Editorial Director
D. J. Laidlaw-Dickson

EDITOR . . . . . V. E. SMEED

Advertisement Manager
M. Gray

model maker & Model Boats

HOBBY MAGAZINE

Published by

Model & Allied Publications Ltd.

Publishers of

Scale Models
Incorporating "Model Cars"
—first Friday of each month.

Model Railways
—first Friday of each month.

Radio Control Models & Electronics
—second Friday of each month.

Aeromodeller
Incorporating "Model Aeroplane Constructor" and "Model Aircraft"—third Friday of each month.

Woodworker
—third Friday of each month.

Model Engineer
Incorporating "Mechanics", "English Mechanics" and "Ships and Ship Models"—first and third Fridays of each month.

Military Modelling
—fourth Friday of each month.

Aeromodeller and Model Maker Plans Service

ABC
MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

JANUARY 1976

VOLUME 26 NUMBER 300

Contents

On the cover

John Darnell, of Darnell Models, with his prototype model of U47, 63ins long. John won the Southern SR Steering Championship with another submarine last season—the first time either a scale boat or a sub. has won it.

Next month—

Plans for a working model of the *Ark Royal* aircraft carrier head the list of features in preparation for February issue.

Editorial and Advertisement Offices

P.O. BOX 35, BRIDGE STREET
HEMEL HEMPSTEAD, HERTS HP1 1EE

Tel: Hemel Hempstead 2501-2-3 (Mon.-Fri.)

Correspondence anticipating a reply must be accompanied by a stamped, self-addressed envelope or equivalent. Forthcoming events should be notified at least five weeks before publication date and are included as space permits. The Editor is always pleased to consider articles and designs for possible publication: photographs should be accompanied by negatives where possible and can only be accepted if exclusive. All separate documents should be identified by including names, etc. While every care is taken, no responsibility can be accepted for loss or damage to unsolicited articles.

Second class postage rates paid at New York, N.Y. Registered at the Post Office for transmission by Canadian Magazine Post. American inquiries regarding news-stand sales should be sent to MODEL BOATS, Eastern News Distributors Inc., 155 West 15th Street, New York N.Y. 10011, U.S.A.

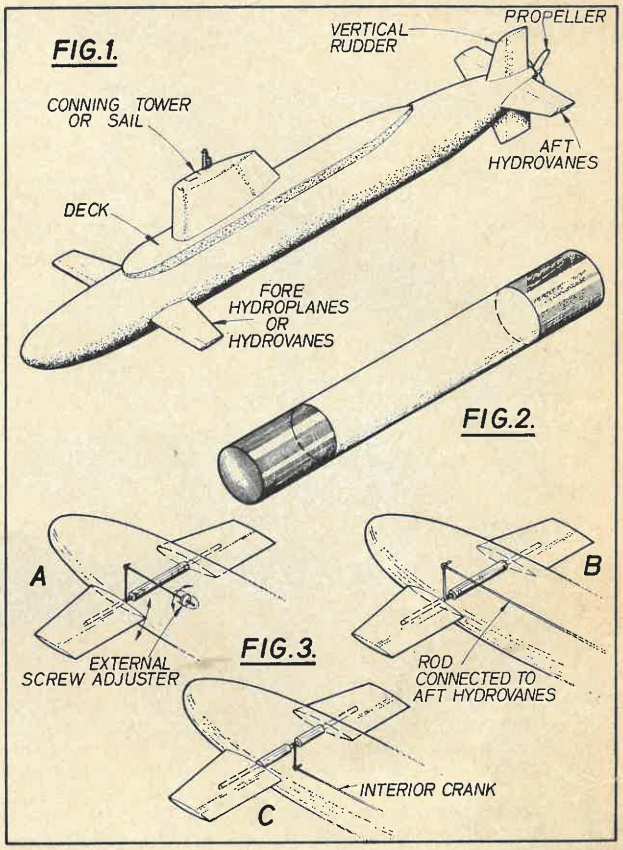
SUBSCRIPTION DEPARTMENT: Remittances to MODEL & ALLIED PUBLICATIONS Ltd. P.O. Box 35, Hemel Hempstead, Herts HP1 1EE. (Subscription Queries Tel: KINGS LANGLEY 66846.) Subscription Rate £5.00 per annum including Index. Overseas $15 U.S. (airmail $24).

