotation of the propeller shaft, using the transmitter and receiver. Last, mount the propeller hub adapter to the front output shaft on the gearbox, using threadlock compound on the set screw. With the motor/ESC harness checked and working properly, it's ready for installation into the fuselage a little later.



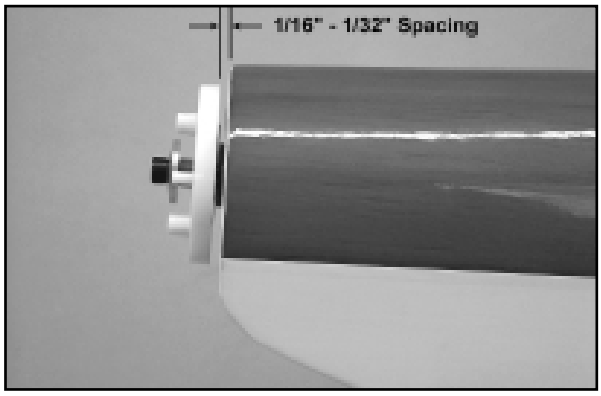
❑ 5) Locate the spinner assembly from the kit contents. You will need the backplate and the propeller shaft adapter rings (the 4 molded rings included with the spinner). Select the spinner adapter ring that fits onto the gearbox propeller shaft, without any play. Cut this ring off of the molded tree and insert it into the back face of the spinner backplate. Slip the backplate in place onto the propeller shaft, all the way back to the rear.



❑ 6) With the spinner backplate in position on the gearbox, the motor/gearbox and ESC harness can now be mounted into the fuselage. Use a screwdriver to loosen the four screws holding the motor mount and remove the bottom battery hatch from the fuselage. Hold the fuselage upright with the nose straight up. Fish the connectors, switch and ESC through the middle of the clam shell motor mounts and the lower half of the hole in the firewall. Gently press the motor/gearbox assembly into the mounts, all the way back to the rear of the plywood motor mount plate. Note that the gearbox propeller shaft is above the center of the motor when properly in place.



The motor/gearbox is now locked in place by tightening the four motor mount screws. Position the spinner backplate with approximately 1/16" - 3/32" clearance between its rear face and the front of the fuselage and be sure the propeller shaft is centered. Now tighten the motor mount screws. We strongly suggest that you do not mount the propeller in place until you are ready to go flying.



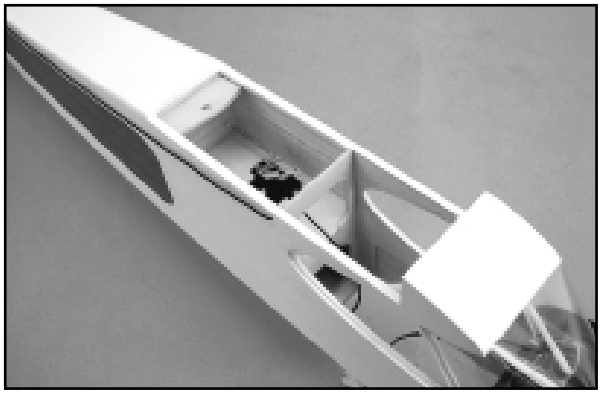
❑ 7) The ESC On/Off switch is now mounted into the fuselage, on the left side at the provided pre-cut slot. Glue the plywood switch

mounting plate to the inside of the fuselage, aligning its slot with the slot in the fuselage. The plywood plate provides a hardpoint for the switch. Using the screws provided, mount the switch in place into the fuselage. Do not over-tighten the switch mounting screws.

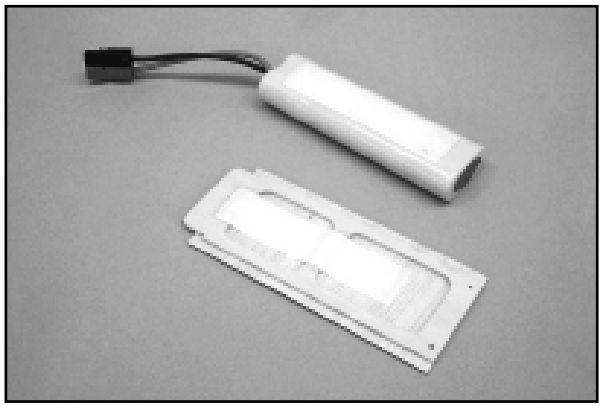
❑ 8) Connect the rudder and elevator servo leads to their appropriate receptacles in the receiver. Switch on the transmitter. With a charged battery pack plugged into the ESC, your radio system can now be checked. Be sure that you have the servo leads plugged into the correct receiver receptacles. Remember that the rudder servo should be plugged into the receiver aileron receptacle. Next, check the servos for the correct direction of travel. If needed, reverse their travel direction through the transmitter. Without the propeller in place, check the throttle action of the motor. With all controls checked and the correct direction of travel confirmed for both servos, the servo arms are now centered.

