Assembly Manual

= ZAGI - 400 =

= ELECTRIC =

Wing Span	48"
Wing Area	2..833 sq. ft.
Airfoil	Zagi 999
Weight	19 oz.
Loading	5.7 oz/sq. ft.
Radio	3 channels w/mixer

Visit: www.Zagi.com Email: Zod@Zagi.com Voice: (310) 301-1614 Fax : (310) 822-7695

TRICK R/C Products LLC 938 Victoria Avenue Venice, California 90291

Recommendations and Notes

To avoid injury or damage to electronic speed control, Do not plug the battery into the speed control until all of the steps have been followed on page 14.

The ZAGI-400 is not a combat or bungie launch airplane. The design objectives were to make a rugged low cost, light weight electric flying wing.

Read the entire manual before beginning construction!

The target weight for the Zagi-400 is 19 oz. The airplane is designed to balance at 8" measured back from the nose. In order to achieve these two objectives, a speed 400 motor, micro servos, and a 500 mAh 7 or 8 cell battery pack must be used. Any modifications, reinforcements or substitutions not described in this manual must be considered carefully to maintain the correct weight and balance. If all of the procedures in this manual are followed, the Zagi-400 will not need nose weight.

A separate battery is not required for the receiver and servos. They are powered by the 500 mAh battery through the Electronic Speed Control (ESC) which contains the Battery Elimination Circuit (BEC). When the motor drains the battery there is still sufficient power to control the plane.

Larger radio components are not recommended.

The manufacturer did not test any covering materials such as UltraCote, MonoKote, Solarfilm, or any other iron-on materials. If an alternate covering material is chosen, test a patch on the beds first. Lower heat will be necessary when covering the 1# white foam.

Do not cut into any part of the leading edge foam for the radio installation or nose weight.

Do not use polyester resin, solvents, or solvent-based paint on either type of foam.

Tools and materials needed:

Optional - a roll of contrasting color poly tape (see text)
90 degree square
Sanding block
150 to 320 grit sandpaper
X-Acto knife or Dremel
Round pencil or ball-point pen
Spray adhesive (3M Super 77 or similar)
3/4" fiber filament tape (2" filament tape optional - see text)
Soldering iron

The ZAGI-400 <u>Complete Kit</u> Electric Wing Kit contents:

2	Expanded polypropylene (EPP) leading edges laminated to 1# white foam wing panels and beds
2	Pre-cut balsa elevons
2	24'' strips of 1'' x 3 mil paper backed Mylar hinge tape
1	Roll 2.2 mil color poly tape
2	Control horns with 4 screws
2	Threaded 2 X 56 push rods
2	Threaded 2 X 56 clevises
2	Die-cut clear plastic winglets
1	Molded motor mount and battery tray
1	Molded canopy
1	Speed 400 motor and prop
1	Zagi 20 Electronic Speed Control (ESC) with Battery Eliminator Circuit (BEC)
1	7 or 8 cell 500 mAh battery with Deans Ultra plug
2	Tie wraps to secure motor
4	Velcro strips for canopy and battery hold down
1	Deans Ultra plug with red and black leads (for charging the battery)

Needed Components:

1	Mini or micro receiver with crystal for your transmitter channel Suggestions: Hitec 555 or comparable
2	Mini or micro servos. Suggestions: Hitec HS-81 or HS-85BB; Cirrus CS-20 series, CS-30, or comparable. Servos are available with metal gears (HS-81MG), providing added protecion from gears stripping on hard impact.

(See Figure 1) Separate the top and bottom beds from the wing cores. Lightly block sand the wing panels (cores) with #150 or #320 grit sandpaper and round the leading edge (LE).

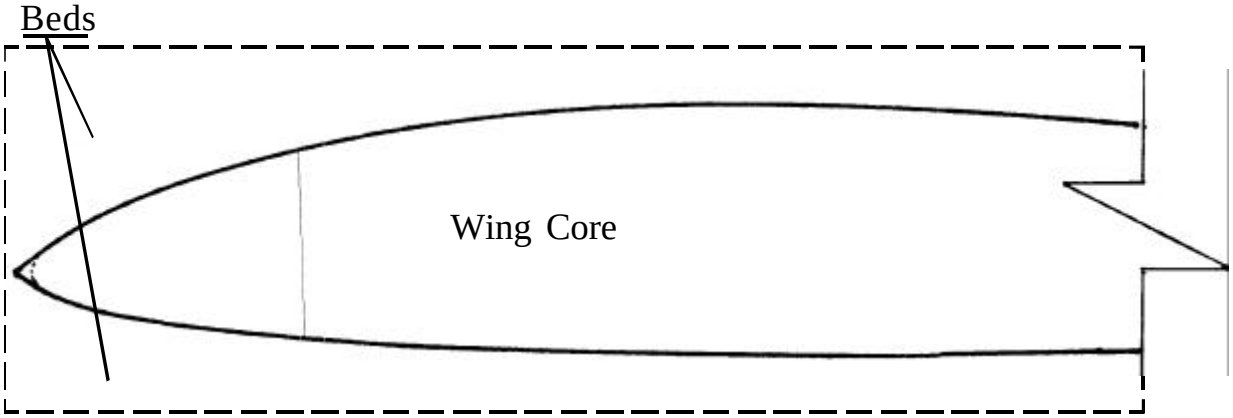

Figure 1

Layout the bottom beds on a flat surface. Tape them together. Repeat for top beds. Align the cores together on the bottom bed. Spray the root end of the wing cores with #77 spray adhesive. Put a piece of clear wrap or wax paper between the beds and the cores to prevent sticking. Let the adhesive dry for 10 minutes. Put the wing cores together using beds as a jig.

(See Figure 2) Measure 12" from the nose along the center line and make a mark. Use a square to measure 2 1/2'' on both sides of the center line. Mark the 5" line and make two lines parallel to the center line from the ends of the line to the trailing edge (TE). Cut along the lines and remove the foam.

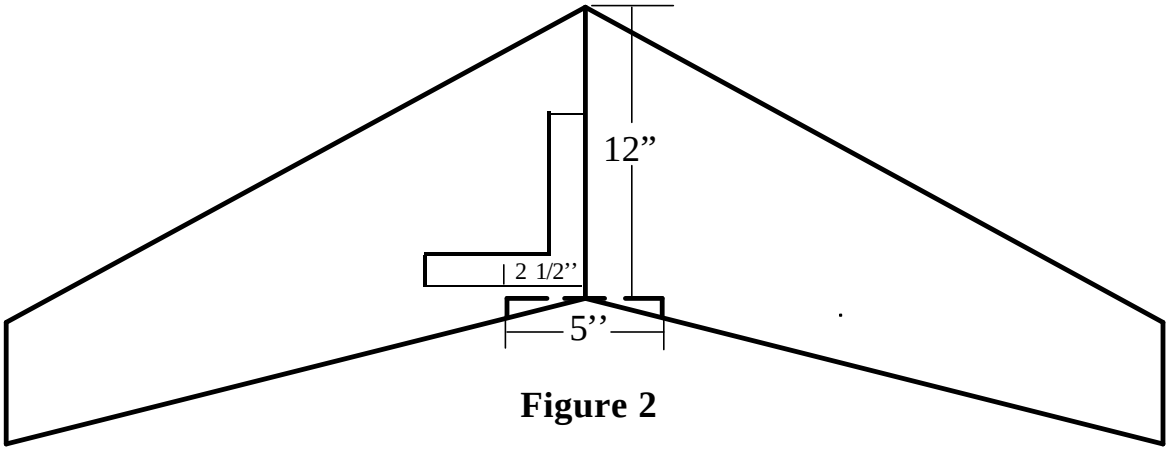

Figure 2

Optional Procedure

A smooth finish can be obtained using light weight spackling with a minor weight penalty. Apply the spackling to the 1# foam only and not on the EPP leading edge. Apply a thin coat of lightweight spackling with a 4 inch wide squeegee. Let the spackling dry. Sand to a smooth finish with 320 grit sandpaper.

