

FAST HYDROPLANE FOR SMALL MOTORS

If you (or your boy) have a yen for speed,
but are faced with a small-outboard budget, this inexpensive
and easily built boat may be just your ticket

BY BRUCE N. CRANDALL

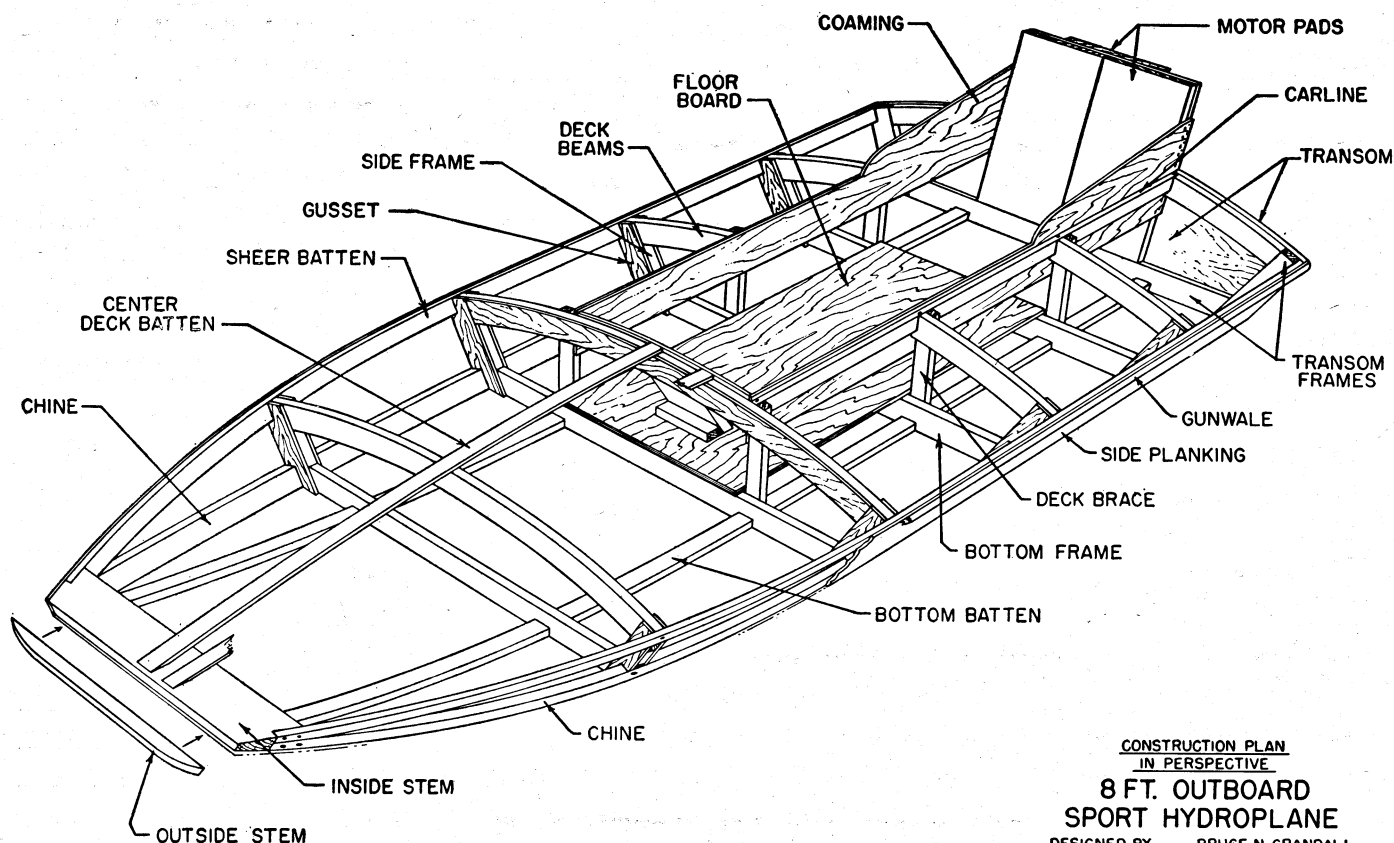
HERE'S AN EASY-TO-BUILD, inexpensive little boat that utilizes the simplest and most efficient type of hydroplane bottom. While an experienced driver can use more horsepower, it is especially designed for the young driver who wants to get the greatest speed possible from the small and inexpensive 5- to 7-hp

outboard motors. Standard types of racing hydroplanes cannot be expected to give the best speed and efficiency with these small motors, because they are designed for much higher speeds, with racing motors of much greater power.