MODEL BOATS incorporates 'Model Maker' and 'Model Mechanic' and is published monthly on the fourth Friday of the month previous to issue date.

Model Boats is printed in Great Britain by Leicester Printers Ltd., The Church Gate Press, PO Box 20, 99 Church Gate, Leicester LE1 9FR, for the Proprietors and Publishers, Model & Allied Publications Limited (a member of the Argus Press Group). Trade Sales by Argus Distributions Limited 12-18 Paul Street, London EC2A 4JS

Ever thought of a Submarine?

A surprising number of readers write with queries about possible submarine models. These notes may help to crystallise thoughts.



THERE is something about a working submarine that appears irresistible to many people, judging by the crowd that collects when one is operated. It might be the delight the public seems to find in anticipated disaster, but that doesn't completely explain why so many people are interested in building one. Perhaps it's just the challenge, the new problems to solve, the movement in three dimensions, or the apparent glamour of the full-size craft (to those who haven't lived in one!), but whatever it is, there is undeniable fascination as a modelling subject.

Functionally, for competitions, there are only two areas where a sub may have any slight advantage, one being in straight running, where the hull shape is particularly suited and the minimal above-water profile reduces wind effects; the success of a submarine in winning the Southern Steering Championship for 1975 supports this. The other sphere is in the F6/F7 demonstration classes, and this was amply shown at the 1975 European Championships as well as in many previous regattas featuring novelty or demonstration events. However, quite obviously sport modellers enjoy submarines – the little *Sprat* design has been one of the top three sellers in Model Maker Plans Service every year since it was published in 1960, and the *Type IX U-boat* has usually made the top ten.

Modern full-size subs make life easier for scale enthusiasts, since many of them are simply cylinders for much of their length, and plastic pipe as used for plumbing can thus form the basis of a model. What often surprises newcomers is the sheer weight required for a model submarine; for example, a 4in pipe 36in long will displace about 16½lb of water, a 6in pipe 60in long some 62½lb.

Most people are familiar with Archimedes' statement that a body floating in water displaces a volume of water equal in weight to its own weight. A 4in, 36in pipe weighing 16½lb will, since it displaces 16½lb of water, simply replace the water wherever it is left, *ie* it will not float upwards, neither will it sink. This condition is called neutral buoyancy. If it weighed 16lb, it would slowly rise to the surface (positive buoyancy), and if 17lb it would slowly sink (negative buoyancy). The only complication we need consider is water temperature, as the warmer the water the less dense, so that a model which was neutrally buoyant at a certain temperature would sink gradually in warmer water and rise in colder water. Visions of ships sinking in very deep water and remaining suspended because of temperature, pressure, or density variations need not concern us in the sort of depth we are likely to be using.

The weight of 16½lbs is arrived at because the volume of our 3ft length of pipe is roughly 450cu in (divide by 27 to give approx lb) so that if we can reduce this volume, while still retaining the exterior dimensions, we would have a lighter model to carry about. The only way to do this, of course, is to replace some of the interior space with water, *ie* allow part of the pipe to flood. If, say, 9in at each end could flood (Fig 2) when the pipe was put into the water, the (waterless) carry about weight would be just about halved. This would necessitate thorough waterproofing of the flooding compartments, but waterproofing is essential throughout on a submarine model anyway.

Considering our pipe as a model, we have to have a few shafts and controls coming through the skin, and where possible these should not open to the main motor compartment. The bow planes, for example, can pivot on a rod rotating in a tube which passes straight across the hull, with external control, so that no water can get in via the tube. If radio is fitted, we have to allow for control rods; an external rod can be operated by a crank mounted outside the main compartment, with an interior crank operating it, so that there is a bush in the hull skin in which rotates the wire on which the cranks are mounted (Fig 3). It is difficult to prevent some seepage through such a bush, unless it is fitted with a gland on the inside, which could be packed with graphited yarn or fitted with an O ring, either of which can be obtained from steam model specialists (Fig 4).

