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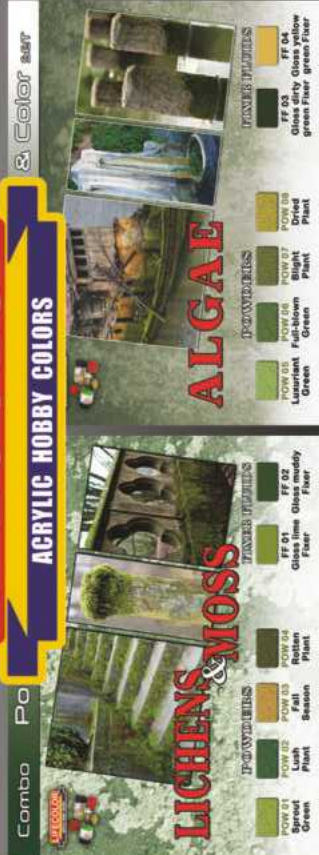
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Bow piece



This 100 page Model Boats Winter 2015

Special Issue includes a new CAD Feature Plan for Fleetfoot, a 1/8th scale fast runabout with comprehensive pictorial building instructions presented by John Parker. In addition there is a kit review by Ivor Warne for the Mountfleet Models Cruiser tug. This kit for a traditional steam powered tug has been updated since the recent change of ownership of Mountfleet Models and in his review, Ivor emphasises the additional practical features he has included in this r/c model.

Andy Cope has a rather nice piece on his simple, easy to build, and fully functioning hovercraft and Craig Dickson of the British Model Powerboat Racing Society has a fully illustrated feature for building an inexpensive offshore style model powerboat for competitive use in this type of racing. Indeed, this boat has already won some races in 2015, so you can't get much better than that.

This 100 page issue has for its second thread, the theme of 'Improving your Modelling Skills' and for this there are articles by Ron Rees on how to make bespoke figures for your model boats; the art of soldering by Dave Wooley and Richard Simpson has a guide to buying a steam plant from UK based suppliers for your latest model. Richard is demonstrating that 'steam', which has a fascination of its own, need not be expensive and that there is nothing mysterious about it.

I hope in this Special 100 Page Special issue that there is something for everyone who has a passion for radio control scale model boating and please don't forget to visit our website and participate in our Model Boats Forum which is managed by Colin Bishop. Model Boats is also on Twitter and Facebook for those readers who like to use other social media.

I should also add, that Colin Bishop has been 'minding the harbour' during the final design and layout stage for this magazine during early October whilst I have been on holiday, so a heartfelt 'Thank You' to him for his positive input.

Paul Freshney - Editor

Website and Forum



Your Online Model Boating Resource

Website Editor Colin Bishop explains

In a world when everything seems to be increasingly 'going digital' there are still many people who prefer the more relaxed experience of a real magazine to pursue their leisure interests and in fact you are one of them, otherwise you would not be reading this!

However, modern technology has a lot to offer even the dedicated magazine reader by providing the opportunity to add to the enjoyment of your leisure interests and model boating is no exception. Even better, it allows you to choose the areas that are of most interest to you and usually it costs nothing as long as you have an internet connection.

The Model Boats Website and Forum

These are to be found at:

www.modelboats.co.uk

The website is designed to build on the popularity of the hobby's leading magazine and bring the benefits of the online experience to established modellers and newcomers alike. The website itself has a large selection of free to view sample features from previous issues of the magazine which demonstrate the breadth of material covered and which is a very useful practical information source in its own right. If you are a Digital, or Print and Digital subscriber, then you also have access to the magazine's digital archives going back to January 2007 with a vast number of articles available to view and please check the subscription options on the website for details of access to the digital archives. If you have not yet subscribed, then you can still see the covers and tables of contents of issues dating back over the last five years which can help track down that elusive half-remembered article.

Other website features include viewing the many superb photo albums posted by boat modellers covering almost

all aspects of the hobby, plus links to suppliers, subscription options and competition prize draws.

Underpinning the website is the **Model Boats Forum** which is a friendly place where like minded boat modellers describe their current builds, share information, provide advice and engage in entertaining exchanges, not all of which are strictly about boat modelling. This Forum allows you to 'meet' fellow modellers with shared interests who you might not otherwise encounter and who can often help you with those knotty problems that inevitably arise on any model making project. They say, 'a picture is worth a thousand words', and it was never more true than when helping to explain a particular modelling technique or resolve an issue which is holding up your build.

Registering on the website is free and enables you to post on the Forum. If you are a subscriber with digital access as well, then access to the digital archives means that the world is your boat modelling oyster.



▲ The HMS Snowberry Revell 'Plastic Magic' kit conversion is just one of the feature articles available on the website.



▲ The Digital Archives are an invaluable resource for Model Boats magazine readers with Digital or Print and Digital subscriptions, taken out with the publisher. Please check the options on the website, but note that subscriptions, of any type, taken with third parties do not confer the same archive access.



▲ Ashley Needham's 'Today's Boating' topic on the Forum features some unorthodox models and their adventures.



▲ Forum members regularly write for the magazine and support model boating events. Paul Thomason and Robert Abell, both regular Forum supporters can be seen here at Haydock Park in 2014.

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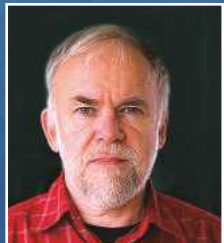
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Fleetfoot

John Parker's new plan for a 1/8th scale fast runabout

“No amateur boat builder should plunge blindly into the construction of a boat unless he is sure that the necessary store of time and patience is at hand so that the work may be properly completed.**”**

The American John L. Hacker (1877 to 1961) was undoubtedly one of the greats when it came to the design of fast motorboats.

A pioneer of the vee-bottomed planing hull, which broke through the speed and stability restrictions of narrow displacement hulls in the 1920's, he drove innovation on many fronts, introducing the forward cockpit arrangement and producing a string of designs that won more races than any others. His influence extended far beyond the products of his own company, Hacker-Craft, for at one time or another he either worked for, or provided designs for, many of the other 'big name' manufacturers.

In 1923, Motor Boating magazine published a series of his designs, offering them royalty-free and intended for home construction. Full specifications and drawings, a table of offsets and building notes accompanied the articles, with larger blueprints available at extra cost if required. These designs have formed the basis of many a modern reproduction by people wanting a classic wooden runabout. They were collected together with some other designs and issued as a book in 1944, entitled 'The Runabout Book - Complete Designs for Eighteen Smart Runabouts and a Selected Group of Cruisers, Sailboats, Dinghies and Utility Types', Volume No. 22 in Motor Boating's Ideal Series. Needless to say, this book is also of great interest to builders of model boats, and I'm pleased to have a copy of the 1947 edition on my bookshelf.

Most of the Hacker plans in this book form two families of designs, each with their own characteristic appearance, in a range of sizes and performance. Forming the first group are the 14ft Marybelle, 16ft 9in Anita, 22ft Suzette, 25ft White Cap and 28ft Irene, all with raised sheer lines for greater freeboard at the bow. The second group, with a hogged (upwardly humped) sheer line, consists of the 16ft Lorraine, 18ft Flapper, 20ft Gladys, 22ft 6in Fleetfoot and 26ft Miss APBA. In addition, there's Priscilla, a 21.5ft hydroplane and Chiquita, a 23.5ft knockabout (runabout with a cabin).

Although Hacker became an advocate of the forward cockpit arrangement for better driver visibility, these designs all feature aft cockpits. The obvious one to choose for a modelling subject is Miss APBA, the famous Gold Cup racer, but this is already available in kit form from Legend Model Boats in the USA, and I saw no point in duplicating it. My earlier runabout offering, Woodstock, appeared in the 2010 Model Boats Winter Special Edition and was based on the 16ft Lorraine. Going about half-way between these two, I settled for the 22.5ft Fleetfoot, which you might think of as an enlarged four seat version of Woodstock and it results in a model 857mm long by 211mm wide at 1/8th scale.

Degree of difficulty

In his introductory notes for Fleetfoot, John Hacker wrote:

'No amateur boat builder should plunge blindly into the construction of a boat unless he is sure that the necessary store of time and patience is at hand so that the work may be properly completed. It requires skill and craftsmanship of no mean order to turn out a creditable job. The mere reading of a set of instructions, or a story on how to build a boat is not sufficient to impart the necessary skill'.

The same may be said of building a model Fleetfoot. The defining characteristic of a runabout is the beauty of its varnished mahogany woodwork, and this cannot be achieved without a supply of suitable timber, experience in planing a hull with it, and a general commitment to achieving a good fit and finish throughout. Clear varnish will immediately betray any underlying attempt at filling or corrective work. Much careful sanding and shaping of parts will be required. There will be setbacks and on occasion, the time involved in making the model will seem out of proportion to its simplicity.

For those that do rise to the challenge, the reward will be a fast electric scale model that will not only look fine on the display shelf, but whose flanks will

Fleetfoot, a Fast Runabout

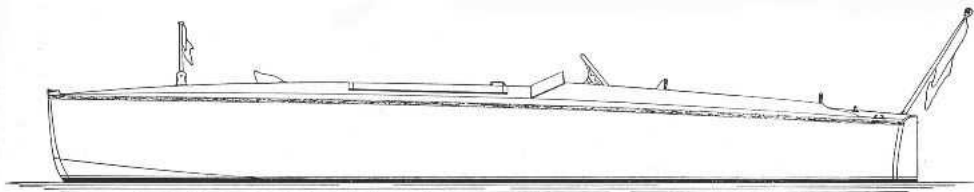
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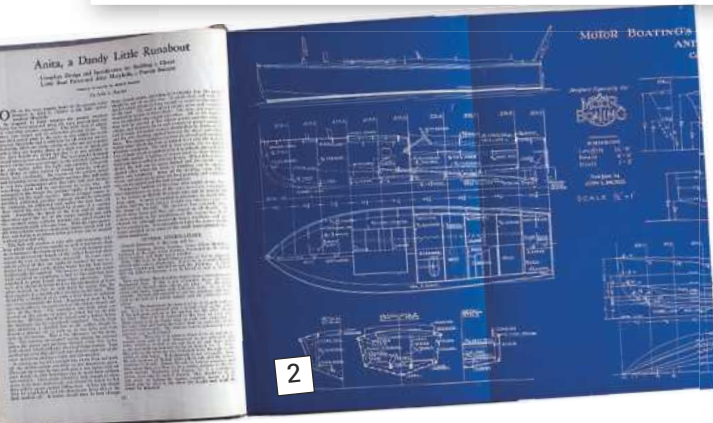
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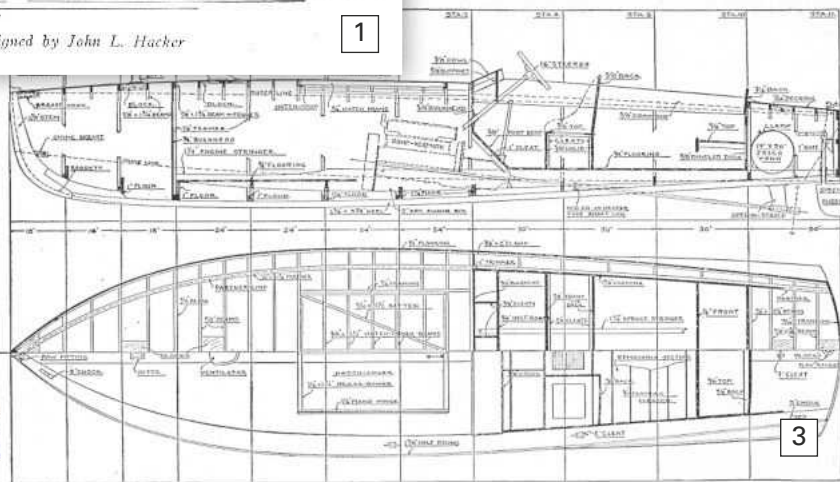


Outboard profile of Fleetfoot, a 22-foot runabout designed by John L. Hacker

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reflect the late afternoon sun in the glow of their varnished timber as you perform lazy figures-of-eight at the lake, leaning into the turns this way and then that, the ripples pattering a drum roll under the hull and closing over the foaming wake in time to do it all again on the next pass, the better part of an hour passing in this blissful way until it's time to motor in for a battery change.

Model design

With all the information needed to build the full-size boat in front of me, there was little guesswork required in tracing Fleetfoot's lines into a CAD (Computer Aided Design) program to produce the model drawings. I chose to retain the original main frame stations, spaced at a scale 18 inches (57mm on the model) at the bow, stretching to 24 inches (76mm) amidships and 30 inches (95mm) over the cockpit area. All sections and curves are faithful to the original design, as are the stern tube location and angle, propeller size and position, engine hatch, cockpit layout and so on; the drive motor is located where the engine flywheel would be on the full-size boat.

I did take some liberties with the front seats and steering wheel in order to accommodate my 1/8th scale driver figure and you will probably need to do the same. These guys are hard to come by and must be pandered to, for a runabout looks very strange careering around without a driver. Mine was originally a wrestling commentator, hence the striped suit and his hand now grips the wheel instead of a microphone. One need not be too particular about the fittings and details, for these would have been left to the individual boat builder, the specifications allowing considerable latitude; even the transom for example, could be either curved or straight, but we'll go for the curved one. I couldn't manage to duplicate the air scoop for the engine compartment, so settled for a horn instead.

The construction method assumed is a

framework of 3mm Liteply frames and basswood stringers, with a single layer of 2mm to 2.4mm (3/32inch) mahogany planking, reinforced with glass cloth and resin on the inside (optionally, on the outside too). This results in a rigid and seaworthy model with the light weight that is needed to achieve a high performance. Variations are possible of course, depending on your preferences or experience. The hull could be double planked, using 1mm or 1.2mm plywood for the first layer and 1.6mm mahogany for the outer layer, but this will require intermediate stringers on the frames to which to attach the inner diagonal planking. I find that internal reinforcement with glass cloth effectively removes the need for double planking, saving both weight and work and removing all possibility of de-lamination occurring after year's of use. The drawings, available now from MyHobbyStore, are on two A0 sheets and include details of model construction and running gear, as well as full-size templates for the frames and other major components.

Photo 1: Fleetfoot, from *The Runabout Book*.

Photo 2: Another design from *The Runabout Book*, blueprint partially unfolded.

Photo 3: Fleetfoot in plan and elevation.

Photo 4: Logo of the Hackercraft company.

Photo 5: A modern reproduction of a boat similar to Fleetfoot, by Frecheville Heaney Boatbuilders.



5



Photo 6: Running gear: Motor, exposed propshaft and alternative rudders.

Photo 7: Detail of the outrunner motor on its water-cooled mounting plate.

Running gear

For greater realism, the model has an exposed propeller shaft with a strut providing the rear bearing, and a short stern tube with two bearing bushes for the portion lying within the hull. This may require careful sourcing, or perhaps you can do as I did, and make one up from 4mm stainless steel shafting, brass tube and bronze bearing bushes. The easier option is to simply use a conventional long stern tube extending to the rear strut, as it won't be seen once in the water and may be less prone to picking up weed. It will likely need a centre bearing to avoid nasty vibration from 'whipping' of the long shaft. I made two rudders for comparison, one to the scale outline and the other a functional dagger shape. The rudder servo sits behind the rear seat.

Motive power comes from a medium size

brushless outrunner motor, but please don't ask what the most suitable brushed motor would be. The model may be a 1920's design, but that doesn't mean its motor technology should be likewise. I've heard all the excuses for not using a brushless motor, for example:

They're too expensive.

Really? A useable motor and speed controller combo can be had online for US \$30 or less and the branded name motor I used cost less than the list price of a Speed 600 brushed motor.

You can't get a controller with reverse.

Not true and many such types are available now, intended for car and boat applications.

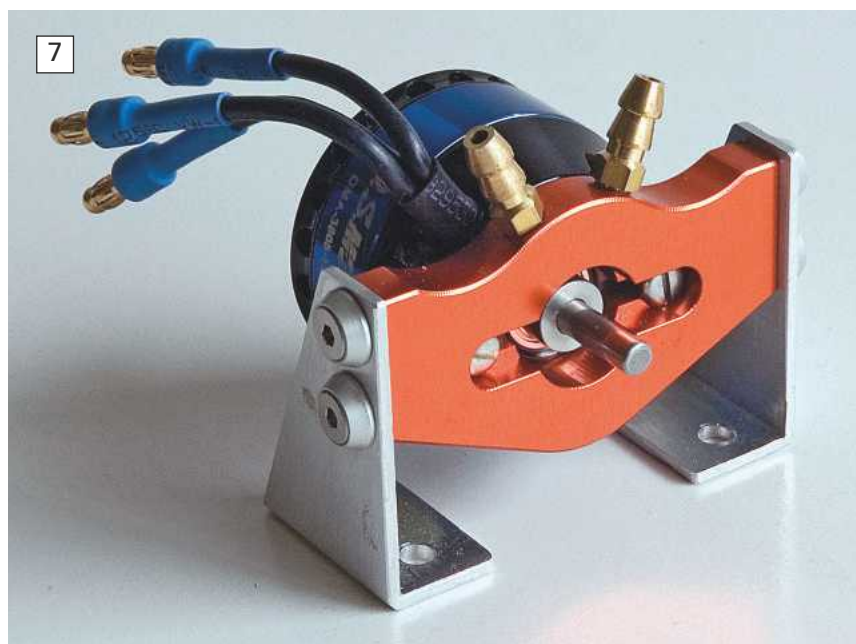
You can't get good low speed control.

True to a degree, but this is a speedboat and the slight forward lurch on throttle opening is no more than the full-size boat would display when put into gear with the engine idling. Mine fires up and runs at about 300rpm, so it's realistic. Enjoy the speed and power, and don't worry about emulating a tug boat. If you really must have good low speed start-up, a brushless motor with a sensor and suitable controller will provide it.

There's no real advantage.

Are you kidding? Half the size and weight, yet more power and greater efficiency, no need for a gearbox and no need to solder up those fiddly suppression capacitors! A model like this cries out for a brushless motor.

Outrunner motors are known for their high torque output and are able to drive a large propeller effectively and efficiently. We have to be a bit





careful not to go too far here however, as Fleetfoot's hull by today's standards is quite narrow and the torque reaction from too fierce a propeller will make the model want to dig one side of the hull into the water. When offset to the left side, the weight of the driver figure will help to counter this, assuming the usual propeller that turns anti-clockwise when viewed from the stern. The combination shown on the plan, a 43mm diameter three bladed scale propeller of standard pitch and the 1200KV 37mm diameter brushless motor, worked well in practice.

For long runs in the hot Australian summer I have fitted water-cooling, but this would be an unnecessary complication for many people. It is easily achieved though, by fixing the motor to a water-cooled motor mount, the supply tube running from a pick-up behind the propeller through holes in the frames on the starboard side. The shortest path for the outlet is to run it out one side of the engine bay, but with a little more work it could be ducted back to the stern via the port side to exit from the exhaust as I have done.

A single six-cell 7.2v Nickel Metal-Hydrate (NiMH) 'twin stick' battery, or similar sized 7.4 volt LiPo type, is fitted under the rear seat. The long snout is mostly empty space, a circular hatch in Frame D closing it off to provide buoyancy in case of flooding or providing a baffle for the mounting of a three inch sounds effects speaker. How the sound would escape though is problematical, perhaps through a vent under the dashboard?

Planking timber

Make sure you have a suitable source of planking timber before you start. Mine came in the form of wooden window blinds made of western red cedar, picked up by a friend from the side of a road during a council household rubbish clearance. Well, the price was appealing (i.e. free!) and the timber looked workable, so I thought I'd give it a go. The blind slats were 3mm thick and a little over 40mm wide; each was 2400mm long and yielded six 950mm x 12mm wide planks when cut with a slotting bit on a router table between the three slots pierced for hanging the blinds. These were later thinned down to about 2.2mm thick, again on the router table, and some reduced to 10mm width for the deck planking. In all, I used around

22 slats, cutting some 54 planks (plus rejects). The remaining material was used elsewhere on the model, generally at its full 3mm thickness, including the ends of the blinds which were long enough for the cockpit floor planks. Throughout this article, I will refer to the timber though as mahogany, as that's what it's intended to represent.

If your local hobby supplier doesn't stock anything suitable, mahogany sheets are available from Midwest of the USA through retailers such as Micro Mark. These are only 610mm long though, and will require joining with scarf joints cut through the thickness (not width) of the planks cut from the sheet. Alternatively, I note that suppliers such as Cornwall Model Boats in the UK list mahogany sheets and planks on their website, though I have not sampled these myself. Fine hobby grade mahogany will be easier to work with than the timber I used and produce a more consistent appearance. I used medium cyanoacrylate (super glue) to fit the planking and epoxy adhesive for all other joints.

Photo 8: Cedar blind slats sawn to length.



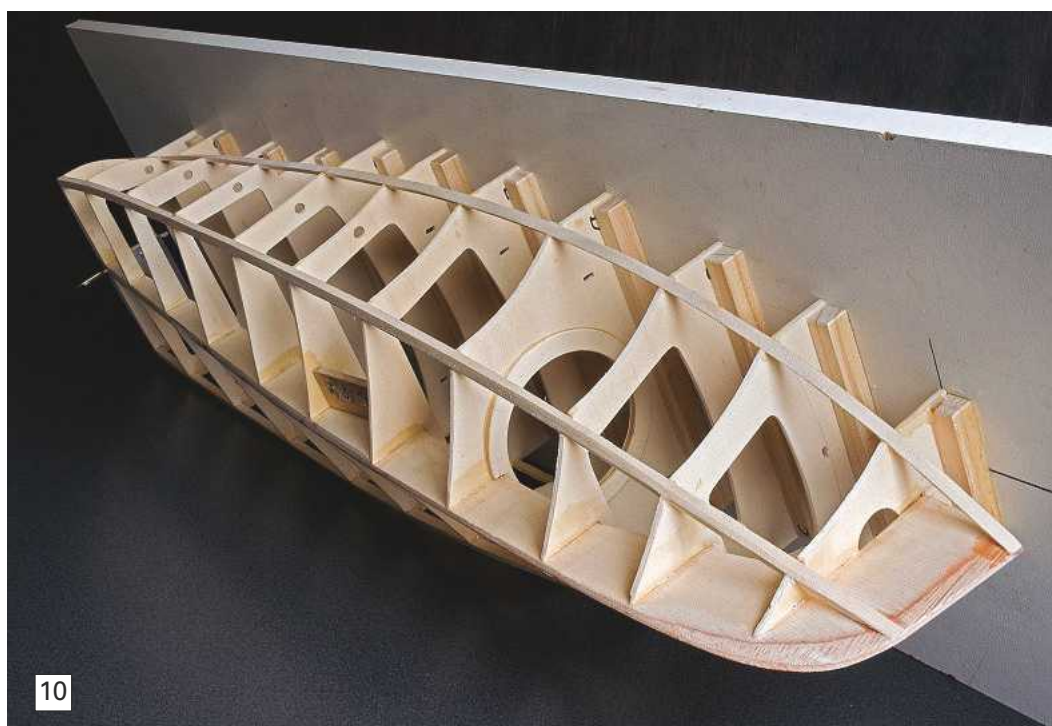


Photo 9: Keel and frames assembled on the building board.

Photo 10: Stringers attached and some fairing carried out.

Photo 11: Another view of the framework, now ready for planking.

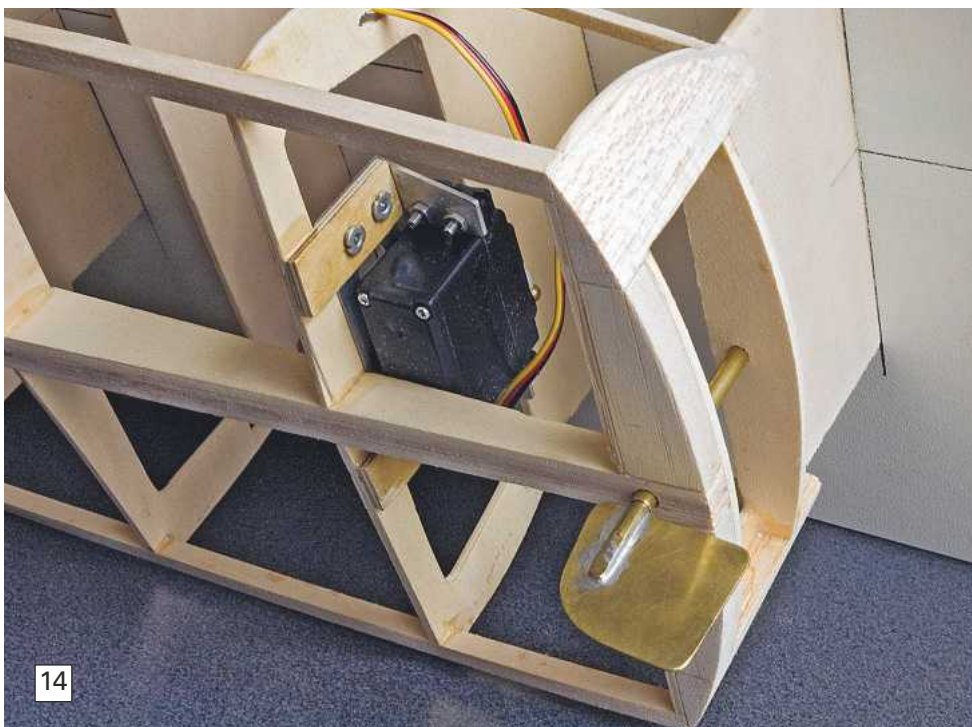
Photo 12: Bow detail.

Hull framework

Fleetfoot's framework is straightforward to build. The two main keel components of 6mm ply are joined by the two 3mm side doublers to form a built-up keel with a recess for the stern tube. Once the glue is fully set, round the recess out with a file or sandpaper wrapped around a wooden dowel until the stern tube is a nice fit, but don't glue it in place yet. Cut the frames from 3mm Liteply and check for correct fit and depth of engagement with the keel; ensure that any necessary service holes for wiring or water cooling are in place and fit a doubler around the cut-out on the front of Frame D. The frames should have the deck camber marked (or lightly

scribed) on to them along with a centreline. Mark the centreline and frame locations on your building board and glue the frames on to it via square strips of timber previously glued to their extensions, checking carefully for squareness and alignment. By using PVA glue and a melamine-faced shelf for a building board, I find I can tap the frame extensions off later using a small hammer, without damage to the board.

Some initial shaping of the keel's bottom edge, from a sharp 'Vee' at the bow to a complete flattening out by the stern, can be done before it is engaged with the frames and epoxied into place. The motor mounting plate can also be prepared and fitted at this stage, when its alignment can



more easily be checked. Captive M3 T-nuts on the underside of the plate, or cheese head screws with piano wire through their slots, epoxied into place, provide anchorage for the motor bracket mounting. I took the opportunity to provide extra T-nut locations to provide for alternative motors or brackets in the future. It may be as well to also incorporate at this early stage the tube for the rudder stock and a mounting for the rudder servo.

The 1/8 x 1/4 inch (or 3mm x 6mm) hull stringers are fitted next. Mine were cut from 1/8 inch (3.2mm) basswood (limewood) sheet, which was only 610mm long, and therefore required scarf joints to span the hull length. A single strip is fitted at deck level, and doubled-up strips fitted (one at a

time) at the chine, all sharply angled at their front ends to merge nicely into the keel. If any of the frames are slightly twisted, adjust them to be at right angles to the keel when the stringers are glued in, using clamps if necessary. Two curved formers and their associated balsa infill blocks need to be fitted at the transom, followed by a piece of 1.5mm plywood to take up the curve and form the foundation for the transom planking. If all looks well, the stringers and the edges of the framework can then be carefully faired to the shape of the hull to provide the best possible foundation for the planking. Take your time to do this well as you'll get it back with interest when you do the planking.

Photo 13: Motor installation.

Photo 14: Stern view showing servo mounting, rudder and transom formers.



Photo 15: Commencement of planking at the keel.

Photo 16: Completion of hull bottom planking.

Photo 17: Clamping of side planks.

Photo 18: Transition from right-angle to butt join at the chine.

Planking

Have your planks prepared and start with the bottom of the hull to establish your technique. Here, any expletive-provoking episodes may remain your guilty secret beneath the paint coverage later to come, but on the sides they will be there for the world to see. If your timber varies in its grain pattern or colour, sort your planks first, keeping the best ones for the deck and sides and ensure that, for them at least, there is a natural random nature to any variation, no groups of dark or light planks together. Hold pieces of paper against the outside of the framework and trace on to them the shapes of the panels formed by the framework, labelling them as you go; these will form templates for the glass cloth to be applied to the interior.

Start with the garboard planks, nearest the keel. They will need the most shaping of all the planks, an increasingly sharp angle along the edge to allow the first two planks to meet on the centreline and a tapering width. I found my medium superglue did not set with its usual speed on the cedar timber and had to call on clamps and tightly-stretched masking tape to hold the planks in place for two or three minutes before it held. I would put this down to the oil present in the wood, as the glue took no longer than a few seconds to work on basswood or ply.

Subsequent planks (alternate sides to avoid distortion) will be easier to fit and probably not require any tapering of the width, though the edges will require careful angling to nestle tightly

against the previous plank. Glue both the abutting edge and points of contact with the framework. I found the cedar timber I used quite treacherous in its tendency to 'let go' (split) across the grain and had to avoid applying too much sideways pressure. Hobby mahogany can also be bad in this respect, but not this bad. Run the planks past the transom edges at the stern for trimming later. Call a temporary halt to proceedings once the entire lower area of the hull up to the chine line, has been fully covered with the planking.

The next point is almost impossible to explain, so I hope the photos make it clear. The edges of the bottom planking now need to be carefully trimmed back to the outside edge of the chine stringers. This needs to be done in such a way that the next planks to be fitted, on the sides, are able to transition from being roughly a right angle joint to the bottom planking at the stern to being a parallel butt joint with it at the bow. It can be achieved by providing a sort of undercut to the edges of the planking from about Frame C forwards, which will leave a shoulder at the bow for the side plank to butt against.

The remainder of the side planking can then progress quite rapidly. There will a tendency for the bow length of the model to grow a little; don't be too concerned about this as any minor voids may be back-filled later with epoxy adhesive. Imperfections within about 12mm of the bow may be ignored as they will be hidden by the cutwater. The ends of the planks may be chamfered to meet on the centreline at the bow, or interleaved to run out on alternate sides. Continue planking past the deck line, then



Photo 19: Completion of hull planking – prior to cleanup of sides.

Photo 20: The hull after some initial sanding with custom sanding blocks.

Photo 21: Off the building board, with hatch framework completed.

Photo 22: Stern view showing premature planking of transom!

Photo 23: Covering boards fitted around deck edges.

Photo 24: Detail of foredeck covering boards and deck support beam.

Photo 25: Glass cloth pieces cut for interior lining.

trim all planks back flush with the transom at the stern. It would be permissible at this stage to give the outside a preliminary sanding to remove the worst of the glue patches or high spots, as I did for the sake of the photos, but the final sanding should wait until the interior has been fibreglassed.

The hull can now be cut free from the building board, the frames cut back to the scribed deck camber lines, and the side planking sanded back flush with the top of the deck stringers. It's not a bad shape is it? and it impresses me to think that its design is almost a hundred years old.

Sealing the interior

This can be done before or after the deck edge planking commences, but either way you need to work a piece of coarse sandpaper around the hull's interior to remove any particular high spots or ridges in the planking. Pieces of fine glass cloth (a satin weave 80 grams per square metre material was used on this prototype) can be cut to fit against the planking on the inside, butting snugly against the surrounding frames and stringers, using the paper templates you made earlier. It is then simply a matter of applying some resin (I used epoxy resin) through the cloth to bed these in place. The resin will fill any tiny gaps in the planking and form a nice fillet against the framework. It will also make the planking more rigid for final sanding to shape. Mop up any excess resin beyond that needed to wet out the cloth thoroughly as it's only then adding needless excess weight.





Photo 26: Interior sealed and deck planking underway.

Photo 27: The deck planking is continued over the hatch framework.

Photo 28: Completion of deck planking with hatch cut out.



The deck

It will help if you make a stand for the model at this stage, for progress now continues with the preparation of the engine hatch and planking of the deck. First fit the 6mm x 3mm support beam on the centreline, then the bearers that run between Frames D and G to form the engine hatch frame, along with the arched cross members. These will all be visible when the engine hatch is opened, so it is best to cut them from mahogany.

