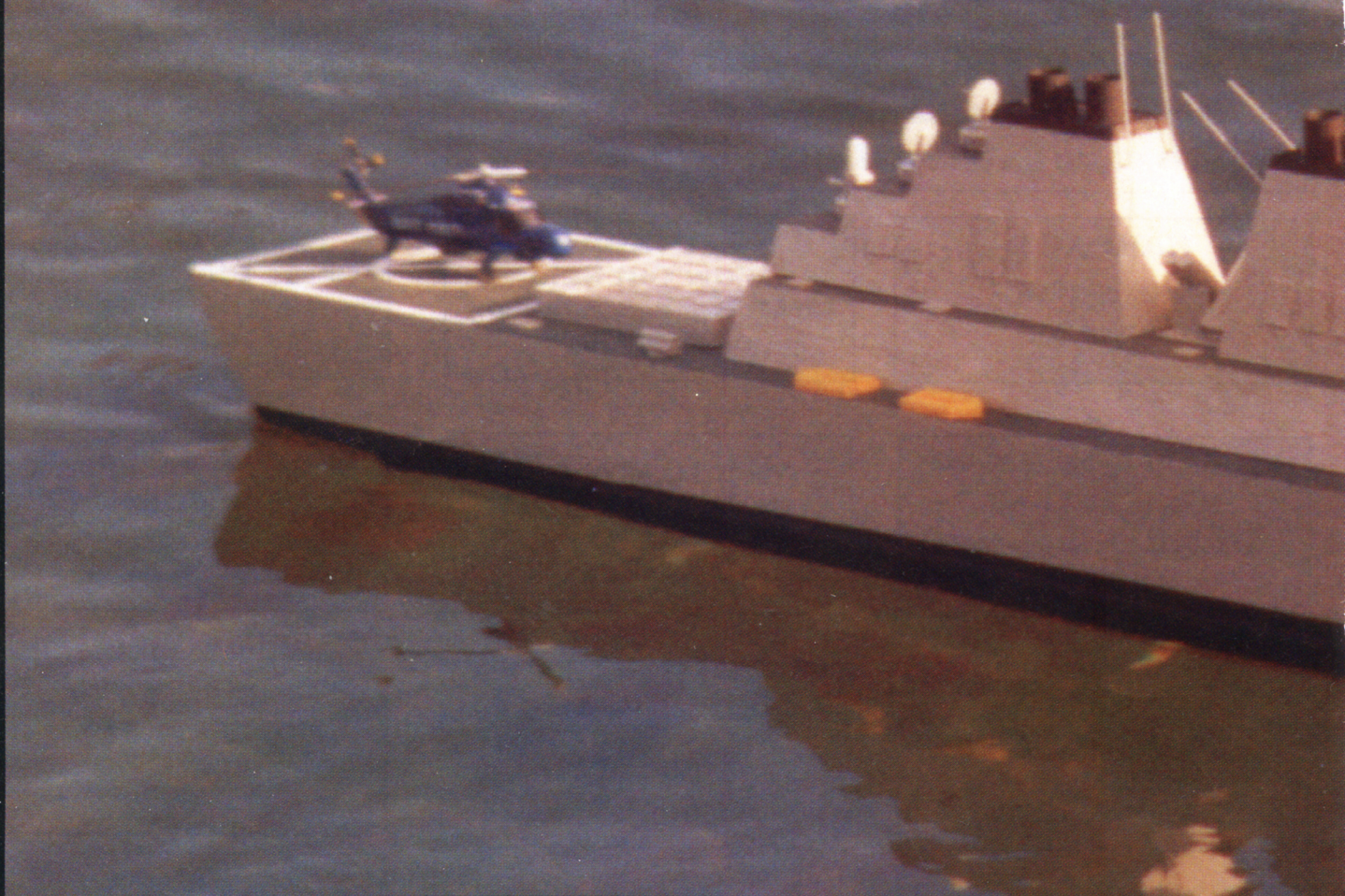




# U.S.S. HIBBARD



## *A Sport-Scale Model Of A Guided Missile Destroyer*

Another warship model was wanted for my next boat project, something quick and easy to build but still smart looking. Exciting performance and the ability to cope with rough conditions would also be desirable. A few ideas were sketched out but nothing caught my imagination until I sailed in a local club event. A model based on a proposed "stealthy" warship design was entered and attracted most people's attention. It looked very different; well to be honest, it was weird in my eyes. This would not have been a problem but its handling on the water was not very encouraging.

I returned home with the thought that a modern stealthy warship would be a good challenge. Now a lot of stealth is obtained by angling the hull and superstructure sections so that right angles, which strongly reflect radar signals, are avoided. With a little care, this does not automatically produce an ugly design and a model based on the U.S. Navy's "Arleigh Burke" class of destroyers soon became favored. The resulting model was very much of a freelance design. The hull and superstructure was simplified, but most people can recognize its origin.

### U.S.S. HIBBARD

Designed by:

Glynn Guest

**TYPE BOAT**

Sport Scale Destroyer

**LENGTH**

36-3/4 Inches

**BEAM**

4-3/8 Inches

**RADIO COMPARTMENT SIZE**

Ample

**REC. MOTOR SIZE**

Speed 600 or 05 Electric Motor

**BATTERY SIZE**

4-"D" Cell NiCd (4.8 V)

**REC. NO. OF CHANNELS**

2

**CONTROL FUNCTIONS**

Rud. & Throt.

