LASER 2000

ARF

ASSEMBLY MANUAL

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Warranty: Kangke Industrial USA Inc. guarantees the kit to be free of defects in both material and workmanship at the date of purchase. This warranty does not cover any parts damaged by use or modifications. In no case shall Kangke Industrial's liability exceed the purchase cost of this kit. Since Kangke Industrial has no control of final assembly and material used by user for final assembly, no liability shall be assumed or accepted for any damage resulting from the use by user of final user-assembled products. This kit has been flight test for normal use. If the plane will be used for extremely high stress flying, the modeler is responsible for reinforcing the high stress points. Inspect this kit immediately after receiving it, report any missing and damaged parts within 10 business days otherwise the claim may be denied.

Congratulations!

The LASER 2000 is one of the finest ARF high performance models available. Originally designed as a competition aircraft, It has proven itself time and time again in the winner circle. All the great flying characteristics have been retained, along with all the special design features of a full bread competitor. The tail surfaces are removable for shipping. The flying wires are functional. Several servo and engine options are available to suit you personal needs and the highest quality hardware available has been included. When properly assembled if can perform anything in the current realm of I.M.A.C or T.O.C high Alfa maneuvers.

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 this size and weight 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 yours 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.

Enjoy this aircraft, you may never find one that flies better!

Specifications:	
Length	**70 in.**
Wing span	**87 in.**
Wing area wet in.	**1204 sq.**
Surface area in.	**1421 sq.**
Weight	**16-18 lbs.**
Wing load	**27-29 oz.**
Engine	**2.4-3.2**
C.I. Gas	

Kit Contents:	
Fuselage	**1**
Wing panel	**1**
Ailerons	**2**
Cowling	**1**
Canopy	**1**
Main gear	**1**
Stabilizer	**1**
Elevator half	**2**
Rudder	**1**
Fin	**1**
Servo mount	**1**
Fuel tank	**1**
Wheels	**2**
Tail wheel	**1**
Control horns	**6**
Control rods	**6**
Hardware pack	**1**
Wheel pants	**2**
Set flying wires	**1**
Wing tube	**1**

The following items will also be needed to assemble your LASER 2000:

Hobby Items:
30-min. epoxy
Hobby Knife
4-6channel radio
Gas line
5 heavy duty servos
Engine
Med. CA 1-oz.
Muffler

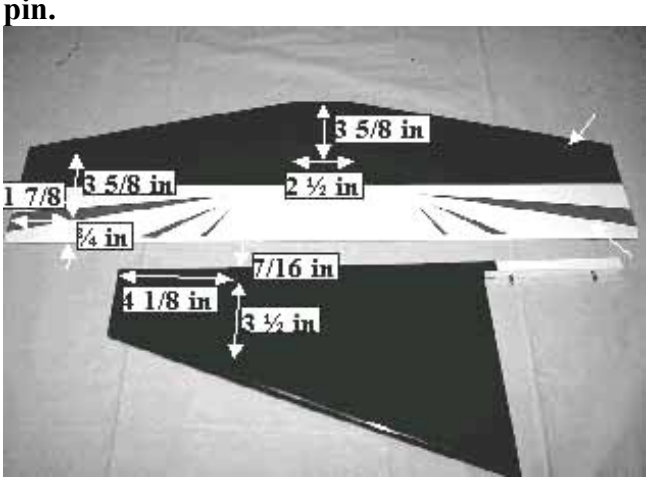
Household Items:
Paper towels
Alcohol
Popsicle sticks
Felt tip pen
Screwdrivers
Wax paper
Pliers
String

If you are familiar with the assembly of ARF type aircraft, you will find the assembly sequence to seem out of order. This is because of some of the unusual features of a competition airframe. Please follow the sequence as written. The Laser 2000 will take 20-25 hours to complete.