Place the trim levers on the transmitter to their neutral positions. Unscrew the servo arm retaining screw from both servos and lift off the servo arms. Reposition them back in place at 90° to their direction of travel. Doing this provides equal servo travel in both directions. (Many of today's modern R/C systems provide servo-centering capabilities and should you have trouble mechanically setting the servo arms in the right position, this feature allows you to do it through the transmitter.) Be sure to replace the servo arm screws. With the servos centered, the radio installation is just about done. Turn off the radio system, disconnect the battery pack from the ESC and turn off the transmitter.

❑ 9) The ESC simply floats free in the fuselage nose, behind the motor. **DO NOT** wrap the ESC in foam, plastic, etc. It gets warm during operation and must be free of any wrapping, allowing it to remain relatively cool. The receiver should be placed into the compartment, directly beneath the two servos. We suggest using a couple of squares of thin foam on the top and bottom of the receiver to hold it in place without being able to shift position. The receiver antenna is routed out of the fuselage through the tube installed just behind the window frame on the right side. We suggest securing the end of the antenna with a pin at the rear of the fuselage or the top of the fin.



❑10) The battery pack is held securely in place during flight with the 3-1/2" length of Velcro® tape provided in the kit. Pull the two Velcro® strips apart, remove the protective backing from the tape side and stick one strip to the bottom of your battery pack and the other strip to the floor of the battery hatch.



❑11) With the above steps taken care of, all that remains is the connection of the pushrod ends to the rudder and elevator horns. Start with the elevators. Use a small piece of masking tape at each elevator tip, holding the elevators in neutral to the stabilizer. Turn the radio system on to accurately center the servos. Lay the fuselage on its side on your workbench. Slip one of the Z-bend connectors into the outer most (bottom) elevator horn hole. Hold the pushrod cable in line with the straight end of the connector and use a fine line marker pen to make a mark on the cable where it just meets the end of the connector. Use diagonal cutters to cut the cable end at the mark just made. Use a small piece of aluminum foil at the rear of the fuselage, directly beneath the cable/connector junction, protecting the fuselage from a possible stray drop of solder. Slip a brass tube connector onto the cable. Line-up the end of the wire connector with the end of the cable and slide the brass tube halfway onto the connector. Place a small amount of flux on the cable/tube/connector joints and use a small amount of solder to "sweat" the joints together. Remove the foil and tape from the elevators and test the elevator movement with the radio system. Turn the fuselage over and repeat the process with the rudder connection. However, this time, use the middle (center) hole in the rudder horn for attaching the linkage. Remember to tape the rudder in its neutral position to the fin. After making the solder connection, remove the tape from the rudder and test the movement of the rudder with your radio.

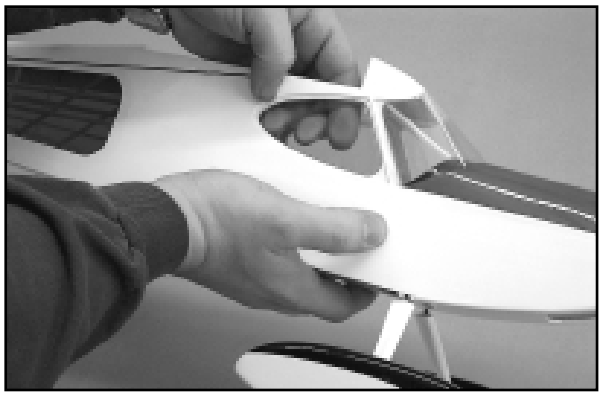
❑12) The suggested initial control movements for the rudder and elevators are now set. Most modern radio systems allow you to set the total movement of the servos directly from the transmitter. The following control movements are recommended for initial flights. These measurements are taken from the widest part of the elevators and rudder, at the trailing edges. Later, when you're more comfortable with the Rascal and how it flies, these control movements can be increased to suit your needs.