**BASIC MATERIALS USED IN**

**CONSTRUCTION**

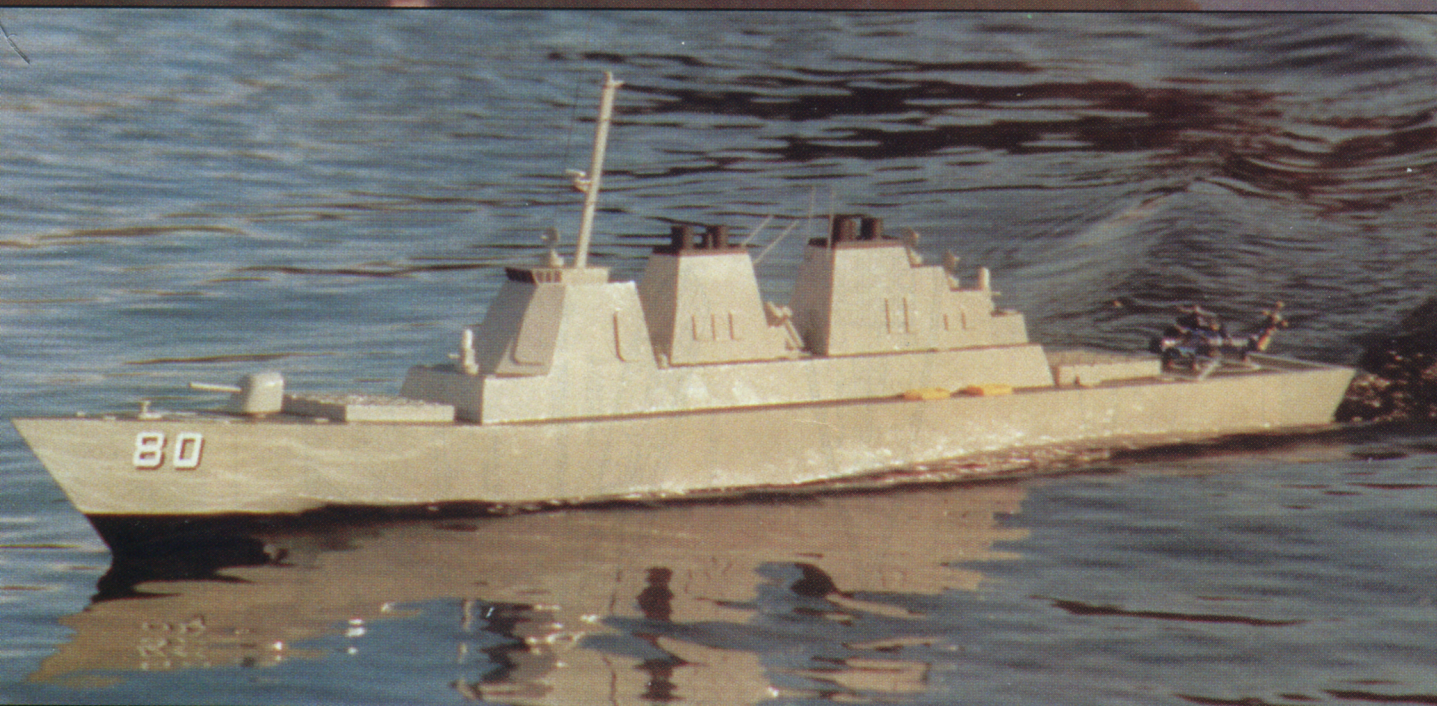
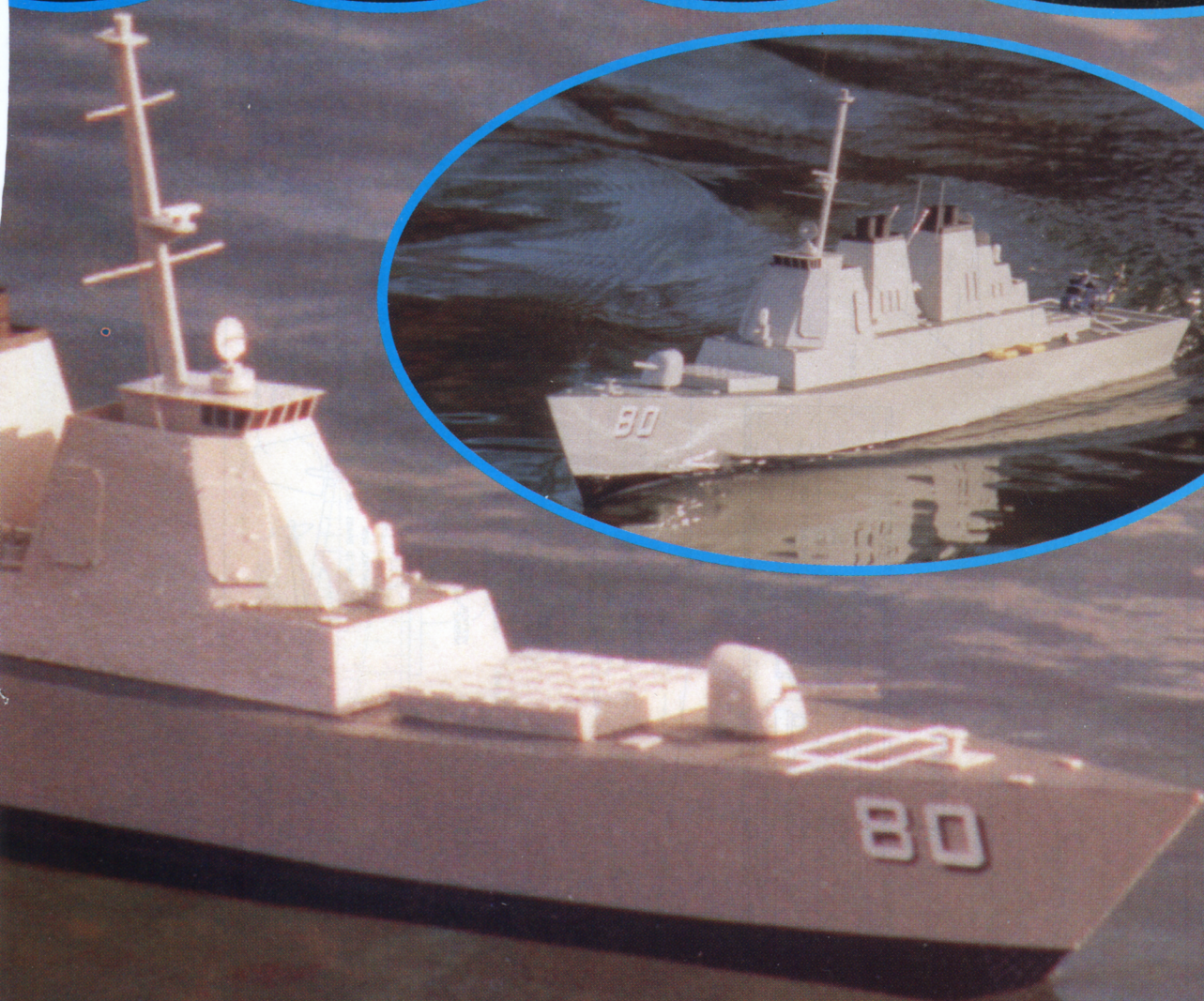
Hull ..... Balsa & Card Stock