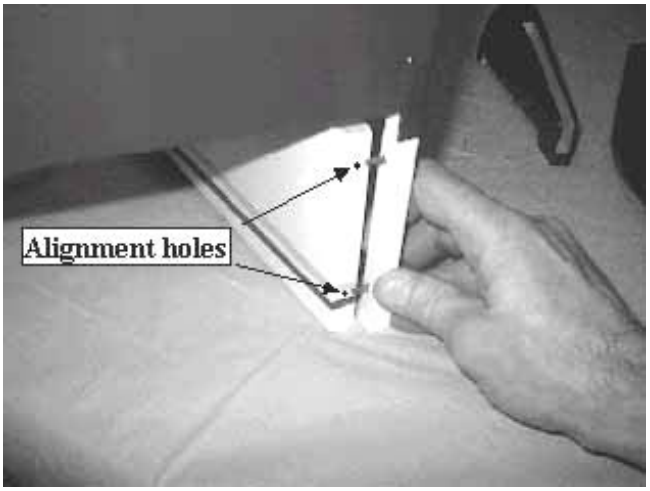
Read each step of the assembly carefully. Be sure you understand what is required for each procedure before you glue of cut anything. How well you assemble this model will have a direct effect on its flight characteristics. Do not omit any steps. Take your time and enjoy the building process.

ASSEMBLY

Because the tail section is removable, the flying wires are functional. Locate the pre-drilled holes in the fin and stabilizer for the flying wires attach brackets. The holes are small and difficult to find. They must be opened with a pin.



Use the rudderpost to locate the alignment holes in the rear of the fuselage. Open the holes.



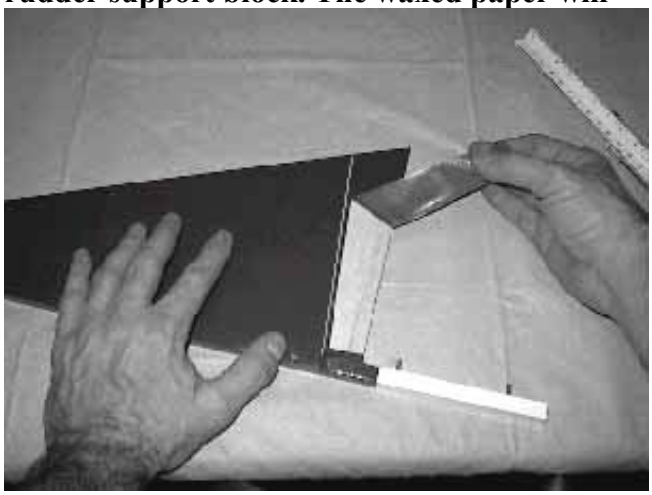
Assemble the tail as shown with a piece of waxed paper between the stabilizer and the rudder support block. Install the stabilizer hold down screws for alignment, do not tighten

Use a felt tip marker to outline the rudder support block on the side of the fin.

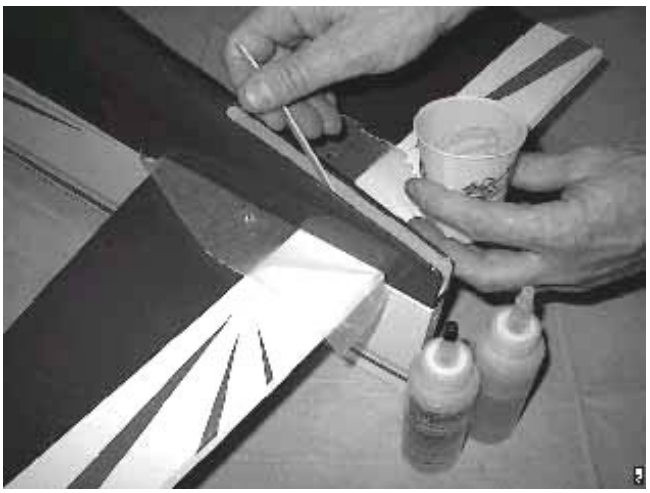
With a sharp hobby blade and a straight edge, slice the covering ¼ inch below the marked line. Be careful not to slice into the wood, as

that would weaken the structure. Peel away the covering a shown.

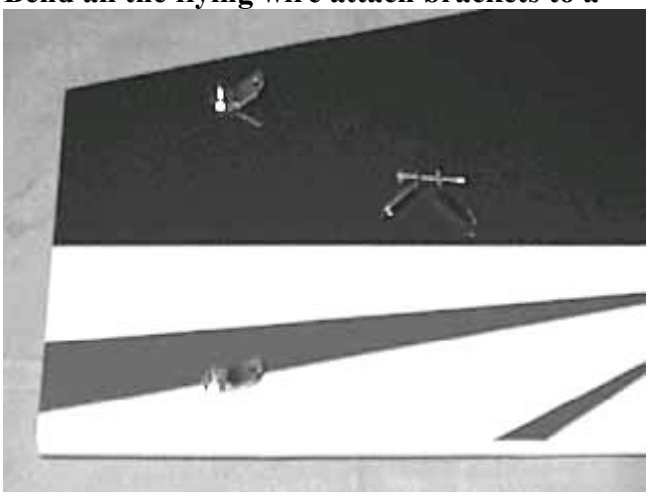
Apply a <u>thin</u> coat of epoxy to the inside of the rudder support block. The waxed paper will