The internal crank, or any other control such as the

rudder, can be operated by a push-pull rod passing through a bush in the fore or aft bulkhead of the main compartment. A push-pull movement is easier to waterproof, since a ballon can be bound to the rod and stuck to the bulkhead to make a seal; it would of course need renewing occasionally since it will eventually perish. (Fig 5).

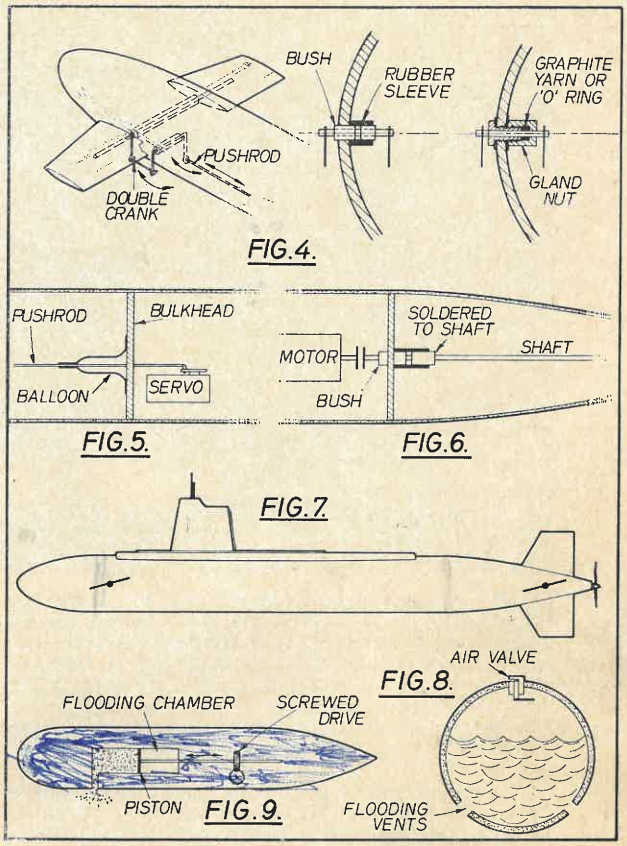
Elsewhere in this issue are some notes on prop-shafts, and these are components providing another possibility of leakage. A gland is the most obvious seal, again using graphited yarn or an O ring, but we have seen models using simple rubber sleeves which give a practical seal. The sleeve is simply a piece of rubber tube a reasonable tight fit over the shaft bush set in the watertight bulkhead, and a piece of brass tube the same diameter as the bush is soldered (preferably silver soldered) to the shaft. The rubber tube extends over this brass tube and is well lubricated with silicone grease, so that although it is quite tight on the brass tube it offers very little drag when the shaft rotates (Fig 6). A similar sleeve could be used for a rotating control-rod bush, of course.

Radio is quite feasible, provided that the receiver aerial is insulated completely from the surrounding water; the normal plastic-covered wire is entirely suitable, cemented along the outside of the hull, provided that the end is sealed so that the metal core does not contact the water. It is desirable to slip the receiver into a screw-top container, greasing the threads with Vaseline or silicone grease and/or sticking a strip of surgical tape round the join, taking wires out through minimum size holes subsequently sealed with epoxy. The super-cautious could do the same with servos; plastic boxes for 35mm transparencies provide one form of container which is fairly easy to waterproof.

Most R/C subs have rudder and motor control, plus hydrovanes, the hydrovanes sometimes being linked fore and aft and operated by a single servo. Such a model can be ballasted until it is just positively buoyant, when it will cruise on the surface at low speed, dive at slightly higher speed (this can be done without separate hydrovane control, by presetting their angles, Fig 7) but, in the event of the motor stopping or the prop(s) weeding up, will automatically resurface. It will not resurface if it takes in water, cancelling its positive buoyancy, or of course if it gets trapped in weeds. Some form of clockwork timer releasing a buoy after, say, 30 minutes might be a suitable safety measure, the buoy being secured to the sub. by fishing line.