Superstructure ..... Balsa &

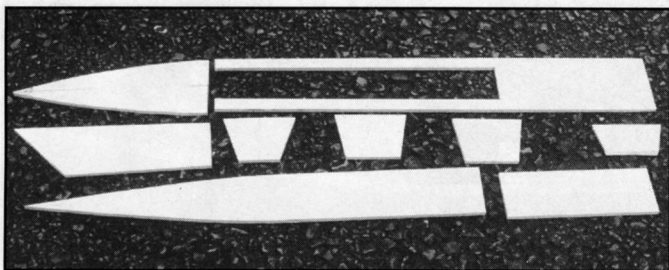
Card Stock

**Wt. Ready To Sail .. 80 Oz. (5 Lbs.)**

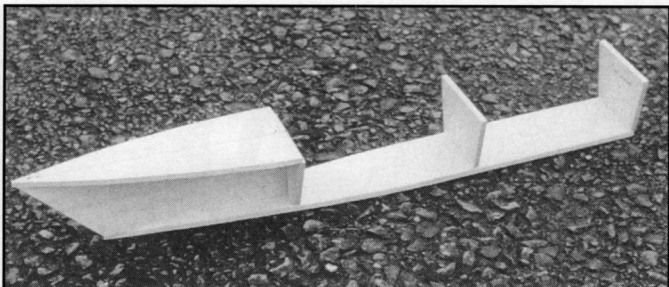
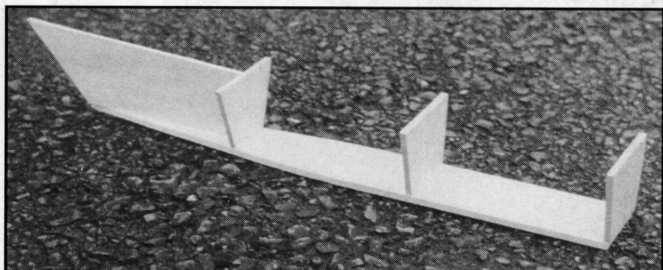




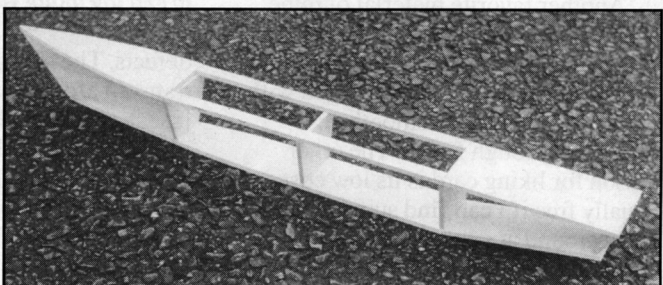
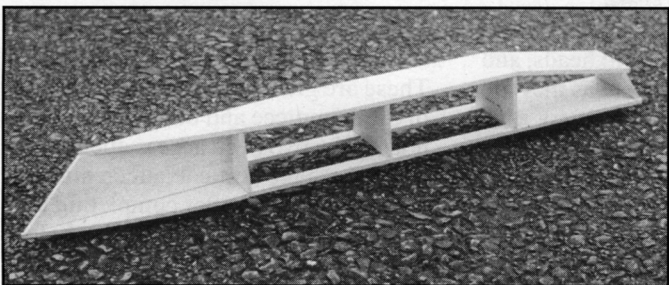
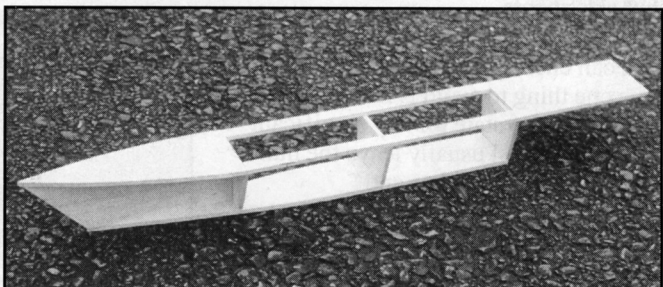




**LEFT:** Hull parts that are cut from 1/4" balsa sheet. **RIGHT:** Bulkheads and stem piece glued to hull bottom.



**LEFT:** Forward deck piece added to hull structure. **RIGHT:** Remainder of deck glued in place.



**Basic hull structure completed, ready for equipment installation and siding.**

## Size And Power

Using a balsa hull structure made me keep the model within the standard sheet sizes. The length was a shade over 36" and, with a reasonable beam, it gave an operating weight of about five pounds. All this seemed to make for a good battery capacity with enough room left over for ballast and positive stability.

The power plant had me puzzled at first. A model like this ought to be fast, and previous experience suggested that 05 motors might be suitable. Thus started one of the longest motor/battery trials I have ever had to carry out. The first runs were with a five-pole motor and 6-volt sealed speed control. This gave an exciting top speed of around seven feet/second but a woefully inadequate full speed duration of about ten minutes. Several installations later and I still had not obtained the right combination of speed and duration.

