

HOWARD DGA 15

ARF

ASSEMBLY MANUAL



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Congratulations!

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

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

Specifications:		Kit Contents:			
Length	69"(1750 mm)	Fuselage	1	Fuel tank	1
Wing Span	95"(2400 mm)	Wing panel	2	Wheels	2
Wing Area	1398 sq. in	Ailerons	2	Tail gear	1
	(90 sq.dm)	Flaps	2	Tail wheel	1
Weight	16-17 lbs	Cowling	1	Control horn	7
	(7300-8000 g)	Canopy	1	Hardware pack	1
Engine		Side Windows	1	Manual	1
- (Glow)	1.0 - 1.6 cu. in	Main Gear	1	Wheel pants	1
- (Gas)	1.6-2.4ci (26-40cc)	Stabilizer	1	Wing tube	1
		Elevator	2		
		Fin & Rudder	1		
		Main Gear Covers	2		

If you are familiar with the assembly of ARF type airplanes, you will find the following assembly sequence to be unusual. The sequence was designed to speed assembly by incorporating the radio gear installation in the workflow. Please follow the assembly instructions as written. The Howard DGA will take approximately 15-20 hours to complete. The following additional items will also be needed to build the Howard DGA:

HOBBY ITEMS:	HOUSEHOLD ITEMS:	
Radio, 5-channel min. 8-9 servos Flight Battery 2000mah Control rods Fuel line 20-inches Engine Muffler Gas Stopper Conversion Kit (If Gas)	4 oz. 30-min. epoxy Popsicle sticks Hobby knife Thin CA .5 oz. Med. CA 1 oz. Paper towels Alcohol	Ruler Felt tip pen Screw drivers Pliers Masking tape 5 /32 drill 1/8 drill Work Bench Pad

SERVOS

Because of the size and weight of the Extra 330L, standard servos do not produce enough torque for high performance aerobatics or 3-D flight. The following are the minimum torque requirements for this level of performance:

- Ailerons: 50 oz-in.
- Flaps: 80 oz-in
- Elevators: 80 oz-in.
- Rudder: 100 oz-in.
- Throttle: Standard servo
- Choke: Standard servo

Also, due to the number of high load servos, we strongly urge you to use a good flight pack of at least 2000 mah or better.

CAUTIONS:

Gas engines, because of the ignition systems, require some special care. The ignition is capable of producing radio interference that can shorten the range of the radio gear.

To help minimize these problems use the following recommendations: Never use a solid wire for throttle control, use Nyrod or other plastic nonconductor. Keep all radio gear at least 12 inches from all ignition components, such as battery, switches, wiring and the unit itself. If a servo is used to operate the ignition on/off switch, do not mount the switch at the servo, instead use a piece of Nyrod and a remote switch bracket. Be sure spark plug wires are shielded and the shield is properly grounded to the engine. Follow the engine manufactures instructions. Large powerful servos have a higher power consumption rate than standard servos, for this reason it is important the battery selected be capable of supplying the required amperage. The switch harness must also be of the heavy-duty type. A lightweight switch may overheat and fail under high loads.

ASSEMBLY

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

You should take into consideration the size and type of engine you will be using **BEFORE** you install servos, etc. With larger gas engines, the servos for the elevator and possibly the rudder should be mounted in the spaces allotted for them just below the stabilizer. If you are using a lighter engine, the servos will most likely be installed in the cabin area. In this case, you will have to create your own push rod assemblies as materials are not supplied.

We suggest that you temporarily mount your engine early in the fuselage construct phase, as well as all major wing, tail and gear parts, the place your servos to determine the CG balance point, moving the servos, batteries, etc as needed. This will save you a lot of time and aggravation later in the process.

For the purposes of this manual, we will be installing **SPE – 43cc** gas engine sold by **KangkeUSA (www.kangkeusa.com)**. It is the ideal engine for the Howard DGA

We will also be installing Hitec 625MG servos on all flying surfaces except RUDDER where we will be using a Hitec 755HD servo. Standard servos will be used for Throttle and Choke. (We recommend using a servo to control the choke rather than using a manual lever as it provides an option of shutting off the motor should the throttle linkage fail).