More sophisticated methods of submerging involve flooding and resurfacing by blowing out the water with compressed air or an inert gas, for example the propellant cans sold for use with spray guns. The flooding compartments have apertures at low level allowing water to flow in when the air in the compartment is released through a radio-operated vent valve at the top (Fig 8). To resurface, the vent is closed and a valve opened to allow the compressed gas to enter the compartment and force the water down and out. Just as in full-size practice, of course. An alternative is to pump water into or out of a cylinder, possibly even using a single piston moved up and down the cylinder (like a bicycle pump) by a slow electric drive (Fig 9). An idea which we have always liked is the suggestion of a chemist friend – mix six parts sodium bicarbonate with five parts citric acid. When this gets wet it fizzes and gives off a considerable amount of safe gas, so that it might provide a safety factor or could be adapted to blow tanks.

Free-running models frequently cruise at conning tower depth, but can be dived. An uncontrolled dive can be risky, but there are methods of producing sequence diving or controlled depth cruising. A worm gear on the prop-shaft can release a catch holding spring-loaded hydrovanes so that on launching with the catch engaged, the model dives. After a period, depending on shaft revs. and gear reduction, the catch is released and the vanes spring to the up position, when the sub should reappear

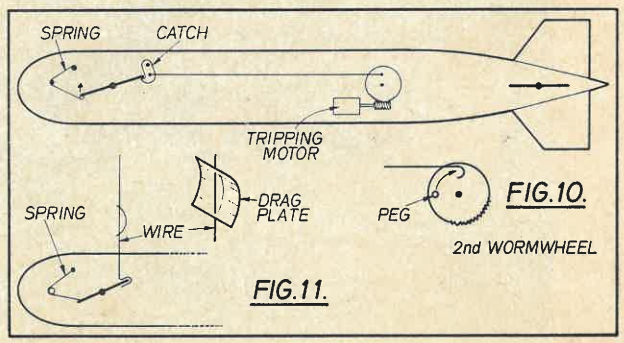


(Fig 10). This can be adapted to give cyclic diving and surfacing.

Another idea is to use a soft rubber membrane in the hull surface to operate a micro-switch at a moderate depth, switching in a motor which alters the hydrovane angles or drives a pump etc. The position of the microswitch in relation to the membrane could be adjustable by an external screw for 'fine tuning'.

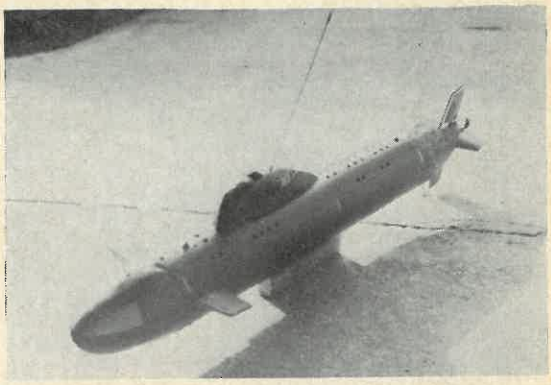
The simplest scheme, which we have used on a number of models, is to spring-load the forward hydrovanes lightly to the dive position and fit a vertical wire onto the vanes. A small square or circle of acetate is slid on the wire (its height and size require experiment) so that as it submerges, it exerts a backward force on the vanes, overcoming the

(*please turn to page 29*)



Charlie Class Submarine

A 40in model by F. J. Macclay



THIS model of the Russian *Charlie* Class submarine follows the layout of using a 4in dia. PVC tube for the hull and glass fibre for the nose and tail cones. The nose and tail cones are formed around expanded polystyrene blocks (obtainable from builders' merchants) cut and sanded to the general shape, then glued into the cut length of PVC tube. Masking tape is wrapped around the polystyrene to prevent any reaction against the glass fibre resin, and two or three layers of glass fibre tissue are required. When completely dry, cut away the end sections and remove the polystyrene from the moulds.