The planing surface of this design is a simple flat plane that is absolutely straight fore and aft and from side to side. No attempt has been made toward soft riding, as speed and safety are the only considera-

tions. The dimensions of the planing surface have been calculated for best efficiency with a driver weighing 100 to 150 pounds and at speeds from 20 to 24 mph. Nontrip chines for safety on turns have been incorporated in the simplest manner, and the whole hull is designed for easiest possible construction.

The construction is so simple, in fact, that all dimensions are given directly on the frame drawings, and no Table of Offsets, lofting (laying



CONSTRUCTION PLAN
IN PERSPECTIVE
8 FT. OUTBOARD
SPORT HYDROPLANE
DESIGNED BY — BRUCE N. CRANDALL

down the lines) or full-size drawings are necessary. A boy can build it himself, and in a small corner of a shop.

The speeds that can be expected with motors of various sizes and drivers of different weights are about as follows:

Driver	5-hp	6-hp	7-hp
100 lbs.	22 mph	24 mph	26 mph
150 lbs.	20 mph	22 mph	24 mph

These speeds are based on a hull weight of 90 lbs. and the average weight of the motors used. It is also assumed that the propeller and gear ratio are nearly correct. Strangely enough, the gear ratios of most 5- to 7-hp motors are just about ideal for this sort of boat, but the propellers are usually of a diameter and pitch more suited to the average rowboat or fishing boat. It may be possible, however, to obtain a special propeller better suited to this boat. It should usually be of two-blade design, with less diameter and more pitch than the standard propeller that comes with the motor. In some cases it will be possible to make the boat plane with two aboard even with a motor of as low as 5 hp, and for this purpose the standard propeller would likely be the best. Persons trying motors of over 7 hp should avoid engines that are heavy for their power.

The speed may also be increased somewhat by the use of an aluminum fin for steering instead of the outside keel shown on the plans. The fin will take the place of the keel to prevent skidding on turns, and its principal disadvantage is that it interferes with beaching the boat. If the fin is to be used, the keel must be inside the planking notched into the frames, transom frame and inside stem, as are the two other longitudinal called bottom battens. The fin, which is made of aluminum and is obtainable from marine-hardware stores, should not be over 12" long and 4½" deep, and it is bolted to the inside keel with about ¾" flathead bolts or machine screws. Fore and aft, the fin should be located at about Frame 3.

The hull weight of 90 lbs. given on the plans assumes that the boat will be built of waterproof plywood, with spruce used for frames. Sitka spruce is probably the most suitable of all materials for use in framework because it is very strong in proportion to weight and holds fastenings well. However, many other woods are well suited. Besides the kinds indicated in the List of Materials,

various kinds of cedar, cypress and pine can be used. Generally speaking, if softer woods are used, the fastenings should be larger than recommended in the article and List of Materials; and if a hard wood, such as oak, is used, they can be smaller—and for that matter, the size of the material could be reduced, for example to ½" thickness for frames made of oak. All plywood should be waterproof, and the choice will range from ordinary exterior Douglas fir to the various kinds of marine plywood, including mahogany and overlaid plywood such as Harborite and Weldwood Royal Marine Duraply.

The drawing of the Construction Plan in perspective is included as an aid to understanding the other plans. Since the design is so simple as to require no lofting, the first step in starting construction can be cutting out and assembling the frames, using the dimensions given in the drawings. Make a template of the deck-beam curve to use in laying out the deck beams. Assemble the bottom and deck beams using the short side frames shown in the drawings, which are nothing more than filler pieces. They will be connected to the bottom frames and deck beams by the plywood gussets. Assemble the frames, gussets and deck beams using resorcinol resin glue, or other glue if preferred, and 1" corrugated nails or 1" No. 6 or 7 screws. These fastenings should be set in far enough to allow for the chine and sheer-batten notches.

You can assemble the transom and transom framework in the same way, using resorcinol glue and screwing from the transom into the framework using 1" No. 7 or 8 screws. The height of the transom will, of course, depend on the motor being used and also somewhat on the propeller. If the transom is too high, the motor will cavitate (get a poor grip on the water); if it is too low, there will be extra lower-unit drag and loss of speed. The height shown will be about right for most motors; but if there is some question, it will be best to make it higher and cut it down little by little after trial runs. The amount of bevel due to the transom angle is shown on the drawing of the transom, so that the transom beveling can be done roughly after or as the transom is assembled. The final beveling will of course be done during the fairing process after all the framework is assembled. Frame 1 will also have to be beveled somewhat at that time. The outside bottom transom frame should be fastened to the inside bottom frame, and the