Vacuum the dust from the cores, beds and the work bench. Lay the wing in the beds top-side up. Apply a light coat of 3M Super 77 spray adhesive to cover the top of the entire wing. Allow the adhesive spray to dry at least 30 minutes. Repeat this procedure on the other side.

The fiber tape schedule described in Figure 3 is intended for aerobatics and thermal applications. If the tasks for the Zagi-400 will include high-speed dives, the fiber tape must be increased to three side-by-side strips instead of only one or use 2" fiber tape. The two-inch tape I used increased the flying weight by ½ ounce.

(See Figure 3) Lay the wing top-side up in the bottom beds. Apply a strip of 3/4'' fiber filament tape along the trailing edge between the wing tip and the prop cutout. Apply another strip to the trailing edge to extend to the opposite leading edge. Apply two spanwise strips of tape at the motor tray cutout extending to the leading edge on both sides. Apply another two spanwise strips of 3/4'' fiber tape in the center of the wing 4'' from the motor tray cutout. Apply two strips of fiber tape diagonally from the nose to the outboard tip of the trailing edge. Lay the wing bottom-side up in the top beds and repeat the same taping procedure on the bottom side.

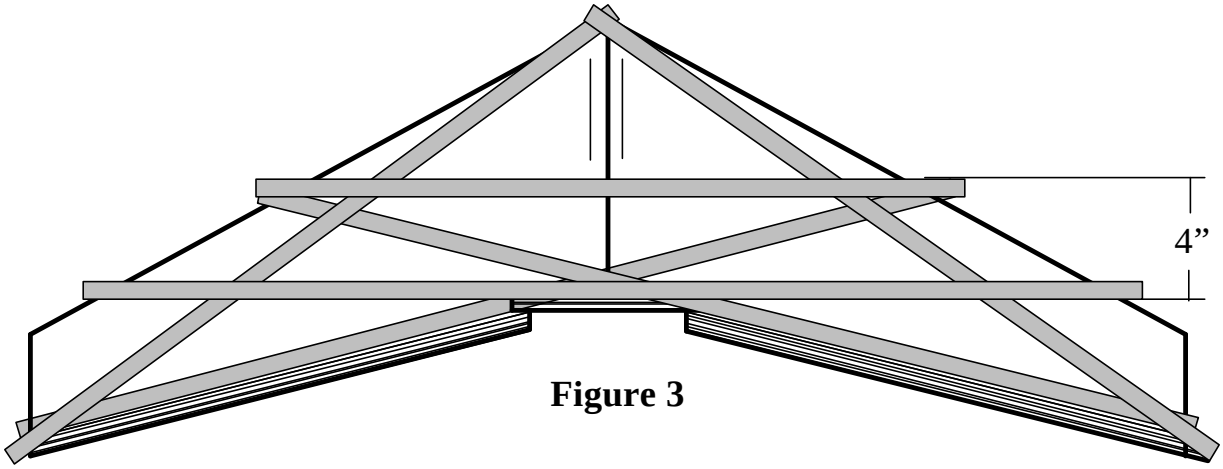

Figure 3

(See Figure 4) Lay the wing in the top bed bottom-side up. Start the tape covering at the trailing edge (TE) of the wing by wrapping a strip of color tape around the TE being careful to follow the shape. Working from the TE forward, lay strips of tape from tip to **at least 4 inches past center**. Overlap the tape only 1/4" all the way from the center to the tip. Cut the tape to match the angle of the leading edge. Place the wing top-side up in the bottom bed and repeat the taping procedure working from TE forward to the LE. Finish the leading edge with a single spanwise piece of tape wrapped around the LE.