Cut away the removable deck section from the PVC tube (it is used later) and glass fibre into position the tail section to the tube. The PVC tube will tend to collapse when the removable deck is cut, but will be corrected by the next step.

Cut to shape the ¾in thick ply deck, cut out the aperture, and glue into position. It must be pushed and kept in position to straighten the PVC tube and enable the removable deck to fit in place. The ⅛in thick ply bulkheads can then be glued into position with the necessary hole cut in the rear for the prop shaft. Use only Araldite or a similar epoxy adhesive.

Fit out the motor and radio equipment as shown in drawing. Cut out the removable section in the tail cone to gain access for fitting rudder and controls. The aft hydroplanes are fixed but the trailing edges can be bent up or down as required for adjustment of dive.

Fit Rubber Soalant.

The ⅛in thick clear Perspex cover is drilled for 30 1in x 6BA bolts, generally at 1½in centres around the aperture. Use the Perspex as a jig to drill corresponding holes in the ¾in ply deck, then cut the heads off the 6BA bolts and glue into the holes drilled in the ply; also drill the holes for the deck fixing bolts and glue in position. Position the forward hydroplanes as shown and connect via linkages to servo no. 2, then connect rudder linkage to servo no. 3. Wire up micro switches (M/S) as required. Don't forget suppression of the motor.

Mould the sail in the same way as the nose and tail sections and glue the resulting glass fibre shape to the PVC deck. The sail is free flooding. Glue two lengths of ⅜in x ⅜in mild steel bar to the bottom of the hull for ballast; lead is added loosely when testing for trim.

Fill the prop shaft tube with water pump grease and apply some of the same grease to the valve rubber sleeves (RS). Paint the ply deck section before applying grease between this and the Perspex when testing for trim. When testing allow for a small list to port to counteract the torque of the propeller. (Water level is near correct as shown). Total displacement of model is 11lbs.

The nose section and the removable rear tail section are each positioned by three lengths of tinplate glassed into position and secured by ½in long self-tapping (ST) screws. The deck is drilled with ⅜in dia. holes to allow trapped air to escape, and drill some holes as well in the underside of the nose and tail sections for water to escape when lifting out. The model is mostly painted matt black with two red and white segments, two white circles, and a deck walkway (non-slip) which is dark grey. The sonar is a metallic colour and the number white.

The same principle can be used for a variety of submarines, just by changing the deck and sail.

This model was designed for a 3-function proportional R/C unit, but can be used with two function R/C. If the number 2 servo is removed then connect the forward hydroplane linkage to servo number 1, as shown in fig. 1, after altering the servo disc. This will allow full movement of the hydroplanes at forward and a reverse. (Reverse will be used when hydroplanes are in the surfacing position).