Drawing on electric flight experience, a Speed 400 motor and six NiCds was tried. This was almost perfect, good speed and control with a duration of at least 30 minutes. Well, perfect until I removed the superstructure and found the motor to be very hot. A motor temperature which can burn your fingertips is not good news.

This lead me to try a larger motor (a Speed 600 rated at 8.4 volts) on four D cell NiCds. Despite running the motor at a fraction of its rated voltage, it proved perfect. The top speed was about seven feet/sec. with a flat-out duration of over 30 minutes. This means that with the usual range of speeds and maneuvers being used, a sailing time of at least an hour can be achieved. This ought to be enough for most people.

During all these experiments, the model's handling never gave any cause for concern. It is not unknown for a model using a displacement hull to become unstable when running at high speeds. The Hibbard's bow rose, but never came out of the water, as it sliced through the waves with little fuss. In fact, its speed is deceptive and you can have fun gliding effortlessly past other models struggling to approach your speed.

If such speed is not needed, then more modest power plants can be used. I have also used a stock 05 motor and a spare speed control in another scale model. This gave excellent speed control and sailed on and on; in fact, I always got bored before the battery ever ran out of energy.

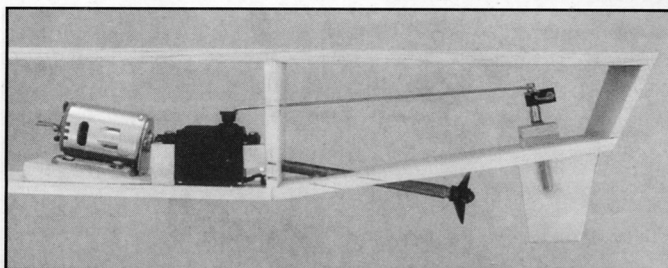
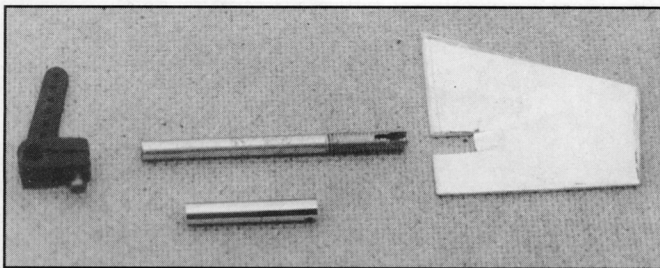
## CONSTRUCTION

The hull of this model uses the same basic construction technique as the Arkady Tugboat (RCM plan #1247, February 1998). This involves cutting out the hull deck and bottom sections, then building a framework before finally adding the side sheets. This method copes well with the angled hull sides, "flare" for you nautical types. It also allows you to easily install the drive line and rudder before fitting the sides.

Only a modest amount of wood is needed for this model: two sheets of 1/4" x 4" x 36", one of 1/4" x 3" x 36", and two sheets of 3/16" x 4" x 36" balsa will be enough for the hull. Medium density grades are adequate so there is no need to struggle with hard grades. Unlike an aircraft model, we do not have to watch the weight; so soft balsa, which will only make the model prone to damage, can be avoided.

All the wood joints were made with rapid setting white wood glue. The 15-30 minute setting time allows you to get joints correctly lined up. The resulting joints are more than strong enough for this type of model. Although not rated as waterproof, these glues can cope with the light wetting





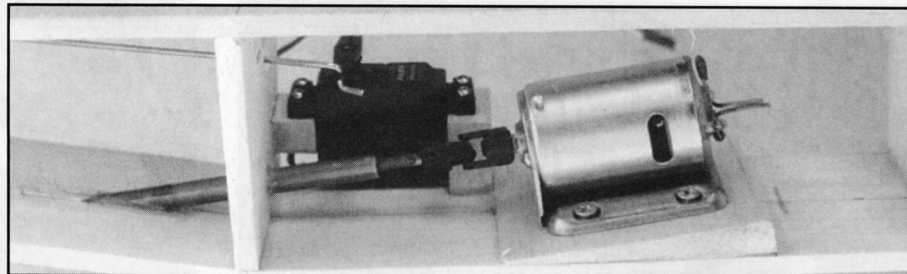
**LEFT: Rudder parts, ready for assembly. RIGHT: Driveline, rudder linkage, and servo are installed and adjusted prior to installing the hull side sheets.**

you can encounter in normal sailing. The one thing to avoid is leaving the hull in a damp state for any significant length of time. I usually leave the hull opened up with hatches and superstructure removed for a day or two after each sailing session. To date, none of my models have ever suffered from using these glues.

Another favorite material of mine was used on this model: "card stock." The hull sides above the water line and superstructure sides were covered with card stock to obtain a smooth and remarkably tough finish. The other reason for liking card is its low cost, usually free if I can find suitable pieces lying around at work or home.

#### Hull

The deck and hull bottom pieces are cut from 1/4" sheet. These need to be symmetrical about their centerlines. This is a fairly simple task as the only curves are in the bow area. Perfect curves are not essential as later sanding of the edges will remove any minor



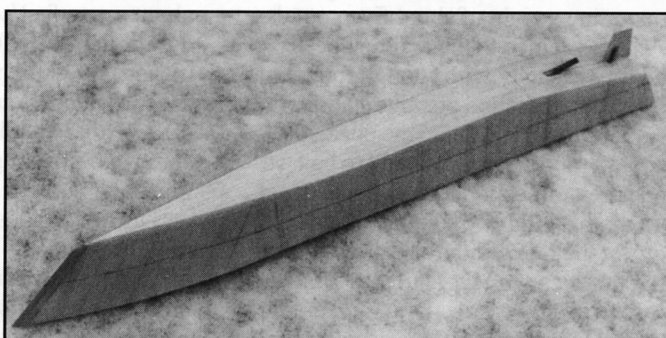
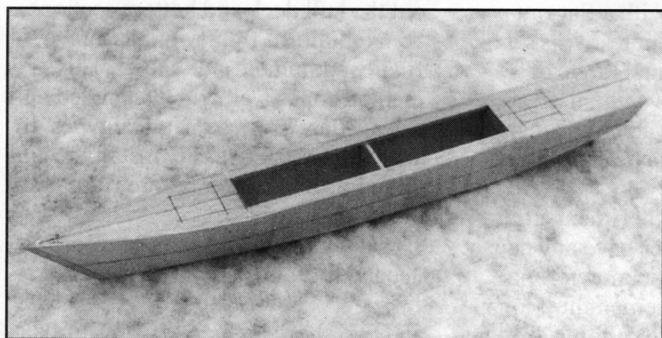
**Close-up of motor and rudder servo installation. Note that a commercial coupler is used to join the motor to the shaft.**