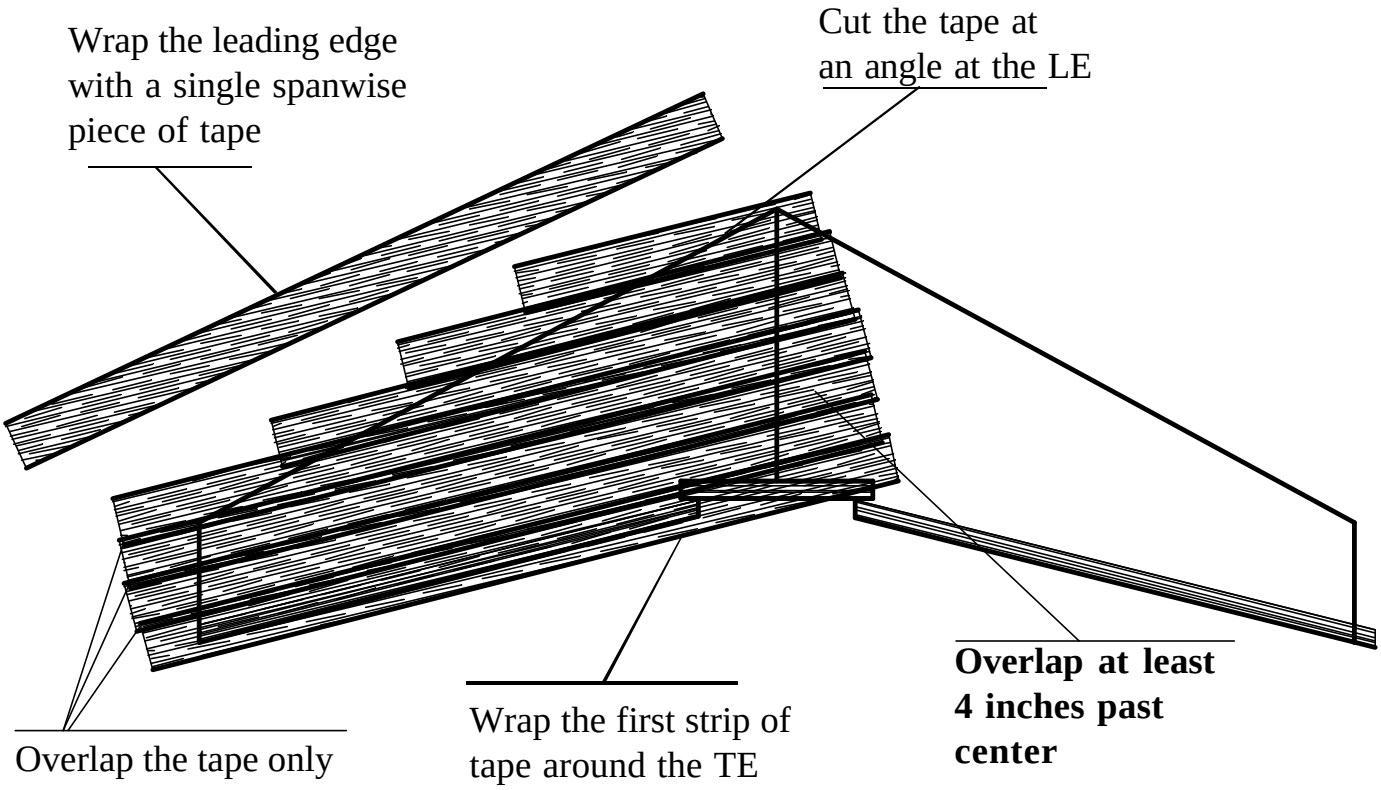

Figure 4

(See Figure 5) Hold the elevons together and sand them until they are identical. Trim the outboard end to match the angle of the wing tip. Trim the inboard end of the elevon to match the angle of the motor cut-out. Make the elevons about 1/16" shorter than the wing tip to make sure the elevons don't rub against the winglets after they are installed.

(See Figure 5A) Round the top of the trailing edge of the elevon. Sand a 45° angle into the front of the elevon.

Spray the elevons with any spray enamel. Primer works well. Apply a light coat of paint and immediately wipe it with a cloth before it soaks in and dries. Let the paint dry and repeat the procedure one more time.

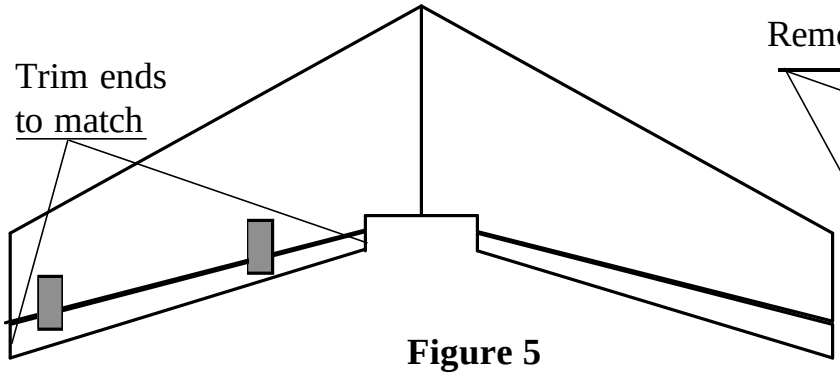

Figure 5

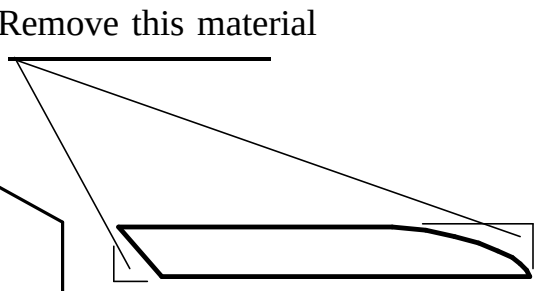

Figure 5A

(**See Figure 6)** Make sure that the paint is dry. Position the elevon on the trailing edge of the wing with small pieces of masking tape on the bottom side. Move the elevon to check for binding. Peel the paper backing from the 1" x 3 mil Mylar hinge tape. On the top side, align the hinge tape by holding the peeled paper over the seam. Secure the elevon by pressing the hinge tape in place at one end. Press the hinge tape down along the length of the elevon. Remove the masking tape. Make a tape hinge the full length on the top side of both elevons.

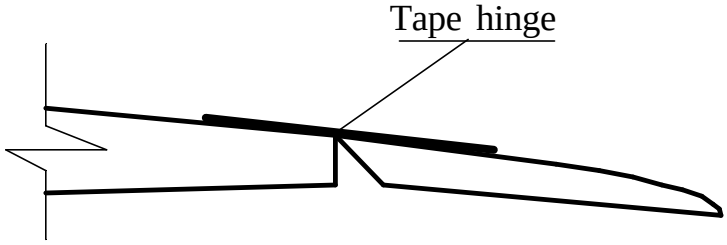

Figure 6

(See Figure 7) The control rods may not fit in the servo control arm. The end of the control rod can be filed to fit in the servo control arm or the top hole in the servo control arms can be reamed by spinning an X-acto #11 blade in the hole or drilling with a #48 drill (.076”). Attach control rods to the servo control arms with a Z-bend. (NOTE: Z-bend pliers may be purchased from your local hobby store to make this operation easier). Position the control horns on the elevon directly behind the servo control arm close to the hinged edge but be sure the control horn and screw plate do not interfere with the movement of the elevon. Mark the position of the control horns. Drill two holes. Install the control horns on the elevons. Note that the two screws will self thread into the plastic screw plate. Attach the control rods to the top hole of the servo control arms. Attach the clevises to the control horns. It may be necessary to put a slight bend in the control rod about 1 inch from the servo to prevent hitting the wing. Beginning flyers put the clevis on the 1st or 2nd hole from the top of the control horn for less response. Experienced flyers put the clevis in the 3rd or 4th hole from the top for more response.