RECOMMENDED INITIAL CONTROL MOVEMENTS:

RUDDER:	3/8” RIGHT, 3/8” LEFT
ELEVATORS:	1/4” UP, 1/4” DOWN

SIDE WINDOW INSTALLATION:

From the contents of your kit, locate the small bag containing the molded side windows. We suggest using 5-minute epoxy or RC-56 glue to mount the windows into the inside of the fuselage. DO NOT use thin CA glue for this step! Use scissors to cut out each window, leaving about 1/8" of plastic around the edges for a gluing surface. Apply a thin bead of glue to these edges and press the window in place from the inside of the fuselage. Use small pieces of tape to hold the windows in place until the glue sets. A little alcohol will clean off any excess glue from the windows.



DECAL APPLICATION:

The decals supplied with the Rascal ARF kit are high quality Mylar with an extremely aggressive adhesive. These are <u>not</u> die-cut and must be cut from the sheet with a hobby knife and sharp #11 blade or with sharp scissors.

We suggest the following method to accurately apply these decals. Carefully cut out the decal with a hobby knife. Lift it carefully off its sheet with tweezers. Use a product like SIG Pure Magic Model Airplane Cleaner, Fantastic®, or Windex® to spray the area of the model that will receive the decal. Then spray the adhesive side of the decal as well. Lightly position the decal in place on the model. The liquid cleaner allows the decal to slide easily into the desired position - do not press down on the decal. Once in position, hold the decal lightly in place with your finger and use a paper towel to gently dab the excess liquid away. Use a small squeegee to now set the decal in place, removing all excess liquid and any air bubbles. The Sig 4" Epoxy Spreader - #SIGSH678 - is perfect for this job. Mop up any excess cleaner with a dry cloth and allow the decals to set overnight. They will be solidly adhered to the model without any air bubbles.

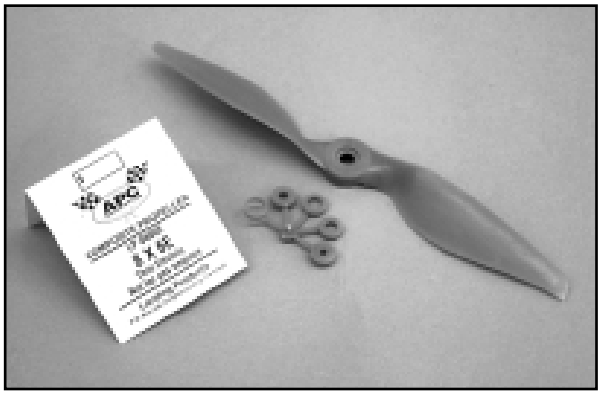
BALANCE:

IMPORTANT: The flight pack battery must be installed in the fuselage and the propeller and spinner mounted in place to the gearbox when determining the correct Center of Gravity (CG) location.

The correct CG location for your ARF Rascal is located precisely at the main spar location. This means that when you place your fingers, one on each side of the bottom of the wing, at the main spar location, the airplane must balance in a level position. If the nose hangs low, the model is "nose heavy". If the tail hangs low, this means the model is "tail heavy". If either of these conditions exist, you must make adjustments to correct the problem. Never attempt to fly your model in an out of balance condition. Since the flight battery pack is the single heaviest component in the airplane, it can be used to adjust almost any tail heavy or nose heavy condition. This is simply done by positioning the battery pack either forward or rearward on the battery hatch, as needed. In the unlikely event this cannot correct the problem, then additional stick-on type lead weights may be needed. These are available from your local hobby shop.

PROPELLERS:

We have used and can recommend the APC 8 x 6E propeller for this airplane. This propeller comes with its own set of adapter rings, allowing it to fit perfectly onto the propeller shaft on the gearbox. You might want to experiment with different propellers as they can make a big difference in how your airplane flies. For best performance, always carefully balance your propellers.



Note that the propeller shaft adapter on the gearbox assembly is fitted with a 6-32 x 1/2" Allen head bolt. Some propellers with thicker hubs may require a bolt length longer than 1/2". In this case

you will need to purchase another 6-32 bolt with a length of 3/4" or 1" and cut it down to fit.