Within the void defined by the engine hatch frame, but about 0.5mm to 1mm smaller all round, the two engine hatch doors are assembled initially as a single unit, using suitable pieces of thin ply to provide the necessary spacing. There will be four longitudinal members, the inner two spaced a millimetre apart, all joined by the three arched cross members, using halving joints for strength. Later, the cross members will be cut through to separate the two doors. The door frame assembly can then be tack-glued in place on the hull, using small packing pieces of timber that will also be cut through later, or held in place by small clamps. Sand the entire top surfaces of the hull framework now to form a smoothly curved foundation for the deck planking.

The covering boards, wide pieces running around the deck edge, are made from three pieces each

side with their grain running tangent to the mid-point of the curved edge. They are a focal point of the model, so select your timber carefully to provide the best matching pieces, preferably with the three pieces of each side coming from the same sheet and book-matched (a mirror image) to the pieces on the other side. Only the inner profile and joint lines need to be accurately cut, the outer profile can be left a few millimetres over-side and sanded back to the hull planking later. Start with the foredeck and work aft, ensuring the joints occur where they are supported by the tops of Frames D and G. To ensure compliance with the double curvature, the inner edge can be clamped to the framework whilst being glued, with the outer edge held down by masking tape stretched tightly over the edge and run down to the keel.

White strips of plastic, 2mm x 1mm, may be used to represent caulking in a contrasting colour, though this really only became common practice in a later period. They will need to be fitted to the inside edge of the covering boards using superglue, back to the point where the cockpit starts. The first planks to fit are the ones whose inner edges coincide with edges of the engine hatch. Position these carefully, parallel to the keel, with their forward ends shaped to match the curvature of the covering boards (excess length at the cockpit end may be trimmed later).

It is then a matter of interspersing plastic strips and planks until the whole area of the foredeck is covered. Glue the planks to both the engine doors frame as well as the hull framework, marking the position of the engine hatch on the top of the planks whilst it is still visible. Keep a check on progress with respect to the width remaining, aiming either for planks of the same width throughout or just a wider central king plank. To end up with a narrow gap to fill on the centreline would spoil the appearance.

The stern deck is planked in a similar manner. Temporarily fit the rudder servo and its linkage first to check for correct operation whilst access is still open. Finally, with these planks sanded back flush with the transom, the transom can be planked. Thin the transom planks down if necessary, to conform with the curvature, and epoxy them in place, perhaps using stretched tape to pull their outer ends firmly against the ply with no trace of a gap. Notice the error I made here: I planked the stern deck after planking the transom, leaving the ends of the plastic caulking visible; the transom planking should go on last and cover everything else.





Engine hatch

On the foredeck, the engine hatch needs to be carefully cut out with a razor saw, ensuring that the cuts are made between the members that were spaced apart with packing pieces. The two doors can then be similarly separated, if it is intended to hinge them, or alternatively kept as one piece for the easier option of a large plug-in hatch. I used the smallest extruded brass hinges I could find, about 25 x 25mm open size, which had to be recessed about 1mm into their attachment bearers. Using M2.5 countersunk machine screws for fixing, instead of woodscrews, and 3.2mm holes in the bearers provided a small amount of adjustment to get the doors sitting just right. Admittedly, the hinges are out of scale, but they provide strong and practical access for a working model. The gaps around the door openings will be disguised later by the trim strips. The cockpit cowl can then be constructed and essentially it consists of a piece of thin mahogany curved over an arched framework. The cockpit sides can then be attached to the cowl and the whole assembly fettled for good fit on the hull. Don't glue it in place yet, sanding and finishing work will be easier with it off the hull. The underside of the deck planking and any remaining unprotected areas of the structure now need to be sealed with resin as best you can, using a long brush and working through the access panel in Frame D to seal the foredeck.

Cockpit interior

Mahogany planks, 12mm wide and spaced 2mm apart, form the slatted linings of the cockpit, joined in their staggered configuration by narrow strips on their rear sides as shown on the plan. Each lining panel may be held sprung in place below the cockpit side coaming by a single countersunk brass wood screw into a small basswood block fixed to Frame

H. The cockpit floor consists of wide transverse planks of 3mm mahogany with their upper edges chamfered slightly, held together on their underside by two glued fore-and-aft members of 6.4mm by 3.2mm basswood. The aft frames will need to be notched to clear these. Trim the sides of the cockpit floor until it fits neatly between the cockpit sides. At the rear of the floor, a vertical mahogany bulkhead forms the front of the rear seat/battery box, supported outboard of the cockpit sides by two side pieces glued to the rear of Frame I.

The front bucket seats are of straightforward construction from 3mm mahogany, but in my case, I had to join pieces to obtain the necessary width. Their design enables the plinths to be screwed internally to the cockpit floor, whilst the seats themselves are held to their plinths by a single discreet rear-facing countersunk screw. In this way, complete disassembly is possible, with the seats hiding the screws holding the cockpit floor and sides in place. The seat cushions are formed from strips of balsa rounded-off on their upper edges and glued edge-to-edge, then sealed and painted a darker green colour to represent leather. The rear seat is an unpadded bench seat, made removable for access to the battery. Two small super magnets may be used if necessary to hold it in place against Frame J.

Completion of the cockpit requires fitting a mahogany panel to the rear of Frame G. The angled kick panel is fitted to this frame via forward facing screws into its mitred attachment beam, enabling all cockpit components to be removed for finishing and access to the services running behind the side panels. Please note that gluing the angled kick panel to the cockpit floor or firewall would prevent the floor from being angled out and removed. All wooden cockpit components are stained to match the hull, but I dispensed with an epoxy finish here, relying on a few coats of marine varnish instead, applied as a spray.

Photo 29: Fitting of the cockpit lining panels, each held with a single screw.

Photo 30: Addition of the cockpit floor.

Photo 31: Rear bench seat and cockpit surround.

Photo 32: Front bucket seats.



Photo 33: Hull is stained and epoxy coat applied, prior to wet sanding.

Photo 34: Sanding progress with starboard side still showing a few low spots.



Hull finishing

With the hull basically complete, the stern tube and skeg can be fitted now, back-filling any voids with epoxy, that is if you have not done it already.

The hull and deck exterior will need to be carefully sanded to the final smooth surface, using long custom-shaped sanding blocks, such as pieces of foam or PVC tube, to blend the planks into the final overall shape. Working in different directions (but not at more than say 30 degrees to the grain) and constant checking by sighting along the surface will help to avoid any grooves or depressions. All traces of glue on the surface of the planks will need to be removed as they will prevent the stain or varnish from penetrating and show up badly later. Attempting to remove freshly spilt glue with solvent and a rag will only spread the mark thinner over a larger area. It is better to wait until it has set, then scrape or sand it off. Follow up with a finer grade of sandpaper, particularly if the plastic caulking strips have scratch marks on them from the initial sanding, working along the grain. Try to avoid handling it all too much after this final sanding, or wear cotton gloves, as the timber will tend to absorb oil from your fingers and this may result in patchy staining

Staining and epoxy coating

I used a water based mahogany stain on the hull as it has minimal effect on the white caulking strips. 250ml of the stain should be sufficient for the whole model. There's no need to stain the bottom of the hull, which will be painted, but this is a good place to practice your technique if needs be. With luck you'll find that any slight patchiness will add to the appearance, making it appear a natural timber rather than a painted-on appearance.

Once the stain had dried, I applied a coat of epoxy resin to the entire hull, incorporating a layer of 80gsm fine weave glass cloth to the area below the chine line, feathering the edge out near the bow where the chine line becomes indistinct. I chose not to use glass cloth elsewhere as my test pieces indicated it had a slight spoiling effect on the appearance of the timberwork. Once hardened, I knocked off high spots with coarse abrasive paper and applied a second coat of epoxy resin. The resin was mixed using exterior grade hardener (Type 207 in the West System) to protect the clear finish from the effects of the sun. Over-coating with marine varnish is also required for ultra-violet protection, but that will come later.

The glossy epoxy coating then needs to be wet sanded back to an even matt finish. This will take some considerable time and effort, but then the alternative of laying up many, many coats of varnish to provide the same coating thickness would take more. I used a fairly coarse grade, 180 grit, until the remaining gloss spots were few and far between, then finished off with 240 to 320 grit. Be very careful not to sand through the epoxy and remove the stain from the timber! If this does happen, the area can be touched-up with a little stain and some resin, but it is unlikely to be a completely invisible repair. A further coat of resin could be applied and sanded if it really looks like an even surface can't be achieved with what's already there.

The bottom of the hull can now be masked-off, primed and sprayed in the desired colour. Light green was a popular choice with these boats, bronze or a darker red or green are alternatives. I thought the light green looked terrible at first, but it soon grows on you, rather like mould perhaps?



Photo 35: Fittings, including a section of filed rubbing rail and a sample control horn used in making the jackstays and a horn for the deck.

35

Trim work

Fleetfoot's specification calls for a 'special cutwater'; that is, one custom made to suit the design. I made the one you see here from thin aluminium about 0.2mm thick, after trial fitting some cardboard templates to get the shape right. It is folded for over half its length, which straightens up the bow line a little; the lower section is split to run around the curve of the hull, and the whole fitting is carefully epoxied into place. An easier method may be to use a thick self-adhesive foil material. It's not an easy part to make, but is important to the overall appearance of the boat.

Fleetfoot's hull rubbing rails, specified as 1.25 inch D-section, present a bit of a problem when it comes to modelling them. I didn't think painted plastic D-section would pass muster so instead chose to use one-metre lengths of 4mm diameter aluminium tubing, filed down to half their diameter. Doing this wasn't as hard as it sounds though. Two pieces of 2mm thick plastic sheet were glued to a plank of wood, 4mm apart, and the tubing clamped in the resulting slot at one end of the plank, and then filed down to the plastic. The trick is to keep the tubing in tension as the slightest backward drag with the file will cause the tubing to arch up and get mangled. I found one could get quite a nice half-round section this way and two complete lengths were made, plus another for the stern rubbing rails. The open side of the tubing was backed with a strip of basswood epoxied in place, to give it better strength and gluing area. 1mm holes were drilled every 50mm along the lengths of the rails which were then epoxied to the hull using small brass nails to hold them in place until the glue set. An alternative method would be to fix the timber backing strips to the hull with the help of small brass nails (pre-drill the timber first) and then glue the aluminium rubbing strips in place over them.

The engine bay doors were framed with 6mm wide strips of thin aluminium, notched to clear the hinges. These were cut from a 0.2 mm sheet using a steel rule and Stanley knife to keep them as straight as possible. When gluing them in place with epoxy adhesive, it is possible to overlap the shut lines slightly and thereby largely hide the clearances necessary for the doors to open without binding.

Fittings

There aren't many fittings required, but they'll probably need to be made rather than purchased.

I don't have a lathe, but managed to 'turn' some parts in a pedestal drill to achieve what was needed, as per the following brief notes. One item of considerable assistance was a model aircraft control horn, nicely made of machined aluminium, which proved adaptable in many ways and it may be seen in the photo of the fittings.

Gear lever

This was 'turned' in the drill stand from 6mm aluminium rod, flattened on two sides, fitted to base piece consisting of 13mm diameter aluminium spacer from the spares bin, edges rounded over and drilled to suit the lever.

Instrument panel

Printed dials (BECC) fitted to 3mm ply piece of double-elliptical shape with thin black-painted aluminium cover/masking plate drilled to expose dials; the assembly was fitted with wrap-around trim strip of 4mm wide thin aluminium sheet.

Front deck jack-staff

Its pole was 'turned' in drill stand from 5mm aluminium rod, threaded M3 at lower end. Fitted with base and top from the control horn fitting, with a length of 10mm diameter aluminium tube in-between, with cut-out and internal length of brass tube to represent running lights. It screws into an M3 captive nut on the underside of the deck.

Rear deck jack-staff

The cut-down control horn fitting was used for base, fitted to 9.5mm diameter brass tube plug to fit into length of next size brass tubing fitted at angle to rear deck. Screw-in pole of turned aluminium tapped M3 at bottom end or timber fitted with M3 stud. Removable to assist with fitting/alignment of rudder linkage.

Steering wheel

Aluminium spokes cut from sheet, one piece, angled at ends and rubber O-ring epoxied in place to represent rim; steering column is of 6mm diameter aluminium tubing.

Horn

Formed from aluminium control horn fitting and 4mm wheel collar, screwed into M3 captive nut on underside of deck.

Exhaust

Length of 6mm diameter aluminium tubing glued through transom, inner end stepped down to smaller size of tubing for fitting of silicone tubing cooling water exit from motor; chromed brass upholstery washer fitted over outer end and glued to transom.

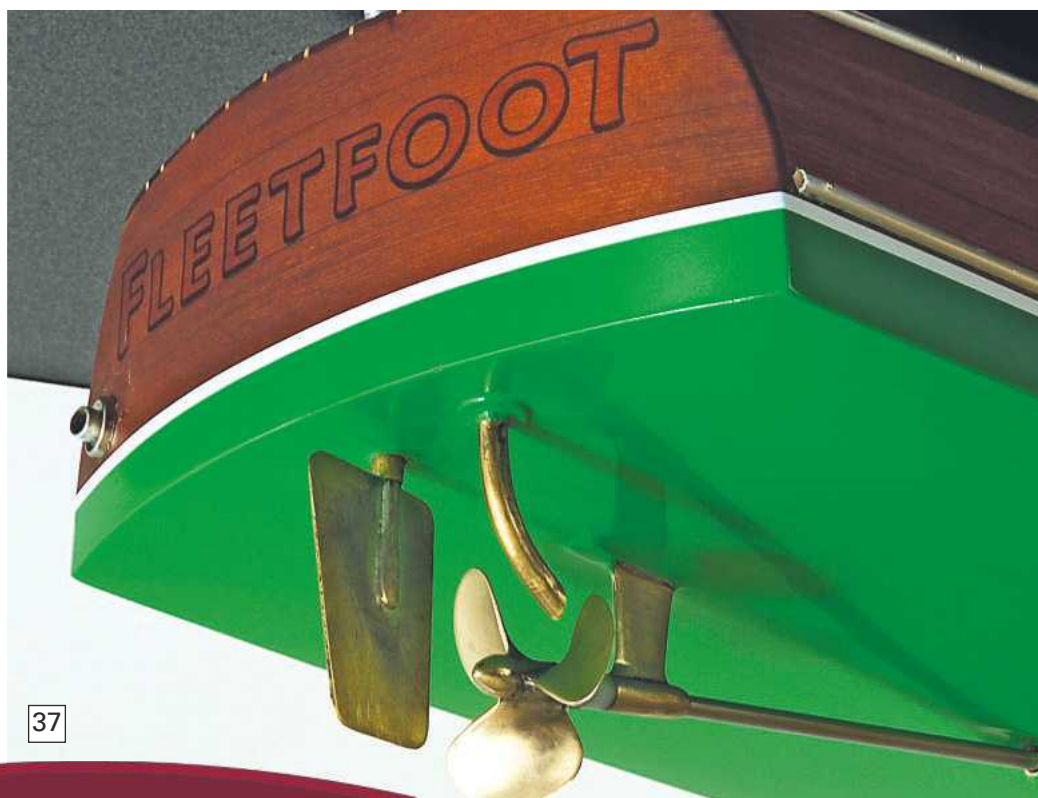
"I didn't think painted plastic D-section would pass muster so instead chose to use one-metre lengths of 4mm diameter aluminium tubing, filed down to half their diameter. Doing this wasn't as hard as it sounds though."



Photo 36: The intended graphics for the transom.

Photo 37: Lower stern view showing how the graphics eventually turned out and the external running gear of propeller, rudder and cooling intake.

Photo 38: Engine compartment with brushless speed controller.



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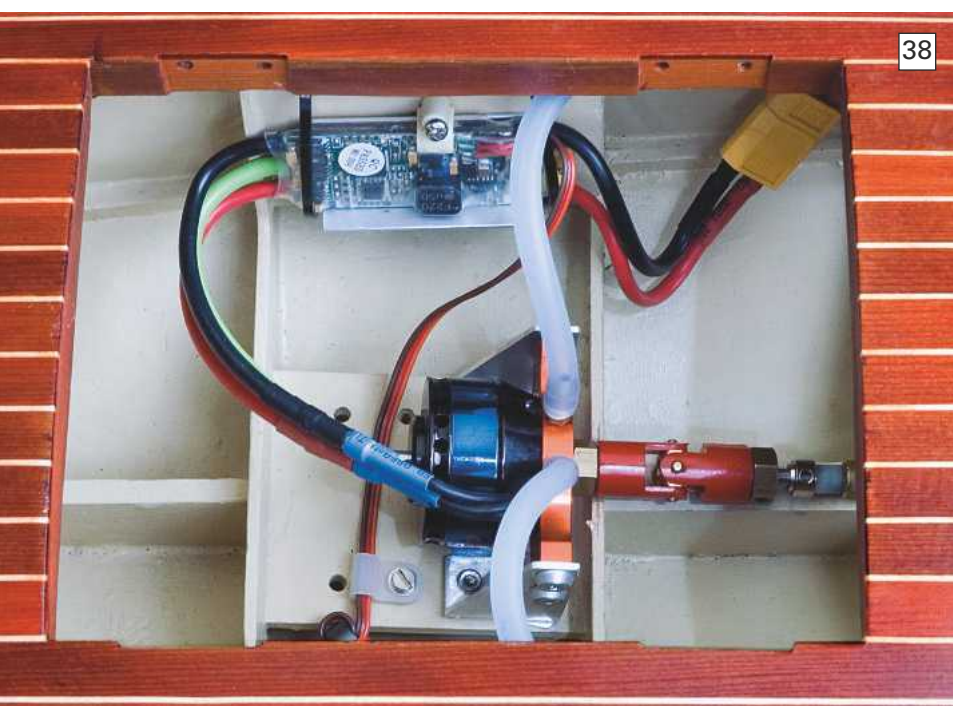
Painting and varnishing

With all the fiddly bits done, the lower hull and bright work can be masked and the protective coats of marine varnish applied. I managed to do this with an airbrush, using the largest jet nozzle, but it was a bit of a struggle as the instructions on the varnish tin warned against thinning it more than 10%. Three coats of satin varnish were applied. The full-size craft would have had a gloss finish, but most people seem to agree a lower gloss level looks more realistic on a model.

Using a print-it-yourself water-slide transfer sheet in an inkjet printer, it was possible to produce quite a nice looking 'Fleetfoot' name for the transom, using a non-cursive font for greater impact, in yellow-gold with a heavy black outline. Imagine my disappointment when it was slid into place, only to realise the yellow disappeared completely, leaving just the black outline! A second attempt, using the densest yellow the printer was able to print, was no more successful. Against a white background it was fine, but the yellow became transparent on the stained timber. I did eventually conclude it was better to have the black outline script than none at all, so left it in place, protected by a further couple of coats of varnish. The final step was to apply a coat of silicone car polish to the whole hull.

Final fitting-out

Installation of the running gear is straightforward, though things are a little tight under the rear deck when it comes to the rudder linkage. A long Allen key may prove helpful to tighten the rudder horn, which may be guided into place via the flag-staff base fitting. Run the battery wires on one side and the servo wires (an extension lead will be required)



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Photo 39, 40, 41: Fleetfoot - Detail pictures of the completed model.



40

on the other, along with the water-cooling hoses if required. Within the engine compartment, I found it convenient to mount the 2.4GHz receiver to a vertical panel on the port side and the brushless speed controller to a similar panel on the starboard side. Velcro strips were generally used to hold things in place, including the battery under the rear seat. The drive line was run in for a couple of hours at low speed with frequent lubrication after careful alignment of the motor and coupling.

Completed model

As you can see from the close-up static photos, there is nothing more satisfying than creating a wooden miniature replica of a full size craft and to be honest, with patience there is nothing here that cannot be achieved by a model maker with average skills and determination.



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42

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Photo 42: In the water for the first time.

Photo 43: A relaxed cruise at about 50% power.

Plan for Fleetfoot

The two sheet full size CAD (computer aided design) Plan **MM2109** is available from MyHobbyStore Ltd and is priced at **£12.50** + p/p as of November 2015.

MyHobbyStore plans may be purchased online at www.myhobbystore.co.uk or please call: 0844 848 8822, 1000hrs to 1600hrs, Monday to Friday.

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On the water

The completed Fleetfoot model weighs 1.8kg plus the battery, a total of some 2.2kg with a 7.2v NiMH type or a little less with a 7.4v LiPo battery of similar physical size, but less weight. As such it floated nose high and required some 200gm of ballast in the bows to bring it more level, though still a slightly nose high, stance. This is the problem with an open boat, as you are not able to shift weights around or put the battery where you might want it like you can in a cabin cruiser. As I prefer not to tote around dead weight in a planing craft, I tried a second battery (parallel connected) in the engine compartment, secured on a ledge in front of the motor. The model then sat almost level at the correct waterline, which was encouraging, but was much more reluctant to turn when run like this and so it was returned to the single battery installation with a little nose ballast.

'The Skeg', the tame runaway test driver (last seen testing Woodstock in the 2010 MB Winter Special Edition, Plan No. MM2052), reports stable running up to the maximum speed, with the hull running angle only increasing slightly as the hull

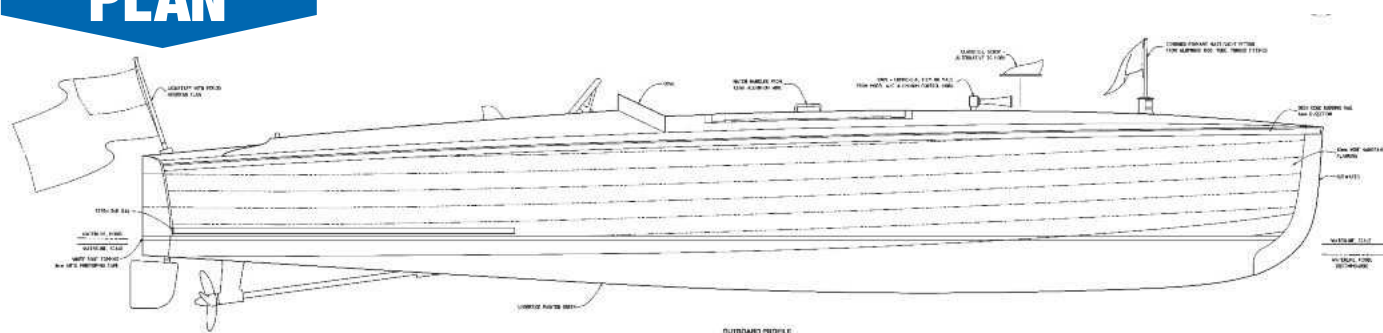
comes up on to the plane, and no evidence of pounding. Some care is needed to avoid harsh rudder application at speed as it can lead to the rudder stalling and the narrow functional rudder shape is superior to the scale rudder in this respect. The spray pattern is rather untidy and a cross wind can ship some of it on to the back seat at speed, as unfortunately, John Hacker never got around to inventing chine spray rails.

The hull could certainly cope with more power and a 1500KV motor would provide a speed boost, but as it is, the 1200KV motor does provide a nice balance between speed and run time for 'social running' on sailing days. To put some figures to that, peak power was measured at 98 watts (input), peak current 13.7 Amps, average consumption around 40 watts and run time around 45 minutes on a single 4300mAh NiMH 7.2v battery. Use of a 2S LiPo battery (7.4v) of 5400mAh extends the typical run time to well over an hour. I am sure these figures, together with the sometimes tricky rudder response, can be improved given more time for experimentation.

Conclusion

Combining a natural timber finish, a planked hull and an open configuration, does create more of a challenge when building a model boat than a cabin cruiser with sheet hull cladding and a painted finish. However, wood is such a natural material to use for a boat and even Noah chose it, though he knew he would have to embark two termites! A curvy classic wooden runabout model like this, being scale and fast electric, to my mind makes the effort all very worthwhile and I do hope you agree.

John Parker - August 2015



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A Glynn Guest design for a semi-scale MTB

This is a two sheet scale plan for a typical WW2 Vosper MTB. It is to an approximate scale of 1:32 producing a model just over 26 $\frac{1}{4}$ inches (670 mm) long and of 7 inches (180 mm) beam. It is intended for radio control with a single electric drive motor, or for static display. The model is simple to build using balsawood and is ideal for beginners to the hobby.

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Cruiser

Ivor Warne reviews the Mountfleet Models kit



This kit of a tug has been in the Mountfleet Models range for some years now, but the company has changed hands and there have been some recent updates to the kits and this model is a popular subject, lending itself to either electric or steam power.

Cruiser was one of the last coal fired tugs to be built in Britain, being built by Alexander Hall of Aberdeen and launched in 1953, the tug going

into service with the firm of Steel & Bennie of Glasgow and **Photo 1** is a historical black and white picture of the tug. Interestingly a picture of Cruiser helping manoeuvre the incomplete QE2 being built on Clydebank also exists, **Photo 2**. She was converted to diesel power in 1963 and later changed owners in 1969 working around North Wales and Liverpool. It was during this period that the beautifully proportioned funnel was removed and replaced by a stubby diesel exhaust stack. In 1984 she was sold to the Cartmel Tug Company of Ardrossen and her time in the UK came to an end in 1999 when bought by Aquatic Diving Services of Takoradi in Ghana, who for some reason renamed her Ardriel. At some point in time they moved operations to Rema just outside Accra, but the trail



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2



of this old tug then goes cold. However, it would be nice to think that Cruiser is still earning her daily crust in some form or other.

The kit

This was designed by Frank Hinchliffe, who sadly died a few years ago. The model is to a scale of 1:32, giving a length of 45.5 inches (1156mm), beam of 12 inches (305mm) and a displacement of 40lbs (18.2kgs) and represents the tug as in 1953. At 18.2kgs it is no lightweight and is a substantial model, something that needs to be born in mind.

This is a real builder's kit and not for the faint-hearted or the beginner, but what can be created from the huge pile of parts is something quite remarkable. With each model I build, I like to try something different or unusual, so this time added detail such as working lights, internal fittings and smoke, or at least the appearance of smoke, were on the menu. The kit contains:

- A GRP moulded hull, funnel, superstructure and ship's boats complete with superb surface detail.
- Printed wood parts
- Nearly 1000 white metal fittings
- All necessary wood, cordage and tube etc.
- Full-size drawing and a comprehensive instruction book
- Propshaft and propeller
- Colour photo pack

The kit is described as being suitable for static display, free running, or at least two function (rudder and motor) radio control and the current 2015 price is £515 including p&p.

Construction

I am not going to go into a full 'glue Part 1 to Part 2' description, because on the Mountfleet Models website is the original excellent full build review by Dave Abbott from the 1999 Model Boats Volume 49, Issue No 579. In addition, in that same issue, there was a separate article by Allan Millar describing the installation of a steam plant and that is also on the Mountfleet Models website. So, if you are buying the kit, or just browsing on the Internet, there is much to be gained from looking at those articles and here we are going to concentrate on the additions and changes made to this model since then.

Photo 3

This picture shows what the model looks like when roughly assembled, but not yet painted and already the complexity of the build is showing itself. In the kit the deck plating is simulated by white cartridge paper. My attempt at this was a disaster and it all had to be taken off. I am sure it can be done, but obviously not by me and 0.5mm styrene sheet was substituted, held down by contact adhesive, which has done the job and when painted no one knows the difference. That's the 'holding-up of the hands bit' out of the way and yes the workshop could do with tidying-up.

Photo 4

This is the basic hull completed and painted. Halfords primer filler has been used as a base coat and then red oxide primer over that. The black hull and the red deck have been hand painted using Humbrol enamels. The yellow and white trimlines are tape of the type you can buy for line-work on model aircraft. There have been a good few hours work between this and the preceding photograph as you will appreciate, but as noted earlier, the 1999 Dave Abbott review and pictures are freely available on the Mountfleet Models website, more than adequately describing the building process.

Photo 5

A series of cells have been created within the superstructure so that internal detail can be included, these being created as pre-built sub-units, which can then be inserted into the superstructure. The layout for this detail has come from the classic book, *British Steam Tugs*, by P. N. Thomas. To enable viewing of the detail, the openings in the





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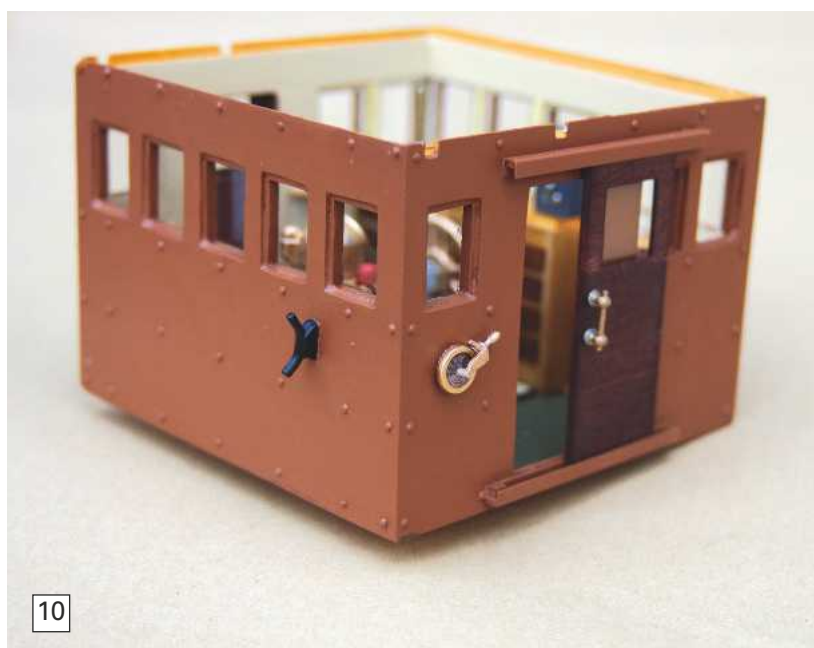
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superstructure moulding have been cut out and the doors swing on 0.5mm brass pins with internal illumination highlighting these sub-unit features.

Photo 6

This is the crew's shower room sub-unit that inserts into one of the cells inside the superstructure's GRP moulding.

Photo 7

This is the galley, another sub-unit.

Photo 8

And most important of all is the toilet. A cross corridor situated under the bridge has also been installed, its floor covered with black and white chequered tiling which can be readily sourced from doll's house suppliers, or for example, BECC Flags.

Photo 9

This shows the bridge and bridge deck before painting. It is of all wood construction, and so just for the nostalgia and because a tin of it was in stock, Cascamite was used exclusively in its construction. One often forgets just how good some of the older glues were, and indeed still are, as the old skills come flooding back. The kit-supplied runners for the doors were replaced with brass section as these look more to scale. A couple of days drilling extremely small holes in the panelling

and inserting and supergluing pin heads into those holes to represent rivet heads was also usefully spent.

Photo 10

And after all that hard work, this is what the bridge unit looks like once painted. It was not fixed in place until the internal and upper bridge detailing was complete, access being much easier when 'off' the model.

Photo 11

The internal bridge detail came from the plans, plus extra information from the aforementioned British Steam Tugs book, an invaluable tome. The screws securing the bridge to the deck are hidden underneath the grating by the wheel and underneath the binnacle. The chart is of the Lee Valley Regional Park Lakes, Fishers Green Sailing Club included, of which I am a member of the Model Boating Section. This is all just in case the model gets lost.....

Photo 12

The bridge deck is much easier to paint if the bridge unit itself is not in the way. I have long grown out of using printed plywood decking, especially at this scale, and have used individual Pear wood

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“A couple of days drilling extremely small holes in the panelling and inserting and supergluing pin heads into those holes to represent rivet heads was also usefully spent.”



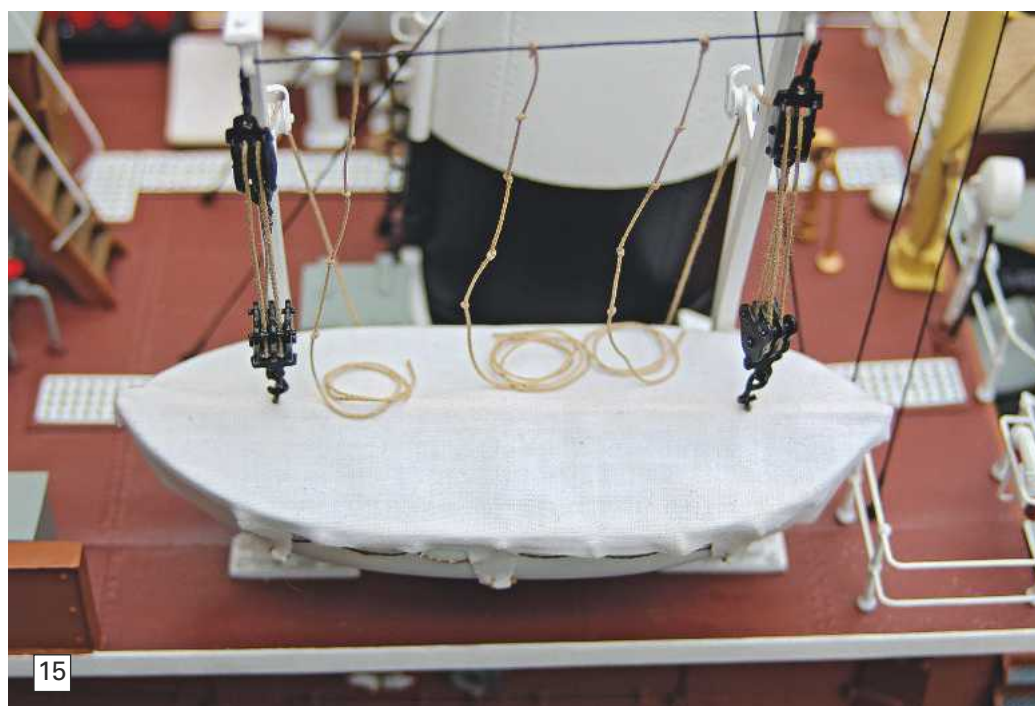
planks with their edges blacked with a 2B pencil to represent the caulking. A steady hand is required for this, but it's well worth the effort. The planks are glued in place with exterior grade PVA adhesive, which has the advantage of drying clear.