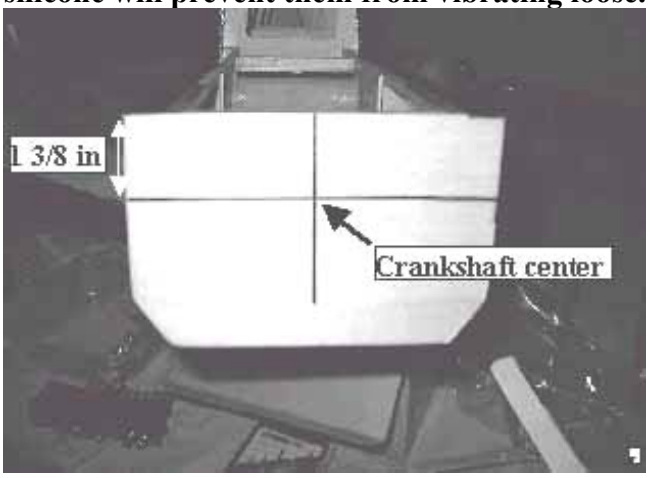
prevent it from sticking to the stabilizer. Slide the rudder all the way in, engaging the rudderpost alignment pins. Wipe away the excess epoxy with a paper towel moistened with alcohol. Allow to cure before moving.



Bend all the flying wire attach brackets to a



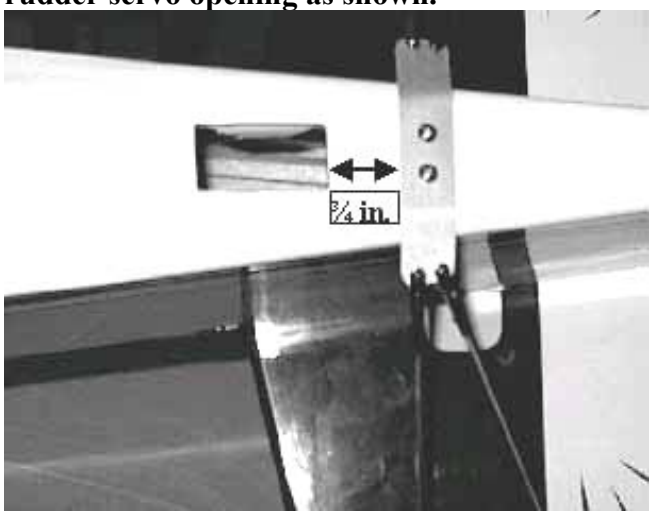
45-degree angle and install in the fin and stabilizer as shown. Tighten the screws only to the point where the stabilizers wood begins to crush, do not over tighten. A small dab of RTV silicone will prevent them from vibrating loose.



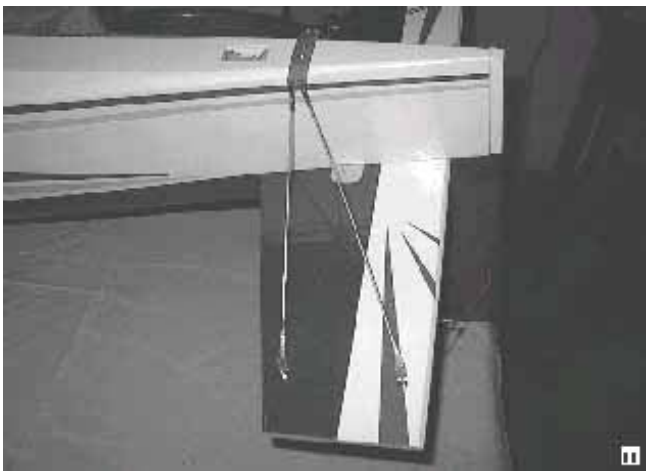
Measure the firewall across the top and bottom, locate and draw the vertical centerline. Measure down 1 3/8-inches from the top of the firewall and draw a horizontal line. Where the lines cross should be the center of the crankshaft of the engine.