PRE-FLIGHT NOTES:

Be sure your flight battery packs are fully charged or that you take your 12-volt battery charger to the field with you. Also be sure that your transmitter is fully charged. We highly recommend that you perform a standard range check of your radio system - with and without the motor running. Any problems with your systems' range will not magically disappear at the flying field! Make very sure your propeller is balanced and that it has no nicks or cracks - never fly with a faulty propeller! Finally, take a few minutes to completely go over your model. Make sure that everything is secure and that nothing is loose. Satisfied? Let's go flying!

FLYING:

If you are new to the hobby/sport of flying R/C model airplanes, ***DO NOT*** attempt to fly this model by yourself! There are hundreds of AMA (Academy of Model Aeronautics) chartered R/C clubs in the U.S. The easiest way to find clubs in your area is by simply asking your local hobby retailer. AMA chartered clubs often have qualified instructors who can teach you how to fly and perhaps even test fly your model for you. If you are already an R/C pilot, then you will likely have no problems at all with the R/C Rascal.

Choose a calm day with little or no wind for the initial flights. This is important in getting the model properly trimmed. We also suggest that for the first few familiarization flights you or a flying buddy hand-launch the model. When hand-launching, the airplane must be launched straight and level directly into the wind, with the nose aimed at a point on the ground about 75' in front of you. *NEVER* launch the model with the nose pointed up or the wings tipped to one side or the other. The launch should be firm enough to achieve flight speed but not overly hard. Later, when you're more familiar with the airplane and how it flies, you can perform R.O.G. (Rise Off Ground) takeoffs from smooth surfaces.

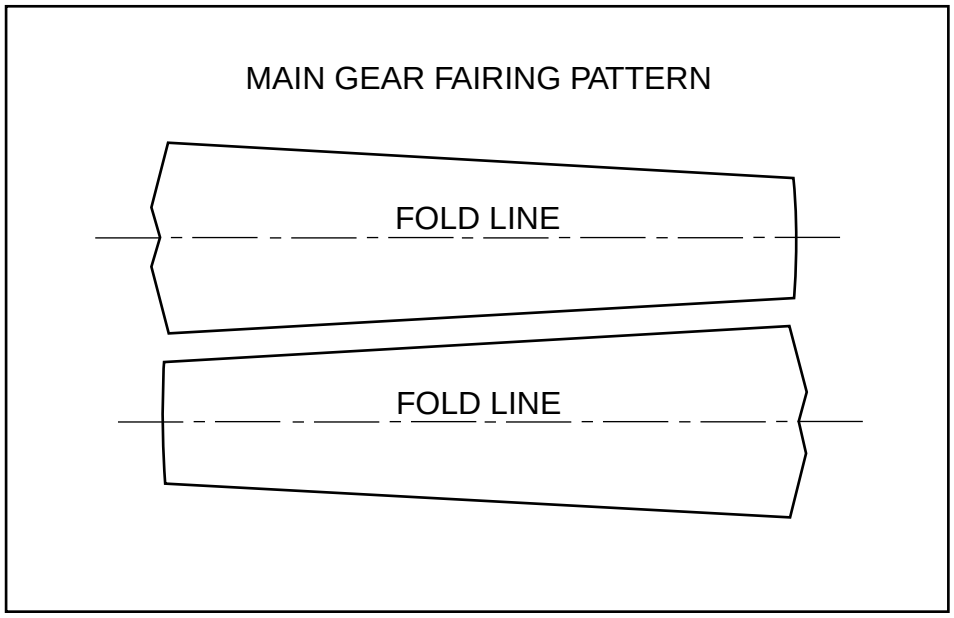
With a fully charged 7-cell battery pack, your Rascal ARF should climb out well at full power and you should have no problem getting to a comfortable trimming altitude quickly. At altitude, throttle back to a comfortable "cruising" speed and get familiar with the model at slower speeds. Take care of any trim requirements that might be needed and settle back to enjoy the flight! Now is the time to find out how the airplane reacts to control inputs. Properly set-up, with the CG in the right location, the airplane should be very comfortable to fly at the suggested initial control movements. Throttle all the way back, turning off the motor and check out the glide. It should be quite flat and fairly slow - perfect for hunting thermal lift! While still at altitude, with the motor off, test the stall characteristics of your airplane. The Rascal ARF should demonstrate a straightforward, shallow stall with almost instant recovery.