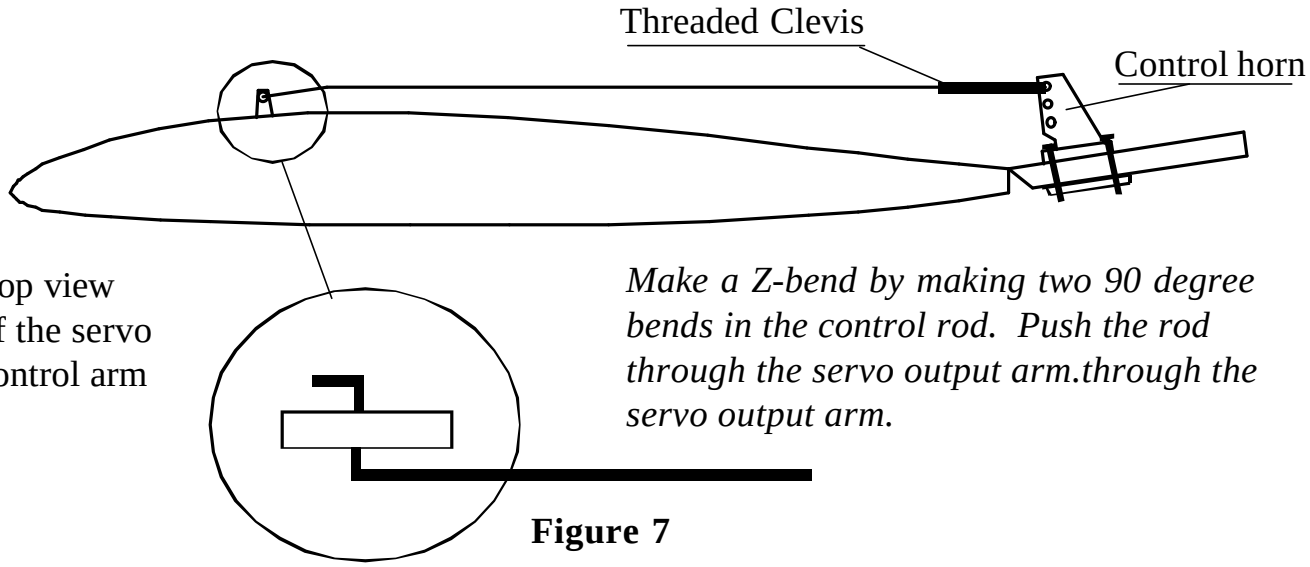

Figure 7

(See Figure 8) Position the servos on the pre-marked servo positions. Outline the exact shape. Cut or router the foam to provide a snug flush fit. Wood shims can be used to assure a tight fit. Position the receiver 6 1/4" back from the nose. Position the receiver so that the input slots align with the centerline of the wing. Outline the exact shape. Cut or router the foam to provide a snug flush fit. A separate bay can be made next to the receiver bay to hold a separate mixer. Cut the bay wider so that the mixer and all of the plugs and extra wires fit underneath.

Draw a line perpendicular to the center line from each servo wire to about 1/4" from the center line of the wing. Continue the lines parallel to the center line down to the receiver. Make a 1/2" deep cut along the lines. Push the servo wires into the slot with a flat blade screwdriver. Plug the servo leads into the appropriate receiver output slot, typically the right servo in slot 1 and the left servo in slot 2. The extra servo wires can be stowed under the motor mount tray.

Trim the motor tray with scissors along the cut line. Notice that the cut line is the impression 1/2" from the side rails of the compartments. Leave the vertical lip at the rear of the motor. Position the motor tray over the center of the wing. Trim the vertical lip at the rear of the motor tray to be flush with the bottom of the wing. Check the receiver position. Make a cut-out in the rear bay of the motor tray to provide access to the input slots of the receiver. Mark the antenna layout. Draw a line to the leading edge seam. Continue the line spanwise to the wing tip. Cut a 1/4" slot along the line. Push the antenna into the slot with a flat blade screwdriver. The antenna will extend beyond the tip.

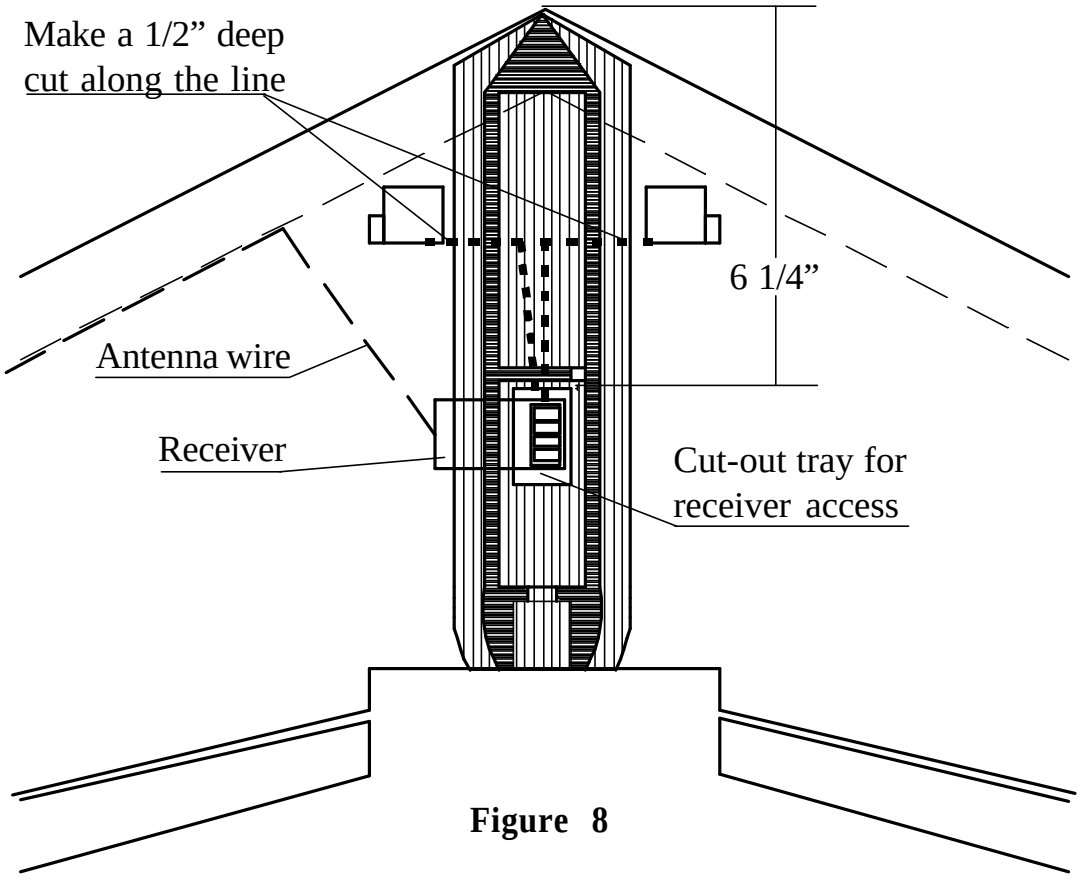

Figure 8

(Figure 9) Trim the canopy along the cut line. The canopy cut lines are more visible when viewed from the inside. Remove the rear wall of the canopy. Cut out the oval shaped flat surface to make a vent for motor cooling on the canopy.