Photo 13

And now for a break with tradition. Until now none of my models have ever had a crew, but after planking the upper (flying) bridge and putting all the fittings in place it just did not look right. Happily the kit includes three white metal crew figures and so

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one was pressed into service to man the wheel and it has to be admitted, he looks quite realistic.

Photo 14

One of the treasures of Mountfleet Models kits are their winches, and the anchor winch on Cruiser is no exception. If being very critical, the rope work on the anchor davit has turned out a bit furry and could do with another coat of wax or PVA. So yes, sometimes the camera lens can be very unkind.

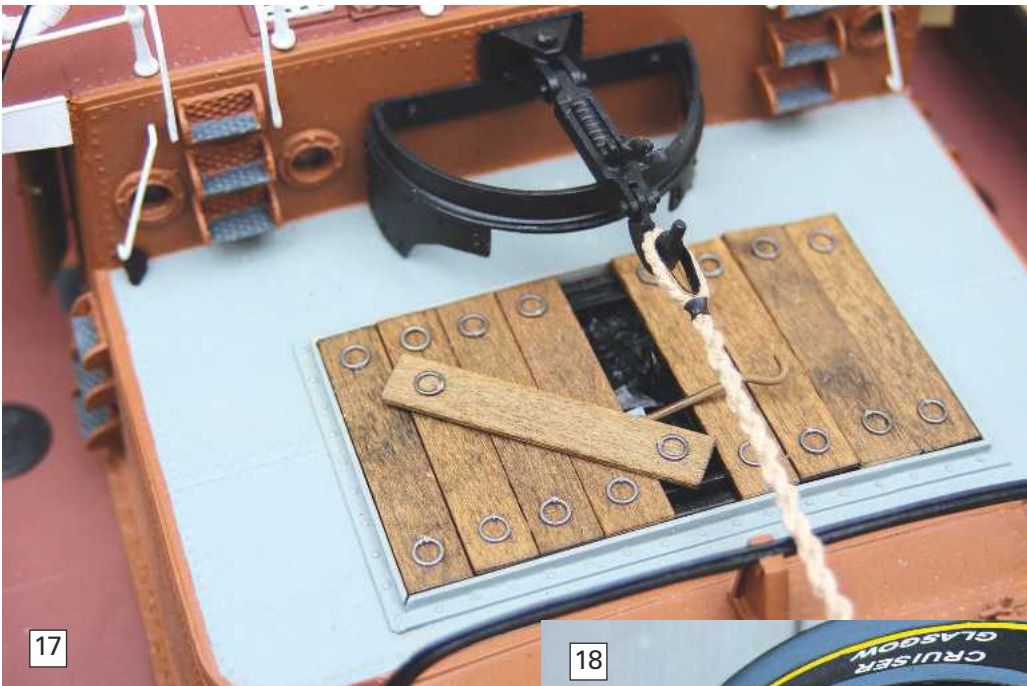
Photo 15

The lifeboats are a prominent feature on Cruiser and so lend themselves to detailing. It was decided to have one open and one covered, for artistic reasons rather than imitation of real life. The kit includes model aeroplane covering film for the lifeboat covers, but in my opinion this is too smooth to imitate canvas. Full-size aeroplane fabric was substituted, the sort of stuff they used

to cover WW1 aeroplanes, it being handy that I work at the Imperial War Museum at Duxford near Cambridge. This material is absolutely perfect, but a substitute could be handkerchief linen. To get the cloth to suitably drape, it was painted with diluted PVA glue and prodded with a paintbrush until it looked right.

Photo 16

This is the open boat to which a rudder has been added and yes, it would normally be stowed inside the boat until launching. The addition of a set of oars made from cocktail sticks and scrap plastic don't look out of place. Walnut veneer was glued to the top surfaces of the open lifeboat as the large expanse of white looked bare, and in this period they might just have run to a bit of wooden cladding for the comfort of boat's crew. The grab lines around the lifeboats are of twisted fuse wire, painted brown.



“When running a large and complex model like this, the last thing you want to do at the pondside is dismantle it to turn the power on. Therefore, all the switches are on a Perspex panel situated under this coal bunker”

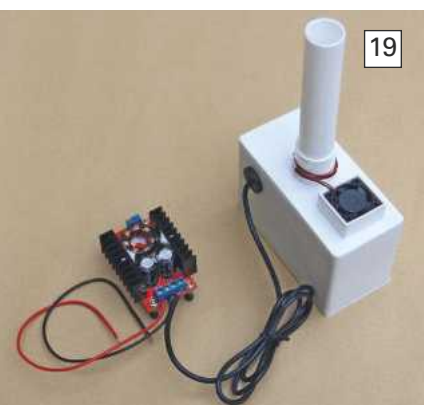
Photo 17

When running a large and complex model like this, the last thing you want to do at the pondside is dismantle it to turn the power on. Therefore, all the switches are on a Perspex panel situated under this coal bunker. The whole bunker area in the superstructure GRP moulding has been cut away and a box sits in the hole which can be removed to access the switches. The box is disguised by filling it with real coal held in place with diluted PVA glue. The outer (wooden) boards stay put whilst the whole thing lifts out as a single unit using the small grip just visible sticking out of the coal.

Photo 18

This detail picture of the stern shows the gratings that cover the rudder quadrant and underneath this is a hatch, which on the model enables access to the rudder post and linkages. If you have access on a model like this, then it will probably never be





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needed, but if not provided, then something will happen requiring you to chop a hole in the pristine deck, this being Sod's Law.

Photo 19

This is the invention of one of my fellow FGSC members, Colin Graham. His smoke unit needs a 12 volt supply to make it work and requires just 250cc of regular tap water to fuel it. The unit provides a very convincing plume of smoke for over 30 minutes on this volume of water. As the unit is water powered, it is 100% clean to operate, and as there is no naked flame involved, there is absolutely no chance of a fire. It all seems a bit like alchemy, but it works brilliantly. (Contact details at the end of this article)

Photo 20

A picture is worth a 1000 words, and this shows just how well Colin Graham's smoke unit works when installed in an r/c scale model.

Photo 21

The interior of Cruiser. A bit of an effort was made in the wiring department this time, rather than having the usual bird's nest mess. A Perspex plate was cut to size and 'test' bolted into the hull so that it did not move about. It was then fitted with all the electronics, attached with nuts and bolts, or Velcro as appropriate. The hub of all this electronic activity is the ACTION RC Electronics Power Distribution Board. Some might say it is a luxury, but it keeps everything tidy and fused. When bolting the Perspex plate back into place the wiring was run underneath as much as possible to keep it out of harm's way. This is a large and heavy model, so the weight of Perspex is not an issue, several pounds of sheet lead still being needed during the ballasting process.

Photo 22

Moving aft, here you can see the 12v battery in the centre of the hull next to the keel. Above the battery mounted on Perspex are the on/off switches, which align with the removable coal bunker. The switches are clearly marked so there is no doubt what is On and what is Off. The big one is the main power switch which kills everything, should there be a problem. This area gives easy access to the rudder servo on another Perspex plate. Having the electronic bits and pieces mounted on clear Perspex enables a clear view of what is going on underneath in the environs of a model boat hull, and so finally to the motor. I know brushless is now all the rage, but as you can see it is a Marx geared Decaperm. In a model boat of this size, weight and space are not critical - please note the lead bricks packed around the motor mount. The gearing is ideal for



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the big propeller and gives more than adequate performance, plus I suspect this quality motor will keep running for longer than I will.

Weighty considerations

When building Cruiser, although large and taking up more room in your workshop than anything that has gone before, it is still manageable, but once you have ballasted the model down to its waterline, it is much, much heavier, weighing in at 40+ pounds. So, please bear this in mind if it is a project that appeals to you., the kit lending itself to the addition of detail and features as mentioned earlier. Anyway, the preceding photo sequence has I hope given you an idea of what is possible with this kit.

On the water

Photos 23 and 24. The time had finally come after three years of blood, sweat and tears (I am a slow builder). to see if it was all worthwhile and would Cruiser work as planned, particularly after spending half a day ballasting it in the bath and using my entire stock of lead? The great day came, a Sunday at Fishers Green Sailing Club, but bad weather meant a postponement. The following



weekend, still no 'go' as transmitter batteries were now dead, but as to why I have no idea. On the third weekend, the sun was shining and after successful pre-sailing checks Cruiser was launched, admittedly with a bit of human help, it not being a one-man job, at least safely.

All the effort was justified in an instant, as Cruiser sat on the water perfectly, sailed well forwards and reverse, despite having a single propshaft. It really does push a lot of water about and for a large heavy model is quite agile, providing you remember two things:

With all this 40lbs (18kg) on the move it will not stop on a sixpence, because with weight comes momentum, so you can cut the power but Cruiser will still keep moving. So plan ahead as you sail your model. Also, if you want to make a tight turn,

increase the power which may seem counter-productive, but it works and this is because by increasing the thrust, more water is being sent past the rudder increasing its turning effect.

Conclusion

So was it all worthwhile? Too right it was and I shall be running Cruiser as often as I can henceforth, but please keep in mind its displacement and you will need a trolley or something similar if you are endeavouring to launch and recover it when on your own. Yes, £515 is a lot of money, but there has been three years of enjoyment from the project which should now give many years of future operating pleasure.

Enjoy your hobby - Ivor Wame

Useful contacts

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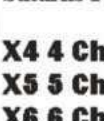
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Semi-Scale Hovercraft

Andy Cope's model, based on an RNLI version



At our Buxton Model Boat Club we pride ourselves in turning out to sail in most weather conditions all year round, but in the earlier part of 2015, many of our sailing days seem to have been deluged with heavy rain. On the plus side, it has given me the opportunity to advance a few projects from the shelter of the garage and the latest model to leave (or hover) from the workbench is this scratch built hovercraft.

Some years ago, I had purchased a radio controlled hovercraft kit from America, but after being charged exorbitant import duty, it turned out that the kit was very poor and the completed model didn't work anyway, so the whole thing ended up in the bin. However some of the basic principles of hovercraft construction were gleaned from the kit and the design methods adopted.

I will admit that I didn't work from a plan to construct this hovercraft, and the design process

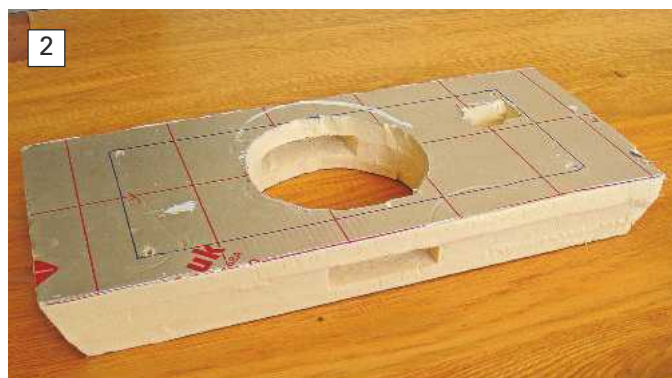
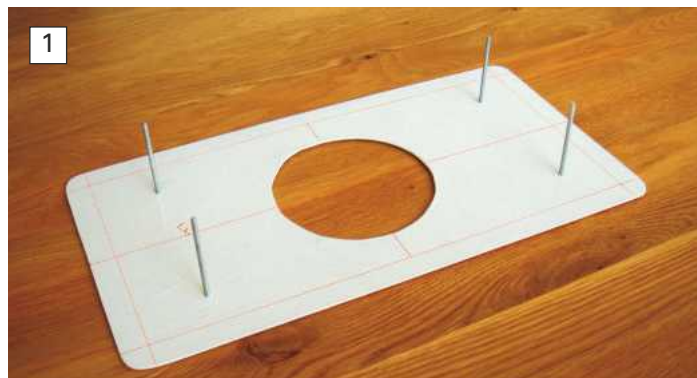
was just an organic 'best-fit' based around the bits and pieces already lying around the garage. However, with a little research and a little luck, a working hovercraft has been created and this article covers the basics of what occurred. Be warned though, as I won't apologise for using any wrong terminology as frankly I don't know much about hovercraft engineering, and wouldn't expect others unfamiliar with the technology to know either.

Photo 1: The baseplate

Using 3mm birch plywood, a 230mm x 440mm rectangle was cut and four 70mm M4 bolts inserted through it, as these would be used to clamp the whole model together. A 127mm (5 inch) diameter propeller was to be used for the lift fan, so a hole just slightly larger was cut into the middle of the baseplate. This and all the subsequent wooden components were sealed with paint on all their surfaces, as it was a good guess that most of the hovercraft would get wet at some time in the future.

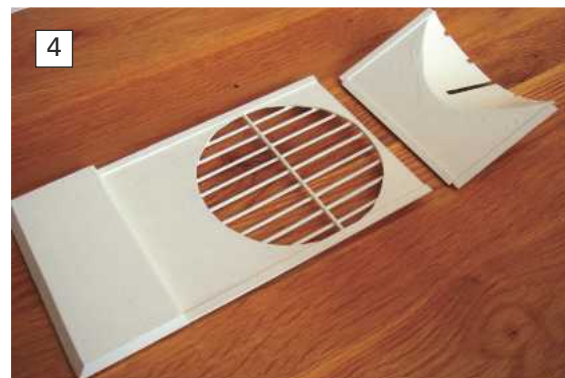
Photo 2: Lift duct

This forms the central body and hull of the model and was cut from one sheet of 50mm foil backed builder's insulation foam, which is cheap, light, buoyant, waterproof and rigid enough to hold the baseplate and upper deck positively. The baseplate was used to template the lift duct hole onto the foam, which was also tapered front and rear to





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5



aid air circulation when the skirt was fitted. Two rectangular lateral holes were cut into the foam to enable the skirt to inflate from the central lift duct. A small depression was also necessary in the top of the foam to accommodate the bottom of a standard sized servo which would activate the rudder fins. Please note also that the four 70mm M4 bolts from the baseplate pass right through the foam core and up into the cabin unit above.

Photo 3: Deck, cabin & thrust fan

The deck and cabin were made from 3mm plywood, with some extra strips to brace the cabin sides and form motor mounts for the lift and thrust fans. The rear thrust fan cage assembly was created in one piece by cutting off the end of a cheap squirrel proof bird feeder.

With some forethought, by cutting and bending the wires of the cage, the mounting supports for it and the two rear rudder fins can be created in one go. The rudder fins were also of 3mm plywood, with brass tube glued along their leading edges to make a hinge with the wire cage. A conventional set of ball joint linkages connected the rudder fins to the steering servo mounted in the cabin.

Photo 4: Cabin roofs

The same 3mm plywood, together with some balsawood, was used to form the cabin roof sections; the rear section was screwed into place as a maintenance hatch, the forward cabin roof being detachable for access to the battery etc. The lift fan needs a large air intake of course, but should also protect the fingers, so the lightest option was to use several bamboo BBQ skewers to form a protective grill. The parabolic rear section of cabin roof was formed by steaming plywood around a paint tin. This enables maximum air flow to the thrust fan, which is set quite low.

Photo 5: Completed hovercraft sandwich

The baseplate was test fitted to the foam core and deck ensuring the M4 bolts slotted though the whole sandwich with the securing nuts accessible, but now hidden inside the cabin. The advantage of this sandwich construction over a more complex internal structure is its low weight, easy skirt attachment (and replacement), low cost and ease of construction. Most important though is that if the lift fan fails over water, the buoyant foam filling in the sandwich means it doesn't sink. The electrics also remain high and dry, meaning you can always 'airboat' your way back to shore.

Photo 6: Lift fan

The lift fan components include a 127mm propeller, a 400 size brushed d.c. motor and a 20 amp Turnigy forwards only electronic speed controller.



6



Photo 7: Thrust fan

The thrust fan installation includes a 160mm propeller, another 400 size brushed d.c. motor, and small r/c buggy esc with a forward and reverse feature.

Both these esc's (Lift and Thrust fans) are wired in parallel to a 7.4v, 2 cell (2S) LiPo battery. This gives a run time of 10 to 15 minutes, and a small audible voltage alarm is also fitted to the LiPo battery, to warn when it is approaching the safe minimum voltage, which is very handy if it's in the middle of a pond at the time. A trusty and reliable Tamco six channel 2.4Ghz transmitter and receiver have been used for the radio control.

Photo 8: General view of power components

This picture shows the key electrical components laid out more clearly than when installed in the hovercraft. These are all 'stock' products and quite inexpensive if you know where to look. The yellow propeller is the Lift Fan and is 127mm diameter, which demonstrates the relative sizes of the other components.

Photo 9: Skirt

The skirt could have been made from a multitude of materials such as rip-stop nylon, plastic bags, kite or sail cloth, as long as it didn't leak water or air. There are plenty of templates on the internet to get the shape right, but I cheated and purchased a pre-cut



and stitched skirt for the Griffin 600 model supplied by Palaform Ltd.

It did the job with only a minor reduction in length, and while it is perhaps a little on the small side when inflated for a 'scale look', it has in practice worked a treat.

Photo 10: Sealing the baseplate & foam lift duct

Attaching this was easier than it perhaps looks. First a ring of silicone sealant was applied to the top side of the baseplate before threading the foam lift duct on to the four retaining bolts. The sealant prevents air escaping from the bottom of the lift fan duct and any water ingress should the lift fan fail when over water.



Photo 11: Securing the skirt to the baseplate

The skirt was then secured to the upturned baseplate with 'spinnaker repair tape' which is an easily obtainable waterproof and self-adhesive rip-stop nylon tape. This tape also comes in a variety of colours, but white tape was used in the picture so you can see how it was applied, it later being overlaid with black tape for added strength.

Photo 12: Securing the skirt to the top of the lift duct

This picture shows the 'hull' now turned the right way up before the top of the skirt was taped to the top of the lift duct piece in the same way.

Photo 13: Top of skirt now fixed to the top of the lift duct

The tape sticks very well to the metal foil backing of the insulation foam.

Photo 14: Final assembly

The cabin unit was now secured in place by the four M4 nuts on to the bolts running through the sandwich and apart from painting, the model is now just about complete.

Photo 15: Painting - orange?

I would be lying if said I had planned to create an RNLI themed hovercraft from the outset, as the original concept was of a Griffon 2000 hovercraft painted yellow, but when it came to it, the half-used large tin of Humbrol No.18 Gloss Orange paint, left from a previous lifeboat project, proved too tempting.





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Photo 16: Decals & completed model

A lucky rummage through the unused sticker collection found both RNLI and 1:10 scale truck window decals which were used for cabin decoration. The RNLI use small hovercraft on tidal sands and that inspired the overall appearance of the model.

Photo 17: Completed model

The completed model works happily on water, flat solid ground, carpet, and very, very short grass, but doesn't have the scale, power or lift height (about 10mm) to tackle more rugged terrain. It isn't too noisy either, so it doesn't unduly disturb other sailors. There are a few options for setting up the transmitter



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controls if you have six channels to play with. I plumped for having the left (un-sprung vertical axis) stick for the lift motor control, and the right dual axis stick for steering left and right on the horizontal axis, with forward and reverse thrust on the vertical axis movement.

Conclusion

This model was quick to build and is fun to sail, fly, pilot or hover, in other words however you choose to describe its motion. Only a few cheap materials were used to fabricate the bulk of it and I reckon a competent modeller could construct something similar for under £65, assuming they already have the radio gear and drive batteries.

Essentially it is nothing more than a sheet of foam, sandwiched between a plywood top and bottom, so it's has not been a complex or challenging model to construct and is fun to operate. No doubt, by experimenting with lift motor power outputs and perhaps a different type of fan, more lift can be generated. Something to try in the forthcoming months. Perhaps other readers might have a go at this concept and send pictures of their creations to the Editor?

To see a short video of the hovercraft's construction and in action on land and water, please either search: YouTube for 'Buxton Model Boat Club 49' or go to this link: www.youtube.com/watch?v=T69lbnn4Hq4&feature=youtu.be

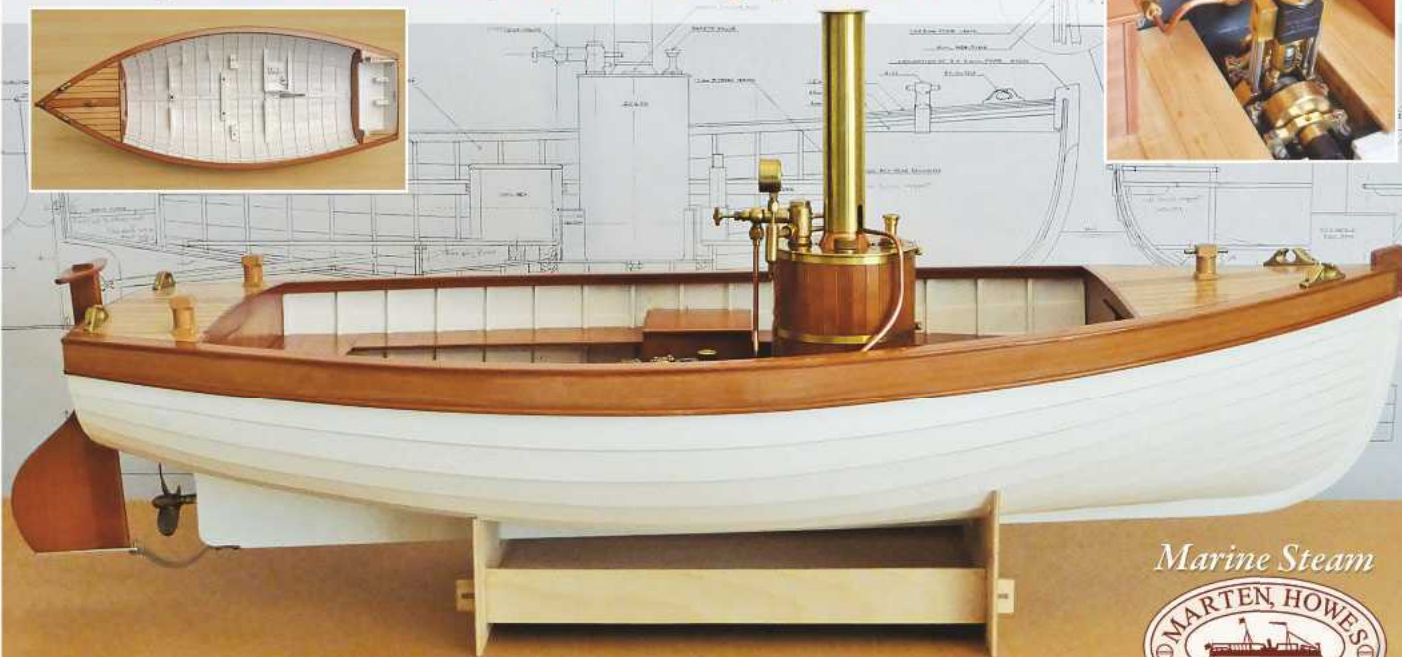
Buxton Model Boat Club

The club operates on the Pavilion Gardens Pond on Thursdays and Sundays (0900hrs to 1200hrs), set within the Victorian Gardens in the Spa Town of Buxton in the Peak District, Derbyshire.



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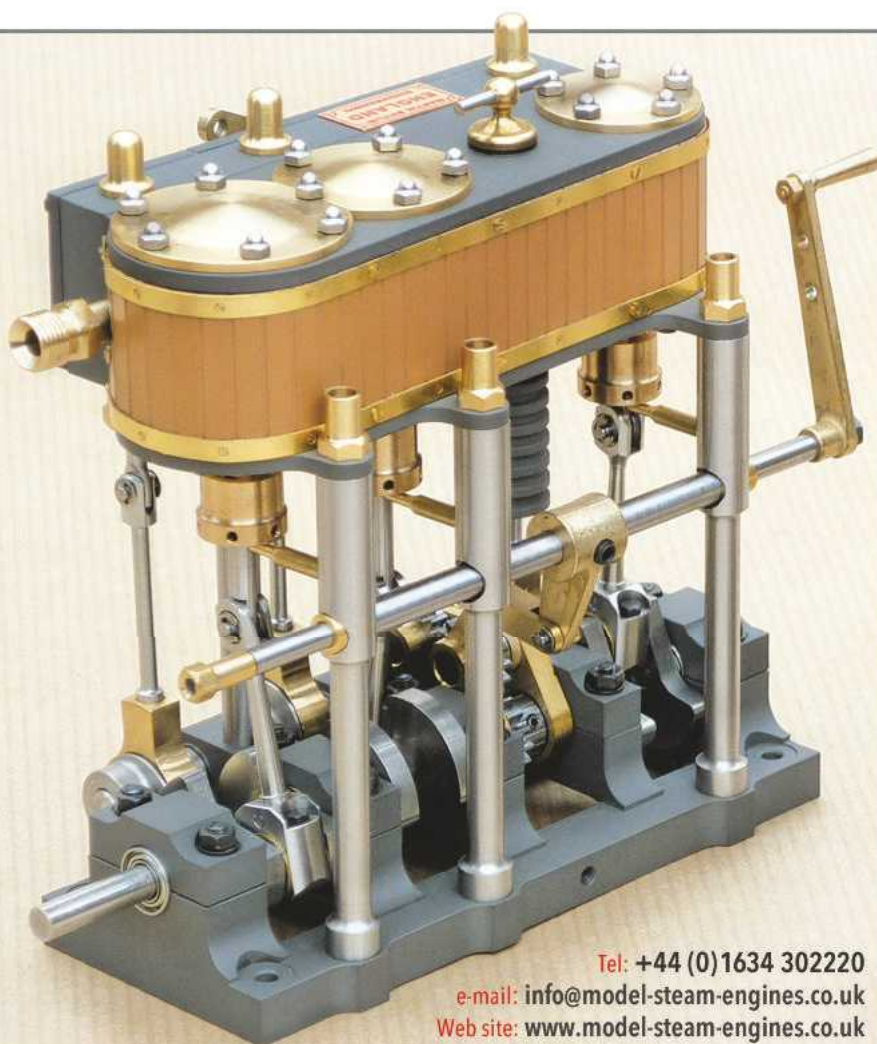
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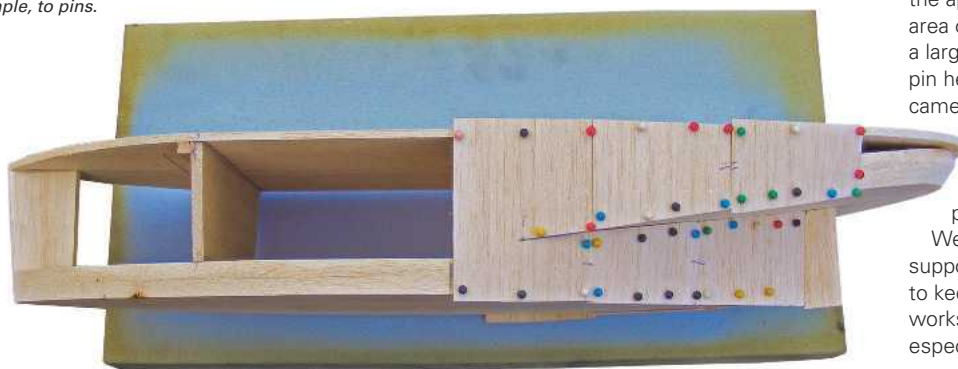
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Mooring Post



Glynn Guest with advice and tips for modellers

BELOW: A piece of foam rubber under the model protects when applying pressure, for example, to pins.



Building on Foam

One of those irritating occurrences in this hobby can be damaging a model during its construction. It is galling enough to suffering sailing accidents, but needing to repair damage before the model has ever been in the water!

A common method of hull construction that I use is to make a framework from the parts that will become the hull bottom and deck. These are assembled with the bulkheads and any stem and/or stern pieces required. After this the hull sides are added by gluing pieces of balsa sheet in place. To minimise any risk of distorting the hull, these side pieces are added to alternate sides.

When adding the side pieces I normally hold the hull in one hand and press pins (those short ones with round plastic heads being ideal) through the balsa wood to hold them in place whilst the glue sets. On a recent model I was having trouble pushing the pins into place as the balsa was unusually hard. There was an obvious danger that

the extra effort required could easily cause the partially built model to twist in my hand and end up being damaged. What I needed was a firm surface to lay the hull on whilst one hand steadied it and the other pushed the pins in.

Therein lay the rub, as both sides of the hull were covered in pins. Pushing firmly down on it whilst it lay on an unyielding surface would cause the pins already in place to damage the hull surface. The answer was found in a box of foam plastic pieces, usually used to secure internal items in my models.

Placing the hull on a convenient piece of foam about 1 inch (25mm) thick I cautiously started to press the pins through the side sheets. This foam worked a treat as it gave enough support to the hull for me to press hard on the pins, whilst allowing the pin heads to locally deform the foam and cause no damage to the hull. Looking back and this was a good demonstration of the creative application of: Pressure = Force divided by Area.

When first pressing a pin into balsa wood sheet, the applied force was only supported by the small area of the pin heads on the other side. This created a large pressure which acted on the foam under the pin heads and the foam easily deformed. As the hull came in contact with foam the area to support the force suddenly increased and a much smaller pressure was generated on the foam which then hardly had to deform to support my pin pushing efforts.

Well that is the science behind the idea of safely supporting a model whilst constructing it. I plan to keep this piece of foam plastic handy in my workshop as I do not like having to repair models especially before they have been sailed!

Still Crawling

Having discovered how well those high turn 540 sized Crawler motors suit my model boats, I have made a habit of occasionally scanning the Internet for them. For the uninitiated, these motors are intended for use in radio controlled vehicles designed for climbing over rough terrain rather than racing around a track. Thus, they feature modest rotational speeds, plenty of torque and good speed control, ideal for many scale types of RC boats. Yes, brushless motors are being used now, but there is nothing wrong with brushed motors.

Going on to the Black Smith Products website recently (www.blacksmithproducts.co.uk), I located a basic 70 turn crawler motor for £7. An example was ordered and arrived very promptly. Equally promptly, the motor was tested and gave the following results using a 6v battery: (See Table A)

Testing under load was simulated by fitting to motor into one of those direct drive units

TABLE A

Free running speed:	5273 rpm
Free running current:	0.29 Amps
Stall current:	10 Amps

and lowering the propellers into a bucket of water. Yes, it is not perfect, but it does give you some idea of what the motor will do when installed into a model, and yes, it can be very messy!

Trials with two bladed plastic propellers with a pitch/diameter ratio of 0.85 (sometimes referred to as P type compared to the coarser X types) gave the following results. (See Table B)

I then tried the biggest propeller that was to hand, a four bladed brass item with a diameter of two inches (50 mm). This really churned the water up, but still only drew a current of around four Amps. Some might feel that £7 for such a motor is expensive when the ubiquitous 27 turn motor can be obtained

TABLE B

Prop' Dia. (mm)	Current (Ampere)
30	0.73
32.5	0.85
35	1.35
37.5	1.45
40	1.66

for maybe half that price. If driving a large propeller in something like a tug model, then the 27 turn motor on six volts would need some sort of speed reduction which would push up the cost. Of course you might be happy to connect such cheap motors directly to the propeller shaft and enjoy spectator comments like, 'doesn't it go fast and what a realistic smoke effect it has'. Well, right up to the moment that it bursts into flames when the wiring, motor and ESC decide they cannot take the abuse any more!

Seriously, this motor from Black Smith Products does show that economical 540 sized motors that are an excellent match for larger scale r/c models do still exist in the market place and are a credible and inexpensive alternative to something more expensive.

Internet Forum Advice?

It would not be difficult to fill the pages of this magazine with examples of poor, dubious and even downright dangerous advice that has been offered on Internet Forums and not just for this hobby.