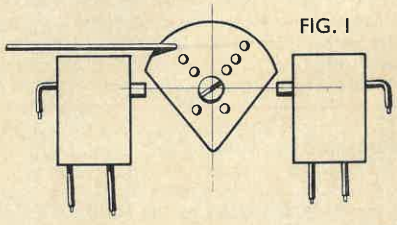
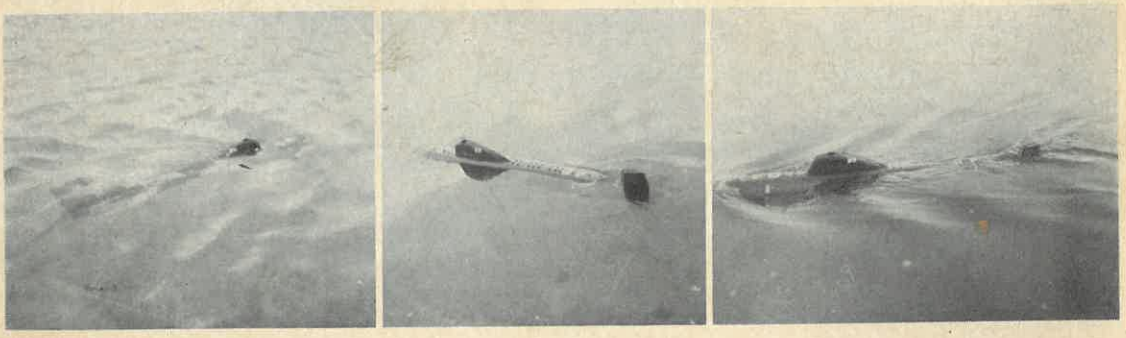
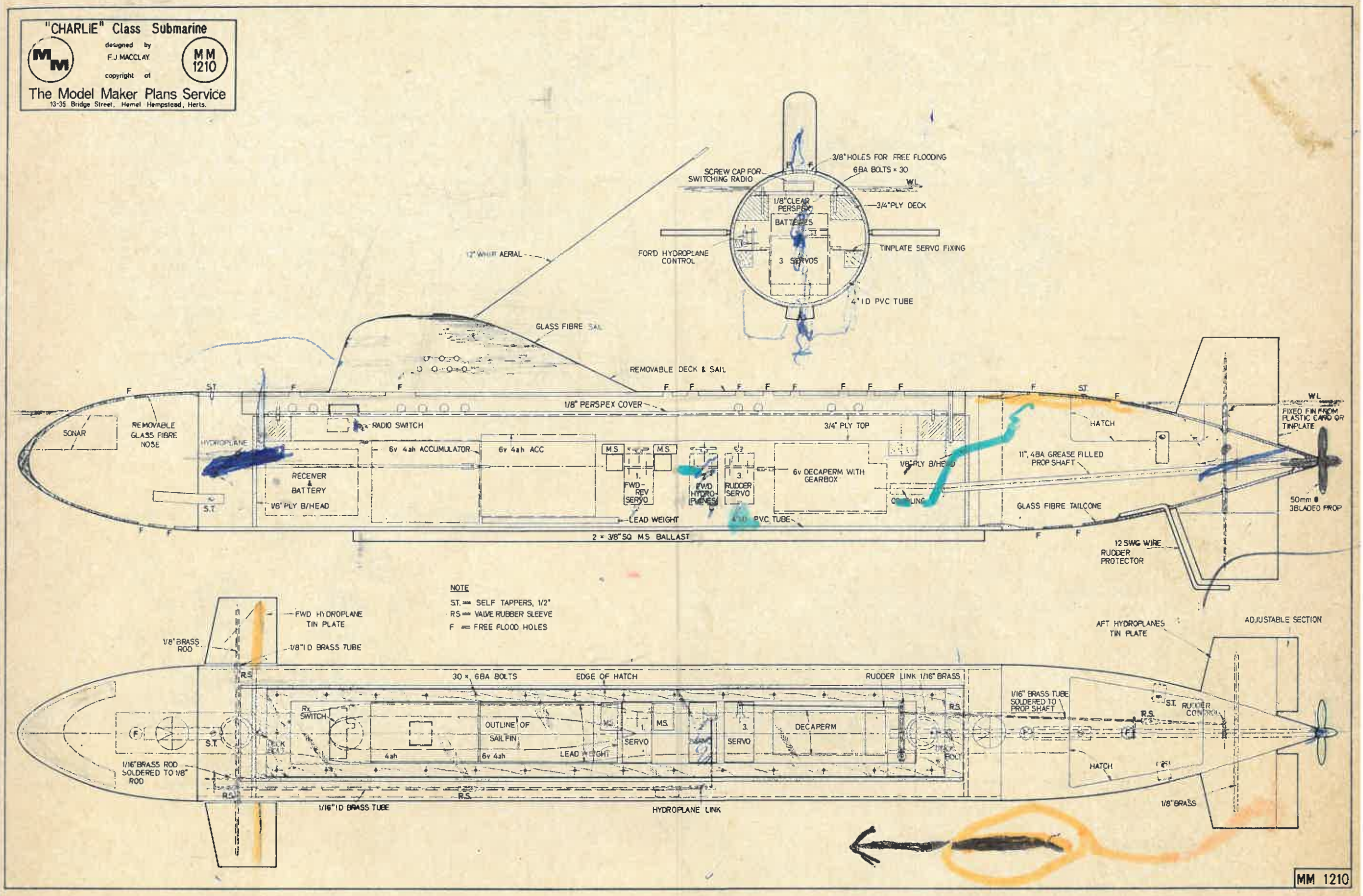