defects. The stempiece, bulkheads, and transom are very easy to cut as they are just straight-sided shapes. It is not a bad idea to have a trial run at assembling these pieces with pins. Any mistakes in cutting can then be corrected before reaching for the glue.

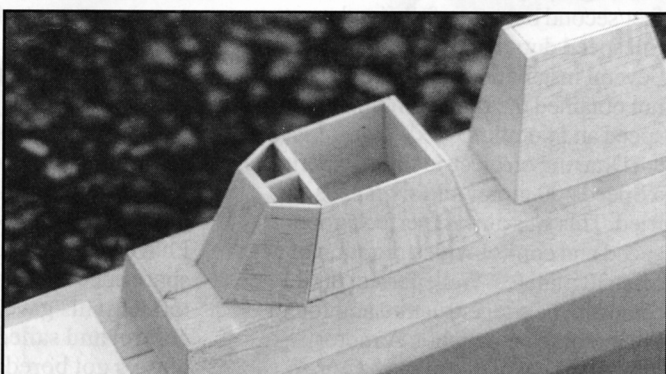
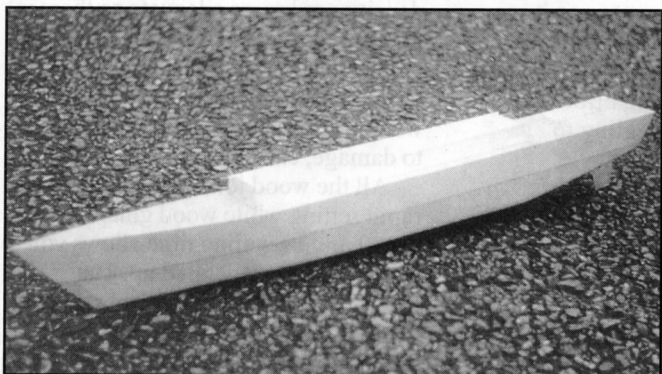
The stempiece and bulkheads are glued to the front hull bottom piece. These need to be pinned square and true until the glue sets. A tip is to let the third bulkhead overhang the bottom piece by about 1/8". This produces a handy ledge when it comes to fitting the rear bottom piece.

The deck pieces are added next. These are glued and pinned to the top of the stempiece and bulkheads. I did not cut the two deck access openings underneath the vertical launch missile installations until after completing the hull. It might be easier to do this before fitting these deck pieces.

The final part of the hull structure is to turn it over and add the transom and rear bottom piece. To get good glued joints, these edges ought to be sanded to the correct angle. At this point, I always leave the hull structure for a few hours. I know the glue is supposed to

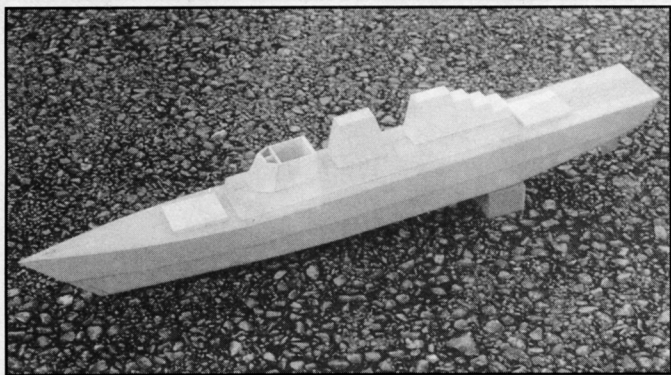


**Completed hull, ready for superstructure.**

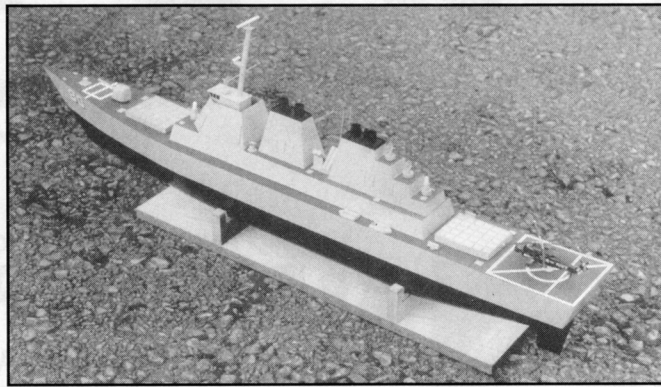
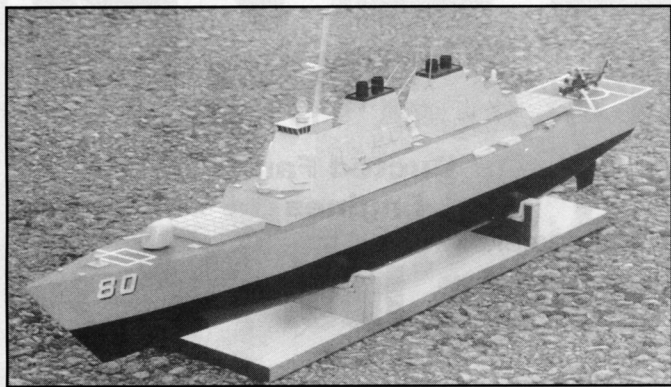
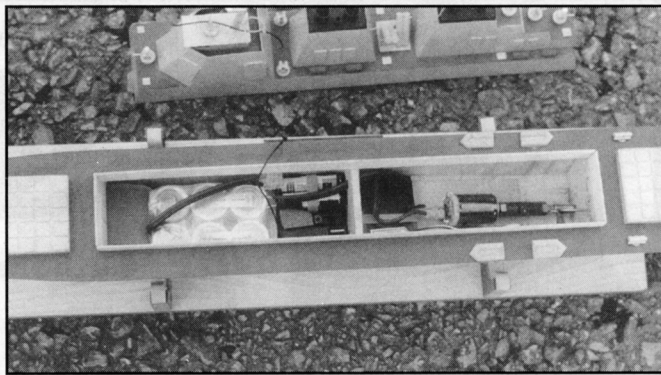