You will notice in the pictures that we use a pad on our work bench. This helps prevent those little dents that can occur on an unprotected work surface. You should also consider using the bags which each major part comes in for work bench padding.

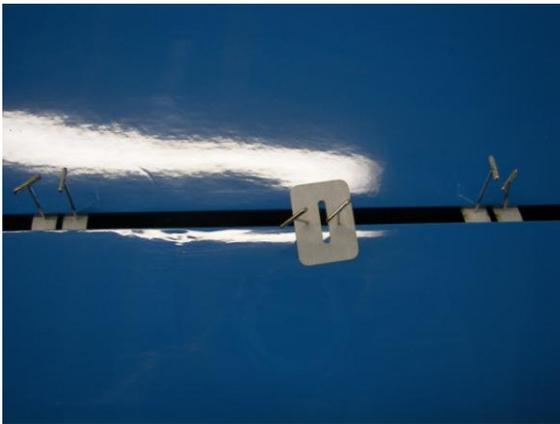


WING ASSEMBLY

Start by removing aileron and flap from packaged wing. Remove hinges.

Place 2 pins in each hinge as shown and reinsert the hinges into flap and aileron.

Attach flap and aileron onto wing panel, ensuring that they are properly aligned and the end spaces are minimal and equal.



CAREFULLY apply THIN CA glue to each of the hinges, ensuring that the flap and aileron surfaces are FLUSH with the wing.

Apply THIN CA to the bottom side of the hinges.

Cleanup and CA spills with CA de-bonder or Acetone. Work quickly and have plenty of paper towels available as well as lacquer thinner. Leaving Acetone will cause a white film.

HINT:

Refer to the following picture. I used a VERY FINE bulb dispenser for the CA glue. This helps prevent accidental splashes onto the covering.



Install both the flap and aileron servos with the screws provided with the servos.

Use the pull string to work the servo wires through the wing and out the exit hole in the root rib.

HINT: - Temporarily hook up your Aileron and Flap servos to your receiver and turn on the radio. This will help you center the ailerons and confirm proper operation of ailerons and flaps at this point rather than at final assembly time.

Install the aileron and flap control horns.

The aluminum horns included with this kit only require you to locate the proper position, drill one hole for the bolt and assemble.

I would suggest using a drop of blue lock tight on the horn bolt to prevent it from becoming loose.

(Remember- the flaps work differently to ailerons, so the horns for them will be mounted on the same side of the servo vs. ailerons which are usually mounted to the wing tip side of the servo).

Fabricate the control rods and attach to servos and control horns.

HINT:- Use a small clamp to keep ailerons in neutral position while hooking them up, then use the clamp to keep the flap and aileron in line.

The kit includes 4 strips of Ultra coat covering which may be used to cover the aileron and flap

hinge lines on the top surface. ON the FULL SIZED aircraft, some had this strip; others did not, so it is left to you to decide if you want to cover the hinge line. To do so, simply remove the clear plastic backing, and using a hobby heat iron, set at medium temperature, apply the covering, ensuring that the flaps and ailerons are deflected in the down position while applying.



Finally, locate and assemble the strut assemblies. The wing components consist of bracket, small bolt, washer and the ball connector/

The ball links are attached to the struts. Finally there are 2 longer bolts and washers that hold the strut to the fuselage. The bolt holes are located just above the main landing gear – for now place the fuse attachment bolts into those holes.

The wing attachments are bolted to the wing temporarily. Later, during final setup, I would suggest applying Lock Tight once you are satisfied with the setup.



FUSELAGE

Note: You can follow your own building sequence if you wish. I have developed this sequence as a matter of personal choice.

LANDING MAIN GEAR

The gear for this plane is just a little bit more complicated to assemble due to the added wheel pant and fuselage fairings.

Take your time and be prepared for a number of trial fits before final assembly. The effort is well worth it.