The distance from the back of the spinner to the firewall must be at least 6 7/16-inches for proper clearance with the cowl. The BRISON 2.4 used on the prototype required a 1 1/8-inch spacer. The size of the spacer you need will depend on your choice of engine.

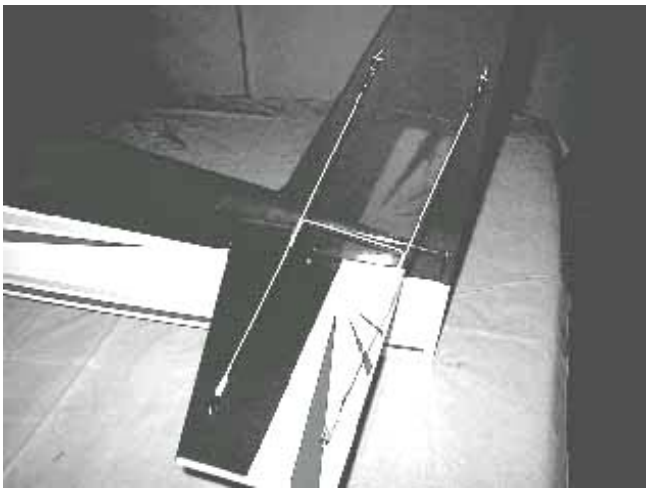
When installing the tail surfaces for use apply a thin bead of RTV silicone to the stabilizer rudder support-mating surface. Install the flying wire attach bracket ¾-inch behind the rudder servo opening as shown.



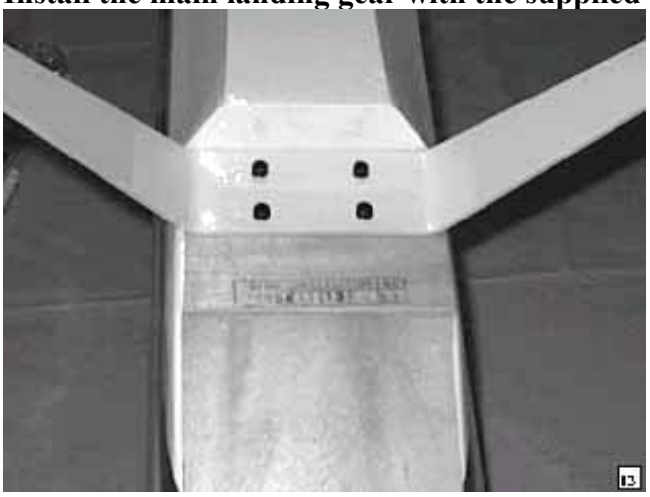
Install the flying wires on the bottom of the stabilizer. The short wires in the front, the long wires in the rear. Square the stabilizer by adjusting the wire tension. *NOTE*: Do not over tighten the wires, excess tension may distort the stabilizer.



Install the upper flying wires; try to keep the tension on all the wires equal. The wires should be adjusted tight enough so there is no endplay, but not so tight as to cause distortion of either the fin or the stabilizer.