I did once comment that any advice starting with; 'I've never had/done/tried it, but...' or; 'I know someone who has...' ought to be treated with extreme caution. Not that I am against people having their own opinions, it's just when they try to put them over as facts.

Potentially more puzzling is when people ask questions using the very medium that could answer their problems. By this I mean the Internet search engines which are

amazingly fast and thorough when given half a chance. It may be that they are overwhelmed by the sheer number of hits that such a search can easily generate. For example if researching a specific vessel, just entering its name could produce far too many results. However, it is hardly rocket science to add some extra details such as associated dates, countries, events, etc. into the search, which ought to narrow things down to a manageable size.

This situation is somewhat akin to walking down the street when a person clutching the Oxford English Dictionary stops you. They then ask you to explain what a word, say 'zeugma' means and it's a fair bet that most other people

would comment that this person already has in their possession the means to answer this question.

So by all means, if you have tried an internet search engine and failed to locate what you want, then it is reasonable to ask for help, but do however explain the criteria used in the failed search, as a mistake in a name, date, etc. could easily be the cause of your problem which others might immediately spot. This will stop you looking like someone who cannot be bothered to make any effort to solve the problem, but expect others to do so for you.

Reluctance to Read?

When dealing with some modellers and their problems, it is hard, very hard, not to keep a look of amazement if not despair off your face. One not uncommon situation is a plaintive cry for help when in difficulty with a new piece of kit. How many times have you heard; 'I've bought a new XYZ but when plugged in/switched on, it doesn't work/go/play a tune or what ever was expected of it'!

This is then followed by; 'Can someone tell me what to do'?

Such a plea for help is often answered by scores of well meaning people who promptly offer wide ranging help, some of which may bear little relation to the original problem. But, one rarely asked question seems to be; 'Have you read the instructions that came with the XYZ'?

In this age where the dominant manufacturing mantra appears to be 'quicker, cheaper, faster', instructions can sometimes seem to be the last thing that is thought of, if at all, before the latest wonder product hits the market. So, when buying something that has more than just an ON/OFF switch, I usually ask to see the instructions before parting with any money.

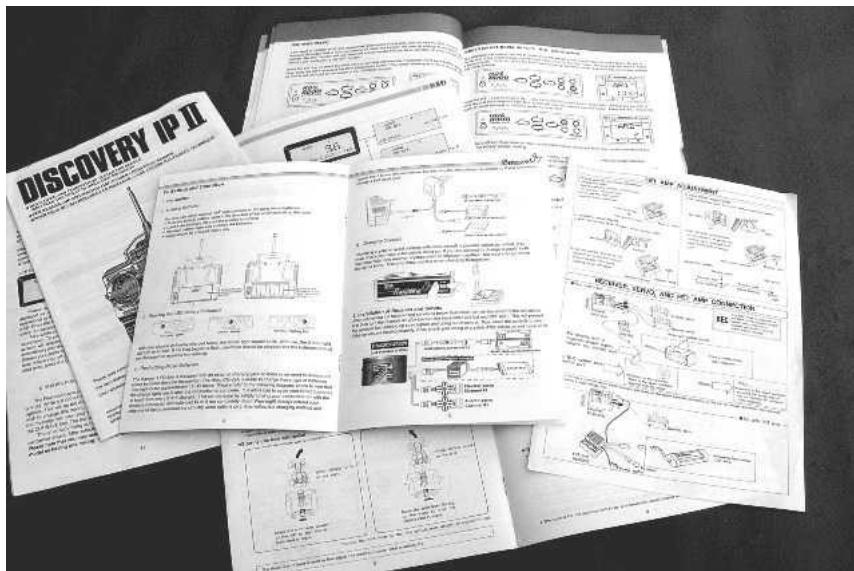
Failure to offer a look at written instructions is often treated as a 'Red Flag' for the proposed purchase. If accompanied with a sneering comment along the lines of; 'You don't need them as it is obvious or intuitive', it would make me seek another product where the customer has not been forgotten.

Even when instructions are offered, it is worth taking a look at them with a critical eye. A bundle of sheets containing nothing but tightly packed text is always off-putting. A few pictures and/or diagrams accompanied with legible and relevant texts are usually a much better sign that some thought has gone into creating the instructions. A quick scan ought to be enough to assure you that the instructions are, especially if they have a trouble shooting section, going to help you through any problems encountered.

Sometimes the instructions come in the form of a disc to insert into your computer. This assumes that you have such a device and are willing to load it into your machine. There is also the problem that unless you never go anywhere without an electronic partner, it's not going to be much help at sorting out pondside difficulties. You could of course print out the disc's content, but I've always felt that this is a sly way to transfer the cost of the instructions from the manufacturer over to my wallet.

So, if you can, check the instructions before purchase of anything that is going to require more than the minimum of effort to install and operate. If it gives problems, then check the instructions before shouting for help, unless you really do want to annoy people. However, if the item has been bought blind (pig in a poke situation!) such as a purchase from the other side of the world via the Internet and it fails to include comprehensible, if any, instructions, just pray someone can sort out your problem!

BELOW: Instructions are a still a vital tool in learning how to make use of a new device, and why should we be expected to download the contents of a CD or download them from the Internet?





Scale Model Fig



Ron Rees shows how to make bespoke figures for your models

Obtaining suitable scale figures for your model boat is not always easy, so here we are looking at practical ways of making them in the poses and forms you actually want, so as to bring your latest model to life. This isn't to say that there are not suitable figures out there in the marketplace, but quite often they are not what you really want, but often they 'will do', so we end up buying them anyway. **Photo 1** is of a selection of figures that can be readily purchased in the market place and which can be used on our models, as well as some homemade versions hidden amongst them. In this article we will be making figures which can be complete in themselves, or used as masters to make moulds from which resin copies can be cast, these perhaps being easier for painting and with a bit of cunning, also later modified.

Most of us will happily whittle away at wood; shape, file and solder metal; bend and form plastics and make the most intricate parts and fittings for our models, so we all have the skills and ability to make something oddly shaped or difficult to create as we do this anyway and enjoy doing it. However, from an art, design and technology teaching perspective, I have found that many people convince themselves that they cannot draw living things and as making

scale figures from scratch involves similar skills, they struggle to do this and when attempting such a project, their figures never seem to come out looking quite right. So the modeller ends up abandoning the idea and sets out for the next model show, wallet in hand to buy some off-the-shelf figures that 'will do', but it is really all quite easy though, so here goes.

Proportions

The main reason figures don't come out looking right is because someone is drawing or carving what they think they see and not what it actually is, so why does this happen? Well, we all look at the same things, but often perceive them in different ways, our eyes playing tricks on us. We know this from Police investigations, where a number of people seeing the same thing will notice different features about it, namely those that are important to themselves. Pre-school children often draw mummy, daddy and themselves, all together with their house, which is usually reproduced in the scale size of a dog kennel. However, looking at how the child has rendered what they have seen and then analysing it, you will often notice that the eyes are usually at the very top of the head and are invariably massive and this is because he or she, always looks at the eyes first. Mummy's eyes are usually bigger than Daddy's and all the other bits such as arms,

Photo 1. There are numerous figures in different scales available in the marketplace, but quite often they are not quite what we want for our model boats.

legs, hands and so on are not as important, so most of the time it is okay to make the legs grow out of their heads. As we get older, we still tend to perceive the head as being larger than it actually is, so in our drawings we can end up with a big head(!) and our eyes mislead us into thinking that the legs and arms are shorter than they really are, but when we are given a drawing with the dimensions of a ship's winch, the model maker can probably make it perfectly. So, what is it about living things and in this case figures, that makes them so different? Well the key word is 'Proportions' and the double page **Diagram One** on Pages 50 and 51 shows pictorially the following rules:

Rule 1: It doesn't matter how tall, short, large or slim a person is, in the vast majority of cases their bones are specific lengths relative to their body height.

Rule 2: On average, an adult male head divides into his total height by 7.5 to 8 times. So a man is 7.5 to 8 head's high. Women generally have slightly smaller heads, but the 1:8 rule still applies, but here we shall concentrate on the male rules in this article, as most of the figures we need to crew our models are men.

Rule 3: The top of the head to the crotch measurement is about the same as the crotch to the ankles.

Rule 4: The shoulder joint to the elbow is the same as the elbow to the wrist.

Rule 5: The hand (arm hanging limp) reaches down to mid-thigh.

Rule 6: The length of the hand reaches from the chin to the hairline.

Rule 7: The hip joint to the top of the kneecap is the same as from the top of the kneecap to the heel.

Rule 8: The eye line is roughly halfway down from the top of the head and the top of the ears are almost level with the eyebrows.

Eight Heads Rule

Looking again at **Diagram One**, the 'ideal average figure' on the left hand side is about 1:9 scale. If we assume that the average man is about six feet high (183 centimetres) and you divide this by nine, you get a figure which is 8 inches (20cm) or so in height. By drawing lines from the eight 'Head Units' down to a vanishing point, it becomes easy to plot how high a model figure should be for a particular scale and some examples of common scales are shown on this diagram. Once we have these measurements we can check the accuracy of our model figures, but always remember that none of us are quite the same, so small changes here and there are acceptable, as long as we try to stick to the 'Eight Heads' rule.

How much detail to include?

In most cases we only see the exposed flesh of hands and faces as sailors are usually fully dressed,



so only these plus perhaps the forearms are the parts you need to replicate accurately. Architects often use 'amorphic' black or grey painted matchstick figures on their models with no detail whatsoever, as our eyes tell our brains that these are people, the brain filling in the spaces and so we still recognise these skeleton models as figures.

We need to make a figure in the desired pose, but the basic body (outline skeleton) does not need to be perfect as it will be covered with simulated clothes, only the exposed flesh parts require more effort to get the shapes and profiles exactly right. In practice therefore, we are actually mostly modelling a figure with its clothing and some attention to exposed flesh. The skeleton (basic body) must however always have all of its limbs the right length, regardless of pose, but we may want to assemble them in any attitude that we desire.

Photo 2. Outside of tmodel boating, there are numerous figures, often very inexpensive, that with a little bit of work can be modified to, our needs.

Readymade figures?

I am not advocating that we make all our crew members, as there are hundreds of figures in lots of different scales in the marketplace that are perfectly suitable for our models and there is nothing wrong with using them. An online search will turn up numerous products from all over the world and let's face it, if others are better at making figures than us and they are good value, then let's go for it, **Photo 2**. With relatively little effort, these can all be modified to represent any crew or passenger member that we desire. Keep an eye open in shops and inexpensive figures costing as little as £1 can be purchased and converted (guess which UK high street (£) shops have these). Specifically suitable marine figures, such as lifeboat crews can be had (painted or unpainted) from a number of good model boating suppliers, but inevitably you can also end up with six lifeboats made by different model builders on display at a show, but all with exactly the same crew doing exactly the same things.

Converting readymade figures from other spheres of modelling can be much easier than making them from scratch, so it is also well worth looking tangentially at other hobbies. 1:72 scale as used in aircraft, armour and some boat kits and is almost the same as OO scale (1:76) and HO scale is 1:87, so these railway figures can be repainted and whittled a bit at a push. Italeri manufacture some lovely 1:35 scale crew figures. Online you can find the old Tamiya 1:20 race car pit crew, plus 1:35 and 1:48 military, tank and infantry personnel.



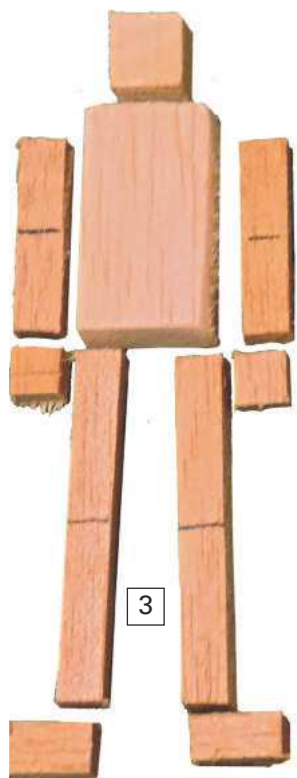


Photo 3. Making a figure is quite easy using balsawood, but it is essential to get the proportions just right.

Photo 4. Limbs do not change overall length, just because they are bent. The cut has to be made on the outside of the bend, and the resulting vee gap filled with a sliver of balsawood or filler.

Photo 5. Here you can see a basic figure. The head is separate and modelled in a different way.



1:24 scale is almost the same as railway garden scale (G Scale, or 1:22.5) and is close to small doll's house scale. There are also suppliers like Preiser, who have a range of different scale figures. Old Scalextric spectator and pit teams (1:32) are easily re-modelled. 1:12 is another useful scale and this can be found in doll's houses, motorcycle and car kits. Even Barbie, Ken and Action Man (all about 1:6 scale) and all their derivatives can be found in the retail market, but could often do with a bit of a makeover. There is a full list of scales and conversions online for those interested. Please search for: 'Building Blocks Tips for the Scales' (understanding and converting scale ratios) by Chris Appoldt.

Getting started

Here, we are going to make some unique figures for our model and to make the basic parts that go to make up the model, the important measurements being on the already mentioned double page **Diagram One**. Using this chart, we should be able to cut and make torso, leg, feet and arm parts as well as hands, feet and heads that can be glued together in various attitudes to suit our needs.

Once we have a basic skeleton, cut to the correct proportions, virtually any task we want that figure to do can be recreated accurately as those parts are fixed together. It is important to remember that an individual limb length, in other words the bones that make up that particular part of the body, do not change length when it is bent, but the skin and clothing will fold. So for example, you don't need longer arms to have them bent at the elbow. We are using balsawood here on this project, but dense foam could also be utilised.

The basic figure

Balsawood is something we are all familiar with and most likely have in stock. It is easy to carve and sands well, but splits easily, so is no good for the tiny parts such as heads and hands. My model boats are mainly 1:24 scale, so that is what is being made here. To be fair, it's very difficult to create decent detailed human figures at 1:72 or even 1:48 scale, unless you are a carving genius, so off-the-shelf and/or modified for these has its attractions.

6mm (1/4in) square balsawood for the arms and legs is being used with small bits of block 30 x 16 x 11mm for the main body as in **Photo 3**. In this picture, you can also see the sequence of shaping the torso and the small blocks to represent the head and hands, but in this article we are not going to discuss these too much as they require a different approach and a different wood or material to accurately model, as remember that here we are talking about exposed flesh parts.



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Each whole leg length of 46mm is one piece, but marked in the middle at the knee joint and the 26mm arms treated in the same way. The limbs can be assembled square, but the body torso needs to be slightly shaped in order to attach limbs in their proper places. In the sequence of torsos in this last picture you can see the marks from the front and the side to which to cut the shoulder slopes, the small of the back, waist, buttocks and hip joints.

When it is likely that the figure will be bent, such as if sitting, bending, running, etc., a small vee cut needs to be made at the front of the waist to allow the torso to be bent forward. This is the only place on the body where you can do this, but remember the total spine length does not change. The torso can also be twisted at the waist if you wish, mimicking turning, pulling or looking around.

Depending on the position you want to model, an angle is also needed where the arms meet the shoulders and the legs meet the angled base of the body, but pare these angles carefully with a knife, checking as you proceed. Do not shorten the overall length of a limb, even if you think it should be shorter, only lightly chamfering the ends so that it can be attached to the body.

Bending a limb at the elbow or the knee requires a small cut on the outside of the bend, **Photo 4**, and a tiny balsawood wedge is later inserted to take up the space that the bending makes. This correctly maintains the overall length of the limb, whereas a vee cut on the inside effectively shortens the limb, thus ruining the proportions.

Feet, believe it or not, are about as long on average as the depth of the chest from breastbone to shoulder blade. Taking shoes into account, the feet on these 1:24 figures are 2mm longer than the body block of balsa was thick i.e. 13mm, which looks about right. A short piece of 6mm square balsawood was stuck on first and then shaped until it looked okay, **Photo 5** being of the basic body. As you will gather from this and some of the other pictures, 'head' production proceeded alongside



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body building (pun there), but for clarity we will worry later about the heads and hands.

Sometimes, if you want a particular movement to be modelled, it can help if you co-opt a family member to pose and take a photograph for reference. This can help when there is a difficult attitude you want to create. Look at the figure cleaning the Browning 50 calibre machine gun, **Photo 6**, where the back foot just looks wrong. Only someone posing and doing the movement domestically, ultimately revealed which way the foot should go.

When you are happy with the pose, glue the parts together. If you prefer PVA or balsa glue to superglue, then you will need to pin the limbs in position. Once set, you can start to pare away sharp corners with a knife and smooth them. **Photo 7** is of a figure pointing, but the basic body skeleton is not yet smoothed. Try and remember where limbs normally taper, such as the forearm down to its wrist, calf down to ankle and so on. Round the shoulders a little and fair-in sharp corners. **Photo 8** is the basic body of someone moving purposefully forwards.

A bit of filler may be needed here and there to complete the basic figure. A mixture of PVA glue and interior Polyfilla is an alternative small gap filler to the popular branded types of filler.

Alternative skeletons?

Balsawood is not the only way of creating the basic 'body' and **Photo 9** is of a figure where bamboo has been used for the basic arms and legs.

Military modellers often use a wire armature method of construction, which involves fitting stiff, but bendable, wires to a wooden base block and creating a wire frame in the desired pose of the human body. Bending the wire frame imparts the desired pose required, and then the body proper is usually slowly built-up in stages using a modelling putty such as Milliput. Any small indentations,



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Photo 6. The back left foot is plainly wrong on this crouching figure with the gun.

Photo 7. A good pose with the figure pointing.

Photo 8. The basic figure in a running pose.

Photo 9. You don't have to only use balsawood. Bamboo from a discarded ornament is being used here for the arms.



9

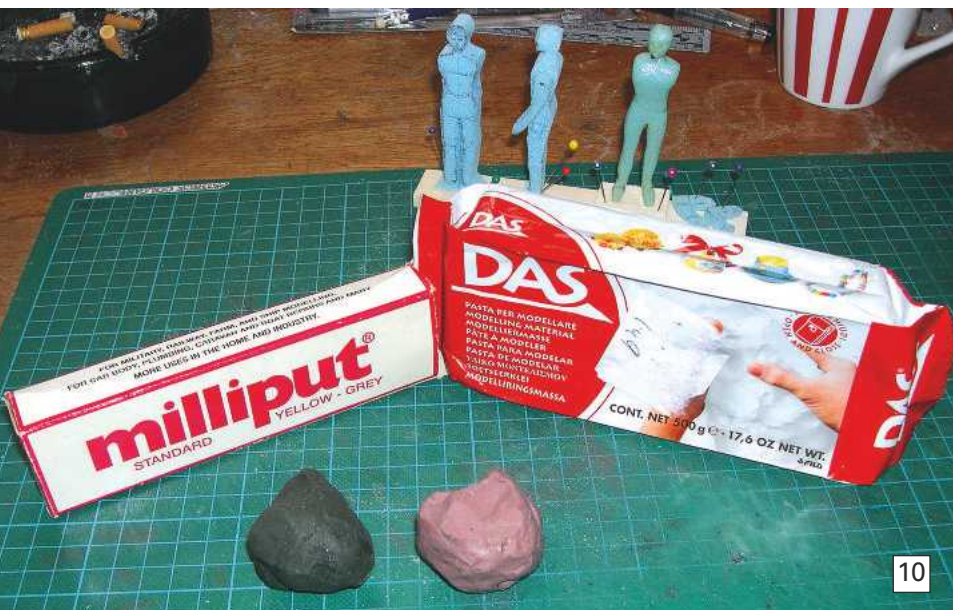


Photo 10. Milliput is widely used as a two-part creative putty, but there are alternatives, Das being a one-part modelling clay.

Photo 11. Milliput can be rolled into thin sheets to create collars, skirts, lapels etc.

scratches or gaps are usually filled with the Squadron or Humbrol types of plastic fillers.

Foam can also be used for the basic body, the material being of the same type as used in the Targa hull (Model Boats, September 2014), but gluing the individual limbs to the torso is not easy and carving the whole figure in one piece means that a mistake with proportions cannot be easily resolved, hence my preference for balsawood body parts (another unintended pun there - sorry) .

Clothing

This can be added using rolled flat pieces of Milliput to the balsawood former as if making a tailored suit, but paper bags, kitchen roll, model tissue, printer paper, felt and washed fine cotton are all also useful materials. Collars, pockets, seams etc. can also be added using Milliput, but very thin pieces of styrene cut to shape can make good lapels (or collars) and with a coat of filler/primer they blend into the jacket really nicely. Belts, webbing, straps and so on can be added by gluing on fine strips of very thin leather, styrene or even Milliput once again. Buttons can be tiny beads stuck on using RC Modellers Glue applied with a syringe and left to dry, or by drilling tiny holes and gluing into them some fine round

headed pins, such as Peco Track Pins. Clothing will also need some evidence of creasing and you can use a filler to do this. Halford's thick filler/primer aerosol spray is also handy for this task, as it builds-up a thick layer of paint, but it will also obscure the fine detail if you are not careful. To solve that problem, you can spray some into a small container and apply it by brush, which means you have better control over where it goes.

Milliput and Das

A few words about these products, **Photo 10**. Das is an alternative type of clay filler to Milliput, this last item being widely used in the military and figure hobbies and is by far the most used two-part putty for this type of work as the standard Green type or the slightly finer White variety, both being perfectly adequate for our purposes. Milliput was originally designed for plumbers in the 1960's to fix leaking tanks and pipes, or for filling a hole that was too big to hold a screw or a wooden plug, but nowadays its main use is in model making. It can be very sticky when first mixed and some users find it hard to apply and smooth, but a slightly wetted finger will help the process or even baby oil can be used. Tools for smoothing always work better if dipped in water (or baby oil) between jobs. A set of those clay or dentist tools sold at model shows are particularly useful, as well as some very small and medium needle files. Surgical knives, sandpaper and Dremel power tools can all be used and female nail sanding strips are inexpensive and very handy. Milliput can be rolled into thin flexible sheets using a non-stick silicone roller and a silicone baking sheet as in **Photo 11**.

If you leave the mixed putty for half an hour or so before use, the worst of the stickiness will disappear, but it is essential to build-up the figure in layers. Don't try and model all its details in one go, but starting with the basic shape, leave to set overnight and then start scraping it away as you smooth and carve it to shape and then apply some more putty if needed. Regularly check your figure against the scale chart, even if you think it is wrong, as perhaps your eyes are deceiving you. I would suggest that completing a body without its head and hands is also very much the easy route. Once happy with the basic body and its attitude, give it a coat of sealer to stabilise the surface, 50:50 dope and thinners being as good as any provided it doesn't interact with the materials used beneath.

On the subject of fillers, there are others like Green Stuff, a blue/yellow room-temperature curing two-part epoxy putty sold usually in a tape format and the aforementioned Das, a clay hobby type of putty. Products like Model Lite from Deluxe Materials also have their uses in some applications. Standard fibreglass car body filler can be used, but does not have enough manipulation time in my experience.

Once satisfied with the body, a light coat of primer (grey is perhaps best) can be applied to enhance the details, but it will also highlight the faults that are not visible until painted, so remedial action can be taken. It only remains now to supply the figure with a head and hands before painting it properly.



Heads and hands

These have a set of rules all to themselves and **Diagram Two** demonstrates these. One thing you can do is use the heads and hands from existing commercial figures if they are the right size for the scale of torso, legs and arms you have just made. Unwanted details can be easily cut and filed off and then the head and/or hands can be painted to suit or even used as patterns to cast polyurethane resin copies. However, assuming you wish to make your own, let's proceed.

The head's proportions

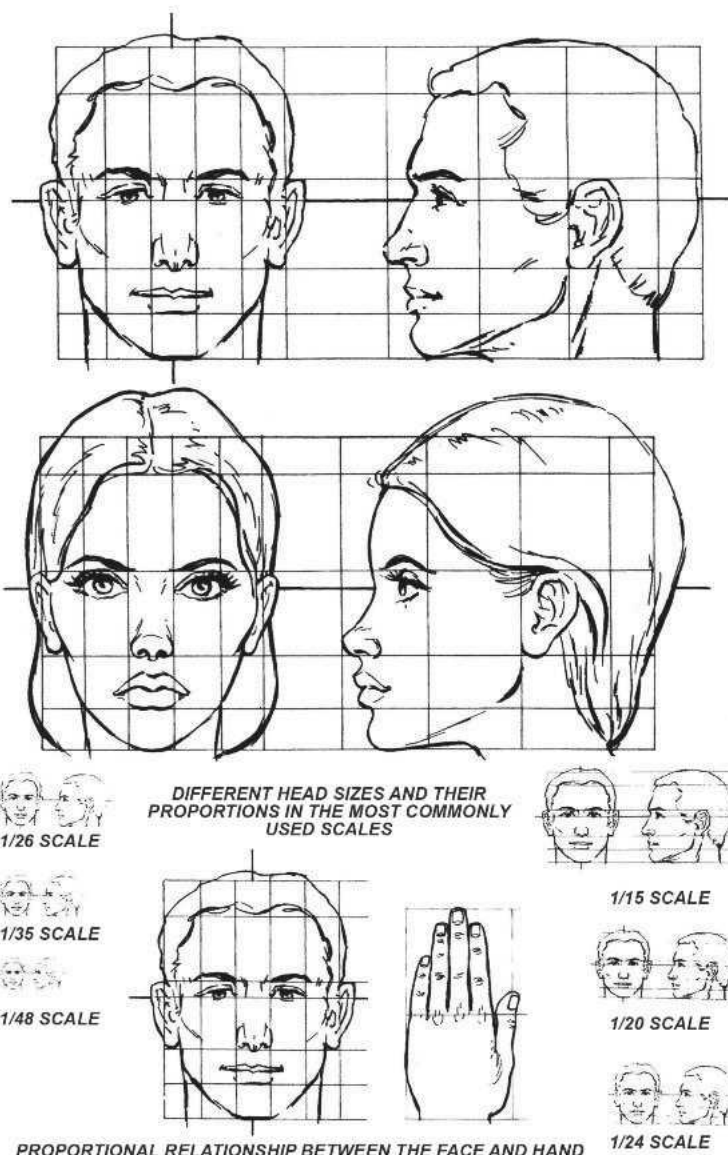
The first step is to look at this Diagram Two again and note how the sizes of most of the parts relate to other parts of the head, so keep these in mind and you won't go far wrong. The eye line is roughly halfway down from the top of the head, and the top of the ears are almost level with the eyebrows as mentioned earlier. While we can only generalise, that rule is so important because if you break it, your model's head will never look right. What this means is that at 1:24 scale, a head is 9 to 10mm high, but because the main details are roughly in just half of the head, you only have 5mm to include the eyes, eyebrows, nose, mouth, chin and ears, so 'precision' is another watchword. If you want your head to wear a cap or similar, that will cover it down to, or rest on, the ears which consumes the other 5mm. To this end, when making a head it is therefore essential to mark out the material accurately. Here are some dimensional rules regarding the proportions of a head.

- 1) The eyes are halfway down the length of the head.
- 2) Looking at the head from the front and using the distance from the eyebrows to the hairline as a measure, the head is 3.5 forehead's from the bottom of the chin to the top of the crown.
- 3) The first measurement is the bottom of the chin to the bottom of the nose.
- 4) The second is from the bottom of the nose to the eyebrows.
- 5) The third is from the eyebrows to the hairline.
- 6) The last half-measurement is from the hairline to the top of the head (its crown), which also means that the bottom of the ears are level with the bottom of the nose.
- 7) The eyebrows are level with the top of the ears.

Because the eyes fall exactly in the middle of the face, a centre line drawn vertically down shows that the width of the nose (nostrils) is exactly the same as the width of the eyes, but it is also the same as the gap between the eyes, dividing into three equal parts. The same gap across the nostrils is also the exact width of the chin and the width of the bottom lip. Looking at the head in profile, that is from the side, you will see that it is also divided into 3.5 parts.

The first part, from the tip of the nose finishes just behind the eyebrows and takes in the chin, mouth, nose, eyes, eyebrows and the forehead.

The second part includes the jawbone, cheek and temple.



PROPORTIONAL RELATIONSHIP BETWEEN THE FACE AND HAND

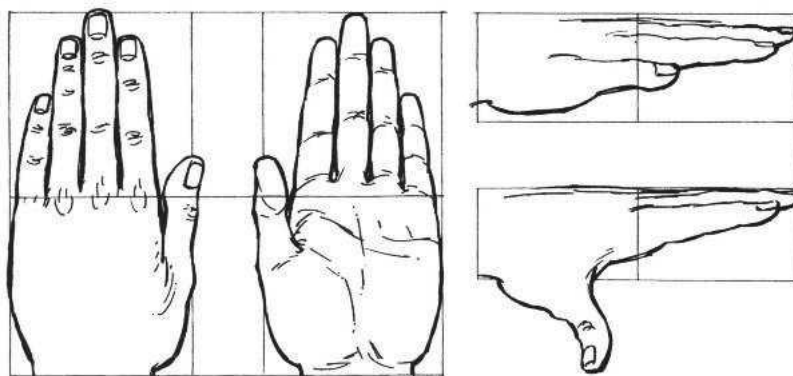


Diagram 2

The third part goes from the front of the ear to the back of the neck.

And the last half (part) is the back of the skull and the hair.

All these measurements, give what we can regard as a well proportioned and shaped head. Yes, okay, this is a generalisation as clearly we are all different, but the principles will give a well shaped head, albeit rather small.

JOINTS AND HOW THEY MOVE

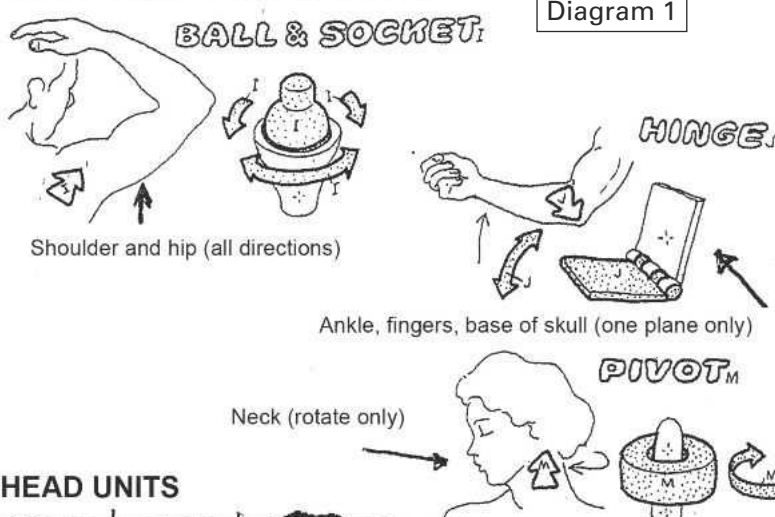


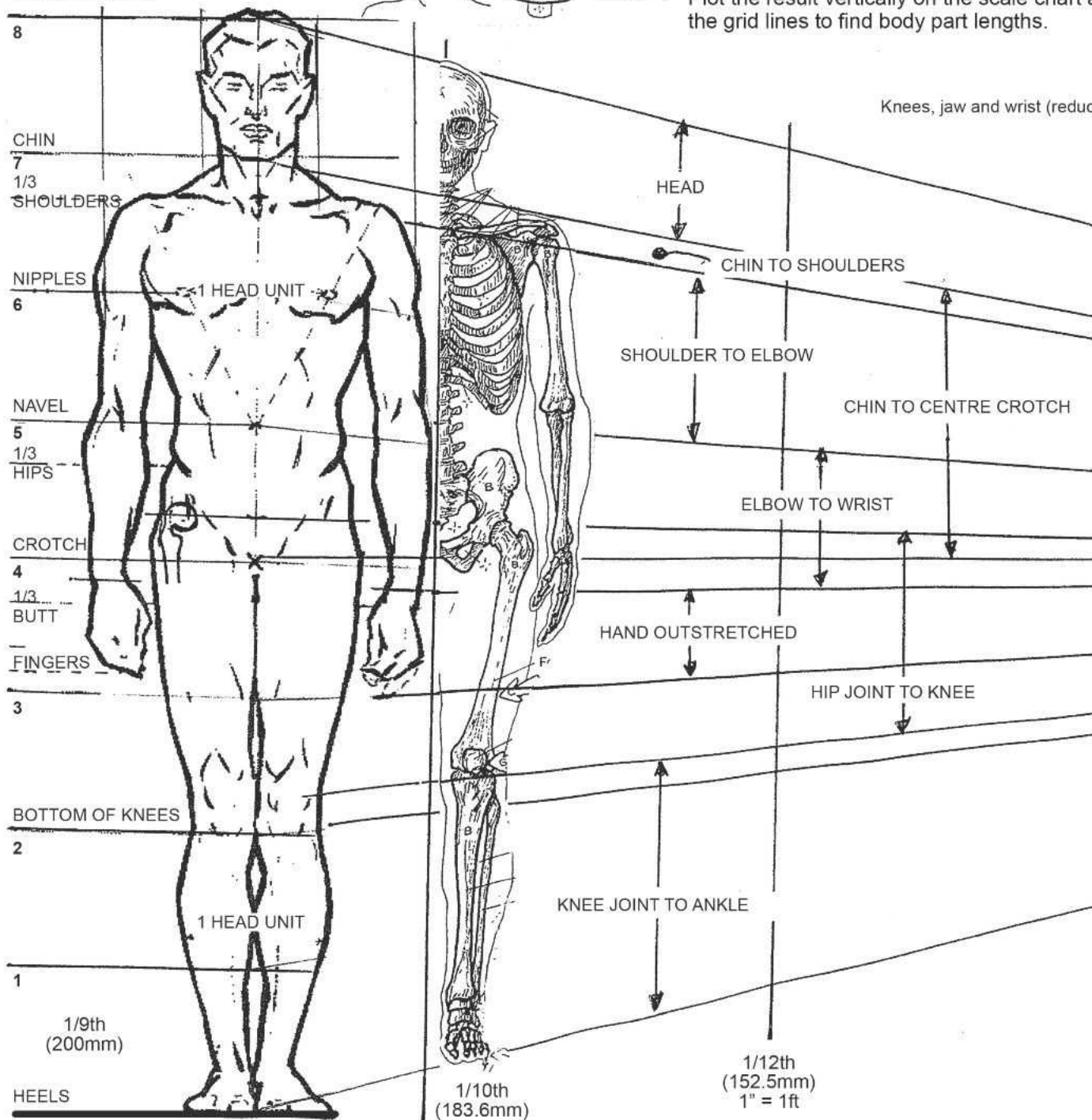
Diagram 1

SCALE LENGTH OF BONES IN MM. Based

	1/72nd	1/48th
Average height (ht ÷ scale)	25.4	38.1
Head height	3.0	4.5
Shoulder to elbow	4.5	7.0
Elbow to wrist	4.0	6.0
Hand (outstretched)	1.5	4.0
Hip joint to knee centre	5.0	14.5
Knee centre to heel	7.0	11.0
Chin to shoulder line	1.0	1.5
Chin to centre crotch	14.0	15.0

For other scales, divide average height by 1/72nd or 1/48th.
Plot the result vertically on the scale chart and use the grid lines to find body part lengths.