Locate all of the pieces to complete the gear. The parts include:- axles, wheels, collars, wheel pants and attachment bolts, pant and fuse fairings and 4 bolts and lock washers to attach assembly to fuselage.



The wheels that come with the kit are perfect for Asphalt or short grass strips. You may wish to purchase 5 inch or greater wheels if you fly from a rough field.

Prepare the axle by creating a slight slot near the end so that the locking stud of the collar will tie down into it. Place one collar on axle, then wheel, the outside collar. You can adjust the wheel for centering after installation.

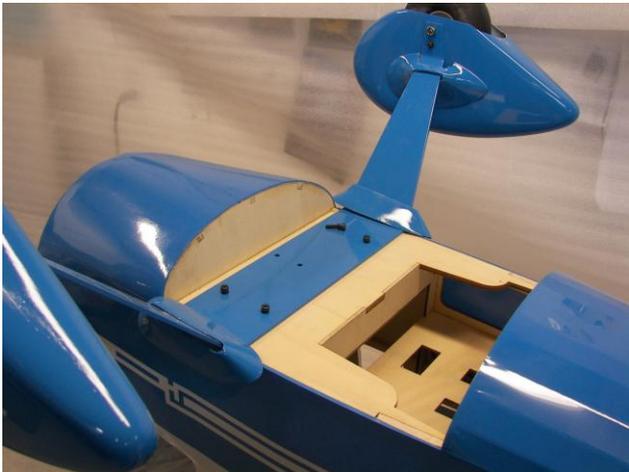
IF you have purchased larger wheels, make the wheel openings in the wheel pants larger using a sanding drum on a Dremal tool.



Notice in the picture above the proper direction of the fairings. Again using a dermal tool and a small sanding bit, enlarge the openings of the fairings so that they slide on and easily locate in their final positions. Also note that you may make these openings a bit larger than the landing gear. (Even the full size plane is this way).

Trail fit all parts before final assembly. Note in the picture above that it was necessary to slot the bottom side of the wheel pant fairing to flush fit over the gear.

The fairings will fit around the wheel pant with no need for glue.



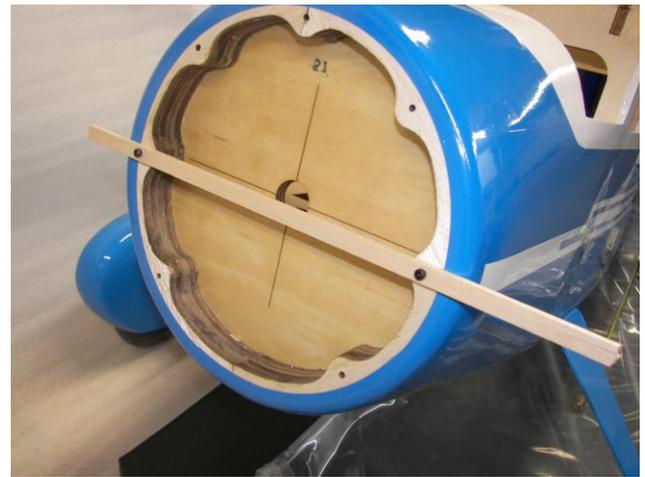
Mount the landing gear to the fuselage using the 4 bolts and lock washers provided. Leave the fuselage fairings loose for the time being.

TAIL ASSEMBLY

STABILIZER

PLEASE NOTE: - The Stabilizer is NOT flat. There is a slight airfoil, so be careful to mount it properly, with the FLAT SIDE on the bottom.

On this model, I found that the easiest way to square the Stabilizer was to mount a stick across the front of the fuselage using the cowl bolts to hold it on.



Next, trial fit the stabilizer, ensuring that the measurements from the front mounted stick to the back outside edge of the Stabilizer is EXACTLY the same on both sides and that the length of the trailing edge from the fuselage is EXACTLY the same on both sides.



Next, using a pen or pencil, mark the stabilizer against the fuselage, both sides, top and bottom.