The Rascal ARF is capable of mild aerobatics. Loops, neat looking rudder rolls, and even inverted flight are within the airplanes' envelope. From experience, we can assure you that you will find those really low flybys a source of endless pleasure. The Rascal ARF is also capable of thermal soaring. Even though the color schemes offer great visibility, be careful of the altitude gain! This airplane can get small fairly quickly.

Landing the Rascal is a pleasure. Throttle back to achieve a shallow rate of descent, turn into the wind and allow the airplane to settle in smoothly to a 3-point landing. With just a little experience, you'll be landing the Rascal ARF right in front of you every time!

A final word of caution is in order. Never land your airplane in tall grass or weeds with the motor running. Always throttle completely back if you see that you may wind up landing in such terrain. Tall grass or weeds may tangle in your propeller and stall the motor if it is running. A stalled motor can overheat the ESC and batteries, causing them to fail. Fly smart and you'll fly for a long time!

IMPORTANT NOTE: *Although the Rascal ARF is classified as a "park flyer" and can be flown in fairly confined spaces by accomplished pilots, it should never be flown within five miles of an organized radio control aircraft flying site. This one simple precaution can prevent the loss of your model due to radio interference. Do yourself a favor and join your local R/C club - you'll almost always get assistance and good advice and you might even make a new friend or two!*



RASCAL ARF NOTES

TROUBLE SHOOTING CHART

PROBLEM	POSSIBLE CAUSE	REMEDIES
LACK OF POWER	1) BATTERY PACK NOT FULLY CHARGED 2) BAD CELL IN BATTERY PACK 3) GEARS TOO TIGHT 4) MOTOR BRUSHES WEARING OUT	1) DISCHARGE & RECHARGE BATTERY PACK 2) REPLACE CELL OR PACK 3) RE-SET GEAR LASH 4) REPLACE MOTOR
AIRPLANE "DIVES" IN POWER-OFF GLIDE	1) CENTER OF GRAVITY (C.G.) TOO_FAR FORWARD	1) REPOSITION BATTERY PACK A LITTLE FURTHER BACK 2) RE-CHECK C.G. LOCATION AND ADD STICK-ON WEIGHTS IF NEEDED
AIRPLANE STALLS IN POWER-OFF GLIDE	1) CENTER OF GRAVITY (C.G.) TOO FAR TO THE REAR	1) REPOSITION BATTERY PACK A LITTLE FURTHER FORWARD 2) RE-CHECK C.G. LOCATION, ADD STICK-ON WEIGHTS IF NEEDED
NOT ENOUGH CONTROL AUTHORITY	1) RUDDER AND/OR ELEVATORS NOT MOVING ENOUGH	1) INCREASE SERVO MOVEMENT THROUGH TRANSMITTER 2) PUT LARGER OUTPUT ARMS ON SERVOS & USE OUTER HOLE LOCATIONS 3) MOVE PUSHROD LINKAGE CONNECTIONS IN THE CONTROL HORNS IN TO THE NEXT CLOSEST HOLE
VIBRATION WHILE MOTOR IS RUNNING	1) PROPELLER OUT OF BALANCE 2) SOMETHING MAY BE LOOSE 3) PROPELLER SHAFT MAY BE BENT	1) BALANCE PROPELLER 2) REPLACE PROPELLER 3) CHECK AIRFRAME 4) REPLACE SHAFT AND/OR GEARBOX 5) CHECK MOTOR SHAFT

COMPLETE KIT PARTS LIST

Pre-Built Parts:

- ❑ 1 each Fuselage, Covered With Speed 400 Motor Mount Installed
- ❑ 1 each Battery Hatch, Covered
- ❑ 1 each Landing Gear Spreader, Covered
- ❑ 1 each Horizontal Stabilizer, Covered
- ❑ 1 each Elevator Set, Covered
- ❑ 1 each Vertical Fin, Covered
- ❑ 1 each Rudder, Covered
- ❑ 1 set Left & Right Wing Panels, Covered
- ❑ 1 each Wing Center Section, Covered
- ❑ 1 set Elevator & Rudder Control Horns
- ❑ 1 set Left & Right Tailwheel Pant Halves
- ❑ 1 set Left & Right Main Wheel Pants