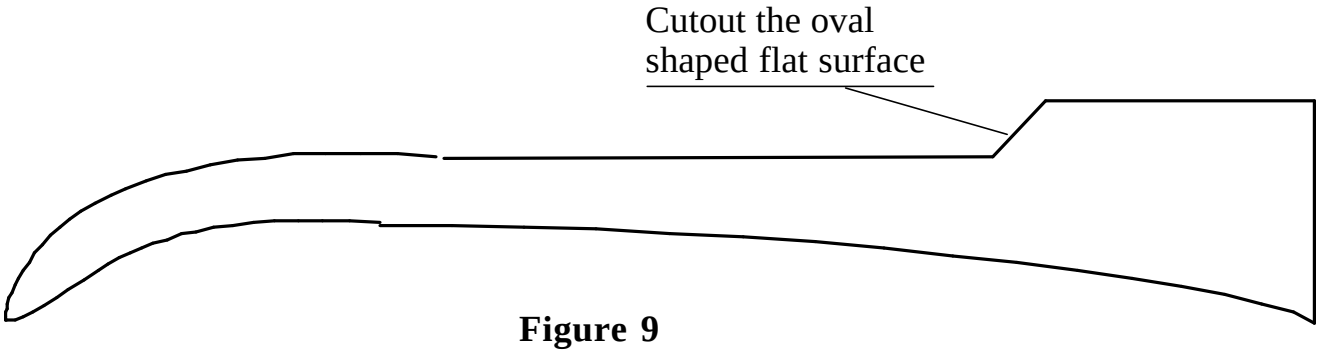

Figure 9

(See Figure 10) The Zagi-20 ESC (Electronic Speed Control) is provided in the kit. The red and black pair of wires with the red male Deans Ultra connector plugs into the battery. The red and blue pair of wires with the separate spade connectors plug into the motor. The Zagi-400 uses a pusher configuration which requires a reverse rotation motor. Reversing the rotation of the motor is achieved by reversing the polarity to the motor. Look at the flat surface on the back of the motor. Observe the red dot next to one of the motor terminals. For a positive connection, solder the spade connectors to the motor terminals, the blue wire on the terminal next to the red dot. The third set of wires is the three wire ribbon lead with the universal RX servo connector. This RX connector goes to slot in the receiver to control motor speed. The three wire ribbon connector will provide power for the receiver and servos. No other receiver battery is necessary. The universal connector will work with all radios except the old Airtronics. The red and black wires must be reversed in the plastic housing of the universal receiver plug to change to the old Airtronics system.

Make a strain relief to protect the ESC wires from damage on impact. Tether the Deans connector on the ESC to the motor wire tie with a length of dental floss. The tether will unplug the battery on impact rather than pulling wires out of the ESC. **Caution: The speed control turns on when the battery is plugged in. Attach the red and blue wires to the motor before the ESC is plugged into the battery. The prop SHOULD NOT be installed on the motor at this time.**

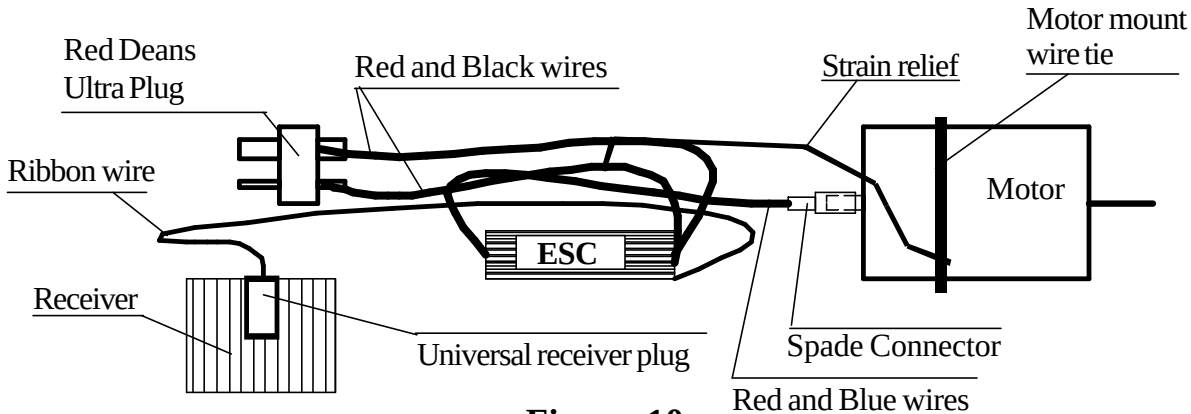

Figure 10

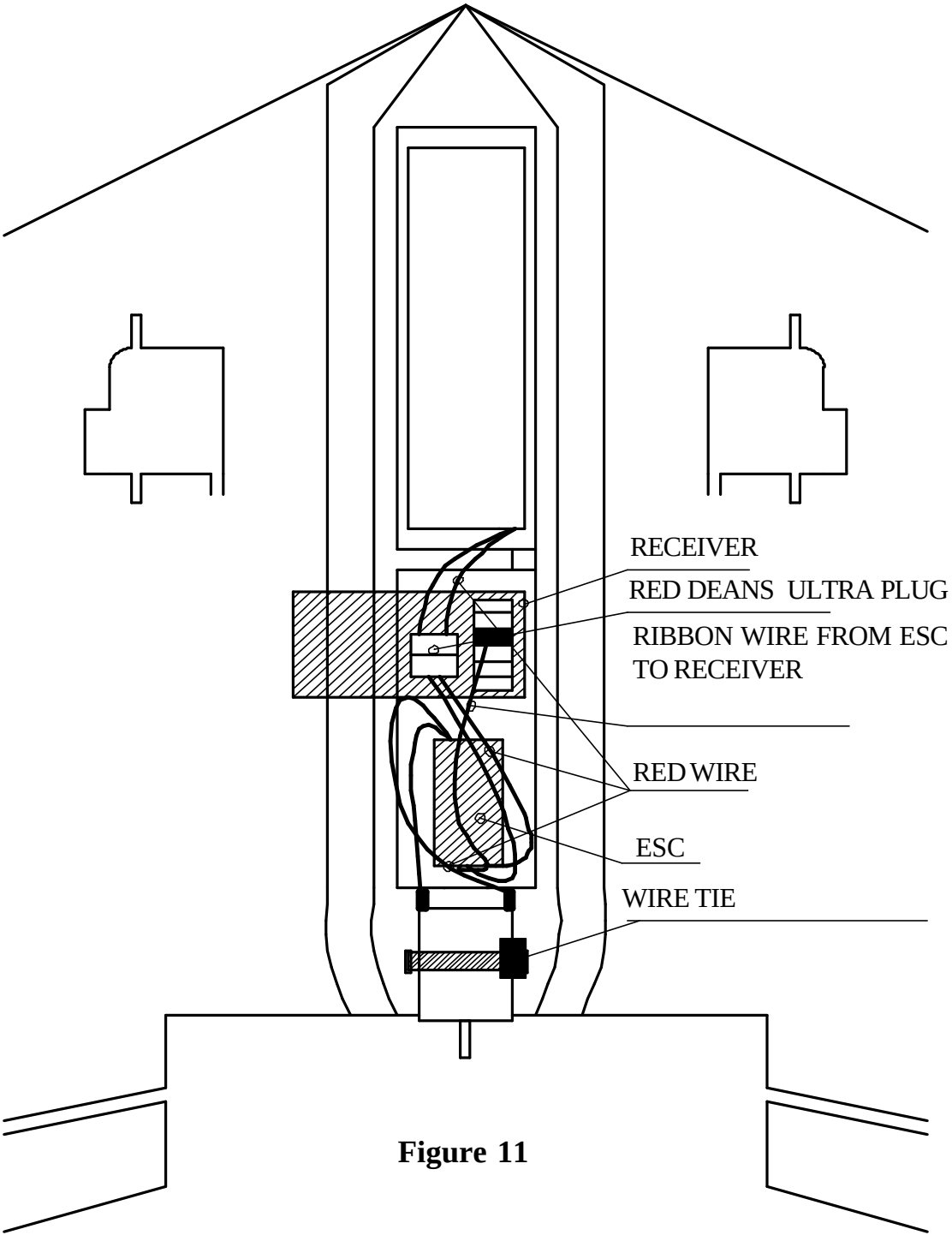

Figure 11

(See Figure 11) Attach the motor to the tray with a tie wrap. Locate the dimples on the rails on either side of the motor mount. Spin an X-acto blade in the dimples to make a hole. Elongate the holes to fit the wire tie. Push the wire tie through from the top of the tray. Wrap the wire tie under the motor tray and through the hole on the opposite side. Set the motor in the motor mount and push it back against the stop. Thread the wire tie and pull it tight. Hold the tail of the wire tie with pliers and give it a good strong tug. Trim the tail off of the wire tie. Slide the wire tie connection to the side of the motor.