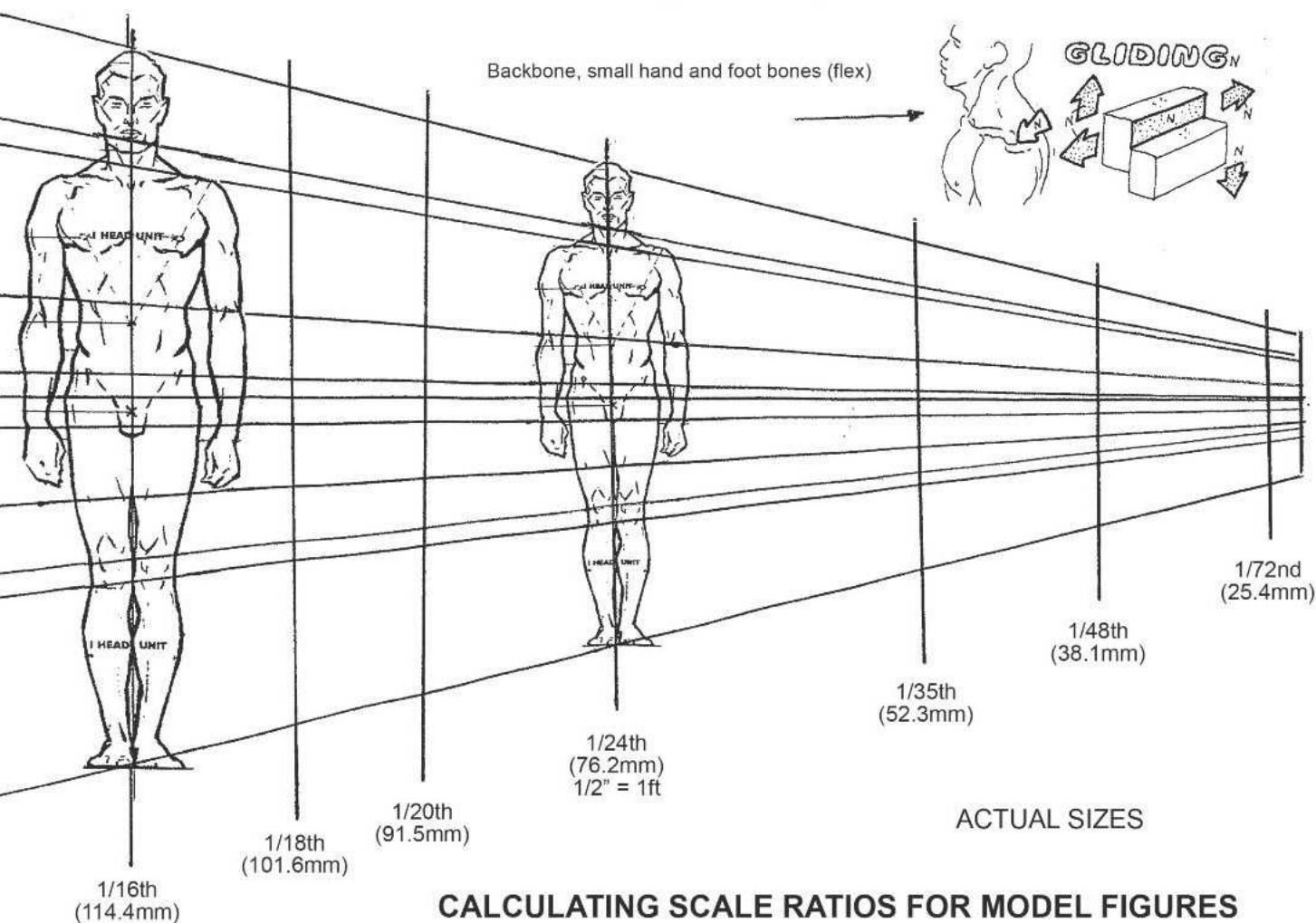
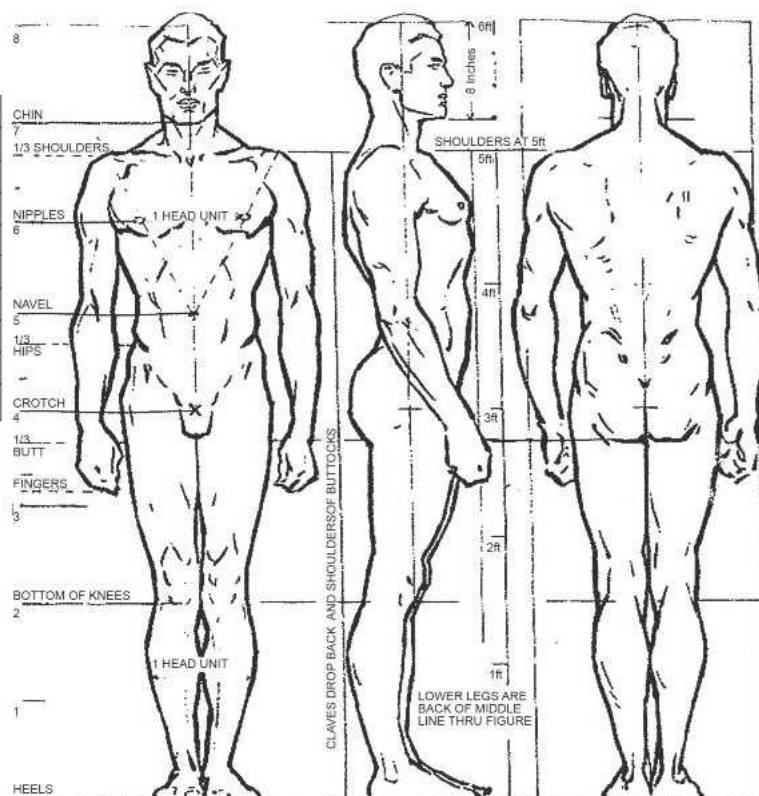
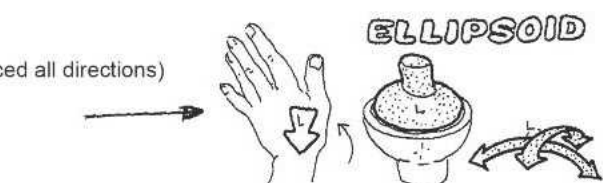
HEAD UNITS



on an average man's height of 6 foot

1/35th	1/24th	1/20th	1/16th	1/12th	1/10th
52.3	76.2	91.5	114.4	152.5	183.0
6.5	9.5	12.0	14.0	19.0	23.5
9.0	13.0	18.0	22.0	32.0	36.0
9.0	13.0	18.0	19.0	25.0	30.0
6.0	8.0	9.0	11.0	15.0	18.0
16.0	23.0	25.0	29.0	40.0	53.0
16.0	23.0	26.0	32.0	43.0	47.0
2.0	3.0	3.5	4.0	5.0	5.5
19.0	29.0	34.0	42.0	57.0	67.0

the scale you want (i.e. $1830\text{mm} \div 1/24\text{th} = 76.2$)
and draw a vertical centreline. Measure parts across



CALCULATING SCALE RATIOS FOR MODEL FIGURES By Ron Rees



Photo 12. Here the basic head has been marked out on a square strip of Jelutong, but Obechi and others could be used.

Photo 13. Ouch! The head block base is held in a vice for trimming.

Photo 14. The waste from the side profile is removed.

Photo 15. More waste has been removed and the proper shape of a head is emerging. Only basic hand tools are needed for this task.



Making the head

For the purposes of this article and to make the task easier (and the photos clearer) I took the measurements from this last diagram to make a head at 1:10 scale. Jelutong is an easily worked wood and which is particularly forgiving when carved minutely. You could as an alternative use any fine grained wood such as Obechi, Lime, Apple, Tulip and with care, even some close grained Balsawood. All these materials are relatively soft, stable and carve well, but steer clear of those that split easily or have clearly visible grain patterns. Woods like Beech, Maple, close-grained Mahogany and Oak have been carved for centuries, but I recommend that you don't start with these. Balsawood, which we have all used in some way or other will benefit from an application of runny thin superglue once you have the basic shape as this will tend to stop it splitting or breaking-up. Add more as needed, but do not use a superglue activator as this makes it very hard to carve.

Chalk is also a practical alternative and nearly half

of the heads and hands carved as masters for later casting in resin have been made out of blackboard or pavement chalks obtained from local stationers or toyshops, all for minimal prices

In the photo sequence, readers will note that the square piece of wood being used has first been marked out to match the three and a half profile measurements for one side of the head and then the front divided as shown in the face drawing. The height was taken from the big chart (Diagram One) initially, **Photo 12**, and then the brow line, nose and chin lines marked on the front and the hairline, chin and ears marked on the side. These lines should be replaced as they are cut away so you have a constant line to work to. Also please note that the piece of wood is long enough to provide a firm hand-hold while carving.

This type of work needs fine tools and on a head at 1:10 scale the bulk of the waste wood can be initially cut away using a fine saw, in this case a jeweller's piercing saw. Do not hold the work in your hand when using such as saw, as these little tools are evil if they slip, besides all this work should be square and accurate and only a proper holding





device, **Photo 13**, will do.

Photo 14 shows the bulk of the front to rear waste removed, defining the eyebrow line, nose, chin and dome of the head and neck. The block can then be further roughly trimmed by rotating it 90 degrees as in **Photo 15**.

Using a very sharp knife (Swann Morton No. 3 handle with new very sharp No. 11 blade is ideal) you can lift the ears and the chin detail by defining the hair line and trimming under the jaw.

Photo 16 shows the brow line which protrudes a little, highlighted by paring away above it and shaping the slight backwards curve of the forehead. Small vee-shaped cuts are made where the mouth will be and for the hollows of the eye areas.

Careful placing of the eyes is essential and in **Photo 17** these have been executed by using a very small twist drill turned by hand. A round headed pin such as those from Peco for model railway tracks will make neat round eyes. The areas under the nose and the eyebrows have been cleaned up a bit as well. This last picture also has a 1:24 model head carved in exactly the same way. Both have also been very lightly sanded and will

be given a thin coat of 50/50 cellulose dope and thinners to seal their surfaces.

The 1:10 scale head took about 30 minutes work so far and was kept plain because anti-flash gear and a steel helmet would be added later. The small 1:24 scale head has a simple woollen hat carved into it.

It is very difficult to carve peaks of hats and edges of helmets out of wood (or chalk) without them breaking, so adding these by using small pieces of styrene and filler afterwards is much easier. It is also useful to now make a rubber mould of the basic bare head, as it saves carving another when making further heads if you want them to have different headgear. **Photo 18** shows how easy this is, as the small container just needing to be filled with cold cure flexible silicone rubber, **Photo 19**, so it can be reproduced at will.

In **Photo 20** can be seen the end result, the resin casting on the right having had a helmet rim added from styrene sheet and anti-flash mask. With sealing, this embellished head can also be moulded, but the basic bare version is preserved for future adaptation.

Photo 16. The eyebrows need a bit of work to get just right.

Photo 17. The eyes themselves can be something as simple as Peco track pins that have a perfectly round head inserted, or a dressmakers pin suitably shortened. Better than just a blob of paint and hoping for the best.

Photo 18. Making a mould of the basic head, saves time later when different types of headgear might be required as the same basic head as a resin casting can then be utilised.

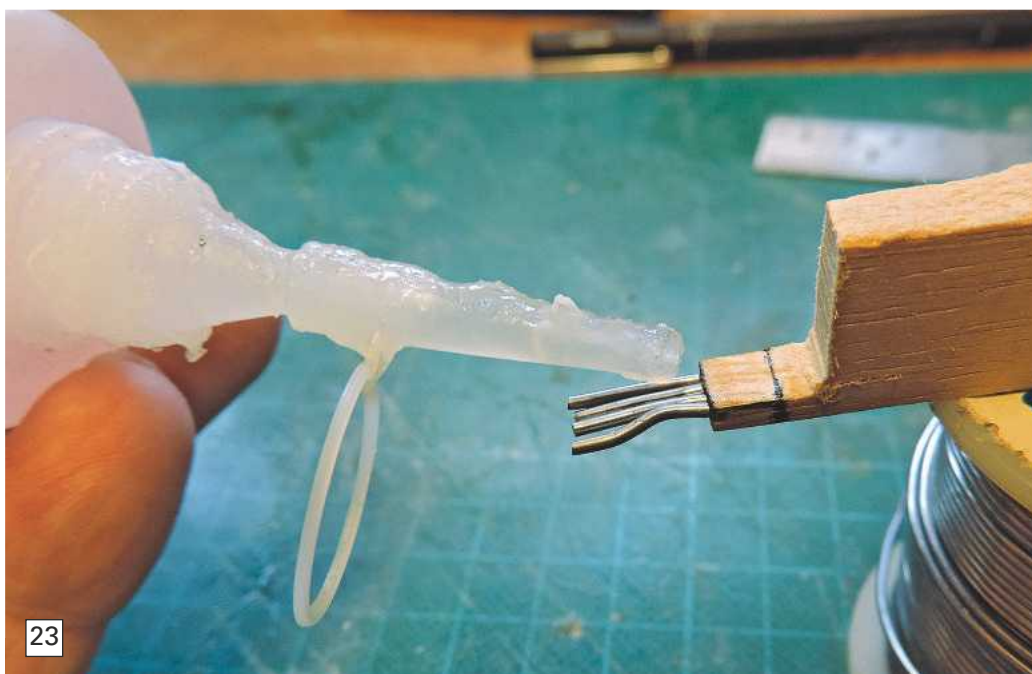
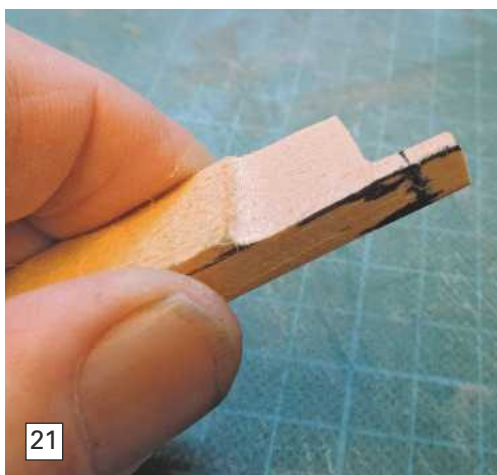
Photo 19. Here the container has been filled with cold cure flexible rubber to make a mould. If it is not possible to extract the master from the rubber when it is set, then a vertical cut to split the rubber mould will solve that problem. The split rubber mould, one re-inserted in the container can then be used with no problem to make perfect heads ad infinitum.

Photo 20. Here is the sequence from left: master on the left, mould, casting and new head, but now with suitable headgear.

Photo 21. First stage in making a hand.

Photo 22. Four slots need to be cut for the fingers.

Photo 23. The fingers are just short lengths of solder wire.



Hands

Good hands on a figure make a huge difference and are well worth the effort. At really small scales though, probably an impression of a gripping hand can be simulated by just a blob of pink paint, but as you get to 1:35 or 1:24 scales and larger you will need something more realistic.

Another look at the diagrams will show that generally, the flat back of the hand is a square if you discount the thumb and fingers. Four fingers of various lengths stick out the front of the square and the thumb is sort of stuck on the side. The opposed thumb is one of the greatest inventions of nature and only humans, together with apes and one or two other creatures are equipped with them, but remember that you need both left and right hands for your model figures.

For these, ideally we need to be able to create model hands doing a host of different things. Because of their size on small scale models, as well as the complexity of so many different hand gestures and actions, a lot of purchased figures have their hands in pockets, which is of course much easier to produce and cast. Individual fingers

at 1:35 scale are tiny and will often break off, so for that reason a lot of hands on commercial model figures are alternatively 'grasped'. Anyway, here we are going to make a universal hand that can be pointing, gripping or waving etc. before being fixed in position on the end of the arm.

Making a hand

The photo sequence shows a hand being made at 1:24 scale. Remember that the proportions of the hand at this scale say that the overall outstretched hand is about 8mm in length (same as chin to hairline), which means that the palm takes up half of that and the fingers the remaining 4mm.

In **Photo 21**, a 4mm square has been cut on the end of a piece of hardwood, that is 4mm wide and 2.5mm thick. A shallow slot 2mm deep, right across its width where the fingers will eventually go is also needed, **Photo 22**. This cut is equal to 1mm diameter soft solder, which will be used for the fingers.

Four short pieces of soft solder wire are cut over-length for the fingers and pushed carefully into the

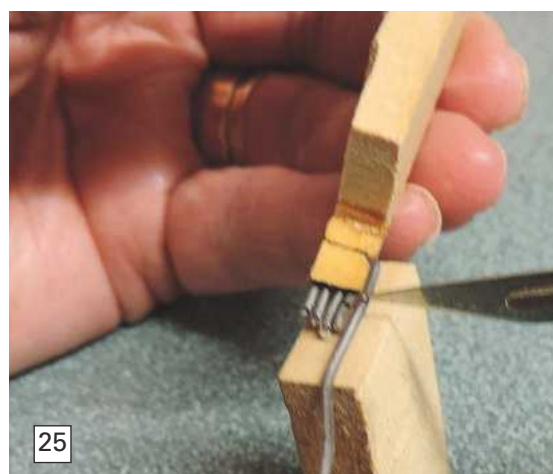


Photo 24. The fingers are now cut to length. At these scales it is probably not worth even trying to include finger nails etc.

Photo 25. The thumb is inserted at an angle into the side of the hand. Don't forget you will need left and right hands, unless you are modelling Admiral Horatio Nelson later in life?

Photo 26. Here is a shaped and primed hand. More than good enough for our purposes.

Photo 27. A sailor with a pointing hand.



slots with long nosed pliers. They are then glued in place with a drop of thin superglue, which also strengthens the wood, **Photo 23.**

When dry, the length of the longest finger, usually the middle one, is marked across all four bits of solder and here it is cut to 4mm, the same as the palm. Cut the fingers down to length initially with a sharp knife and then, depending on whether you are modeling a left or a right hand, further trim each finger to its proper length, **Photo 24.**

The length of the thumb is governed by the distance from the bottom of the wooden square (near the wrist), and the first knuckle joint of the index finger. It is joined to the bottom side of the square part of the hand, depending on right or left hand. A 1mm hole is drilled at the base and a piece of solder inserted at a slight angle. Once glued in place with a drop of thin superglue it can be pushed to lay flat alongside the hand and its length trimmed, **Photo 25.**

Once the shape of the hand as needed has been decided, we can now proceed to completion. In this case, holding something round was desired so the fingers and thumb were carefully bent to

shape with long thin nosed pliers. A small blob of Milliput was used to make the fleshy webbed part at the base of the thumb and this was shaped wet, and left to dry. The sharp corners of the wood were then carefully pared away to round off the hand and it was finished with a light sanding all over and a coat of grey primer applied, highlighting any areas needing further remedial action, **Photo 26.** Above the wrist has been rounded (just look at your own hands to get this right) and a 0.5mm hole in the hand's base and another in the end of the forearm enables a short piece of brass wire to be inserted whilst the hand is rotated to attain its right angle, before being glued permanently in position. **Photo 27** is of an early small scale figure so equipped with the solder fingered hand. To be honest at more than 6 inches viewing distance, it looks absolutely fine.

It's worth taking the time to make a tiny silicone mould of each hand that you make, as you then have the means of making a copy which can be used on other figures in the future as well as slowly building up a collection of assorted hands to go with your stock of heads and bodies!





28

Photo 28. These are complete figures, ready for having moulds made from them.

Photo 29. Depending on the figure's pose, it may be necessary to mould the arms and accessories separately.

Photo 30. By combining different heads with different bodies, then your range of figures is enormously increased. Five heads and five bodies (some with separate arms) can be used to create at least 25 different figures.

Photo 31. A bit of fun! Unbeknown to our editor, I secretly made a cast figure of him at our model boating pond. He rarely misses a Sunday sailing with us at Fishers Green SC Model Boating Section.

Moulding and painting?

You now have a scale figure doing what you want it to do on your model. It can be painted to choice, or a mould of it taken so it can be replicated at will. This might be handy for a marching platoon of soldiers being modelled for example. Making two-part silicone moulds is beyond the immediate scope of this article, but suffice to say there is much out there on the Internet to show how it is all done.

Photo 28 is of some figures ready to have moulds taken and **Photo 29** is of a typical mould, master and a casting for a polyurethane resin figure, using cold cure rubber and resin from Sylmasta who advertise regularly in this magazine. You will note that an arm is separately moulded and the sub-machine gun is scratch built from brass.

Conclusion

If you can find commercial miniature figures that are the right size and in the right poses for your models, then please use them, but the foregoing enables you to make figures individual to your model and that is no bad thing. As you can see, I have taken moulds of each of the individual body parts (nice description!), as well as moulds of the

'dressed heads' and the separate arms, enabling various combinations to be assembled and then even taken moulds of those, so Sylmasta must be very pleased with my regular purchases from them. Seriously though, making figures is not difficult and it is something that can be done on a small tray, in front of the television, domesticity allowing of course, and you will end up with exactly what you want.

Photo 30 is of a selection of heads, which combined with different torsos, enable numerous figure options to be assembled. As I was completing this, I further discovered that principally from China, there are some very good value extremely inexpensive figures that can be easily converted, but perhaps their main value is that the heads and hands can be amputated and used on your bespoke figure torsos. So the point of all this is to please think outside the circle as you can make everything yourself, but equally we can utilise commercial parts very much to our advantage.

On the website: www.onesixth.co.uk, you find further advice and tips and to finish with a bit of fun,

Photo 31 is of a unique representation of Paul Freshney, made from scratch, then resin cast and painted whilst he was at the Fishers Green Sailing Club pondside holding his Spektrum transmitter.

Enjoy your hobby - Ron Rees





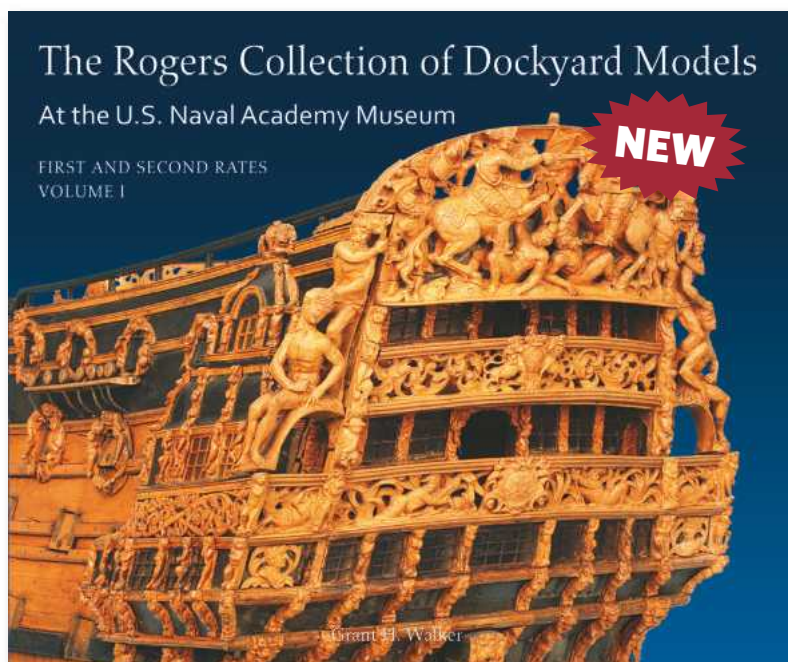
THE ROGERS COLLECTION OF DOCKYARD MODELS AT THE U.S. NAVAL ACADEMY MUSEUM

Volume I, First and Second Rates Grant Walker

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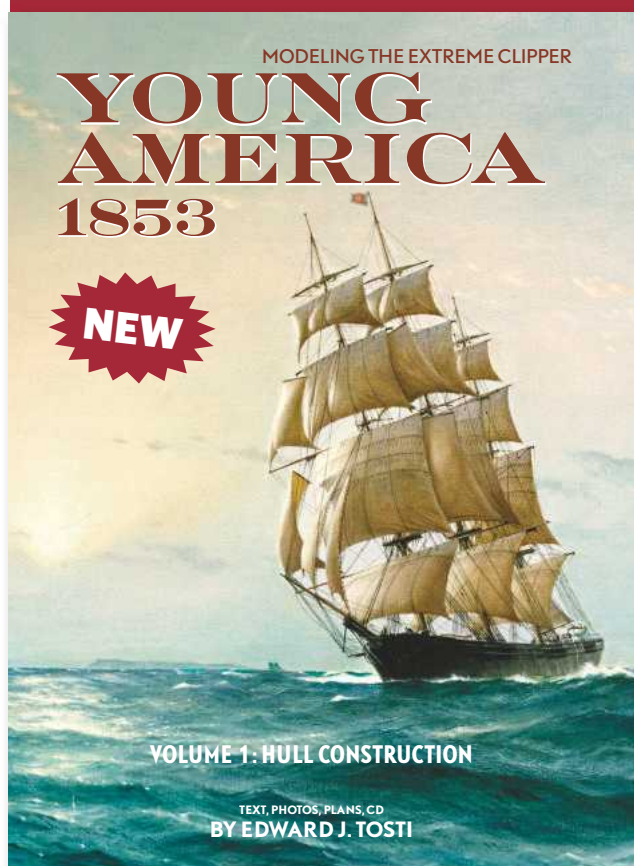
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Modeling The Extreme Clipper YOUNG AMERICA 1853

Text, plans and CD by Edward Tosti

ED TOSTI, AUTHOR of the series on the Naiad Frigate, is in the process of modeling this ship with exquisite detail in 1:72 scale. His plank-on-frame model is, as an extra bonus, accompanied by instructions on building a 1:96 plank-on-bulkhead model.

Book one will cover building the hull. Book two, which will be published at a latter date, will cover finishing the main deck along with masting and rigging her.

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Introducing Gilbert (Gib) McArdle's superb model of

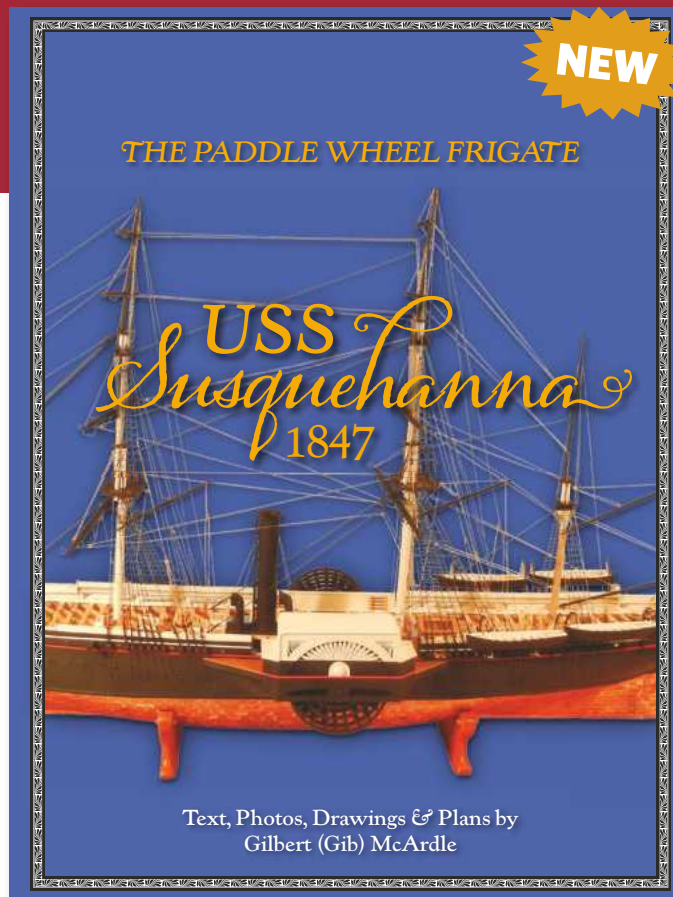
The Paddle Wheel Frigate USS SUSQUEHANNA

USS SUSQUEHANNA was one of the great transition warships of the early 19th century. Using sail and steam, she had full career in the navy. She served as Admiral Matthew Perry's flagship on his historical trip to Japan and as part of the blockade fleet during the Civil War.

While Gib has built his model using the plank on frame method, it could also be built using plank on bulkhead, or with lifts for a solid hull. Plans for all of the frames are provided along with a full set of templates for a plank on bulkhead build. The ship is fully rigged and makes a beautiful model at 1:96. 10 sheets of plans are provided.

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17th CENTURY DUTCH MERCHANT SHIPS

Text, Photos and Plans for the Ship Modeler

Text by Ab Hoving, plans by Cor Emke, models by Herbert Tomesen, photos by Emiel Hoving

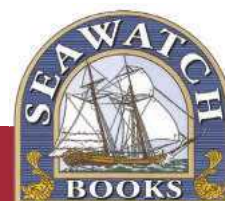
This book profiling ten different merchant ships from large to small and the accompanying "Plans Portfolio" of 24 sheets, in both 1/4 and 1/8 scale, has something for every modeler. Pick your favorite building method, the size and complexity of the ship you want to build, and you are ready to cut wood. Besides being a treasure trove for ship modelers, this work helps document the merchant ships of one of the world's greatest sailing nations.

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Build an AA Class Racing Boat!



Sally with her completed AA class boat which has proved to be competitive with its relatively inexpensive West 28 engine.



Craig Dickson shows how to build a competitive i.c powered craft

The Editor, Paul Freshney, asked me earlier in 2015 whether I would be interested in writing an article about building an i.c. powered race boat, from start to finish. The timing was perfect because by pure coincidence I had just started building a new boat for BMPRS racing in the AA Class. However having enjoyed two successful BMPRS race seasons with an A Class boat, this next project was from the onset intended to be built for the person who has been my absolute rock in terms of support given to me in this hobby, that person being of course my wife Sally. After some persuasion, she agreed that if I were to build her a new boat she would have a go at the fun and excitement of entering races and so the challenge was set.

What boat would be suitable for a person new to racing?

Sally is competitive by nature and wanting to do well, but at that time inexperienced in race-craft, so the decision taken was to opt for the smallest BMPRS AA Class category that allows for boats with nitro fuelled (glow) engines of up to 4.5cc capacity. It has to be said that even in this class, the boats can be very fast and tricky to build and set-up correctly.