Remove stabilizer, Remove covering on both sides, approximately 1/8 inch inside your marked lines.

Apply a LIGHT coating of 30 to 60 minute epoxy on bare wood of Stabilizer and reinsert into fuselage opening, ENSURING that you have correctly identified the top side of Stabilizer.

MEASURE and RE-MEASURE. Ensure that the stabilizer is square and let dry.

FIN

Next, trial fit fin and mark the fuselage. Remove covering and attach FIN using the same method as for Stabilizer. AGAIN ENSURE FIN IS SQUARE and properly lined up. Check not only from the rear of the model but also from the front. Apply masking tape to ensure nothing moves while drying.



Use Isopropyl Alcohol, available at your local drug store, to clean up any mishaps or overflows with the epoxy. It is best to clean it up BEFORE

it dries although, minor epoxy markings can be removed after it has dried.

RUDDER

Now the Rudder can be attached to the fin. First, temporarily attach the rudder to the plane. Using a straight edge, locate the location for the rudder pull/pull assembly. The hole location should be approximately 1/2 inch in from hinge line and 1 inch up from bottom edge of rudder.

Remove Rudder from plane, drill hole and assemble the Pull/Pull control horn. Use BLUE THREAD LOCKER to secure nut / bolt.

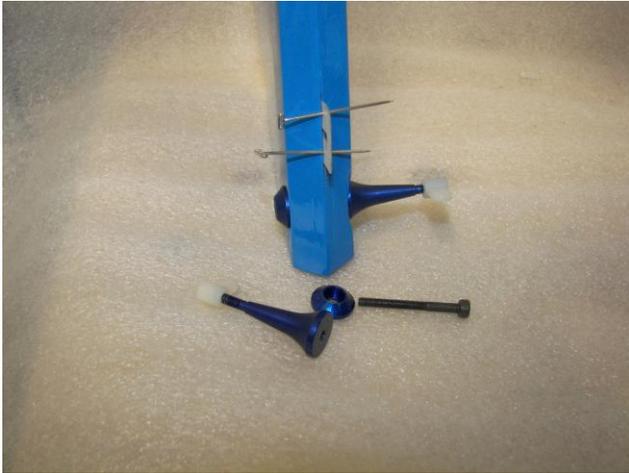


Install hinges in rudder using same method as described for ailerons. Affix rudder to fin.

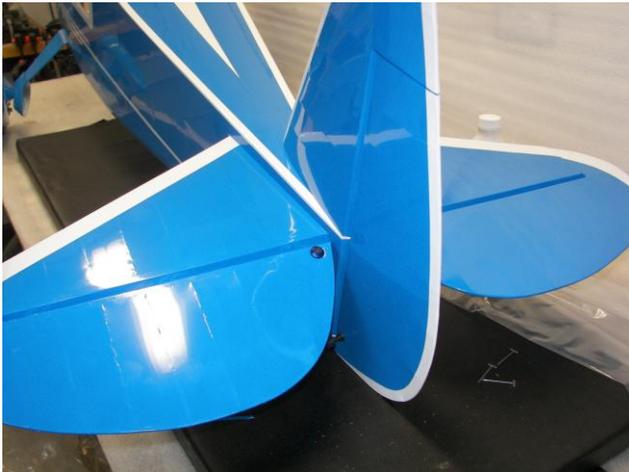
ELEVATORS

Install control horns on each elevator. The horns are located approximately 1/2 inch from leading edge and 3/4 inch in from elevator edge against fuselage.

Use blue thread locker to secure horn bolts.



Attach Elevators to stabilizers, again using the same procedure as you did with the ailerons.



TAIL WHEEL

Put together the tail wheel assembly. File or dermal a flat spot on the top of the wheel wire and on the outside end of the tire axle so that the wheel collars will lock on and will not move about.



Attach the assembly to the fuselage with the screws provided ensuring that the swivel point is directly over the hinge point of the rudder.