(See Figure 12) Align the motor tray with the nose. Make sure that the motor tray is centered over the center line at the trailing edge. Attach the motor tray with a strip of fiber tape on each side. Cover the servos with strips of color tape.

(See Figure 12) Peel the protective paper off of the hook side of two 1" squares of Velcro. Stick the strips to the battery 1/2 inch from each end. Press the loop side to the hook side and peel the paper. Press the battery in place with the sticky side down.

(See Figure 12) Cut the two 1" square Velcro pieces into four 1/2" x 1" pieces. Stick the hook side of one of the strips of Velcro to the nose of the motor tray. Stick the hook side of one of the strips of Velcro to either side of the back of the motor tray. Put the loop side of the Velcro loop side down on the hook side. Peel the paper off of the loop side. Place the canopy over the motor tray, nose first. Spread the back end of the canopy and lower it onto the motor tray.

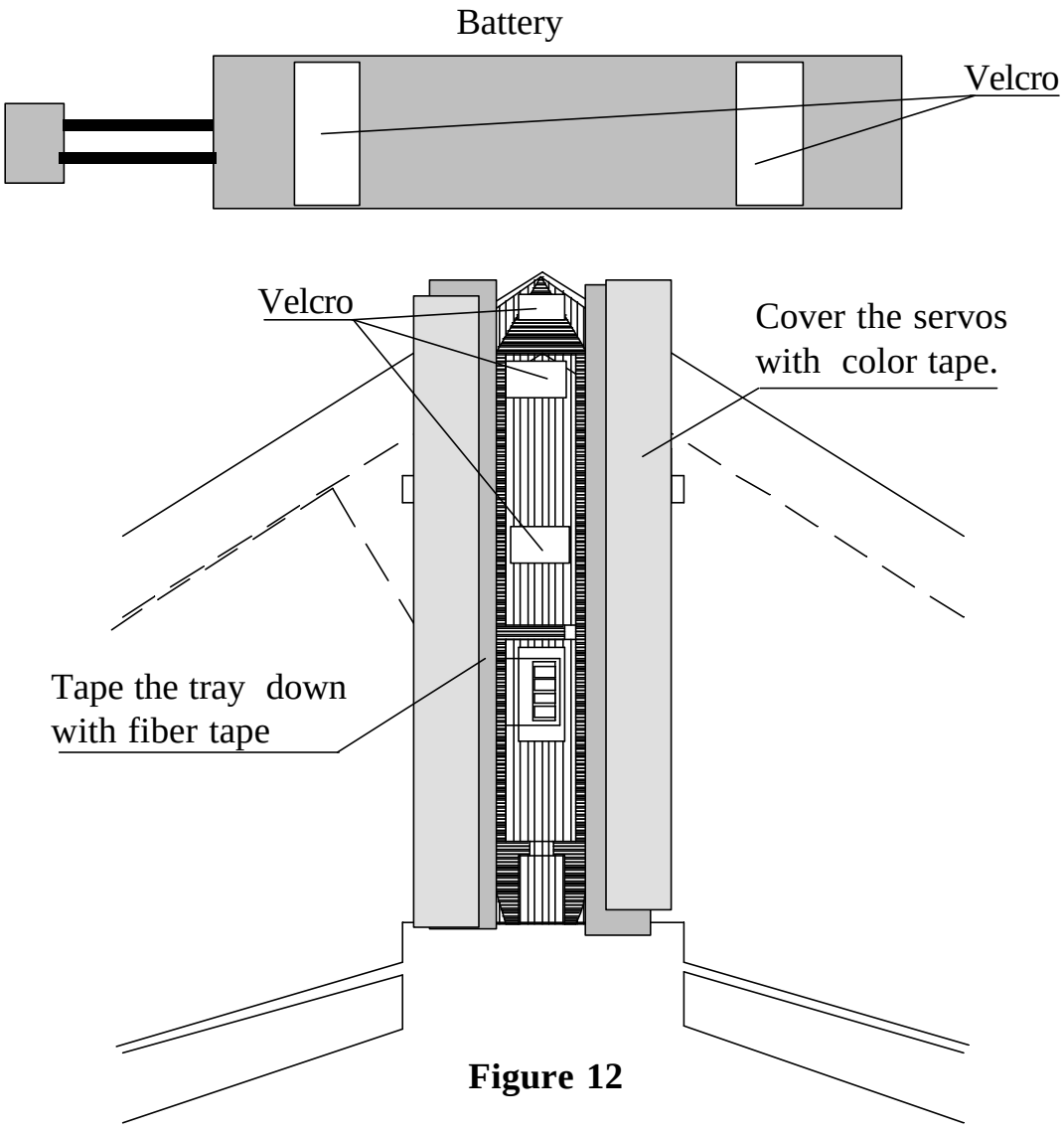

Figure 12

(See Figure 13) Punch-out and separate the two nested clear winglets. Punch-out the 1 1/4" x 1/4" slot in the winglet**.**

(See Figure 14) Put a piece of fiber filament tape through the slot to the top of the wing and wrap it around to the bottom of the wing. Add two more pieces of tape to secure the winglet in place. Make sure that the elevon will not bind against the winglet as it moves.

The winglets are at the very back of the airframe so they will seriously impact the balance of the plane. The tape method of fastening is both light and strong. If a different winglet fastening system is preferred, keep the weight down to the weight of three short strips of tape.