FIG. 1





Full-size copies of the drawing above (hull length approx. 40in) are available ref. MM1210 price 65p inc. VAT from Model Maker Plans Service, PO Box 35, Hemel Hempstead, Herts HP1 1EE.

EVER THOUGHT OF A SUBMARINE?

(*continued from page 15*)

spring tension and moving the vanes to the cruise or even surface position. With the right size drag plate level cruising at a determined depth is possible (Fig 11).

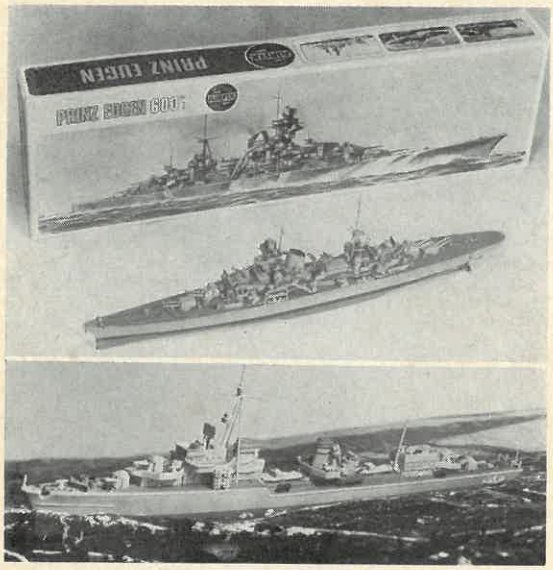
Access to the interior is required for normal maintenance and the hatch should be removable for thorough ventilation during battery recharging, to avoid the build-up of inflammable gases which can ignite from a commutator spark when the motor is switched on. This is important. The hatch should be stiff enough not to cockle when screwed down on a rubber sealing gasket (inner tube or offcut of wet suit material). Most operators have found greasing the joint faces desirable, and some use a Perspex plate enabling lakeside inspection to be made without breaking the joint.

The best switches are the dry reed type, operated by a magnet applied externally, but we have seen models with a conventional switch in a 35mm film can tucked in the conning tower, a press-button type switch operated by finger pressure through a rubber membrane, or a conventional toggle covered by a baby feeding bottle teat.

It is generally appreciated that for stability of any boat, the centre of gravity has to be below the centre of buoyancy. This is achieved by low stowage of heavy items, and helped underwater by the conning tower or 'sail' of the submarine, which should be of wood or sealed hollow glassfibre or metal construction. Since a sub does not carry a lot of superstructure detail high above water, as does a conventional ship, getting a low CG is not quite so much of a problem as may be thought, but on the other hand, with a circular hull there is little or no hydrodynamic assistance from shape; if a sub starts to roll it can go a long way over before the righting forces do much about it.

This is one reason why many submarine modellers prefer twin propellers, and handed ones. A single prop's torque reaction is enough to heel a conventional hull, and can have an enormous effect on a submarine. Anti-torque measures could include a permanent difference in angle between the after hydroplanes, giving a righting force which would increase with speed, but it would probably take a fair amount of trimming to achieve a reasonably roll-free performance, if the model's speed is variable. Twin handed props remove this problem.