**LEFT: The superstructure is built over the 1/16" plywood deck coaming. RIGHT: Close-up of the bridge and fore funnel.**





**LEFT:** Basic superstructure completed, ready for the details, finishing touches and painting. **RIGHT:** Superstructure removed to show the good access to all components. Note that this photo was taken early in the motor/battery selection phase as a 6-cell battery pack was being tested.



*The finished model, ready for the pond.*

set in 15-30 minutes but the vigorous sanding which comes next needs a completely rigid structure.

The edges of the hull structure must be sanded so that the side sheeting will fit flush. A sanding block which covers both the deck and the bottom edges at the same time is the only way to do this. The aim should be to let the side sheets fit to the deck, bottom, and bulkheads with no obvious gaps. If you are a little too enthusiastic in this task, then strips of balsa can be glued to the edges and sanded back to the correct profile.

#### **Drive Line And Rudder**

It is much easier to install these items before adding the side sheets. For accurate placement of the propeller and rudder tubes, a centerline must be drawn down the middle of the rear bottom piece. The plans show a suitable set-up for Speed 600 type motors. To be honest, scale-type model boats are not usually critical with prop and rudder placement, provided they are central.

I used a commercial prop shaft and matching bushed tube. If you opt to use a steel shaft and simple close-fitting brass tube, then do ensure that both items are dead straight. Any bend in the shaft and/or tube will create excess friction, wear, and noise! Slightly oversized holes were cut through the bottom sheet and third bulkhead to allow the tube to be correctly

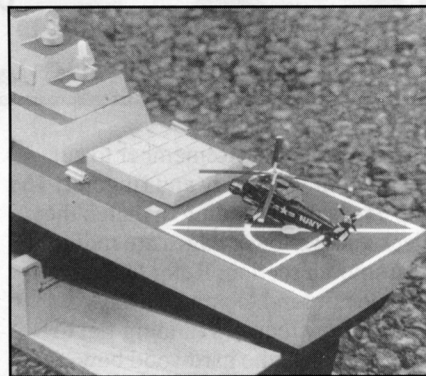
positioned before packing with balsa scraps and epoxied in place.

The motor I was using had a mounting bracket. A piece of balsa was carved into a wedge shape to act as base for the bracket. A little adjustment of this wedge soon had the motor shaft in line with the prop shaft. A commercial universal type of coupling was used to connect the two shafts. You could use any suitable alternatives, provided they can cope with the motor's power, a piece of fuel tubing might last a few seconds!

The rudder was a homemade affair using an aluminum blade epoxied to a slotted steel shaft. This fit into a metal tube epoxied into the hull. It seemed prudent to add a little extra balsa reinforcement around this tube. Realizing that there would be no access to the rudder steering arm after the hull sides were sheeted, it was best to install the rudder servo and linkage. The servo was mounted alongside the motor coupling using balsa blocks glued to the bulkhead and hull bottom. This method required a hole through the bulkhead for the wire link. Simple "Z" bends were used to make the links, this is a reliable method, as the rudder arm is inaccessible later.

#### **Hull Sheeting**

It is probably best to remove the motor and rudder servo before starting



*Close-up of the flight deck. The little helicopter was purchased from a toy store.*

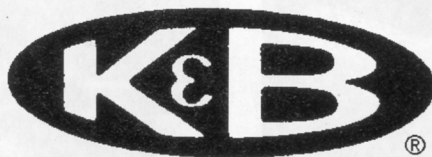
to sheet the hull sides, getting glue over these items is bad news. I usually begin from the stern using 3/16" balsa cut from 4" wide sheet. If these pieces are cut slightly oversize, then the excess can be easily trimmed away to give a neat finish at the upper and lower corners of the hull. The gentle curves in this hull mean that a couple of pins at the top and bottom will keep each piece butted up against the next one while the glue dries.

One trick I have learned is to use a triangular sheeting piece around the position of the first bulkhead. This allows the grain of the remaining sheeting to slope forwards and adopt the bow shape much more readily.

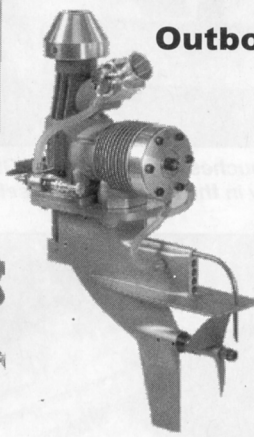
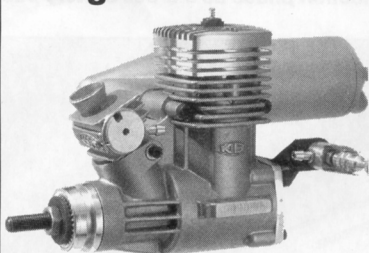
When dry, the excess sheet can be removed from the top and bottom edges. A sharp craft knife will quickly