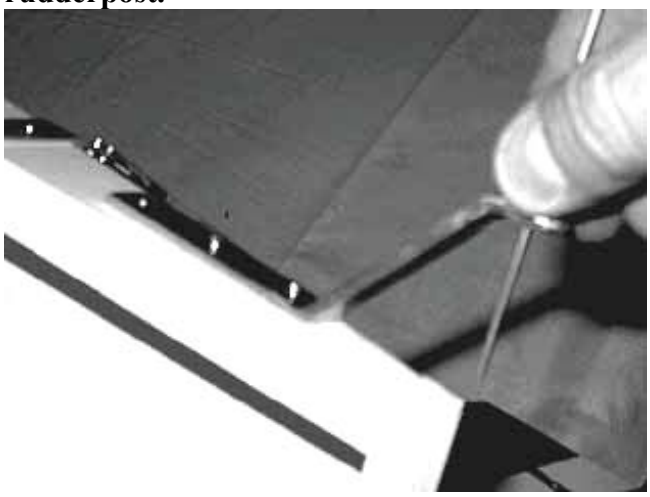


Install the main landing gear with the supplied



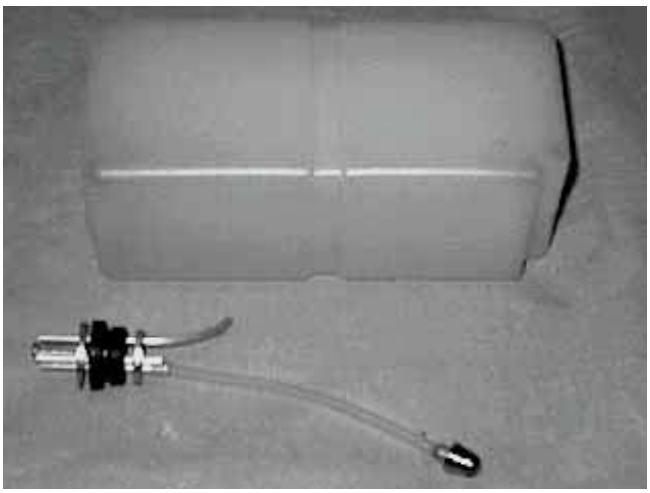
screws and washers. When installed correctly the gear will have a slight sweep forward.

Install the tail wheel bracket. Align the tail wheel pivot hole with the back edge of the rudderpost.



The airframe can now stand on its gear allowing clearance for the cowl. Temporarily install the canopy deck. Line up the cowl and open any holes that are necessary for engine / exhaust clearance. Locate the holes for the cowl mount. Remove the cowl and deck.

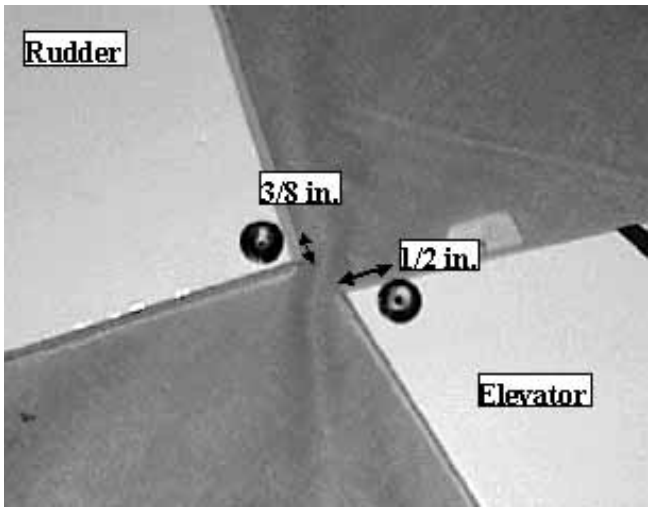
Assemble the gas tank. Be sure the flop tube does not contact the rear of the tank. Bend the vent line to the top of the tank and install the fill tube if third line refueling is to be used.



Epoxy the supplied tank support rails in place as shown. The rear rail should touch the wing tube support doubler. The front rail should be approximately 2 ½- inches behind the firewall.

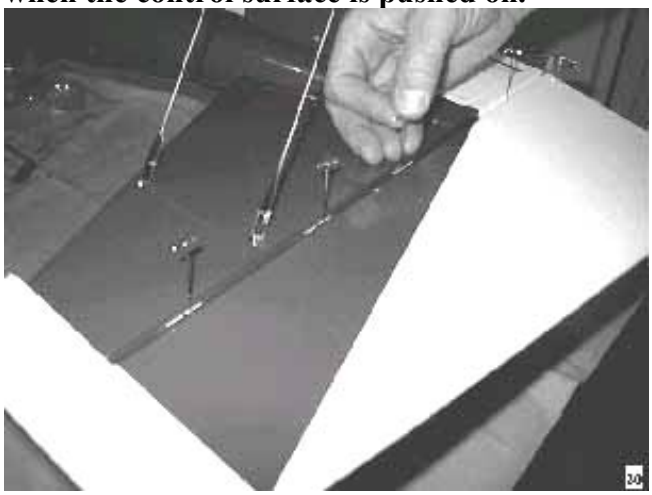
Install the fuel tank using a small amount of

RTV silicone on the rails. Rubber bands or a Popsicle stick may be used across the top for additional support. If your choice of engine has electronic ignition such as the BRISON 3.2, you may wish to slide the tank to the side to allow room for the module and battery. You will have to cut a small notch in the bottom of the canopy deck directly over the tank for clearance.