The hull chosen was an easy decision for this AA Class boat. as it is made and supplied by Bernard Holder. As the 'Sea Spirit', it gained Mike Barnes two consecutive British BMPRS Championship wins in 2013 and 2014. However the latest 2015 version acquired for this project from Bernard is now named 'Magnet'. He renamed the hull after noticing that this new version attracted a surprising amount of interest as it has a revised deck section and top deck, but still retains a realistic appearance



comparable to that of a full-size power boat.

The Magnet hull has been designed to be powered by a traditional solid shaft submerged drive system and we were happy with that, opting for a tuned West 28 glow engine with a bespoke hand-made Genesis tuned pipe, all supplied by Weston UK.

What do we start with?

Perhaps the most exciting part of any new model project such as this, is getting your hands on the new hull and Magnet was no exception, it being supplied with the hull and deck as separate un-joined mouldings, plus separate (polyester glass resin) mouldings for the top hatch cover and an optional internal radio box enclosure. It can be very tempting to prefer, as many people do, a hull that comes supplied with its lower section and deck already joined, but there are advantages in having them separate, mainly for extra access and elbow space when installing the internal hardware and other components as in **Photo 1** (which does not include the top hatch).

Some general information

Throughout this project, the nuts and bolts used are usually of stainless steel, although there are some of brass. Being a polyester resin fibreglass hull, Bonda glass fibre reinforced paste has been used for securing the fittings as well as normal polyester resin, sometimes with added colour pigment. When referring to the 'glassing-in' of various components, this term simply means the process of applying layers of fibreglass paste and/or resin to fix the item in place.

Getting started

The very first task is to make an inexpensive but good quality boat stand, sized correctly to ensure that the hull sits on it properly for stability, particularly for when starting the engine. It is also handy to have a boat stand that allows the boat to be held unsupported on its side, for example for propeller changes, as well as being designed to ensure that only the soft protective foam will touch any surfaces of the hull, to avoid unnecessary marks and damage. Additionally, we need a stand that has minimal chance of catching the propeller, once the engine is started.

The solution that works, at least for the Dickson family, is to make the boat stand out of plywood, with pipe lagging foam for the hull contact areas and four rubber door stoppers for its feet. The pipe lagging foam, which comes split down its middle longitudinally, is secured with plastic cable ties as otherwise it tends to slip off. The four rubber feet provide stability and prevent the plywood sides getting damaged as they never come into contact with the ground when at the lakeside, **Photo 2** being of the near-finished boat on its stand as described, and you now also have a good idea of what my patio looks like! When screwed and glued, such a stand will last the lifetime of the boat and beyond. So, that's the boring stuff out of the way, let's now get started on the boat.



Hull

The Magnet, as with all hulls supplied by Bernard Holder, comes with simple, but vital, recommended dimensions in respect of the engine, propshaft tube and rudder positions. The instruction sheet includes a template for the rudder size and shape and a template for the recommended front bulkhead. As always, the very first steps in construction are perhaps the most critical.

With a submerged drive boat like Magnet, the first task involves installing the engine, propshaft tube and rudder in the correct places, all aligned, and taking time to get these 100% right, is well spent.

Engine mount:

Angle alloy plates were carefully cut to size to fit the quite small mounting lugs of the West 28 engine. It is important to ensure that the plates once drilled and bolted to the lugs do not bind against the crankcase of the engine, so some fine filing will probably be necessary to ensure a stress free fit of these to the engine.

With the two inner plates made to fit the engine, the next step is to measure and drill the holes in these inner, and the two outer, plates to take the rubber bobbins between them, creating a strong, but flexible rubber mounting. The inner plates



were pre-drilled before clamping the outer plates to them (having removed them from the engine) to ensure accurate positioning of the holes.

A pillar drill is essential for this job, **Photo 3**, this showing what we end up with. The rubber bobbins come in different grades, depending on the physical size and cubic capacity of the engine being installed, as the same principal applies to larger direct drive motors.

With the inner and outer engine mounts completed, four more holes are needed vertically in the outer plates to take the steel threaded studs on supporting legs that are fixed (glassed-in) in the hull to support the engine and its mount. These four holes are less critical as they only need to be at the edges of the side plates, with sufficient space to allow for the supports beneath them. The supporting legs will need to be cut to size before being fixed, so they match the curvature and lines of the hull.

Propshaft

The propshaft assembly for this hull was also made and supplied by Bernard Holder. It comprises a brass outer tube with a plain Lead/Teflon bush inserted at the rear propeller end, and a separate alloy housing at the engine end, which holds a stainless steel ballrace. A nice touch with this housing is that it has an internal groove which holds a circlip to retain the ballrace in place, facilitating its easy removal if required. The propshaft itself is of stainless steel. At the external end of the tube, a solid brass plate (the skeg) is hard (silver) soldered to the tube to support it, **Photo 4**.

One immediate question that springs to mind is: Where to drill the hole in the hull before elongating it to allow the propshaft tube to be in the right place and at the correct angle? Thankfully, as mentioned earlier, this hull comes with the measurements

required which makes things a lot easier. Most hulls from all manufacturers will come with some guidance, but not always.

On the outside of the hull, marked with a soft lead pencil, were the front and back edge of the propshaft tube exit hole as suggested in these instructions. It is best to start by drilling a hole mid-position between the marks and then use a coarse file together with a Dremel rotary tool or similar, to elongate the hole until it is the right shape and size to take the tube, **Photo 5**.

A key part of this process involves joining the engine to the propeller shaft with a temporary solid coupling to ensure accurate alignment, and checking that the hole whilst being elongated is still in the correct place, so please remove the waste material bit by bit.

The aim is to achieve the smallest propshaft tube angle, whilst allowing sufficient clearance for the propeller at the outer end and the engine and its mounts at the inner end. Allowance has also to be made for the different sizes of propeller appropriate to the engine and hull, as one doesn't want to be limited later in choice because the gap is too small, but equally, it doesn't need to be too large either.

The next task is to mark and cut a thin elongated slot in the hull to allow the skeg (tube support) to pass through. Once done, two holes were drilled in the brass skeg so that bolts, with flange nuts to lock them to the skeg, can be fitted inside the hull to ensure that once fixed in place, the support will be very strong and rigid. The top of the skeg plate was cut off, once the holes were drilled, to leave only a small amount protruding inside the hull, just enough to retain the horizontal bolts.

The final part of this dry-fit process involves cutting down the engine mounting plate legs so that they just sit on the hull bottom, such that with the engine on its plates and solid-coupled to the propshaft, a final check of alignment and any resulting minor adjustments can be made. It's now, and only now, that the time to fix all of this in place has arrived.

All components needing fixing should be thoroughly degreased and cleaned before reaching for the fibreglass tin. The top bearing housing of the propshaft tube was epoxied to it and the skeg bolts had their flange nuts tightly nipped-up with Red Thread Lock applied to make doubly sure.

A small amount of Bonda glass reinforced paste was thoroughly mixed and gently applied around the engine mounting plate legs, the propshaft tube and the top of the skeg with its two bolts. Just enough was applied to hold these parts in place before





removing the engine unit complete, leaving its mounting legs sticking up from the hull bottom and the propshaft tube with the skeg also in-situ. Further applications of reinforced paste were added to create good, secure and strong fixings, **Photo 6**. It is nice to complete this job, fit the engine back into the hull, replace the temporary solid coupling with a flexible rubber type, and see that everything aligns properly and that the project is really now on its way. I should add that subsequent to this last picture, yellow pigmented resin was used to cover the reinforced paste to make it all look nice.

Rudder tube and water-cooling pickups

The rudder and its rudder post tube were also supplied by Bernard Holder, **Photo 7**. With an outer brass tube with recessed nylon bushes each end to take hidden rubber O-rings, this rudder post tube design ensures no water leakage when the boat is at speed, vital when the rudder post will actually be inside the radio box.

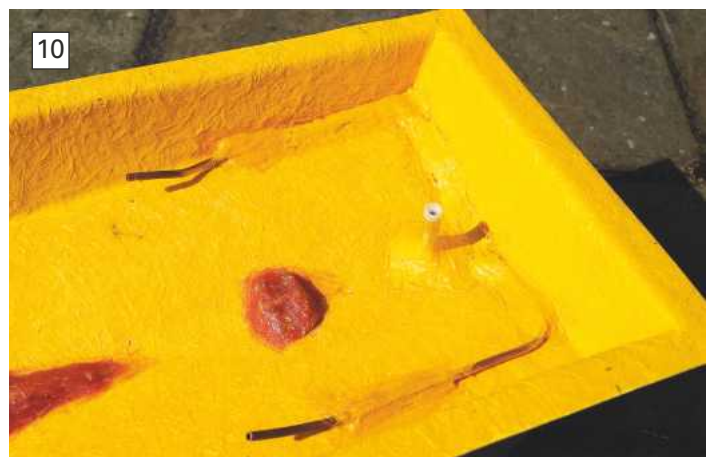
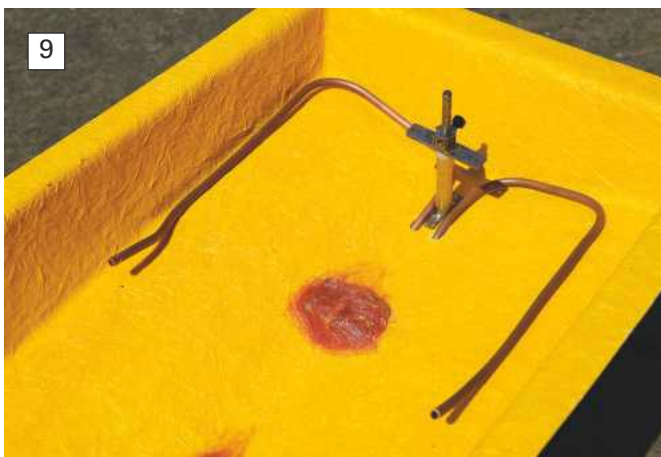
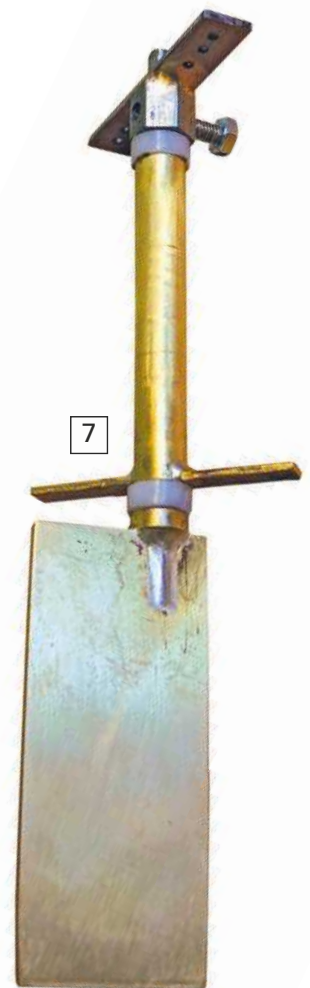
The installation procedure was very simple, drilling a hole as per the dimensions provided and taking care to get the tube perfectly vertical. Once dry-fitted, but before fixing in place, consideration was given to the two water-cooling pickups. Ideally these need to be sited behind the propeller to give a good pressure, but not to be so obtrusive as to create drag. Some redundant copper brake pipe (3.5mm bore) was the practical solution. Two holes were drilled each side of the hole for the rudder tube and angled to take the two separate pieces of copper tubing as in **Photo 8**. The fiddly part of this was bending the copper tubes so that they pointed down at pickup ends, but could be looped around the inside of the hull ensuring both remained flat to the hull bottom and out of the way for the later fitting of the radio control gear, **Photo 9**. Several applications of glassfibre paste were then applied

to fix the rudder tube and the cooling pipes in place, **Photo 10**.

Tip for drilling holes in a Polyester Resin Fibreglass (GRP) hull

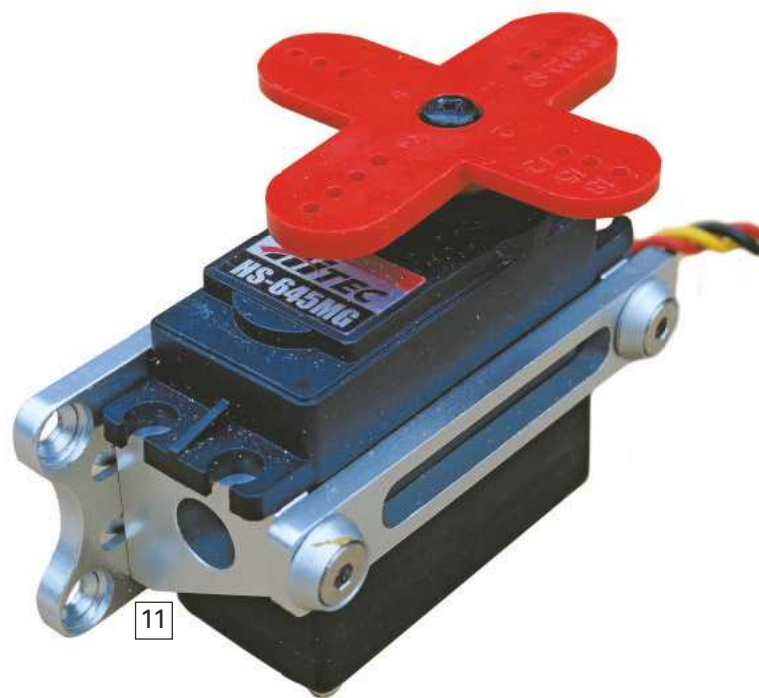
The brittle nature of a fibreglass gel coat means that when drilling holes through it, there can be a tendency for it to chip, which is annoying and unsightly, so a decent sharp drill used with gentle progressive and even pressure is essential. For anything other than 3mm (or less) diameter holes, it is best to cut the hole undersize using a twist drill and then use a tapered reamer, by hand, to enlarge the hole bit by bit for a near perfect fit. That way, any initial gel coat chips are removed as the hole is enlarged and this process ensures that the hole remains circular. Masking tape applied over where the hole is being made also helps to prevent chipping.

Alternatively for much larger holes (2cm in diameter perhaps), if the fibreglass can be held with a timber backing board underneath on a drill press table, a sharp Forstner bit in a drill press works well in my experience.





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13

Radio box and control components

At this stage of the project, careful thought is needed to determine the positioning of the radio control components of the two servos, battery pack and receiver. At the same time, consideration is needed as to the size of the radio box enclosure, because it has to allow sufficient access to its interior, be big enough to add extra boat buoyancy and yet not too big to prevent a one litre fuel tank to be fitted between it and the engine. The box also has to have sufficient clearance for the engine's tuned pipe and exhaust manifold.

So it was decided to install the key radio control mounts first, and then build from good quality marine plywood a waterproof box around them in the hull, rather than use the supplied GRP radio box.

Servo mountings

Two sets of CNC clamp type servo mounts were purchased to take the two standard size Hitec HS645MG servos, **Photo 11**. These servos have metal gears, are ball raced and have decent torque. They have proved very reliable during recent race seasons in other boats, so why change?

For the rudder servo, two pieces of 3mm thick and 19mm wide alloy plate were bent at their ends,

using a vice, to match the contours of the bottom of the hull allowing the longer upright tabs to sit vertically to take a CNC servo mount with holes drilled to allow secure fixing. The bases of the angled alloy plates, were then fixed in position with fibreglass paste, **Photo 12**. It is absolutely essential that the rudder servo is positively mounted and cannot move, and **Photo 13** is of it temporarily in place.

The throttle servo presented a conundrum, in that to ensure clearance for a solid straight linkage from the output arm to the engine throttle lever, it would need to be mounted on the port side inner vertical wall of the radio box, as yet to be built, primarily so that the linkage could be kept to the side of the fuel tank. So the mounting for this will be resolved later.

Battery pack security

This is a five cell, 6v pack and four angled alloy plates were fixed to the bottom of the hull with elongated holes drilled at their top edges to take plastic cable ties. The aim being to have the battery pack fit snugly inside these vertical plates, surrounded by closed cell foam and secured with the two cable ties over its top and (if you refer back to Photos 12 and 13), those alloy plates can clearly be seen to starboard of the rudder servo mounting.

Construction of the radio box

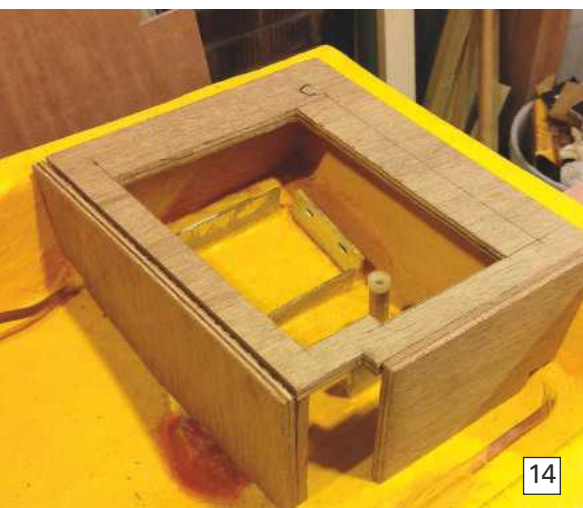
A boat of this type must have a radio box that is strong with sufficient access, but critically it must most certainly be 100% waterproof, and nothing less will do. Marine grade 6mm plywood was chosen for the carcass of the box, requiring one section for the top frame and two main pieces for the sides, with smaller side corner sections to create a recess to enable clearance for the engine's tuned pipe.

Cardboard templates were made and used to cut the plywood to the correct shape to match the contours of the hull as it is much easier to shape and trim a piece of cardboard and then simply transfer the shape to the wood before cutting size. This way, only fine adjustments will then be needed to the plywood sections, **Photo 14**.

With the sections all cut to size and before gluing them together, two extra sets of components are/were needed:

Radio box hatch bolts

How do we strongly secure a clear Perspex (or polycarbonate) hatch lid on a bed of closed pore



sealing foam in a way that is waterproof, reliable and needing zero maintenance? The method chosen has been successful on other boats and that is to permanently fit ten brass pan head bolts vertically (their heads inside the radio box top) so that the clear hatch can drop on and over them, with the hatch retaining nuts then to be added on the outside.

Each 4mm brass bolt was dropped into the hole of a short length of 12mm wide, 1.5mm thick brass plate, the bolt hanging perpendicularly and then being soft soldered in place, thus ending with ten bolts with rectangular brass plates ready to epoxy into the holes of the plywood radio box top,

Photo 15. This method, although perhaps a bit fiddly, does help ensure that there is.

1) Minimal risk of water getting through the seal because the bolts are fixed in place really well.

2) Practically zero risk of the bolts twisting when the nuts are tightened down.

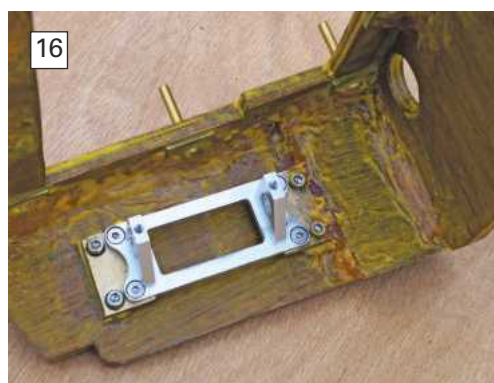
3) A good chance the bolts will all be vertical.

Before fitting the bolts, and having drilled their holes in the plywood top section piece, before being glued in place, the Perspex hatch cover should be clamped over it and drilled with a 4mm twist drill to ensure there are matching holes in it. The Perspex lid can be trimmed to its final size a little later.

Throttle servo mount

Having decided that this servo needed to be fixed to the port side inner wall of the radio box, now was the time to fit a suitable mount before the wood parts were all fixed in place.

Two small pieces of 3mm thick brass plate were



used, permanently bolted and epoxy sealed to the inside of the box side (ensuring no possible water ingress through the joint) and enabling the CNC servo clamp mount to be fixed to these plates, but removable when necessary. Four holes were drilled and tapped into these plates to facilitate their fixing, **Photo 16**, this last picture showing the captive bolts as well.

The basic radio box, as is self-evident from the pictures, was initially glued together as a frame without a bottom, the joints being reinforced with fibreglass paste as in **Photo 17**.

For the moment though, the box is not quite ready to be permanently fixed into the hull as two extra fittings will be needed and are easier done with it in the 'open' form.

1) Throttle linkage hole and bellows

Having opted for a steel pushrod connection

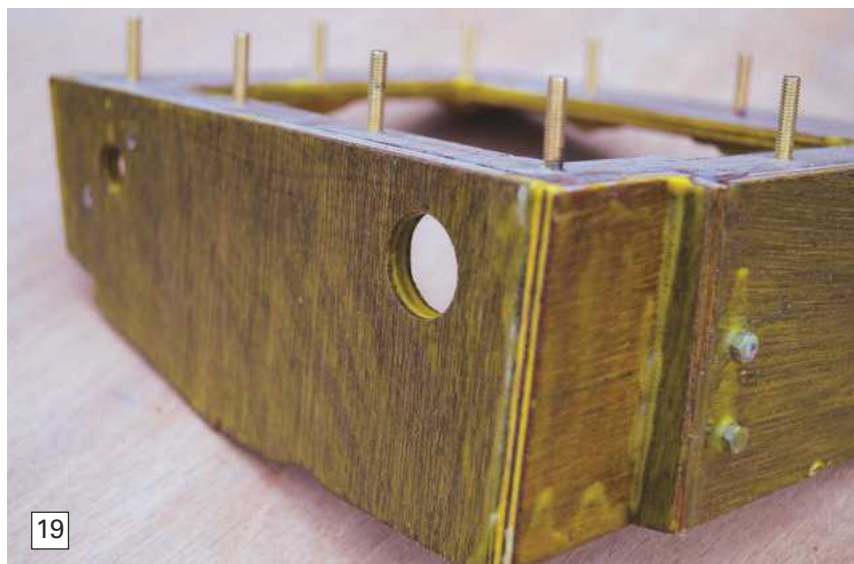




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between the throttle servo and the throttle arm on the engine, the type of rubber bellows that is supplied with a matching aluminium base section and which comes with a securing nut and integrated rubber O-ring was installed to create a secure, but waterproof opening, **Photo 18**. This is a really neat and well made bit of kit that is available from Prestwich Model Boats.

Getting the hole drilled in exactly the right place to ensure the pushrod does not bind against the sides of the alloy housing is quite tricky. To overcome that problem, the alloy bellows mount was fixed into a separate 2mm thick piece of rectangular alloy plate. Then, an oversize hole was drilled in the front plywood wall section. This enables the alloy plate,



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with the bellows mount fitted in place, to be moved around until there is a straight connection via this hole from the servo arm to the throttle arm of the engine, **Photos 19 and 20**.

Final alignment will be completed after the radio box, engine and throttle servo have all been installed and only then is the plate clamped, epoxied and secured permanently with two small stainless bolts.

2) Waterproof receiver switch hole and mount

A waterproof toggle switch was selected for the receiver's on/off power supply, this incorporating a clever rubber housing surrounding the toggle itself, moulded into a screw cap and with its own O-ring allowing the unit to be fixed securely to a plate with a hole drilled through it, **Photo 21** showing this switch installed.

One feature of this switch that concerned me, was that its connecting wires inside the radio box, although soldered to the contacts, seemed vulnerable to vibration as the boat travelled at speed. To address this potential problem, a coating of hot melt glue was applied over them, making the unit a bit more robust and protecting the wires against being accidentally pulled, **Photo 22**.

As you will have gathered, at the same time other work was ongoing, including applying two thick coats of resin mixed with yellow pigment to the box, whose hull/box contact surfaces were roughened with 80 grade sandpaper, before placing the now finished radio box in-situ ready for permanent fixing to the hull. Several thin mixes of fibreglass resin paste reinforce the joint to the hull. The tricky part is getting the paste underneath the inner transom section and a small mirror was needed to inspect the now hidden inner surface. Cheap wooden lollipop sticks or



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23
coffee stirrers make great tools for applying paste, **Photo 23.**

When using fibreglass paste or resin, it sets with an exothermic reaction (generates heat) once mixed with the catalyst and can get really quite hot in a confined space. So it pays to go easy on the catalyst and apply several small amounts, rather than a big 'dollop' of the mixture.

Fuel tank and mount

This boat presented a real challenge as regards the fuel tank, because we thought that the West 28 engine would probably consume fuel quicker than me with a glass of wine, and so fitting the largest Dubro type which would allow a litre of fuel to be carried would be a good idea.

The choice of mounting was easy, principally to keep it simple. Because polyester fibreglass resin paste does not adhere to the plastic used in these tanks, it proved ideal to make a little seat(s) for the tank to sit in. Two blobs of fibreglass paste were added close to the keel of the boat with the tank held in position until the paste had set at each port side corner of it, **Photo 24.**

Three angled alloy plates were also made and fixed to the hull, **Photo 25**, for two purposes.

1) The front plate ensures that the tank cannot move forward (with a soft foam sheet between the plate and tank).

2) The plates each side of the tank have a 5mm by 2mm hole to allow for a plastic cable tie to hold the tank in place.

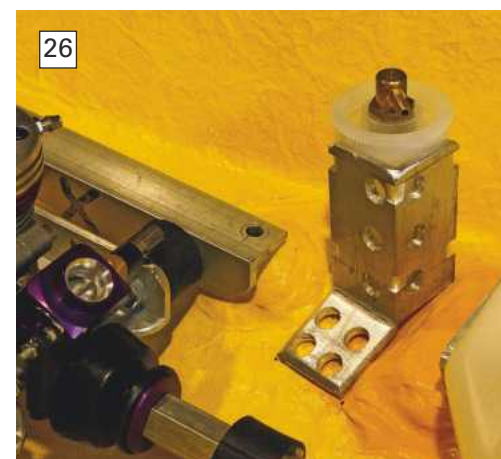
This is a simple and perhaps crude method, but works well.

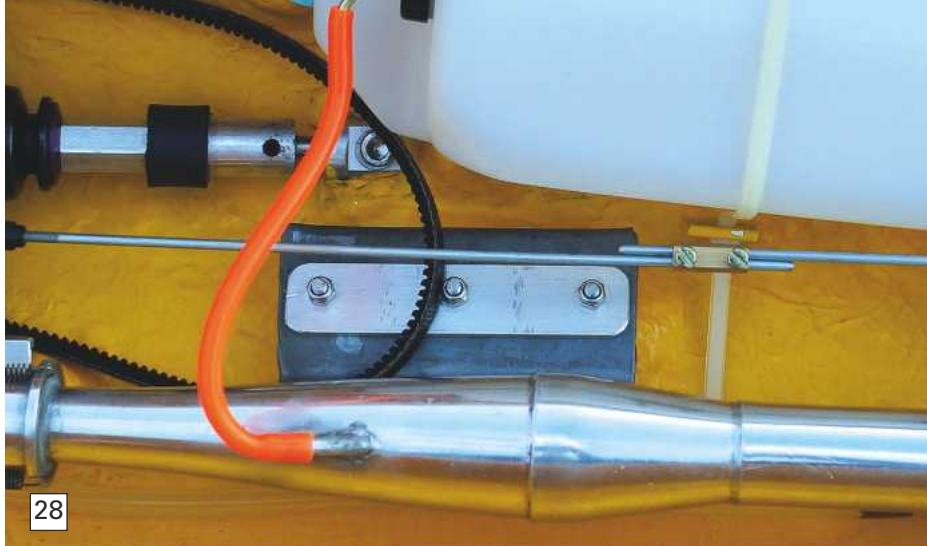


Float chamber mount and fuel filler valve

For the moment, a decision as to whether to run the West 28 engine with or without a float chamber had not been made. So an alloy mount to hold a float chamber, with guide grooves filed in its edges to allow cable ties to hold one in place. was installed anyway, its use depending on a final decision, **Photo 26.**

Holes were also drilled in the plate to allow it to be used to support silicone cooling and fuel feeds should the float chamber not be needed. A Dubro fuel filler valve was secured to the starboard side engine mounting plate which makes it easy to fill and empty the fuel tank.





Lead ballast mount

Because the fuel tank in this boat is situated starboard of the hull's centre line, some compensatory ballast might be needed. So, a 3mm thick alloy plate with three bolts permanently secured to it has been secured inside the hull. The 350 grams of lead ballast drops over these bolts with its matching holes, an upper alloy securing plate and nylon lock nuts keeping it secure. Why three bolts instead of two? Well, that way the lead can be 'sat' in three different positions being moved forwards or backwards one bolt either way if needed, but still be secured by two bolts as a minimum, **Photos 27 and 28**, this last picture being a close-up of the ballast installed in its mid-position.

Front bulkhead

A front bulkhead in an i.c. powered racing boat is pretty much essential, as the void in the bow section can then be filled with expanded polyurethane foam which provides substantial extra strength, buoyancy and helps reduce noise resonance.

The deck moulding of this boat as delivered comes with its inner (waste section) needing to be cut away, easily done with a Dremel cutting disk and/or a hacksaw blade. The waste piece is plenty large enough to use as the bulkhead, so a template in card was cut and adjusted to fit snugly before transferring the shape to the fibreglass. Bernard Holder also supplies a drawing, but the actual size depends on exactly where the bulkhead is finally positioned. The bulkhead was loosely taped in place and the deck placed over the hull to check that its upper edges fitted snugly. One large hole was drilled approximately in the centre of the bulkhead and three smaller holes around the perimeter which are essential for the injection of the two-part foam

mix, as we will see later. Once happy with the fit, fibreglass paste was mixed and applied both sides to secure the bulkhead to the hull, **Photo 29**.

Preparing the deck

With the inner waste section already removed, now was the time to fit two grab handles, one front and rear. These were fitted with large 'penny' washers both sides of the deck and bolts to ensure a good secure mount. Two CNC Alloy cooling outlets were also fitted to the port side of the deck ready to take the silicone outlet piping, **Photo 30** showing the underside of it all with the removable top behind.

Two ball top fittings were bolted to the deck to take the quick release hatch fasteners. At this stage as well, a single section of self adhesive closed cell hatch foam was cut to size and fixed in place on the top of the radio box to make the seal between it and the Perspex cover.

Fitting the deck to the hull

You only get one chance to get this right, so it pays to take the time to get it right.

For the actual joint itself, clear polyester resin thickened with ground cotton fibres was used. The advantage over using Bonda glass reinforced paste, is that it has more working time, is less messy, and easier to apply as a thick long fillet along the hull's top flange.

So with Sally on hand, the resin was mixed thoroughly with the right amount of hardener (catalyst), thickened with the cotton fibres, then copiously applied along the entire flange of the hull using wood lollipop sticks. The deck was then carefully lowered into position, pressed down enough to sit on the paste fillet then strong bulldog metal clips were clamped around the entire flange, **Photo 31**.





After leaving the resin to fully cure overnight, it is very satisfying to remove the clips and realise that all has gone well with nothing untoward happening. A hacksaw can be used to cut back the oversized flange followed by a good sand with 80 grit abrasive paper to smooth the edge, but a Permagrit sanding block will do a similar job. Deck edging rubber should be permanently fitted around the flange, using CA glue (superglue) to give a good looking finish, add protection to the hull and be a soft edge when in contact with one's hands.

Foaming the internal bow section

With the deck fitted, the boat was stood on its nose and a fillet of paste applied between the top section of the front bulkhead and the underneath of the deck to complete its installation. Leaving the boat in a vertical, bows down position, once the bulkhead was fully secure and its edges sealed, the two part foam was prepared ready to be poured through the central hole of the bulkhead. Some rough calculations to work out the approximate volume of the enclosed bow section are worthwhile, so as to establish how much of the two part liquid foam mix will be needed, bearing in mind that it expands up to 25 times its original liquid volume. One way you can do this is to fill the bow section with water, and then carefully pour it out into a measuring jug, but

you must then wait for probably at least a couple of days for it to dry out properly.

The foam needs to be mixed, usually in equal quantities of the two parts, and poured through the central hole. It cures very quickly and

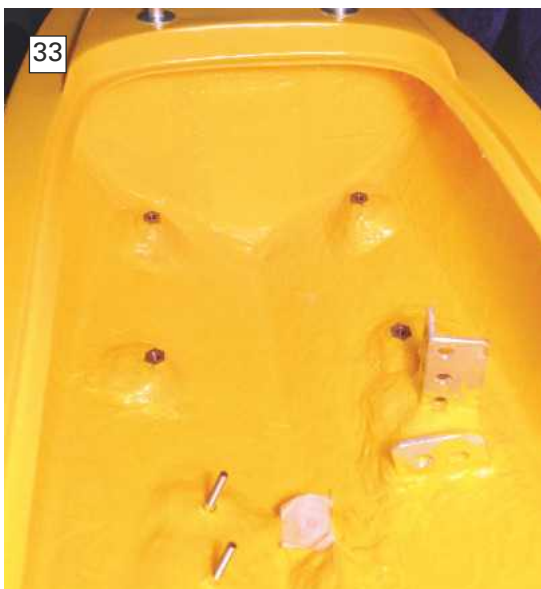
Photo 32 shows the result. In due course, the protruding excess foam was cut away and the holes sealed with fibreglass resin and mat, **Photo 33**, with it now all looking pristine and smooth once again

Removable hatch

With this, the key requirement is to ensure that it is easy to get on and off during a race. Two quick release fittings each side were adjusted to fit properly to the ball parts previously fixed to the deck. These components were previously dry-fitted to alloy plates bent, angled and bolted to the sides of the hatch top.