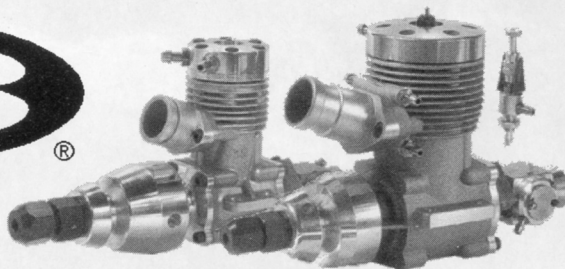
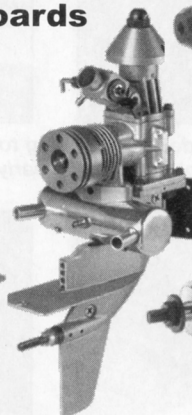
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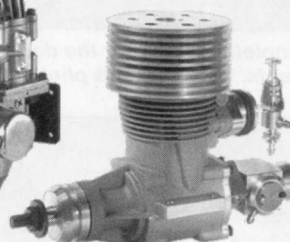
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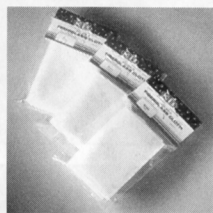


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remove the bulk. (Remember to cut away from your body and fingers!) The top edges need sanding to match the deck and the lower edges are radiused to a smooth section. Refer to the plan, and do not sand too much away.

The bow requires sanding flat to accommodate the hardwood bow reinforcement strip. I found a piece of 1/2" square strip was ideal for this item. After the glue was completely cured, the strip was carved and sanded to match the hull lines and produce a rakish bow.

Any defects in the hull need

attending to at this stage. Gaps ought to be filled and any "steps" between adjacent side sheets sanded away. At this point, I usually give the hull two coats of clear dope and a light sanding. This toughens the surface and produces a good base for the cardstock.

The detachable superstructure fits over coaming strips which run around the inside edges of the deck access opening. In many of my model ships, these coamings have been successfully made from card. In anticipation of Hibbard's high performance, it seemed prudent to use 1/16" plywood for the coaming strips. It is important that the coaming is at right angles to the deck, otherwise the superstructure will be a poor fit.

### **Card Sides**

Covering the hull sides with thin card makes the model amazingly resistant to the odd knocks which inevitably occur when sailing. I usually just cover the hull sides above the waterline, as this is the region which gets the most damage. It also produces a convenient line when painting the hull.

A waterline is drawn around the hull with a felt-tip pen. Starting from the stern, the card is glued down to this line

but with a little card above the deck line. Using a contact adhesive, it is a quick and easy job to butt-joint card strips along the hull sides. The excess card can be trimmed off at the deck edge. The whole external surfaces of the hull is then sealed with dope. To ensure a good grain-free finish on the decks, a layer of lightweight tissue is stuck down with dope. To save damaging the hull while handling it, it is a good idea to make a stand to support it before doing any more work.

### **Superstructure**

When first thinking about this model, I was puzzled as to how to make the inwardly angled superstructure and funnels. The answer was sitting in my stock of balsa sheet and strip; that is, a piece of 1" x 1/4" trailing edge. This could be used to make the edges of the superstructure block around the deck coaming. The triangular section would fit squarely to the deck and coaming strips while the external faces would slope inwards at just the right angle.

The superstructure deck can be made using the piece cut out of the deck for the access opening, it ought to be a perfect fit. The TE strip should be cut to fit across the front and rear of the deck coaming. The TE side pieces are

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cut to be a little too long, the excess being cut and sanded way after the glue sets. The only thing that might go wrong at this stage is using a little too much glue, which means the superstructure gets stuck to the deck or coaming. You have been warned!

The bridge and funnels are made from scraps of balsa; you know, those pieces too small for most things, but too big to discard. It is an easy job to make these items by a cut-and-try process, as all the cuts are straight lines. The external surfaces of the superstructure, bridge, and funnels were covered in thin card to produce a smooth surface to match the hull. Also, I will confess, in my case, the card hid the odd gap and mistake!

The final items to make are the two vertical missile launch silos. If you have not already done so, the two deck access openings under these installations need cutting out. The silos are represented by larger pieces of 1/4" balsa sheet being stuck to the cut-out pieces. This allows them to make a perfect fit when refitted into the deck openings. The doors of the missile containers were just squares of card stuck in a neat and uniform fashion.

The external superstructure surfaces were given a couple of thinned coats of dope. Any small defects were filled at this stage before applying a final coat of dope. The flat surfaces of stealthy designs might not give the most attractive lines to a warship, but they sure make building and finishing easy!

#### Details

Being a freelance model, there is plenty of scope for adding whatever small items take your fancy. A little caution is, however, needed to maintain an air of realism about the whole model. Modern warships can have a very "empty" appearance with most of the weapons systems being installed inside the hull and superstructure.

Plastic sheet was used to make the various hatches and vents which appear on warships. The flat radar antenna on the sides of the bridge were also cut from plastic card. These items can be added to the model before painting but other details are best left off until painting is completed.

The 5" gun was no more than a balsa body with a plastic tube gun barrel. Plastic tube was also used for life rafts, inflatables, and the between funnel missile tubes. The two "CIWS" mountings and three radars can be made from bits of plastic. The "CIWS" gun barrels were just small nails, while the radar aerials were thumb tacks.

The mast could not have been easier, as some aluminum tubing was just slightly flattened to an oval section. Holes were drilled into which the wire yardarm's were epoxied. The mast radar platform and aerials were made from plastic card. The mast slotted into a hole made through the bridge block. I drilled a small pilot hole, then opened it out with a file. Some care was needed to keep the mast square but raked backwards. I was lucky and got the angle just right the first time, but you might need to use some packing and epoxy. It is worth spending a little time to get this right; a misaligned mast stands out like the proverbial sore thumb!

#### Painting

The hull sides above the waterline, superstructure, and details were painted gloss light grey. The large flat areas need a smooth finish, so two or three thin coats of paint are desirable. The hull below the waterline was painted gloss black. This is not true to scale but I hate seeing bright red hull bottom colors when any model is sailing on the normal waterline.