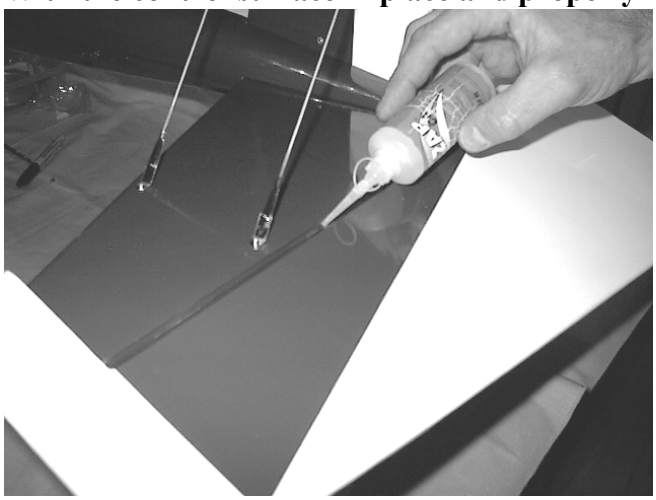


Using a 1/8-inch drill, locate and drill the holes for the control horns in the rudder and elevators. Use the dimensions below, notice that the horn backing ring touches the back of the beveled edge.

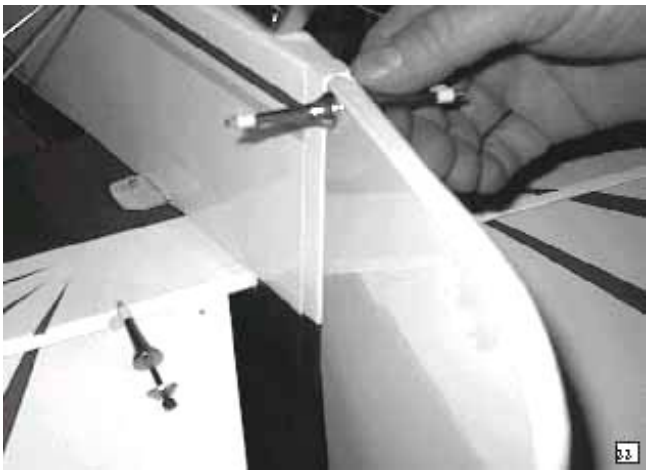
Slide the hinges ½ way into the fin and stabilizer. Insert a pin at the hinge line, this will prevent the hinge from sliding too far in when the control surface is pushed on.



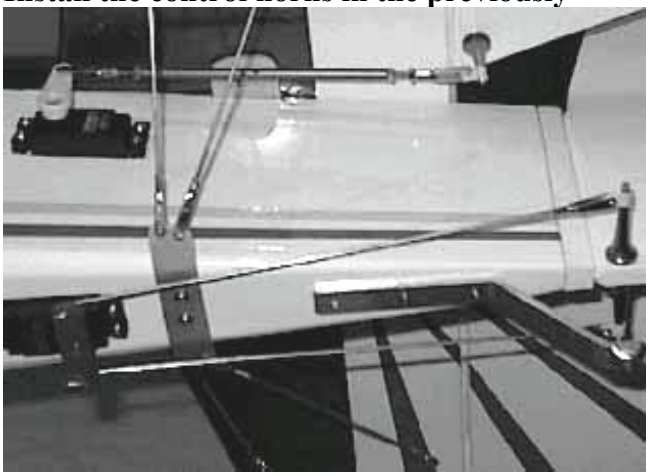
With the control surface in place and properly



aligned apply one drop of thin CA to each side of each hinge. Repeat the process for all control surfaces {rudder, elevator and ailerons}.