Air vent holes will need to be drilled in the sloping front (a Forstner bit in a drill press is a good method), and the opportunity to fit some foam 'pool noodles' secured with cable ties into the interior of the hatch for extra buoyancy should not be missed. Even if these fail to self-right the boat in the event of a flip-over, they will ensure that the hatch does not sink should it get ripped off the boat,

Photo 34, which also shows the rather neat quick release fittings.





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Final assembly

With the messy and delicate jobs all now completed, there is nothing to beat the final step of fitting all of the components back into the boat so that it is a functioning racing craft, **Photo 35**. Attention is needed to make and fit the linkages between the servos and the throttle and rudder arms. Kavan heavy duty ball links, one at the throttle arm of the engine, **Photo 36**, and the other two for the rudder, **Photo 37**, are top quality and robust enough for model power boats such as this, fixed to the steel tiller arm of the rudder. At the other ends of these linkages, the trusted clevis type of heavy duty M3 connector have been used to allow a tiny little bit of 'play' which avoids heavy wear and more importantly, high battery drain if the servo is stalled.



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The Genesis tuned pipe supplied with this engine is super-lightweight, so that it only needs support at its tail end where it passes through the transom, a horizontal hole allowing for a section of glass reinforced heat resistant silicone to support the exit pipe and hold it in place.

Testing

Nothing is more exciting than the first test run of a new power boat, **Photo 38**. After adjustments to find the correct needle settings, this Magnet AA class boat handled well with a good turn of speed and appearing to be very stable. This one has been built a bit heavier than usual, but the West 28 engine delivers a lot of power for its size and the extra weight is to help keep it stable in race conditions. The first true test was how it performed in its first race at Telford on 17th May 2015. On this occasion, Sally asked me to race it, and yes, it took first place with 62 laps from nine other boats in its class, so we can safely say that Bernard Holder has designed a 'good-un', **Photo 39**. It doesn't end there, as there will be further fine



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38

tuning and development over this and the next 2016 season, but this size of boat is an excellent way to start racing, and engines for this 4.5cc engine are relatively inexpensive.

Conclusion

I hope that you have enjoyed this experience of how to build an i.c. powered boat and it encourages you to perhaps have a go.

Enjoy your hobby - Craig.



Data Box - Magnet AA class boat parts

List of suppliers

Bernard Holder

Contact via the BMPRS website.

A leading BMPRS member, kindly hand made many of the essential components, including:

Hull, deck and top hatch.

Alloy engine plates.

Perspex radio box cover and closed cell foam.

Propshaft tube, ballrace assembly and shaft with M5 threaded stud.

A solid (temporary) coupling for shaft alignment.

The flexible rubber coupling to connect the engine crankshaft to propshaft.

Waterproof rudder assembly including the rudder tube, bushes and O-rings, rudder shaft and blade, plus a double-sided tiller arm.

Steel mounting legs for the engine plates, drilled and tapped for the retaining bolts.

Deck grab handles.

CFS Fibreglass Supplies

Website: www.cfsnet.co.uk

Marine Grade two part buoyancy foam.

Bonda glass reinforced paste.

Yellow pigment for the resin and paste.

Weston Model Centre (Weston UK), Sittingbourne

Website: www.westonuk.co.uk

West 28 Marine Engine, bespoke manifold and tuned pipe.

Model Shop Leeds

Website: www.modelshopleeds.co.uk

Hitec Optic 6 system, servos and 2500mah NiMH battery pack.

Fuel tank.

Dubro fuel filler valve.

All linkages, including ball joints etc.

Prestwich Model Boats

Website: www.prestwich.ndirect.co.uk

Float chamber.

Quick release hatch clips.

Waterproof radio switch.

CNC mounted rubber bellows unit for the waterproof throttle linkage.

Fuel filter.

Deck edge rubber strip.

MillPond Models

Website: www.millpondmodels

CNC alloy servo mounts.

Watercooling alloy exit tubes.

eBay

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HMS Agamemnon, 1781 3rd Rate, 64 gun, 1:64 52".....	£615.00
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HMS Diana, 38 gun heavy frigate, 1180mm.....	£442.19
Mary Rose, 1545, 1:80, 730mm.....	£241.17
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Boiler Room

Richard Simpson with a guide to buying a steam plant from UK based suppliers

SPECIAL

So you want to buy some Steam Plant?

Photo 1. Going to a model boat show exposes you to all manner of model boat related vendors and clubs, all of which can be a wealth of advice and information.

Photo 2. Steam model engineering shows also cater for railway and traction engine enthusiasts, but it is surprising just how much is also relevant to the model boat builders. Shows such as the one at Harrogate also include a big selection of model boat club stands.

Photo 3. The stuff boyhood dreams are made of, and something we have all looked at in awe. A Stuart Turner triple expansion marine engine beautifully built and seen on display at a model engineering show.

Photo 4. After taking over the Cheddar range of engines, Stuart Models now produce the Puffin engine as in this tidy example fitted to an open launch.

Photo 5. The Stuart models D10 at the top and the 10V (bottom.) The D10 is perfect for marine use, being reversible and self-starting, but the 10V can also be used with, perhaps, a controllable pitch propeller and is a lot cheaper.

Sometimes I think it is easy to get so wrapped up with writing articles about how to run, operate and build our steam propelled models, that it can be easy to lose sight of the fact that not everyone knows where to get their hands on the materials and equipment in the first place. Sadly, of course, we have to accept that in our modern world, hobbies of a more manually orientated nature are not as popular as they once were, so suppliers of materials and equipment for such things as model steam plants are not quite so common, however they are there, ready and willing to help you put your plant together, if you know where to find them.

First of all this is not a definitive list and does tend to be based more on my own experiences than anything else, plus it makes sense to stick with the more well known and readily available suppliers to the hobby. It is also worth mentioning at this point that magazines provide a great source of vendors in their advertising sections so I would recommend that you buy or subscribe to a publication such as this Model Boats magazine, plus wholeheartedly recommend that you go along to either a model boat show, **Photo 1**, or a model engineering show, **Photo 2**. You will find such shows advertised in model boat and model engineering magazines, but

going to one for a look around the vendor's stands and having a chat with other modellers will prove invaluable, as well as giving you a chance to see what the trade has to offer and how helpful they are with your enquiries. You really can't beat face to face contact to get a feel for whether the vendor is going to be able to help you put together what you want.

To maintain a degree of structure I have separated the suppliers into main category types to help you look for the vendor who may be best placed to help you out. These are:

Steam Equipment Suppliers
Steam Equipment and Model Boat Suppliers
Modelling Suppliers

Steam Equipment Suppliers

The following vendors tend to specialise in the manufacture and supply of steam related plant only, rather than the associated models. Whereas they will be well placed to be able to put together a complete steam plant for you, they may not be in the best position to advise which would suit which particular model which tends to put more emphasis on the modeller to know a bit more about what his or her requirements actually are.





3

Stuart Models

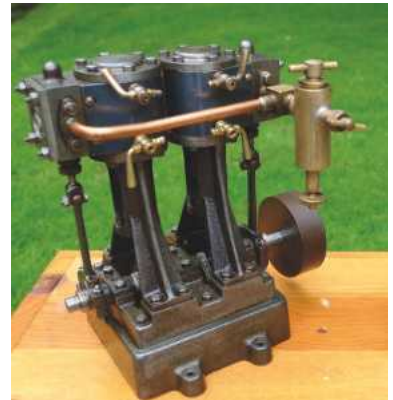
Website: www.stuartmodels.com
Email: sales@stuartmodels.com
Tel: 01308 456859
Address: Stuart Models, Grove Works, West Road, Bridport, Dorset, DT6 5JT.

I think it is pretty fair to say that in this day and age we rarely get to discuss a thriving company that has been in existence for 117 years and still producing much the same items that started the very same business all those years ago. Such a company is of course Stuart Models and while the name has changed slightly during that time it is basically still producing a range of casting sets, machined kits and finished models of steam plant and equipment, some of which are almost the same products that were offered when the company was founded in 1898. Not surprisingly, being a producer of steam related models the company is very close to my own heart, a place it shares with many thousands of other steam enthusiasts worldwide. I still to this day think of walking past the model engineering shop in Liverpool on my way to college, all those years ago, and every day just stopping for a look at the beautiful engines on display in the window.

I am now certain that they were from Stuart Models, although I didn't know that at the time, but nevertheless they held a fascination that has remained with me since and probably their triple expansion engine remains the epitome of model engine excellence to this day, **Photo 3**. Originally started by Stuart Turner himself and based in Henley-on-Thames, the company is now based back on the UK mainland in Dorset, after a number of years operating out of Guernsey.

Most of their current range consists of static models, however after recently buying part of what used to be Cheddar Models, Stuart now also supply marine orientated engines and complete steam plants based around the Puffin twin oscillator, **Photo 4**. They also have an extensive range of varying types of models, accessories, spare parts, pipework and fittings as well as consumables for all their models and have also recommenced production of the Electronic Gas Valve which used to be sold by Cheddar.

The 10V single cylinder slide valve engine and the D10 twin cylinder slide valve engine (top) in **Photo 5**, both remain a popular choice for propelling model boats with the reversibility of the D10 making it a particular favourite. In fact the Wide-a-Wake hull plans produced in the 1960's and still available



5



4



6

today, were of a beautiful clinker built open hull specifically designed for the D10 engine, **Photo 6.** Possibly not the cheapest option, however the D10 can comfortably propel quite a large hull and used examples can be found on internet auction sites for a reasonable outlay, possibly only needing a strip down and thorough clean to get back into service. Added to this of course there is the back-up and technical support still available from Stuart Models, as well as the spares and materials required to maintain and upkeep your model.

Cheddar Valley Steam

Website: www.cheddarvalleysteam.co.uk
Email: cheddarvalleysteam@tiscali.co.uk
Tel: 01934 751285
Address: Cheddar Valley Steam, Unit 4, Castle Mills Industrial Estate, Biddisham, Somerset, BS26 2RH.

The boiler manufacturing part of what used to be Cheddar Models was continued by master boiler maker Tim Taschimowitz, who with 25 years of boiler making behind him, now produces a range of boilers for model steam locomotives, traction engines, model marine engines and full size marine steam launches.

Cheddar Valley Steam will also design bespoke boilers for any application as well as supplying

kits of parts enabling modellers to build their own boilers if they so wish. The boilers however consist of the shell only, so it will be up to the modeller to complete it with appropriate fittings, mountings and burners.

Cotswold Heritage

Website: www.modelsteamenginesuk.com
Email: info@modelsteamenginesuk.com
Tel: 01789 721444
Address: Cotswold Heritage Ltd. Bird Industrial Park, Long Marston, Stratford upon Avon, Warwickshire, CV37 8RP.

The Cotswold Heritage range of models consists of working model steam engines offering something for most modellers from a single cylinder engine in kit form to a factory finished model steam plant, gas fired boilers, accessories and more recently the inclusion of projects for the model engineer to machine.

Although none of the range are specifically for marine use, they do supply boilers and accessories as well as a single cylinder engine that could be used in a model boat.

Mainsteam Models

Website: www.mainsteam.co.uk
Email: sales@mainsteam.co.uk
Tel: 07940 306945

Mainsteam Models is run by Keith Appleton who has slowly built up his business again through the



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Photo 6. Plans for the Wide-a-Wake hull were produced in the 1960's but can still be obtained. This example was built in 2012 from those plans.

Photo 7. A Mainsteam Models condenser/seperator looking beautiful in its brass and varnished woodwork.

Photo 8. You cannot beat the look of the polished brass and varnished wood of a steam launch on a sunny day, and Mainsteam do put together a lovely looking model.



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online auction sites and he supplies live steam parts and accessories for miniature live steam engines. For marine steam plants, the range includes condenser and oil traps, **Photo 7**, displacement lubricators, reversing gearboxes and water pumps, both manual & live steam powered for boiler feed use. Mainsteam Models also undertake repairs, refurbishment and rebuilds of most types of miniature steam models including boats, locomotives, traction engines and stationary steam plants etc.

Keith has a very flexible approach and is prepared to offer just about any service you may require to help you put your steam plant together, ranging from design and advice to production of bespoke accessories and fittings as well as his standard off-the-shelf items. He will also consider making complete models and has in the past sold beautifully put together launches via online auction sites, **Photo 8**.

Steam Fittings

Website: www.steamfittings.co.uk
Email: sales@steamfittings.co.uk
Tel: 01341 280637
Address: 36 Elder Drive, Daventry, Northamptonshire, NN11 5XE.

Steam Fittings manufacture their own range of steam system fittings and accessories in large batches specifically to make them cost effective and hence be very competitively priced. This also enables all their products to be available ex-stock and the turnaround from order to receipt is extremely impressive. They now have a varied range of valves from 3/32 inch pipe up to 1/4 inch pipe, as well as lubricators which can be supplied assembled or uniquely as a fully machined kit of parts for simple self-assembly.

Steam Fittings are rapidly expanding their range and are an excellent source of all accessories required for the model boat steam plant. I have purchased their products on a number of occasions in the past and every time I have been impressed with the price, quality and speed of delivery and **Photo 9**, of a number of linked engines for display purposes, includes some of the fittings from this company.

The range of products is constantly being expanded and becoming ever more useful, so it is well worth checking what they have in their catalogue first. They also use PayPal as one of the means of payment, which may be useful to some modellers and of course this speeds the delivery process.

Photo 9. For such projects as this engineering show display board, you need a good, reliable supplier of all the fixtures and fittings you are going to need and everything used here was sourced from Steam Fittings.

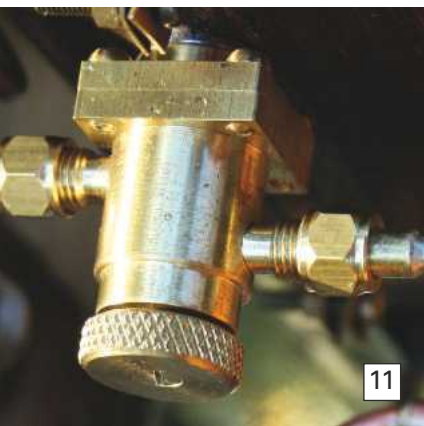


Photo 10. 21st Century Steam manufacture a comprehensive range of accessories including this steam control valve which operates from fully open to fully closed in 90 degrees of operation, this being of particular note.

Photo 11. An attenuator valve can save you a lot of gas as well as improving the length of time you get on the water, so they are well worth considering for any installation. This one from Forest Classics is a particularly good example.

Photo 12. Forest Classics also deal with secondhand models and plant with this Maxitrak Lorry being a particularly well built example.

Photo 13. The Unit Steam Engine or USE from Tony Green can be purchased complete, as a machined kit, or as a set of castings, enabling you to decide on just how much work you want to put into it personally.



21st Century Steam Company

Email: steam.engine.com@hotmail.com
Contact: Chris Lockwood

21st Century Steam Company almost exclusively use online auction sites to sell their steam related products rather than their own website, which may initially lead you to think that they are not a well-established business. However, they have now been around for a number of years and do sell a number of very useful and reasonably priced accessories such as lubricators. They are also one of the very few vendors who sell a purpose built, self-contained, steam regulating valve, which can be remotely mounted off the engine for easy and

convenient servo connection. Being a completely self-contained unit there should be no reason to experience any leaks inside the model, which is a significant advantage of this type of control valve, **Photo 10.**

Forest Classics

Website: www.forest-classics.co.uk
Email: info@forest-classics.co.uk
Tel: 01594 368318
Address: Unit 2B, The New Building, Ellwood J Road, Milkwall, Coleford, Gloucestershire, GL16 7LE.

Forest Classics have been around for many years and provide a huge range of parts and accessories for a very large number of the bigger steam equipment suppliers, including Mamod, Jensen, Maxitrak, PM Research and Unit Steam. Their website has a very comprehensive list of parts and accessories as well as including many completed engines and other parts, but their greatest attribute is the experience and expertise of their staff, who have been dealing in the steam related business for many years. Forest Classics also attend a number of the bigger shows, mainly towards the southern end of the UK, so you get the opportunity to go along for a chat if they are attending a show near you. They also sell a superb attenuator valve, **Photo 11**, which should be incorporated into every steam plant out there, as well as selling some very interesting secondhand models including lorries and traction engines, **Photo 12**. Just in case you might think the model lorry has no connection with model boats this particular example is driven by a Cheddar Puffin boiler and engine set up and even uses a Forest Classics attenuator valve to preserve gas. Their website is certainly worth a very thorough browse through.



Tony Green Steam Models

Website: www.tonygreensteammodels.co.uk
Tel: 01522 681989
Address: 19 Station Road, Thorpe-on-the-Hill, Lincoln, LN6 9BS.

As well as supplying a substantial range of steam model related spares and accessories, probably Tony Green is best known for the development and production of the Unit Steam Engine or 'USE'. The USE employs a concept of producing a very low cost cast engine kit of a single cylinder, single acting oscillating engine that can be bolted together to create a multi-cylinder engine, which can then be self starting and therefore reversing. The USE can be purchased as a set of castings, a machined kit or a complete engine, **Photo 13**, and is probably by far the cheapest engine you can buy for your model boat. To complement the USE, Tony also supplies a range of boilers sized to provide sufficient steam for the USE engines, which very neatly pivot upwards and allow ignition of the solid fuel while the boiler remains in the model boat, **Photo 14**.

Tony Green Steam Models have also recently started to supply model boat kits, so are well placed to be able to advise on a complete package of plant and model to get a newcomer to the world of steam models up and running. In particular they provide a model boat kit of the Swan launch, **Photo 15**, specifically designed to take a single cylinder USE engine and matching boiler, proving a very cheap and easy way to get a model steam propelled boat on to the water. This makes into a particularly attractive model, **Photo 16**, designed to dismantle quickly and easily to enable the model to be operated safely, easily and reliably, **Photo 17**. Tony Green Steam Models are also well worth checking, as they deal in secondhand engines and plant from many sources including Stuart Models, and take a fair number of these along to their show stands, **Photo 18**, so may well be able to assist you with something that would otherwise prove to be very expensive.



Photo 14. Despite being solid fuelled boilers, the Tony Green range all hinge open so they can be lit in place, making them a lot safer than some others of a similar capacity.

Photo 15. The Swan launch is a simple plank-on-frame kit that is specifically designed to accept the Tony Green USE and boiler combination, and is very reasonably priced making it a great starter model for those new to model steam propulsion.

Photo 16. Despite being very reasonably priced, the Swan launch kit makes into a very attractive model boat and should provide many hours of reliable enjoyment.

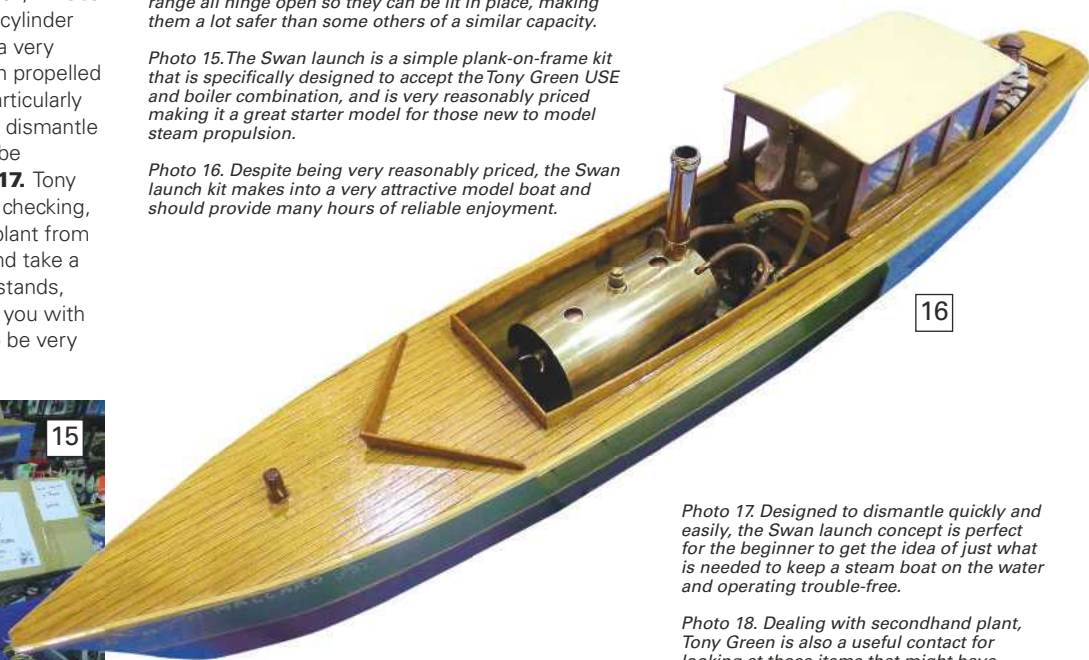


Photo 17. Designed to dismantle quickly and easily, the Swan launch concept is perfect for the beginner to get the idea of just what is needed to keep a steam boat on the water and operating trouble-free.

Photo 18. Dealing with secondhand plant, Tony Green is also a useful contact for looking at those items that might have otherwise been out of the reach of your pocket such as unwanted Stuart Models' engines.





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Photo 19. A complete assembly of a Hemmens steam plant in a Hemmens model boat. The hull has plenty of room to work in, and allows for a relatively straightforward assembly process.

Photo 20. A complete Hemmens steam plant using the vertical Wharfedale boiler and the compact and reliable Richmond engine.

Steam Equipment and Model Boat Suppliers

The following suppliers all sell steam equipment as a main part of their business, however they also supply model boats designed to be purchased in conjunction with the steam plant. Consequently they are well worth talking to while you are planning your project, as they should be in the best position to recommend a particular plant for whatever model you are interested in, and should be able to refer to existing completed models as examples.

John Hemmens

Website: www.steamengines.co.uk
Email: enquiries@steamengines.co.uk
Tel: 01757 289664
Address: 28 Brighton Road, Bubwith, Selby, North Yorkshire, YO8 6DQ.

John has been in the business for very many years and his company has supplied a huge number of model steam engines for steam modellers in that time with his Vee Four Caton engine being possibly one of the most beautiful off-the-shelf engines you could ever put into a model boat hull. Based in the UK, he has taken the company through a number of organisational changes, but today as www.steamengines.co.uk, it remains one of the suppliers of a comprehensive range of engines, boilers and accessories as well as a number of very high quality boat kits of both plank-on-frame and GRP hull construction, **Photo 19**. The steam plants are based on the reliable and proven Richmond vee twin oscillator, which lends itself to radio control perfectly, and the kits are all of very high quality incorporating CNC machined parts and brass fittings, **Photo 20**.

John is therefore in an excellent position to be able to put together a tried and proven package for the beginner to the hobby incorporating a complete steam system as well as a model boat of your choice.

Marten, Howes and Baylis

Website: www.model-steam-boats.co.uk
Email: Martenhowesbaylis@btinternet.com
Tel: 01634 233146
Address: 216 Bredhurst Road, Wigmore, Gillingham, Kent, ME8 0RD.

Another supplier of complete packages for the prospective steam boat modeler is Marten, Howes and Baylis. They started over twenty years ago making four different model marine steam engines and various boilers of different sizes and layout to fit

other manufacturers boat kits.

In 1993 they decided to make their own boat kits and so designed and produced the Opal, and based on the success of that model, moved on to produce the Topaz, Der Seekadett and Vigilant, **Photo 21**, all of which are very highly regarded and were superb quality kits. About ten years ago they loaned Cheddar Models the drawings for the Marten, Howes and Baylis PB2 engine on which Cheddar subsequently based their Gemini engine, which was then used as one of the potential engines for the models.

Since the demise of Cheddar Models they have changed to use Anton engines, but continue to produce their own boilers so are still able to supply a complete package of steam plant and model, although at this time they do not produce a steam package for Vigilant. They also sell a comprehensive set of accessories, spare parts and materials to support their products, but once again, the great advantage is that they can guide you through the entire process of putting together a steam powered model. Of particular interest to some is the fact that they supply the steam plants complete with all the required fittings, tried and tested and including all pre-formed pipework, ready to slot directly into the model boat. At the moment, their website lists just one model boat, Henry, a 1:6 scale open launch.

Modelling Suppliers

The following sell products covering all aspects of model boating from many different manufacturers and are therefore in a great position to be able to provide an overview of a complete package. Whereas they may not specialise in steam related plant, they can certainly advise as to what might be the best type of model hull for the type of plant you are thinking off and in the case of JoTiKa, also act as an importer of steam equipment.

The Model Dockyard

Website: www.model-dockyard.com
Email: Via the web site contact page
Tel: 01872 261755
Address: 17 Tremorvah Barton, Tregolls Road, Truro, Cornwall, TR1 1NN.

The Model Dockyard supplies a huge range of all things related to model boating, including kits, accessories, materials, reference books and steam plants. They are agents for Graupner and Krick steam plants so can advise on which plant from a number of possibilities, including singles, twins, horizontal and vertical boiler combinations to best suit the needs of the prospective modeller. The Model Dockyard is a regular advertiser in Model Boats, so an idea from those display advertisements can easily be gained of just what they have to offer.

Westbourne Models

Website: www.westbourne-model.co.uk
Email: saleswestbourne@btconnect.com
Tel: 01202 763480
Address: 41 Seamoar Rd, Westbourne, Southbourne, Dorset, BH4 9AE.

Another general modeling supplier, Westbourne Models also has a huge range of all things model



20



These provide plans, casting sets or machined units of models (mainly traction engines), but are also a provider of a useful range of steam related accessories.

Noggin End Metals of Stoke on Trent

Tel: 01782 865428
Website: www.nogginend.com

These supply a large range of metal bar stock offcuts and ends which are absolutely invaluable to have in the workshop. They can also supply specific bar stock of various metals so are well worth remembering.

RDG Tools in Mytholmroyd, Halifax

Tel: 01422 885069
Website: www.rdgtools.co.uk

Probably one of the largest vendors of engineering tools and supplies in the UK with a large range of specifically model related items.

Blackgates Engineering in Dewsbury

Tel: 01924 466000
Website: www.blackgates.co.uk

Probably one of the best known of the model engineering suppliers for locomotives, supplying drawings, castings and tools and materials from all the big names as well as being a useful supplier of model steam related accessories and parts that can also be used in the model boat installation.

Conclusion

So there you have it, enough contacts and a wealth of advice and guidance to start you on your way in the world of model boat steam. There are others who have not been included here, but I think I have featured most of those of interest to the model boat steam enthusiast. If you visit one of the big shows you can buy yourself a brochure which will include a listing of all the attending vendors and clubs complete with contact details for each, so the value of attending one of the big annual model engineering shows is immense.

Hopefully some of these contacts will help to provide some useful guidance and direction to start you on your journey of getting a steam engine into a model boat. Just as a final comment with regard to buying from any supplier, of absolutely anything. Nowadays, the vast majority accept credit cards and/or PayPal and buying an expensive item with one of these gives you, the purchaser, some protection should the item get lost in the postal or carrier system or indeed not be dispatched. I would always be wary should someone demand cash up-front, so a credit card is a good safe way to purchase, if you are not familiar with the supplier. *Keep steaming & enjoy your hobby -*

Richard Simpson

Photo 21. The Marten, Howes and Baylis Vigilant customs cruiser. A superbly manufactured kit of the highest quality, complete with beautifully made brass fittings and pre-cut wood parts.

“ it is invaluable to visit one of the larger annual model engineering shows such as those in the London area, Harrogate and at Leamington Spa, where you will find a huge range of vendors and suppliers of all thing steam related ”

boating and supplies parts and accessories from a wide range of manufacturers including many foreign ones. They are also agents for a number of the big manufacturers, such as Anton, Monahan, Graupner and even Marten, Howes and Baylis who are happy to deal with customers direct, but Westbourne Models offer a single point of contact enabling you to deal with a single vendor and get sound advice as to what system goes best with what model.

JoTiKa

Web site: www.jotika-ltd.com
Email: enquiries@jotika-ltd.com
Tel: 01905 776 073
Address: Model Marine Warehouse, Hadzor, Droitwich, England, WR9 7DS.

JoTiKa specialise in scale models of the highest possible standards and with this in mind, took over the manufacturing and distribution rights of the Caldercraft range of models in 1992. Later the Nelson's Navy range increased their catalogue of available models that now stretches to around 100 model ships which they manufacture and distribute. Of great interest to the steam fraternity though is the fact that JoTiKa have recently been working with Miniature Steam Models in Australia on a project to put their steam plant into some of the Caldercraft models. Consequently JoTiKa are a superb one-stop shop for a great number of model steam related models, which is further supported by their being an agent for Raboesch propellers and shafts.

And finally?

In conclusion, as mentioned at the beginning, it is invaluable to visit one of the larger annual model engineering shows such as those in the London area, Harrogate and at Leamington Spa, where you will find a huge range of vendors and suppliers of all thing steam related in conjunction together with some of the model boat vendors mentioned above. It is also worth remembering that such shows also include all aspects of model engineering so there may well be some other vendors in attendance that you may not have heard of because they deal with other aspects of model engineering, such as railway models or traction engines. However, these still have the potential to be useful in the model boating world, so one or two of them are worth a mention.

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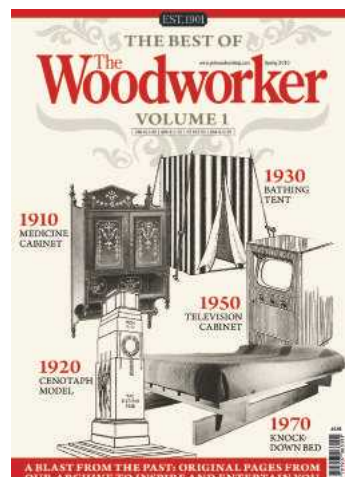
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Soldering

A beginners guide

Within seconds of applying heat from the gas iron, the area around the joint reaches the right temperature for the strip (wire) solder (or solder paste) to flow.



Dave Wooley shows how to make it easy

I often mention during the course of the build projects within the Range Finder column in the regular issue of Model Boats, the need for the soldering of some parts and fittings. Although often discussed, the key skills required are not always covered and here we will rectify that by going back to basics and introducing you to some of the requirements for successful soldering.

Soldering like any skill can be taught, but there is no substitute for experience. It is not a black art and practice will ultimately provide the confidence to tackle even the most demanding of jobs. Here in this article, it's not so much about the results, but about what makes for good work practice as one will follow the other, but also how to get the best out of the equipment to hand.

Generally most of the printed guides available deal with the soldering that is associated with electronic components. For our models, usually we are not dealing with printed circuit boards and their delicate electronic components, so those are possible problems that can be ignored. In this article, we will discuss the various elements of the art of soldering as related to our model building, commencing with the tools required. We can also assume that the items being soldered are of brass or copper, rather than aluminium and steel, materials that are beyond the scope of this article and which require more specialised techniques.

Equipment

Electric soldering irons

I have a number of soldering irons which are used

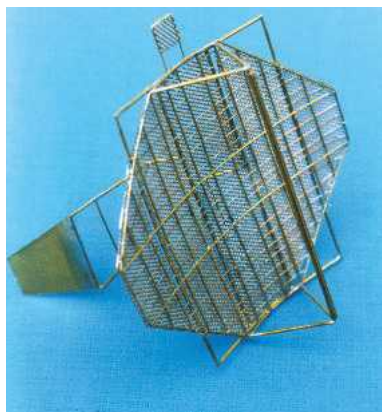
as required for specific jobs. Generally there are two distinct types of soldering irons, electric or gas powered with the former denoted by wattage and the latter by temperature. It should be noted that a higher wattage does not mean that the soldering iron runs hotter, as it simply means that there is more power in reserve for coping with larger pieces of metal and joints. This also depends partly on the design of the 'bit', which is the heated tip of the soldering iron. Consider a higher wattage iron simply as having more available heat when it comes to heavy-duty work, because it won't be drained of its heat so quickly. For example, in **Photo 1** the iron at the top of the picture is registered at 80 Watts, the second one down is 40 Watts and the third is of 20 Watts.