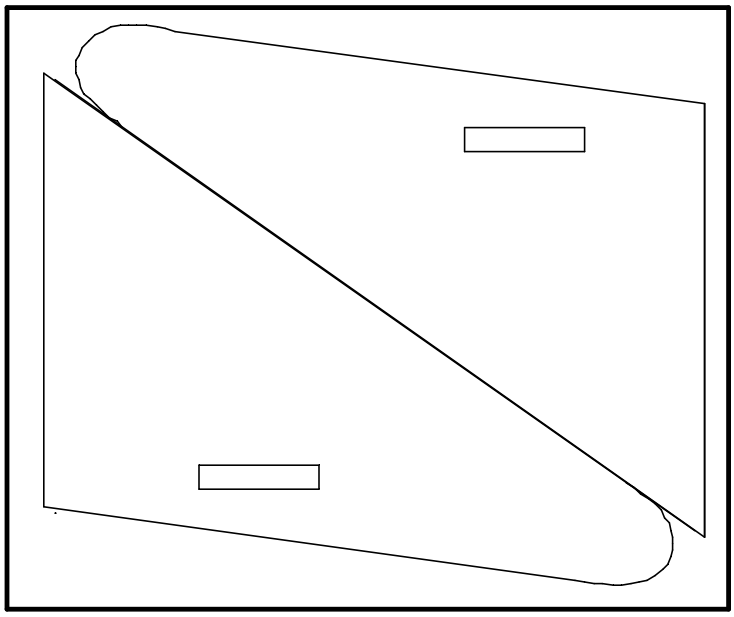

Figure 13

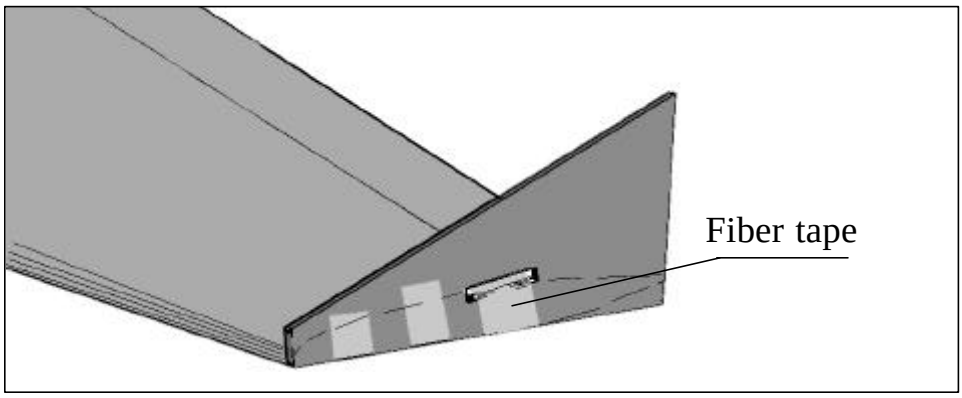

Figure 14

(See Figure 15) Lay wing bottom-side-up. Using a square, mark the CG by making a line perpendicular to the center line 8" back from the nose on both panels. Tape a 1/4" dowel directly over the CG line. A round pencil or ball-point pen can be used. Place the wing right-side-up on a flat surface. Balance is achieved when the wing balances momentarily on the pencil. Add lead nose weight under the battery tray if necessary to achieve balance.

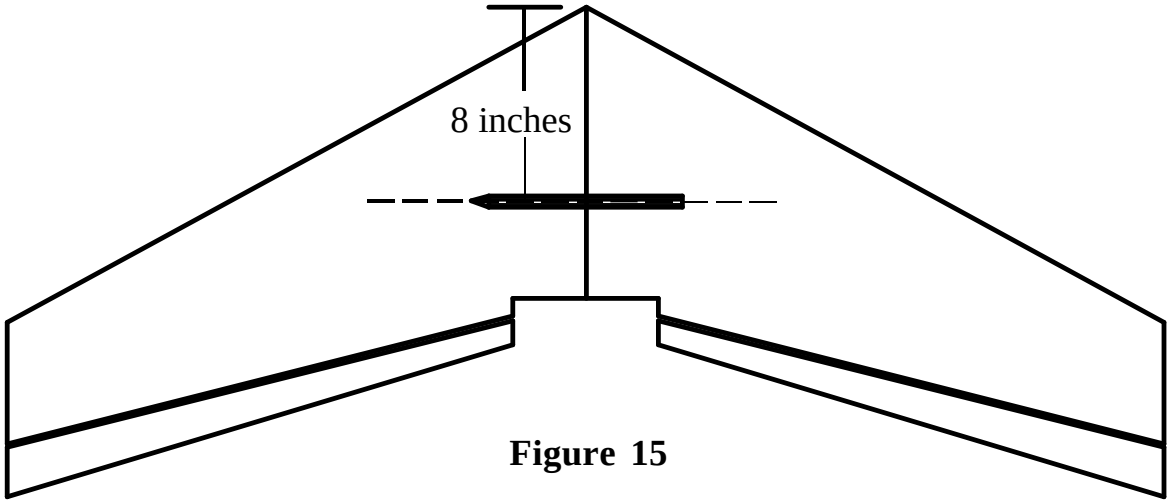

Figure 15

(See Figure 16) With the TX on and the battery plugged in, set the elevon neutral setting by laying a straight edge under the wing at the trailing edge. The elevons should appear to have 2 or 3 degrees of reflex (up elevator).

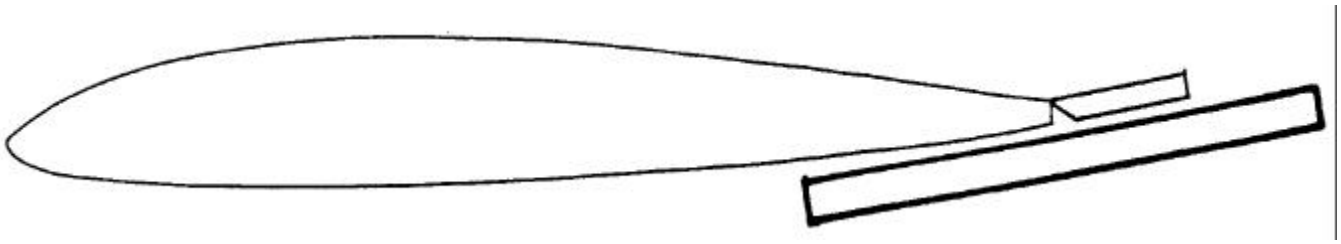

Figure 16

Set the trim and throw. Move the transmitter aileron stick from full right to full left (not up or down). The elevon throw should be 3/8" in each direction measured 1" from the tip (no differential) When moving the elevator stick full up to full down, the throw should be 3/8" in each direction.

Reverse the prop. The prop must be reversed to operate in the reverse direction. The raised lettering on the propeller blades should be on the spinner side. Remove the spinner and hub. Hold the prop by the blades spinner side up. Press it on a flat surface. Grip the spinner and gently twist and pull the hub from the prop. Reverse the prop and replace the hub so that the raised lettering is on the spinner side of the prop, outside and away from the motor.

First time motor power-up

The following steps are provided for a safe first time power-up of the motor. Do not press the prop onto the motor shaft yet. Test the motor hook-up before the prop is installed. Make sure that the battery is charged. The batteries are not shipped with a charge.

SANYO RECOMMENDS CHARGING THE N-500A CELL AT A RATE UP TO 500 MA FOR THE LONGEST BATTERY LIFE. 500 MA WILL CHARGE THE 7 OR 8 CELL BATTERY IN ONE HOUR. AT THE RISK OF A SHORTER BATTERY LIFE, SOME MODELERS REGULARLY CHARGE THEM FOR 30 MINUTES AT 1 AMP. IF THIS CHARGE RATE IS UNSATISFACTORY, YOU NEED N-500AR CELLS. N-500AR CELLS WILL CHARGE IN 15 MINUTES AT A RATE OF 2 AMPS.