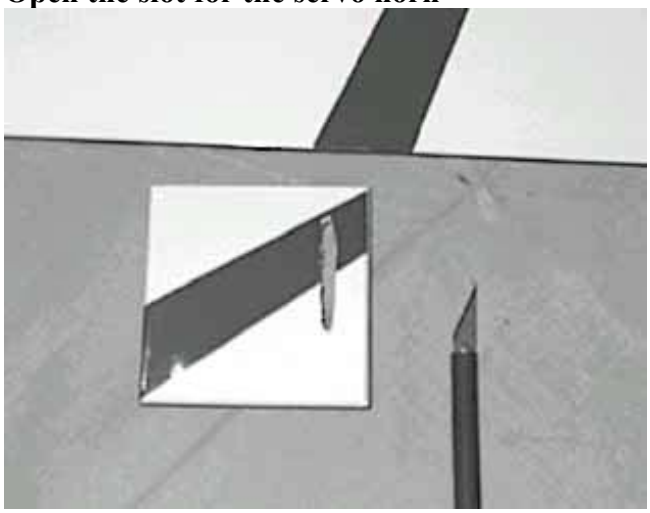


Install the control horns in the previously

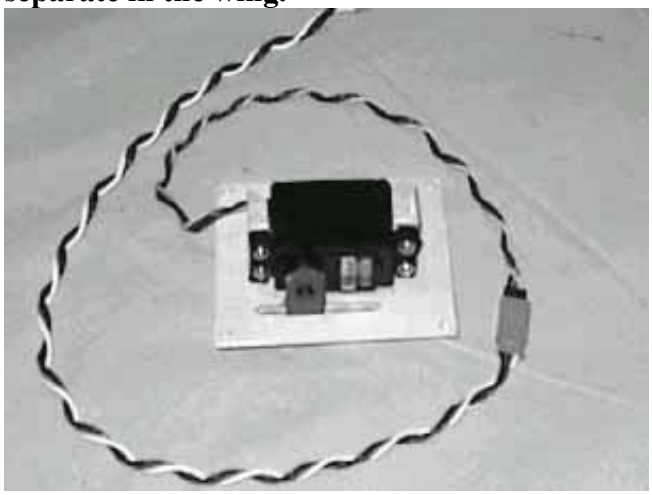


drilled holes. The long ones are used for the rudder, the mid-size are used for the elevator. Open the servo holes and install the servos. The elevator servos must have at least 60-oz of torque; the prototype used HITEC HS625BBMG.
The rudder must have at least 100-oz of torque: the prototype used HITEC HS645BBMG. Install and adjust the supplied elevator control rods. Fabricate the rudder pull-pull using the supplied rods.

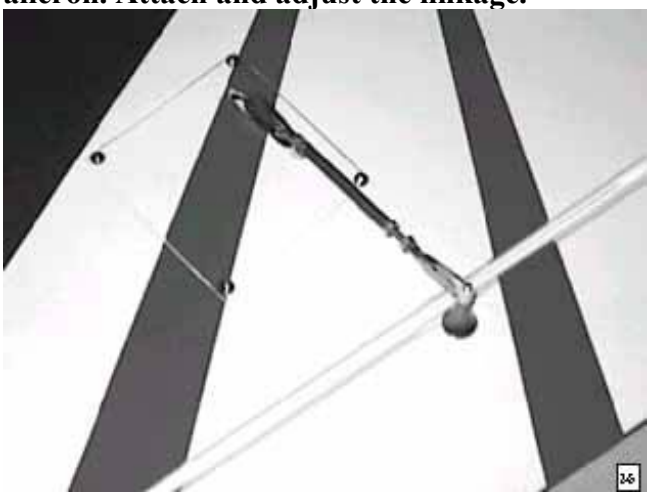
Remove the servo covers from the wing halves. Open the slot for the servo horn



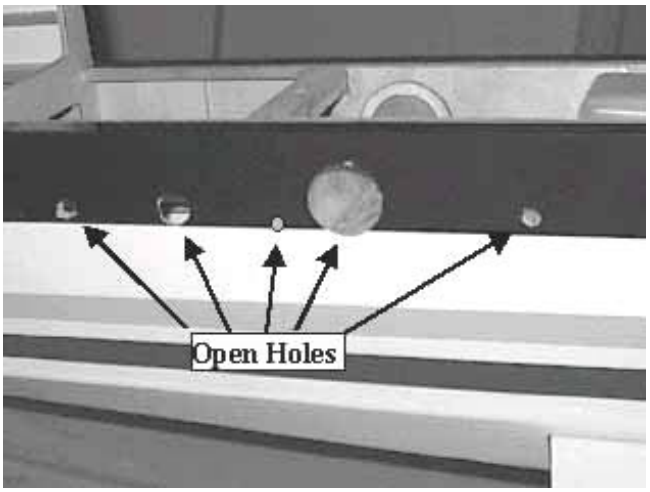
Install the servo in the servo cover. The servo must have at least 60 oz of torque. The prototype used HITEC HS625BBMG. If a servo extension is needed be sure it can not separate in the wing.



Run the servo wire through the wing and install the cover with the supplied screws. Drill and install the shortest control horn in the aileron. Attach and adjust the linkage.