Attach the springs and rudder attachment, mildly stretch the spring assembly back over the rudder and attach to the rudder as shown below.



TAIL SERVOS

Install elevator servos on each side of the fuselage. Mount the servo arms pointing upward. Extend the servo leads with 24" servo extension wires and place inside the fuselage. An option is to you a Servo Reverser Harness (which allows you to connect 2 servos to one receiver port with one servo reversed). Position the extension wires to suit and temporary secure the loose end of the extension wires at the receiver end. (Option: secure the extension wires in the fuselage if so desired). Measure, bend and connect push rod / clevis / keepers as shown in picture below.

(Hint: - Connecting servos to radio and have radio on will save setup steps later on.)



PULL-PULL RUDDER SYSTEM

Install Rudder Servo. The servo arm should be long enough so that the cable connection points at the servo end are exactly the same distance from the center of the servo arm as the connection points at the rudder, NOTE: I had to enlarge servo cutout to fit large servo used.



I found that it was much easier to install the cable first at the servo end, then complete the assembly at the rudder.

First assemble the cable / servo connection as shown in picture below. Ensure that you crimp the copper or aluminum tube well. Also place some medium CA glue on crimped connector.



A simple method of getting the cable from the servo to the rudder is to use a piece of Nyrod. Thread the Nyrod through the fuselage from the rudder cable opening to the servo location. Next thread the assembled line/ servo connection through the nyrod, then remove nyrod.

With the servo and radio turned on, ensure your trims are centered. Connect cables to Rudder control horn / clevis assembly and crimp.

(I used a small clamp to keep rudder centered during this process,)

Refer to the picture on previous page for completed cable assembly at rudder end.

TAIL WIRES

The tail wire assembly is straight forward.

First mount the bottom fuselage wire holding mount just in front of the tail wheel assembly with two screws.

Locate the pre-drilled holes in each stab and fin and remove the covering. (I used a T-pin for this task).

Loosely assemble the stab and fin connectors using the bolt, washer, 2 wing wire connectors and 2 nuts.



Fit wing wires, (longer rods for stab to fin connection), and attach.

Tighten the stab and fin connection assemblies and apply a drop of medium CA to prevent the assemblies from coming loose.



ENGINE INSTALLATION

The following instructions show the installation of the engine.

The engine being used in this manual is the new SPE 43cc gas engine which is also available from KangkeUSA, (www.kangkeusa.com)

Use the mount guide which comes with the engine. Line the mount up with lines which are located on the firewall. Temporarily affix the

motor mount guide and drill out the bolt holes in the firewall for the engine standoffs.



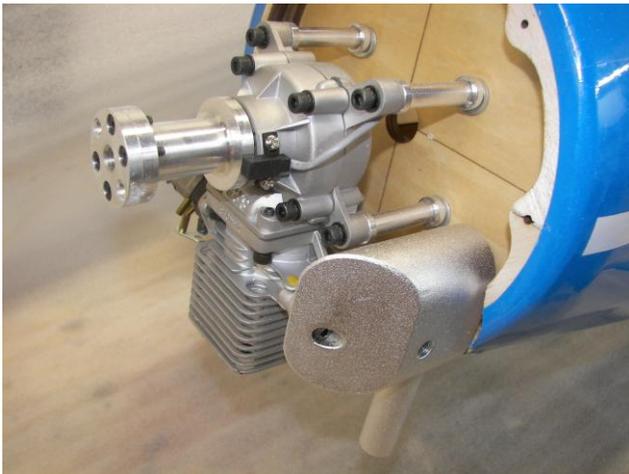
Now install the engine standoffs. Use blue lock-tite on the mounting bolts. Place a large washer on the inside of the firewall to prevent wood compression. For this project, it was necessary to also install 4 large washers behind each of the standoffs to gain the necessary clearance of the cowl mounting assembly.



Next, with muffler removed, mount engine to standoffs, again using blue lock-tite.



Now, attempt to attach muffler to engine. You will have to carefully mark and cut out part of the fuselage / cowl mounting ring to make it fit.