1. Make sure that the motor is seated against the forward stop and securely attached to the motor mount.

2. Make sure that the reverse switch for the motor stick on the transmitter is in the normal position. Not reversed!

3. Push the motor control stick on the transmitter to the full down position.

4. Push the motor control stick trim lever (next to the motor stick) to the full down position.

5. Turn the transmitter power on. Check the output meter for battery condition.

6. Secure the charged battery in place with the Velcro tabs.

7. Plug the ESC JR connector into the motor slot of the receiver, typically slot 3.

8. Position yourself with the nose of the airplane pointed at you. Plug the battery into the speed control.

9. Check that the red LED on the ESC circuit board is on.

10. Move the trim lever for the motor control stick slowly upward to the center position. The motor should not move.

11. Move the motor control stick slowly upward. The motor should run faster the further up the stick is moved. The motor should turn counter clockwise when observed from the front.

12. Unplug the battery from the speed control. Press the prop onto the motor shaft. Make sure you seat the adapter on the shaft fully. This may take quite a bit of force. To make sure you know how far to push, put a pin in the adapter hole, and mark the pin with the depth. Compare that marked pin to the motor shaft. This will give you an idea of how far to push. Rotate the prop to make sure it is clear of any obstructions.

Preflight check and glide test

Do a preflight check before every flight. Always turn the transmitter power on before the motor battery in the airplane is plugged in (and un-plug the battery before turning off the TX). Make sure that the motor control stick is in the full down position. Make sure that the controls are working properly. Check the trim levers on the transmitter. Pull the control stick back and observe that both elevons move upward. Push the control stick to the right and observe the right elevon moves up and the left elevon moves down. Hold the Zagi-400 securely by the nose. Move the throttle stick to the half throttle position momentarily. The first glide test should be done on flat land in a light breeze. The Zagi-400 should be held by the nose with your palm up over your head and your thumb wrapped around to the top. **(See figure 17)** Hold the Zagi-400 over your head with the nose pointed straight ahead. Run slowly into the wind. Give it a gentle push STRAIGHT AHEAD. Do not point the nose upward. Correct the flight path with the radio control stick. The test is successful when the Zagi-400 flies straight ahead with a slow sink rate to a sliding landing. If the Zagi-400 turns in either direction after the launch, compensate by adding 2 or 3 clicks of trim in the opposite direction with the trim lever below or next to the control stick. If the Zagi-400 pitches up and immediately dives, add 2 or 3 clicks of down trim. Repeat the glide test until the Zagi-400 flies straight ahead with a slow sink rate to a sliding landing. Increase the launch speed each time to provide longer control flights.

First flight

IMPORTANT: Please check the frequencies (channel number) of all pilots at your site before turning on your transmitter. Turning on your transmitter with the same channel number as someone who is flying will certainly cause his plane to crash.

CAUTION: While the Zagi-400 is made of foam, traveling at a high rate of speed can cause considerable damage to someone or something if a collision occurs. Please exercise caution while flying. It is recommended that you join the Academy of Model Aeronautics (AMA) (1-800-435-9262) to provide insurance, awareness of safe flying practices, and knowledge of what's going on in the modeling field.

At some flying sites it is mandatory that you be a member of the AMA.

Do not launch the Zagi-400 with the motor running. Hold the Zagi-400 by the nose with your palm up over your head and your thumb wrapped around to the top. **(See Figure 17)** Take a step or two forward and give the Zagi-400 a good strong throw into the wind. A follow through with a little finger tip will increase the launch speed. Slide the throttle stick to the full forward position when the Zagi-400 is a comfortable distance from the ground. Get some altitude and experiment with some throttle settings. Full motor is fun but will use up the battery quickly. It is recommended that beginners fly at quarter throttle until stick sensitivity is developed. Good luck.

JT

Rev 09/01/01

Throwing the Zagi-400

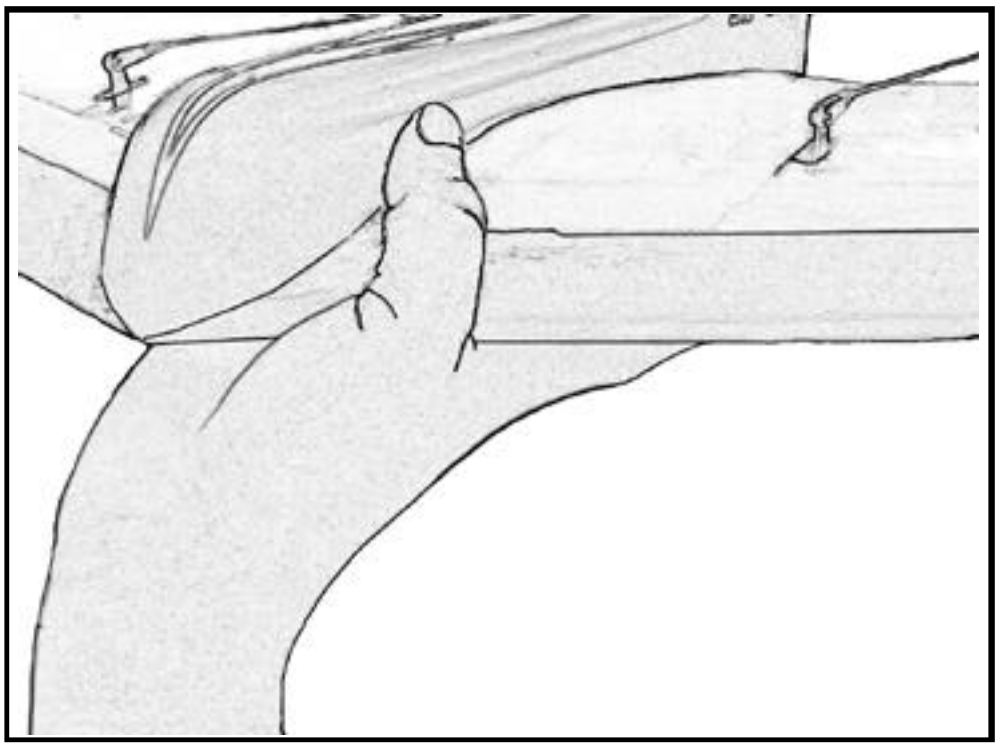

Figure 17

Hold the Zagi-400 by the nose with your palm up over your head and your thumb wrapped around to the top. The secret to this launch is the energy you exert with your fingers in the follow through.

Trick R/C guarantees this kit to be free from defects in both workmanship and material at the date of purchase. This does not cover any components or parts damaged by use, misuse or modification. In no case shall Trick R/C's liability exceed the original price of the purchased kit.

Since Trick R/C has no control over the final assembly, no liability shall be assumed for any damage resulting from the use by the user of the final user-assembled product. By the act of using the final user-assembled product, the user accepts all resulting liability.

Tech Support (310) 827-2288

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