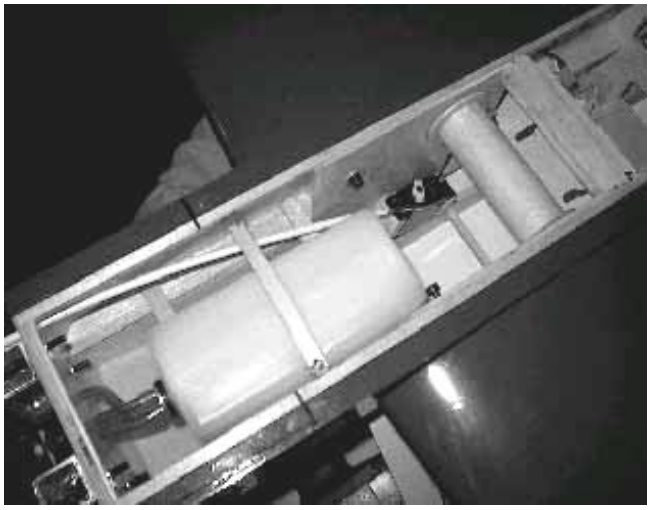
Open the five holes in the fuselage side covering. A sharp razor knife works best for this.



Temporarily install the wing panels. Locate

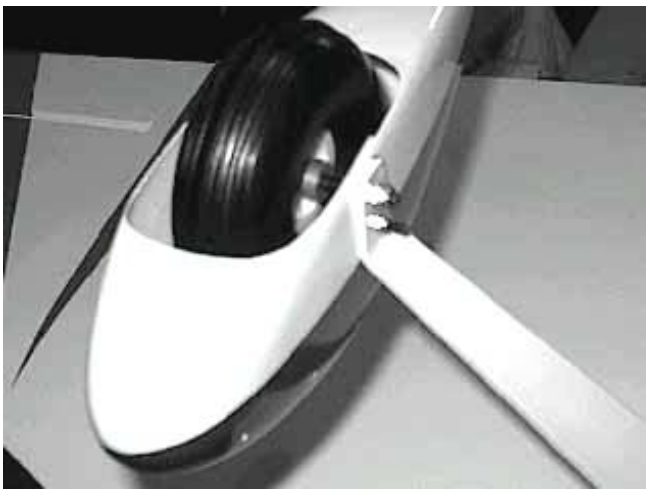
and drill a hole for the plastic outer throttle push rod.

Locate and mount the throttle servo and bracket inside the fuselage. Be sure the servo and push rod do not interfere with the wing attach bolts.

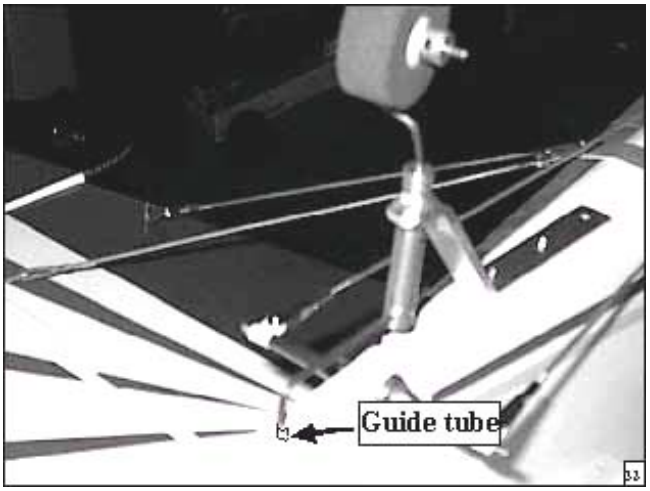


Slide the axle through the recessed side of the wheel. Slide a collar on and tighten the set screw, leave enough play so thee tire spins freely.

Install the anti-rotation screw in the wheel pant followed by the axle wheel assembly.



Locate and epoxy the tiller arm guide tube in the bottom of the rudder.



Place the wheel on the gear wire and lock in place with a collar. Slide the gear through the support. Install the tiller arm through the long collar and into the rudder guide tube. Lock the gear in place with the set-screw. The tiller arm does not use a set-screw.

Open the hole in the canopy deck and secure with the supplied screw.

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 5 3/8 inches to 5 3/4 inches back from the leading edge of the wing measured against the side of the fuselage. 5 ½ inches is 27% of the MAC {mean aerodynamic chord}. 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 1-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, transmitter, ect.}.
Although the LASER 2000 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 LASER 2000 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 ¼-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-once 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.