Mount the muffler with gasket and use lock-tite on the muffler bolts.

Line up the throttle linkage and drill a hole in firewall so that the linkage will generally line up with servo location inside fuselage. PLEASE ensure that if you are using a gas engine that the linkage is of a Nyrod type. Connect linkage to servo and test for binds, etc. ALSO note that the throttle linkage throw on gas engines is usually much less than on glow engines.

Now carefully mark and cut out appropriate holes in cowl for choke / cylinder head and muffler. Ensure that no parts of the engine assembly are touching the cowl.

Trial fit until you are satisfied with the final product.

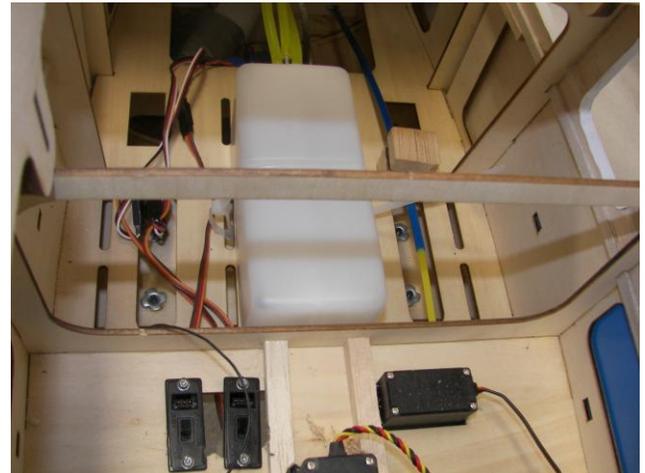
The ignition for this engine is mounted INSIDE the fuselage and a hole was drilled in the bottom of the fuselage to allow exit for the plug wire. The other ignition wire is passed through the existing firewall hole. The battery wire is run through a switch, then a separate 6 volt battery.

Fuel Tank

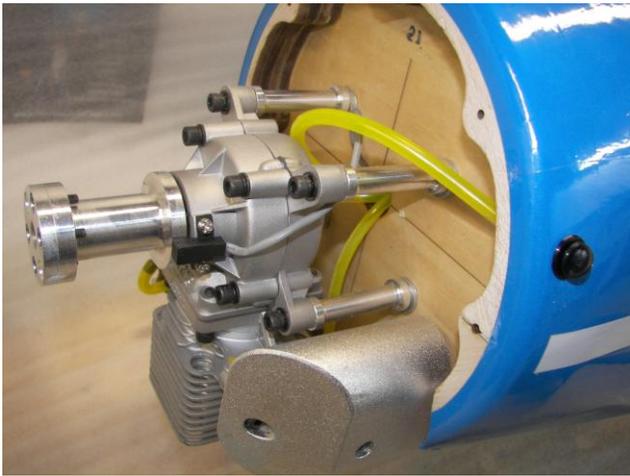
Please ensure that if you are using gasoline that you purchase a GAS CONVERSION STOPPER.

Assemble the tank using the conversion stopper and fuel line for gasoline. For this project, I used a 3 line setup. Carb/Fill/Breather.

Once assembled, install on cabin floor shelf using a quick tie wrap,



Feed the lines out to engine bay area. I drilled a hole in the bottom fuse / cowl ring for the breather line and used a fuel dot mounted on the left side again on the fuse / cowl ring.



Now assemble cowl to fuselage using the provided bolts and washer. (HINT: - to prevent a bolt from vibrating loose, use lock washers as well as flat washers if you have them available.



Now add your prop and spinner. A 3.5 inch spinner was utilized for this project.



RADIO

BEFORE you final install the radio components, it would be a good idea to trial balance the model so that you can shift battery weight if necessary.

The CG balance point is 27% of wing cord or 4.05 inches from the leading edge.

With this project, both batteries were placed near the firewall. The batteries were wrapped in foam and the cavity where the batteries and ignition are located was further packed with foam and I placed a piece of balsa over the area to ensure non-movement.