It's worth remembering that with most low wattage irons, 8 to 20 Watts will be of little use when attempting to solder larger joints such as those incorporating thicker gauge brass and copper wire, strip or tube, because the components being soldered will act as huge heatsinks drawing heat away from the tip of the soldering iron, cooling it too much and thus preventing the solder being properly melted and flowing more freely. So, this is where a higher wattage iron may prove useful, but there is definitely a place for a low wattage iron when soldering small or fine components, such as perhaps photo-etched railings.

Gas powered soldering irons

Gas powered torches (soldering irons) have been available for many years, but they are becoming more and more refined nowadays and are capable of performing a number of tasks including soldering, cutting and even the etching of timber. They are in

Even complex shapes such as this radar array can be quite easy to solder with careful pre-planning and a jig.





many respects less cumbersome than the electric soldering iron as they are self-contained which can make them more versatile. The Wolf butane torch is but one example and this has a built-in ignition system with a controllable flame which determines the heat applied to its bit. These tools retail at around £25 and it is worth purchasing a good 'branded' product as some of the cheap versions can be quite problematic in their functioning. There are smaller types also using a detachable head, which like the Wolf tool, can convert the torch to flame only, or for heating the bit. Heat control on this type is usually through twisting its upper barrel. The drawback is their dependence on Butane fuel, similar to that purchased from stores supplying cigarette lighters.

There are other forms of soft and hard soldering (silver soldering or brazing), but for this article the emphasis will be on the standard types of soldering irons and gas torches as these are relatively inexpensive and for the purposes of our model making, are more than capable of doing the job, **Photo 2.**

Flux

This comes as a powder, paste or liquid, in non-corrosive and corrosive type. The corrosive type of liquid flux works best and a good example is Bakers Fluid, but it requires a flux remover after your soldering job is complete, otherwise corrosion will start very rapidly, and usually where you don't want it. All soldering operations require a flux in order to obtain a complete bond with good strength at the joint. Fluxes clean the area to be soldered, preventing oxidation and increasing the wetting power of the solder by decreasing its surface tension. Whatever the type of flux, application is best achieved by brushing it on to the surface to be soldered to ensure good coverage.

Solder

For the purpose of soft soldering I tend to confine my own activities to three types:

Tin-lead, which is usually referred to as plumber's or acid core solder.

Rosin core and this is suitable for electronic circuits.

Solder paste, but having the disadvantage of a limited shelf life of approx.. six months, once opened.

Photo 3 shows left to right these three basic types.

Soldering stations

Generally and for most model making tasks the stand-alone electric soldering iron will suffice, but it's worth remembering the tip temperature will increase when it is standing unused and decrease when applying heat to the job. However to avoid this, direct control of temperature is useful and it is here that the soldering station comes into its own. Some versions have a built-in digital readout that can be pre-set and control the temperature for delicate PCB work or for more robust soldering, where higher temperatures are required. These digital soldering stations can range in price from £45 upwards, depending on quality.

There are less expensive analogue stations (i.e. manual control) where the temperature can be varied, but these lack the precise control of the digital type when heat control can be critical, but these retail at around £16 upwards,

Photos 4 and 5. Some, as with the one shown, can be supplied with various types of soldering iron tips for the iron, which can be spade or pointed, and it is at this juncture we can proceed to actual soldering.



Photo 1. Examples of three type of electric soldering irons. From the top to the bottom are 80 Watt, 40 Watt and 20 Watt.

Photo 2. Three gas powered soldering irons. The top one is flint ignition and the lower two require external ignition.

Photo 3. Three different types of solder, from left to right: solder paste; rosin core and tin-lead.

Photo 4. A basic temperature controlled soldering station from Maplin (A UK high street electrical component store).

Photo 5. Temperature of the tip is controlled by moving the knob. This is a relatively coarse method for temperature control.

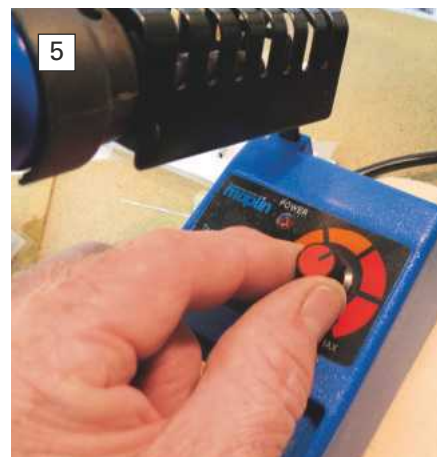




Photo 6. Tip maintenance is an essential task and 'tinning' it with a layer of solder ensures a better transfer of its heat to the job.

Photo 7. It's good practice to wipe the tip of the bit on a damp sponge after each use.

Photo 8. Another aid to cleaning is to insert the tip into a head cleaner ball which contains strips of wire or alternatively just use an old discarded fine wire brush.

Soldering preparation

When purchasing a new electric or gas soldering iron the first job, before any soldering can be undertaken, is to tin the tip, although some do come ready prepared. Generally, most iron bits have some residue on the tip and it's best to clean this off and load the tip with a thin coat of solder as this assists in the heat transfer between the tip and the job and also provides a starting point from which the solder can flow, **Photo 6**.

For good results it is essential that the tip is maintained and to achieve this the tinned surface needs to be cleaned, by wiping the tip with a damp sponge, that is usually supplied with various soldering kits, **Photo 7**, and after completing a soldering job, inserting the tip in a head cleaner wire

ball (or a discarded old wire brush) as in **Photo 8**. Tinning the tip of the bit will need to be repeated from time to time, particularly if corrosive fluxes have been used.

There are two basic approaches to soft soldering, namely 'sweated' joints or tin mating.

Sweated is applying a flux to the job then heating the part until the solder flows into the joint.

Tin mating is tinning both surfaces and applying heat to the whole thing to complete the joint. This is a technique widely used in railway modelling with etched brass locomotive and rolling stock models.

There are also some general safety considerations that are worth noting.

- Soldering should be performed in a well-ventilated area. Flux in the solder, or if applied separately, will release fumes when heated and it can be harmful to the eyes and lungs.
- A soldering iron is very HOT (for most soldering operations the temperature of the iron is 350 to 400 degrees Celsius). Never touch the tip of the soldering iron with your hand.
- Never leave your hot iron down on anything other than a dedicated, made-for-the-job stand.
- Keep flammable liquids and materials (such as alcohol, solvent, butane canisters etc.) well away from the work area.
- Wear eye protection.

These points may seem self-evident, but a hot soldering iron, electric or gas, needs to be handled with care. Now for some examples of soldering.

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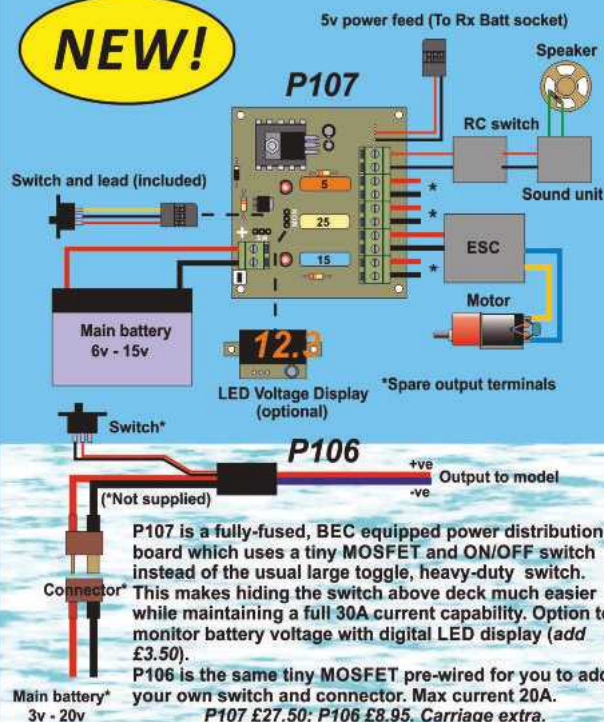
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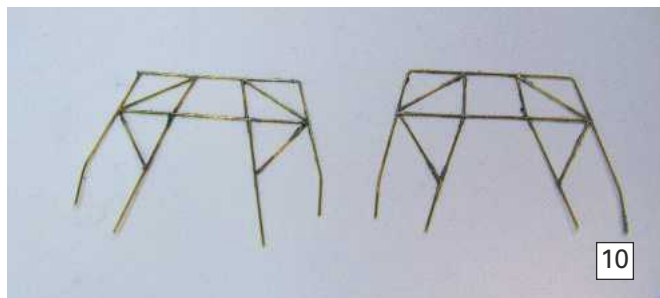
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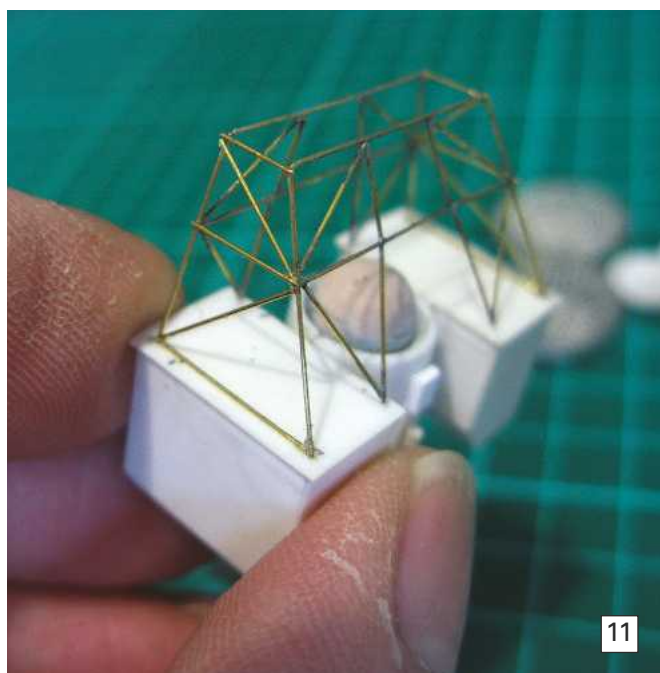
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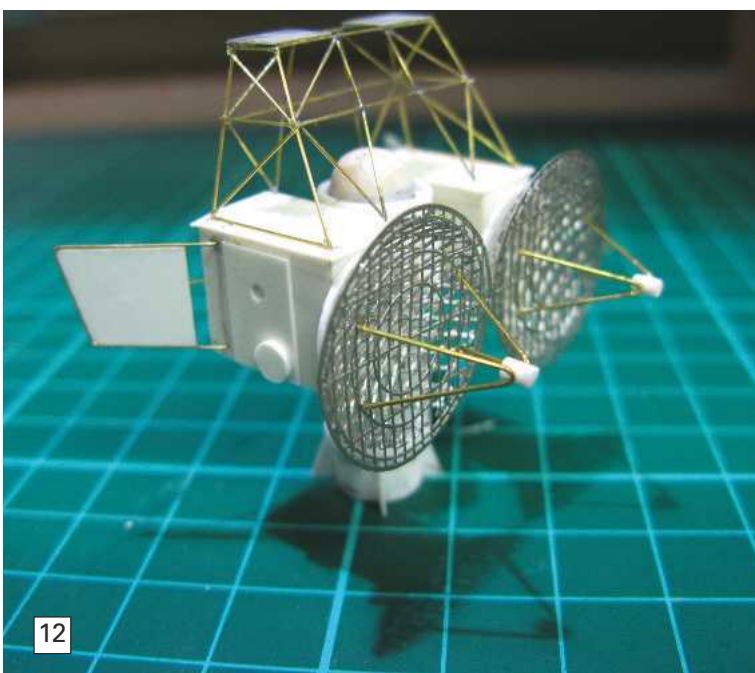
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11



For more substantial jobs such as this foremast assembly, a brush to apply the flux and/or solder paste before using a gas torch for heating and flowing the solder is perhaps the best method.



12



13

Photo 9. One method of securing the parts for soldering multiple joints.

Photo 10. Soldering completed and the job is now ready to be cleaned and excess solder removed.

Photo 11. The two soldered frames set into place on the styrene base of a radar mounting.

Photo 12. A soldering job such as this may look difficult, but if properly prepared and planned, it is in fact very straightforward.

Photo 13. The completed tracking radar array for which a properly prepared jig with systematic sequential soldering was the key.

Using an electric soldering iron

A) Fine framework

Part of the preparatory process is ensuring that the job is secure. How this is done depends on the type of job, one example shown is being used for forming a lattice arrangement for a radar array where the material is of fine 0.31mm brass wire. Here the basic shape of the front and back parts of the lattice were cut and assembled on a flat timber board on to which had been marked the shapes.

The assembly was held in place by the simple expedient of conventional masking tape and this method firmly secures all of the individual parts with no need for a heat sink. Each of the joints can be soldered in turn and as the wire is so fine, even a small 25W iron will be sufficient, or for a soldering station, set the temperature on a medium heat

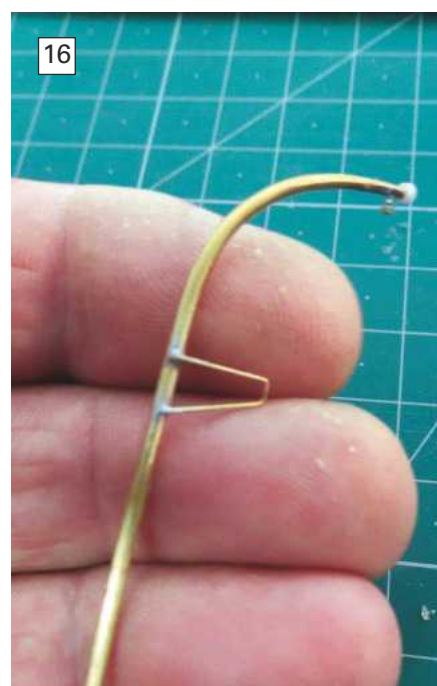


Photo 14. Making use of a simple timber jig to hold all the parts in place ready for soldering.



Photo 15. Brushing solder paste onto the joints.

Photo 16. Solder paste flows into the joint when the area around the joint is heated sufficiently. A 40 Watt electric iron will easily do this form of soldering .



level as the solder will flow easily. Even at higher temperatures I have found this tape is not markedly affected by heat transfer, **Photo 9**. With the soldering of the joints completed, the brass frames can be lifted clear of the board, the joints cleaned and any excess flux or solder removed using an emery cloth or a wire brush as in **Photo 10**. Here the framework has then been assembled into the styrene base unit with the side cross-piece frames added using cyanoacrylate (superglue), **Photos 11, 12 and 13**. More substantial frameworks may require a different approach, and more on that later.

B) Davit boat rest support

Another example is the simple task of fitting boat rest support arms to davits. The difference here is in the choice of solder as instead of cored solder,

a solder paste has been used. Like many tasks in model making, and soldering is one of them, a purpose-made jig can be very handy to secure the job, not just holding the piece in place for soldering, but ensuring the location of the part being soldered is where it should be, **Photo 14**.

It has been suggested that a syringe is one of the best methods of applying solder paste direct to the joint, but personally I use a fine brush and paint the joint as in **Photo 15**. With the heat directed close to these two joints, the paste flowed well and the iron could be removed after a few seconds. Always let the job cool naturally, as the latent heat will quickly be dissipated throughout the job. When cool enough to touch, remove from the jig so the soldered joints can be rubbed down and cleaned as shown in **Photo 16**.



Using a gas powered soldering iron

As mentioned earlier, the gas soldering iron (torch) is versatile in having not just various soldering tips but different types of cutting tools, a hot blade being one of them as in **Photo 17**. However, like all tools and particularly hot ones, there are safety considerations. This Wolf torch uses butane gas which like a cigarette lighter is injected through the tool's base and after use always store it and the butane canister in a safe cool area.

To demonstrate the effectiveness of the gas soldering iron I have prepared two sections of 2.5mm diameter brass rod to form a T-joint.

as in **Photo 24**. On securing the two parts firmly together, heat can be applied to the top surface of one. The end result is a good joint as in

Photo 25. Railway modellers can take this to an extreme I believe and using low temperature solders, assemble a framework such as a locomotive chassis all prepared with solder paste on the proposed joints, and then put the whole thing in an oven or on a hotplate, the heat of which if carefully controlled will enable all the solder joints to be made in one go. This is not something we need to do though in our hobby, or at least not in my experience.

Using an internal jig for soldering complex parts

For soldering difficult or more complex shapes where there are multiple joints, an internal jig can be used and a good example is making a crane jib. The basic idea is to fit the prepared side sections of the jib to an internal jig and solder all the upper and lower cross members to each side whilst all the parts of the frame are held in place with masking tape as in **Photo 26**. With the soldering complete and to maintain its strength, all the joints can be cleaned whilst remaining attached around the jig, **Photo 27**. With the framework of the crane jib now fully prepared, the internal timber jig can be removed, leaving the brasswork matching the shape of the internal jig and that of the full-size original, **Photo 28**. With the jib successfully soldered and cleaned, work could continue on completing it as in **Photo 29**. This same method can be applied to different structures including lattice masts and complex mattress radar arrays as in the heading picture, but do remember that the jig will have to be extracted from the soldered brasswork, one way or another.

Photo 17. The various 'bits' that come with the Wolf gas soldering iron device.

Photo 18. Always clean the parts in preparation for and just prior, to soldering.

Photo 19. Applying a small amount of flux paste before tinning the parts to be joined.

Photo 20. First open the on/off valve!

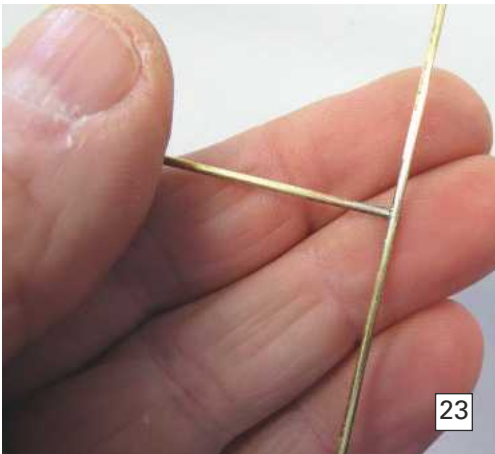
Photo 21. The ignition control for the Wolf gas soldering iron is pressed downwards.

Photo 22. Each part was tinned, and heat applied close to the joint, to enable the solder to flow together.

1. First clean the two parts to be joined, **Photo 18**.
2. Using a brush apply a small amount of flux to each of the parts to be joined, **Photo 19**.
3. The Wolf torch has a switch to open a valve and below that a horizontal lever for controlling the flow of gas and thus the temperature to the tip, **Photo 20**.
4. Ignition of the torch is by pressing down on a red switch as shown in **Photo 21**.
5. Secure the parts to be joined and apply the heat close to the joint until the solder flows making the joint, **Photo 22**.
6. Allow some time for the job to cool before handling. When ready, lift from the board and using emery cloth clean off any excess solder around the joint. What then remains is a good clean and firm job as in **Photo 23**.

Joining flat metal strips.

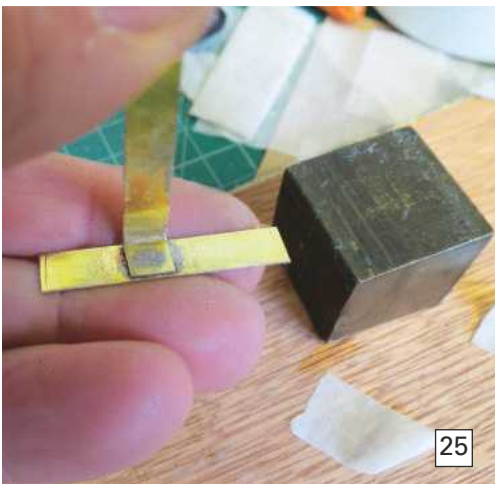
Applying the method of 'tin mating', two flat surfaces can be joined. First the surfaces need to be cleaned and flux applied. Each can then be tinned



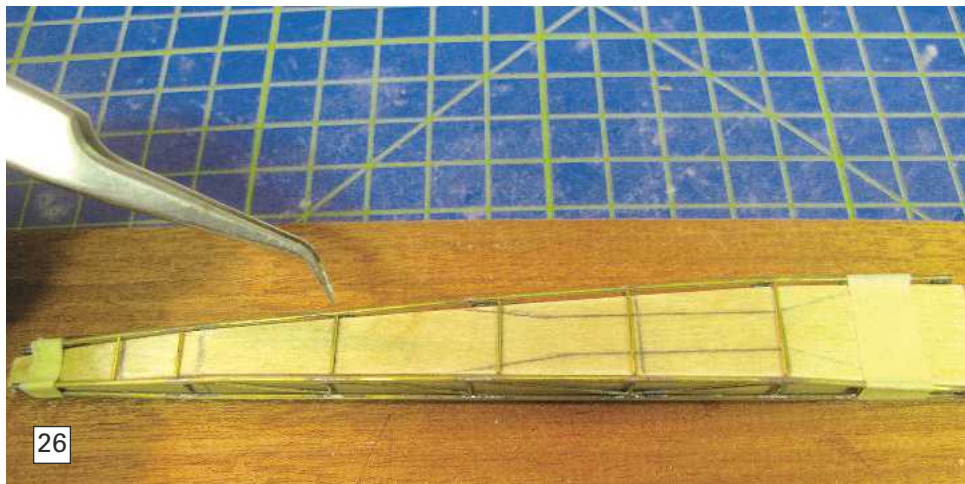
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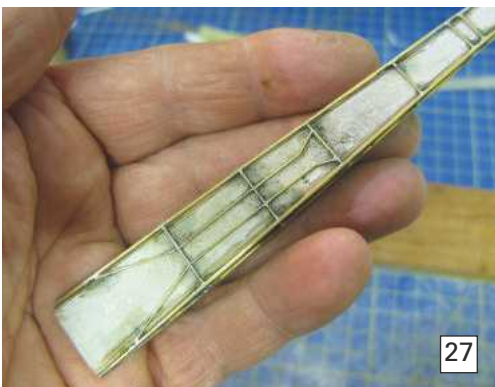
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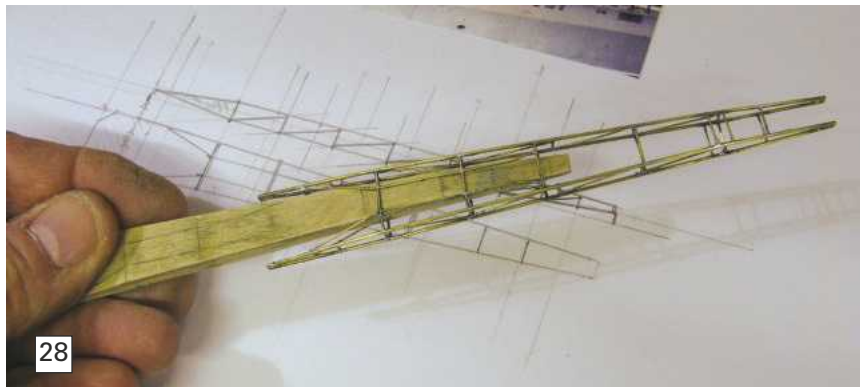
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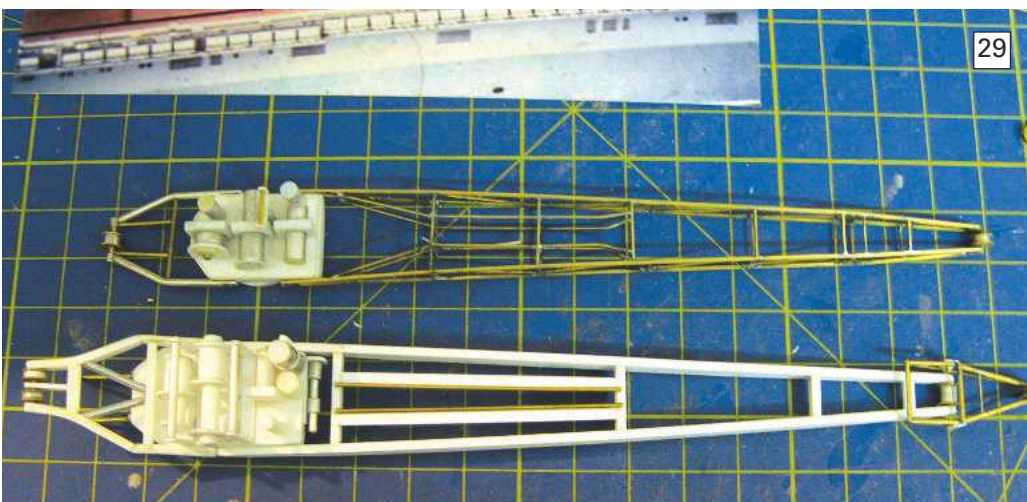
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28



29

Photo 23. A clean, tidy and sound joint.

Photo 24. Tinning a more substantial strip of brass using a gas soldering iron.

Photo 25. Using a simple clamping device the two brass strips can be successfully joined.

Photo 26. For soldering together more complex shapes such as this crane jib, an internal former or jig is necessary.

Photo 27. Internal jigs such as this enable all the joints to be soldered without the need for heat shunts.

Photo 28. With the soldering completed and the joints cleaned, the former can be withdrawn.

Photo 29. Crane jibs such as these are quite easy to solder with patience and planning.



30

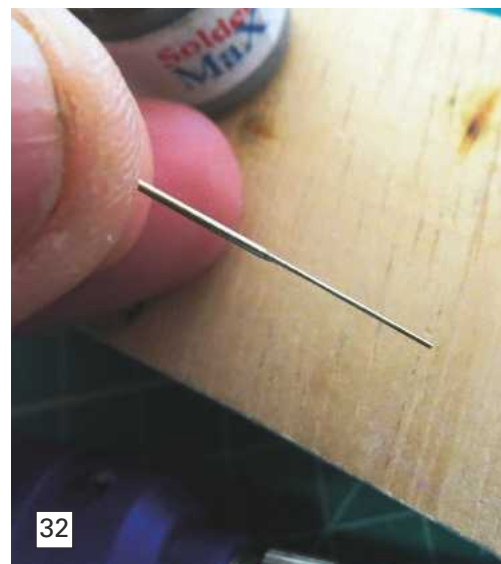


31

Photo 30. An 8 Watt battery powered soldering iron, whilst limited in capability, does have its uses, especially in fine soldering work such as with photo etched components.

Photo 31. An example of how the battery powered soldering iron comes into its own.

Photo 32. The completed job (from Photo 31), and all done with a very low wattage battery powered iron.



32

Low wattage soldering for etched work

For soldering very delicate pieces such as etched brass fittings, I now use a battery powered soldering iron of 8 Watts such as this Silverline iron. It is powered by three AA battery cells, has an LED to indicate when in operation, and is fitted with a lock so the yellow button if pressed does not power-up the tip. It's simple to operate, but the very fine tip is excellent for very precise solder work on very small fragile parts, **Photos 30, 31 and 32.**

Heat sinks and different temperature solders

Just a few notes about these. In the case of heat sinks, these are used to prevent heat getting somewhere you don't want it to go, such as when

soldering something to a part that is adjacent to another already soldered component. The heat shrink can be anything metal, even a paper clip, but it does prevent the annoyance of the bit you are just soldering being in exactly the right position, and the other earlier item then falling-off at that very moment.

Solders - these can be obtained for varying temperatures, typically 70, 145, 188 and 243 degrees C. The 70 degree solder is usually used for soldering white-metal components, although care has to be exercised. The different temperature solders mean that with care, one can create a complex structure adding parts using a lower and lower temperature solder to avoid disturbing those already soldered at higher temperatures. Personally, I have managed without going down this route, but this technique is very popular with railway modellers.

Website reference guide

Electric soldering irons: Maplin website: www.maplin.co.uk

Soldering Stations (example): www.amazon.co.uk/Best-Sellers-DIY-Tools-Soldering-Stations

Gas soldering irons (example): www.amazon.co.uk/Draper-Butane-Powered-Soldering-Iron

Soldering supplies: MBO UK, website: www.mbouk.co.uk

Silverline battery powered soldering iron: website: www.silverlinetools.com

Conclusion

This short article only scratches the surface about the practical application of solder work for the model boat builder, but I hope it demonstrates that you do not need to purchase expensive soldering irons and equipment to create complex, and not so complex, structures. There are plenty of books, internet tutorials and of course fellow modellers able to give you practical advice. However, much of the information that is available (as already mentioned) tends to deal with soldering in the application of electronics, as this is a popular area of interest. However, the best way to acquire a skill is to have a go, make mistakes and learn from them, practice being the key. Please treat soldering not as a 'black art' or a chore, but a useful skill that can enhance your models.

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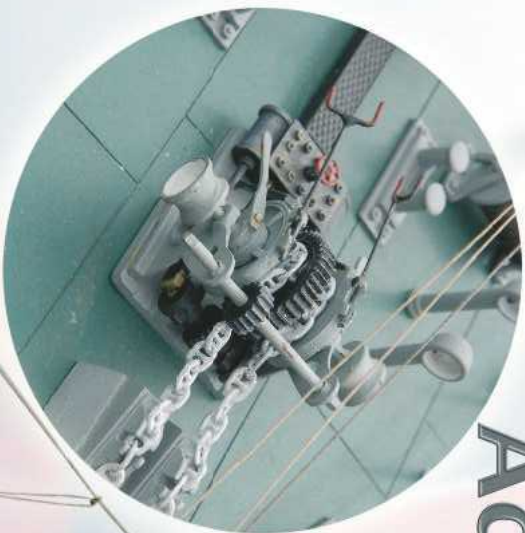
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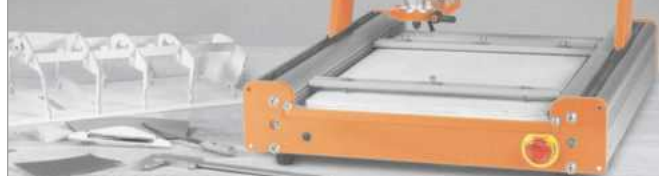
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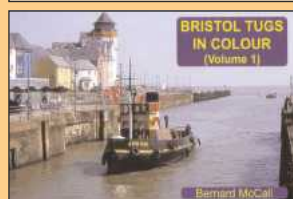
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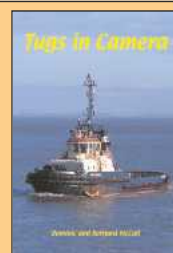
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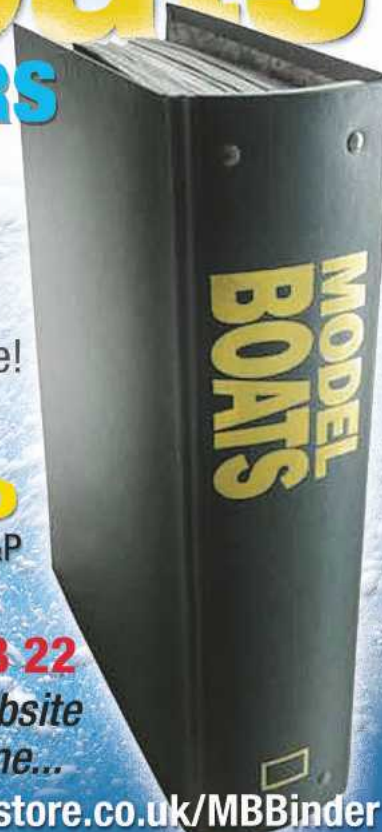
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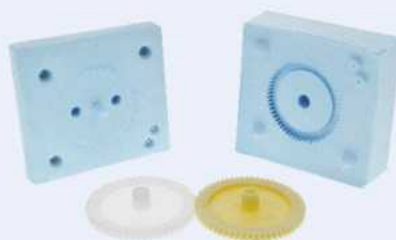


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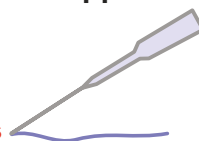
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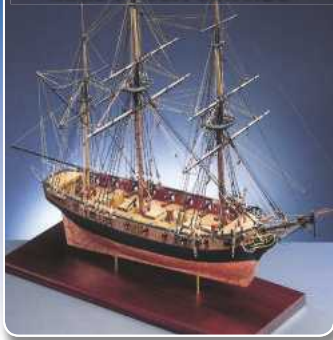
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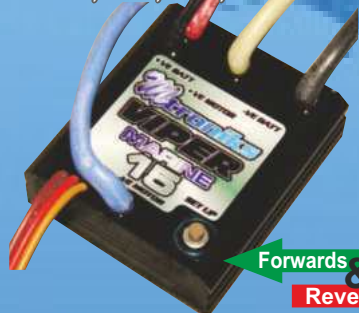
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