Gloss paint might not be considered realistic, but it is far tougher than matt paint. If the final model is considered too shiny, then clear matt or satin varnish could be sprayed over the completed model. Matt paints were used on the decks, a darker grey/green shade, and black on the funnel tops and vents.

To add a little color to the plain warship grey, the life rafts were painted orange, and the inflatables, yellow. Again, not scale but it does add a small amount of "life" to the finished model. The navigation and "CIWS" radars can be painted white.

The final decorations were the helicopter deck markings and the hull numbers on each side of the bow. Skilled artists could try painting them; unskilled people like me just cut them out of self-adhesive plastic film.

#### R/C Installation

The motor and rudder servo need refitting first. It is also wise to lubricate the prop shaft and tube; grease is not recommended as its viscosity will drag the motor speed down. This has the effect of raising the current drawn which results in a hotter motor and reduced battery life as well as a slower model, so I use regular automotive oil. I know it is not water resistant and can form an emulsion, but regular application and an annual strip down avoids any problems.

There is space between the motor

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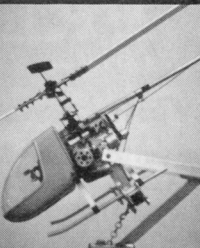
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and the second bulkhead for a speed controller. An electronic or mechanical controller can be used; the most important thing is that it gives a good range of control from dead slow to flank speed. The drive battery and receiver fit between the first two bulkheads. I used a small transverse strip of balsa to ensure the battery pack could not move rearwards. Lateral movement can be stopped with foam rubber packing of loose items.

The receiver antenna wire belongs up in the air, not buried inside the hull. For the first trial runs, the wire was simply fed through a hole in the superstructure deck and draped over funnels using an elastic band around a radar aerial for light tension. This worked okay and was virtually invisible while sailing but needed refitting every time the superstructure was removed. This lead to a thin vertical wire whip aerial being used which is even less visible. The wire slides into a brass tube which runs from the top of the bridge block, ending inside the removable hatch, and the receiver wire is soldered to the bottom of this tube. The receiver wire is shortened so that the total length of the new antenna system, that is whip aerial and flexible wires, is the same as

the original wire; thus, the receiver's performance is unchanged. The wire whip can be removed from the brass tube for storage or transport while a small plug and socket in the flexible wire allows the superstructure to be detached. This method has never let me down in numerous models, the only precaution is to **always bend a safety loop in the top of the wire whip aerial**, failure to do this could result in serious injury.

### Trials

Before rushing off for the maiden voyage, you must check the R/C functions and ballast. The rudder needs to turn through about 30° either side of neutral. This will give good rudder response without fear of the linkage going overcenter and jamming. The motor ought to turn ahead when you move the throttle stick forwards; don't laugh, as it is not uncommon for model boaters to give their latest pride and joy full ahead only to find that it promptly leaps backwards.

The model has an operating weight of around 5 pounds and this calls for some extra ballast. Lead is by far the best material to use and I used pieces about 1/4" thick. The lead is cut to fit on the hull bottom of the bow and stern

compartments just ahead of bulkhead 1 and aft of bulkhead 3. The pieces were fed through the access cutouts under the missile silos until the correct trim was obtained. At this point, the model ought to be very stable, with any attempt to roll the hull resulting in it springing quickly upright. To secure the ballast, I used a latex-based adhesive. This holds the lead in place while sailing, but it allows removal if needed for later re-trimming. A silicon sealant would probably be just as good.

### Shakedown Cruise

With everything installed, secured, and checked, it's just a case of charging the battery for the sailing trials. Although this model will cope with rough conditions, just like an airplane, it's best to wait for reasonably calm conditions for the first run. After rechecking the R/C functions, head the model out to a clear area, then get a feel for the rudder response at about half speed. As soon as a rudder command is given, the model should turn, immediately returning to a straight run when the transmitter stick is centered. Adjust the transmitter trim if there is any tendency to noticeably deviate from straight running. The turns to the left and right should be about the same diameter, around 7-8 foot. If it turns tighter in one direction than the other, then check for even rudder movement. Astern sailing ought to be checked at this stage. Keep the speed modest or the stern can be swamped. The model will be steerable once moving astern.

When you are happy with the model's handling at half speed, then full speed is next. Before storming around the lake, find a clear stretch of water for one vital test. Let the model build up to full speed, which ought to take no more than a few seconds, then cut the power and note how much distance is needed before the model comes to rest. In practice, models have a habit of

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creeping on and on, so settle for it coming almost to a stop. This distance represents a **safety zone** when traveling at full speed. Anything entering, or likely to enter, this zone represents a danger, so you have to keep your attention at least this far ahead of the model when sailing. Far too many people damage their own and other peoples' models by just concentrating on the model, not where it is going!

After this, you can settle down to find out just what your model can do. Full-speed turns will be a little wider than at slow speed, but still stable. In fact, unlike the full-size warships which heel out of turns, the model ought to remain upright. This is due to the sideways force on the rudder being below the model's center of mass, thus countering the rolling moment.

It doesn't take long to become comfortable with the model's handling at all speeds. One favorite trick of mine is to sprint about the lake at full speed, then head for the docking area, still at full speed. Knowing the stopping distance and that sudden turns quickly scrub off a model's speed, I cut the motor and apply full rudder at the last moment. This should result in the model decelerating and turning to end up alongside the landing stage dock with the gentlest of touches — impressive but not for the faint-hearted!

After a little heartache over the correct motor/battery combination, the Hibbard model has been very successful. A modern stealth warship does not have to look ugly and is quite easy to build. The sailing performance is excellent and the top speed is achieved with no fuss or trauma. Rough weather is no handicap as the model can carry on sailing when most people pack up and go home. Not bad for a few sheets of balsa!

## Basic Wood Construction Materials Balsa

Two sheets 1/4" x 4" x 36"  
One sheet 1/4" x 3" x 36"  
Two sheets 3/16" x 4" x 36"  
Two strips 1" x 1/4" trailing edge  
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