While there are switch placement holes on BOTH sides of the fuselage, the switches were mounted to the servo plate INSIDE the fuselage. (The plane is just too nice to be putting switches on the outside). See the picture (top/left of the page) for illustration.

The receiver is lashed to the servo deck with a plastic wrap strap (not included).

BOTTOM FUSELAGE HATCH COVER

Attach the bottom fuselage hatch using the long bolt provided. The bolt head will disappear into the bolt hole.

Next, slide the wheel fairings so they butt up against fuselage. Re-check fit. I found the easiest way to keep them in place as to apply a small amount of SHOE GOO, (available at most hardware stores), to the landing gear, just above the fairing line, push the fairing into place and apply a bit of masking tape until the glue dries. Attaching the fairing in this manner will allow you to remove bottom hatch should you need to get into that area of the fuselage.



SIDE CABIN WINDOWS

Trim the windows carefully from the molded sheet. There are three windows on each side. When cutting, leave about ¼ inch inside seam for each window.

Trial fit windows, make any adjustment necessary, then glue them in. I used aflex white glue called PIX, available at most hardware stores. You can also use R/C Canopy glue or Epoxy, but I have found that it is easy to clean up mistakes using paper towel and water when you use the flex white glue.

Let dry over night.

Next, carefully cut out the Wind Screen.

I found that by lightly marking the cut out lines with a marker made it much easier to follow while cutting. I also found that the wing saddle area of the screen was much easier to cut out using a fine point diamond tip on a Dremal Tool.

Again dry fit until you are satisfied, then mount the Wind Screen using the same type of glue used on the side windows.

Tape down the Wind Screen and let dry.



Detail the compartment to the level desired.

FINAL ASSEMBLY

Apply number decals provided with the kit.

For proper placement, you may wish to do a little searching on the Internet. There are a number of web sites dedicated to the Howard DGA. On some, you will actually find the full sized aircraft depicted by this model. One web site in particular is:-

<http://www.airliners.net/photo/Howard-DGA-15P/1245969/L/&sid=bd3de8e71fbb3a4210120874bfddff64>

The Tail numbers and logo are shown in the following picture.



The large wing numbers fit on the top of the RIGHT wing. I found it easy to apply the numbers by laying down a guide line of masking tape and the lining up and marking the tape and numbers lightly with a pencil before applying.

Once in place, remove your guide tape and remove the pencil marks. The marks should come off with a bit of water and paper towel.



Assemble the model, affixing wings and struts, making any adjustments necessary. You may find that it will be necessary to do a little bit of fine trimming for the windscreen.



Recheck the balance & RECHECK AGAIN.

The balance point is 27% of wing cord or 4.05 inches back from the leading edge.

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." up/down (low)
	2." Up/down (high)
Rudder	2 " right/left (low)
	1" right/left (high)
Aileron	3/4" up/down (low)
	1 1/2" up/down (high)

It is important to double check that all controls move in the proper direction.

Set the flaps so that you can set them at about 15 degrees down for take-off and full flap for landing.

If you have a radio that can be programmed for slow throw movement, it makes the flap operation more like full size scale. Also you can program you radio so that you can turn on the landing flap setting on final circuit and the flaps will deploy once you have throttled back below the pre-established throttle setting. You can also program a bit of down elevator to prevent ballooning. By using this type of set-up, if you have to throttle up and not land, the flaps and elevator will return to normal state.

It is also recommended that if your radio has EXPO, that you set the above functions to about 35 – 40%

ENGINE SET UP

Be sure the engine 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.

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, etc.}.

Although the Howard DGA 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 Howard DGA is NOT a trainer. A true Scale aircraft, it goes only where you point it and will not recover to level flight without control input. If you do not have 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.

For the 1st flight, it is suggested that you DO NOT use the flap system. Save it until you get comfortable with the plane.

Carry a little power on final approach until over the end of the runway, and 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 it's 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.

If you have followed the procedures in this Manuel you will now be rewarded with one of the finest flying SCALE models available.