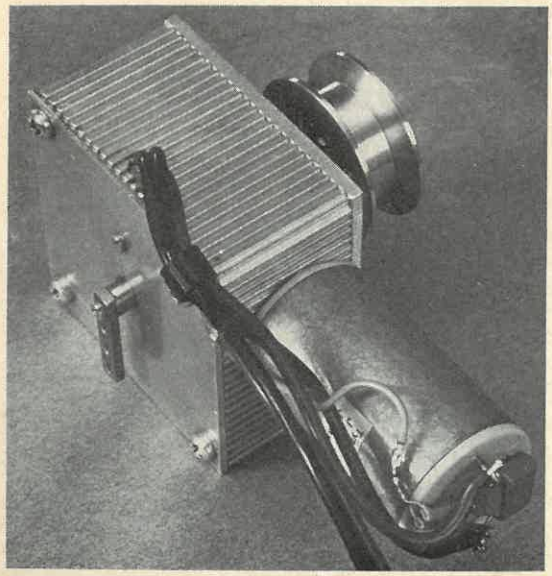
Newcomers who have never thought very seriously about submarine models will begin to see that there are aspects of design, construction, and operation which are somewhat different from conventional surface craft. It is immensely satisfying to succeed at something which has unusual problems, which brings us back to the opening paragraph.

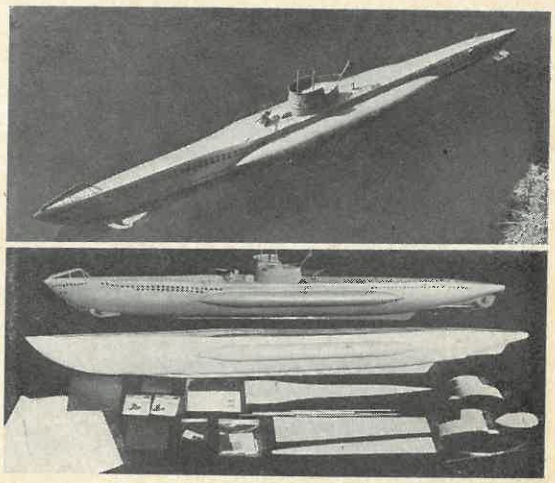


Above, recent Airfix plastic releases in the 1/600 Famous Warship series are *Prinz Eugen*, 151 parts price £1.19 and Narvik Class Destroyer, 90+ parts, 34p.

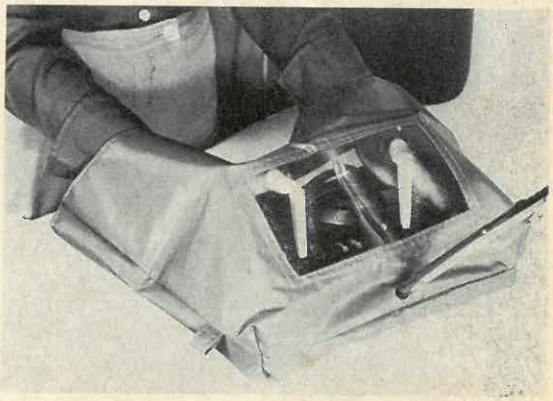
Centre right is Nylet's waterproof transmitter cover, to keep the rain off but allow complete freedom of operation. Note tags for neck strap and clear window to check switch, meter etc. Fits most modern transmitters. Price £2.50.

Below is the new winch offered by Nylet Ltd. at £26.70. This provides proportional control when linked to any modern servo, is powered by a Monoperm Super Special, and has precision metal gears throughout, ¼in wide on final drive. Gears and switches are in a light alloy casing, and the drum (one or two spool) is also alloy. Weight 10¾ozs. Nylet Ltd., (Station Road, Fordingbridge, Hants) have a catalogue of their sails etc. price 20p plus post.





This 63in U-47 U-boat from Darnell Models (33 High Road, Leavesden, Watford, Herts). has a moulded glass-fibre hull, deck, conning tower, etc., and ply, metal, wire, tube, dowel etc. plus illustrated instructions. Price is £30 inc. carriage. This is the model on this month's cover.



Below is latest SHG *Shark* model, 28 x 9in, for, particularly, 3½cc. In the modern idiom shapewise, it is very nicely moulded, and has a neat black plastic edging strip round the joint. Looks a goer. £14.95.