Formed Wire Parts:

- ❑ 1 each Main Landing Gear Wire, .09" Diameter
- ❑ 1 each Tail Wheel Wire, .031 Diameter

Hardware:

- ❑ 6 each #2 x 3/8" Sheet Metal Screws - Battery Hatch 2, Motor Mounts 4
- ❑ 4 each #2 x 1/4" Sheet Metal Screws - Wheel Pant Mounting
- ❑ 2 each Braided Cable, .031" Dia. x 18" - Rudder & Elevator Pushrods
- ❑ 2 each Paper Clips - Cable Linkages
- ❑ 4 each Brass Tubing, 1/16" x 1/4" - Pushrod/Linkage Connectors

Molded Parts:

- ❑ 2 each Nylon Landing Gear Clips, 3/32" - Wheel Pant Attachment
- ❑ 1 each Nylon Wing Bolt, 4-40 x 1" - Rear Wing Hold-Down
- ❑ 1 each Spinner Kit, 1-1/2" Dia. White, With Adapter Rings
- ❑ 1 sheet Clear Plastic Molded Side Windows

Miscellaneous:

- ❑ 1 each Plywood Switch Mounting Plate
- ❑ 6 each CA Hinges - 2 For Rudder, 4 For Elevators
- ❑ 4 each White Self-Adhesive Strips, 1/4" x 10" - Wing Joint Covering
- ❑ 2 each Main Wheels, 1-3/4" Dia.
- ❑ 1 set Velcro Tape, 3/4" x 4-1/4" - Battery Pack Retention
- ❑ 1 sheet Card Stock Landing Gear Patterns/Fairings - Printed
- ❑ 1 each Instrument Panel, Printed
- ❑ 1 each Rascal Decal Set
- ❑ 1 each Assembly Manual

Power Package:

- ❑ 1 each Speed 400 Motor, 7.2 V
- ❑ 1 each Speed 400 Promax Gearbox, With 1 Propeller Shaft Adapter, 2 Mounting Bolts and Pinion Gear Set With 2:1, 2.5:1 & 3:1 Ratios
- ❑ 1 each SIG 20Amp Electronic Speed Controller (ESC) Pre-Soldered to Motor

WARNING! THIS IS NOT A TOY!

Flying machines of any form, either model-size or full-size, are not toys! Because of the speeds that airplanes must achieve in order to fly, they are capable of causing serious bodily harm and property damage if they crash. **IT IS YOUR RESPONSIBILITY AND YOURS ALONE** to assemble this model airplane correctly according to the plans and instructions, to ground test the finished model before each flight to make sure it is completely airworthy, and to always fly your model in a safe location and in a safe manner. The first test flights should only be made by an experienced R/C flyer, familiar with high performance R/C aircraft.

The governing body for radio-control model airplanes in the United States is the **ACADEMY OF MODEL AERONAUTICS,** commonly called the **AMA**. The **AMA SAFETY CODE** provides guidelines for the safe operation of R/C model airplanes. While AMA membership is not necessarily mandatory, it is required by most R/C flying clubs in the U.S. and provides you with important liability insurance in case your R/C model should ever cause serious property damage or personal injury to someone else. For more information, contact:

ACADEMY OF MODEL AERONAUTICS
5151 East Memorial Drive
Muncie, IN 47302
Telephone: (765) 287-1256

CUSTOMER SERVICE

SIG MANUFACTURING COMPANY, INC. is totally committed to your success in both assembling and flying the R/C RASCAL ARF kit. Should you encounter any problem building this kit or discover any missing or damaged parts, please feel free to contact us by mail or telephone.

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SIG MODELER'S ORDERLINE: 1-800-247-5008
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SIG MODELER'S HOTLINE: 1-641-623-0215
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SIG WEB SITE: www.sigmfg.com

LIMIT OF LIABILITY

The craftsmanship, attention to detail, and actions of the builder/flyer of this model airplane kit will ultimately determine the airworthiness, flight performance, and safety of the finished model. SIG MFG. CO.'s obligation shall be to replace those parts of the kit proven to be defective or missing. The user shall determine the suitability of the product for his or her intended use and shall assume all risk and liability in connection therewith.

SIG

RASCAL

ALMOST READY TO FLY