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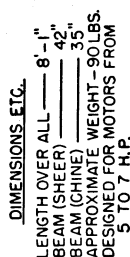
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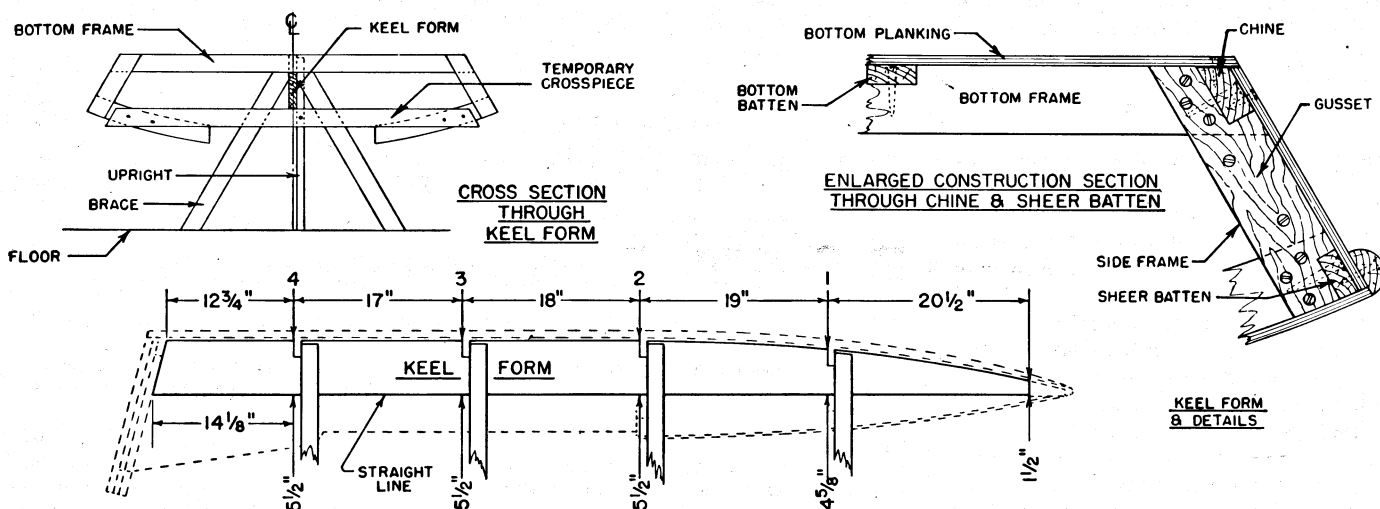
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LINES &
CONSTRUCTION PLAN



battens will be easier to bend and can be fastened with $1\frac{1}{4}$ " or $1\frac{1}{2}$ " No. 7 or 8 screws. It will also be advantageous to use resin glue in these joints.

Next comes the job of fairing the framework and completing all the beveling, so that the bottom and side planking will fit perfectly. The bottom surface of the chines must be beveled and the bevels checked on the transom and stem. Some beveling of the sides and bottom on Frame 2 is also required. The planing surface must be checked accurately with a straightedge. In other words, the entire bottom surface from Frame 2 aft must be perfectly straight in all directions. You can check the fairness of the framework and the accuracy of the bevels forward of Frame 2 by bending battens over the framework fore and aft in various positions, to find out just how well the planking will fit everywhere. Sometime during the fairing process, the bottom battens can be notched into the frames, transom frame and inside stem and fastened with $1\frac{1}{4}$ " No. 7 or 8 screws.

When the fairing and beveling is completed, it will be time to put on the side planking pieces. One of the pieces can be cut out first from the dimensions given in the drawings. There should be a little extra left all around to allow for possible inaccuracy. After one piece is cut out, tried on both sides and roughly fitted, it can be used as a pattern for the other side.

For the purpose of making all joints watertight, a soft-setting marine glue (or sealer) such as Kuhls Avio or a hard-setting waterproof resorcinol resin glue such as Elmer's

waterproof glue can be used. If you use hard-setting glue, you may as well use corrugated nails such as Anchorfast to hold the planking, as you would be unable to unscrew the bottom for replacement anyway. More careful fitting is needed if hard-setting glue is used, because as a filler to keep out water, it is not too good. In any case, enough glue should be applied so that a little will squeeze out when the planking is fastened down tight.

After the surfaces of the transom, transom frames, frames, chines, sheer battens and stem are coated with glue, the planking can be clamped in position and fastened in place. Use flathead screws as follows: 1) into chines, $\frac{3}{4}$ " No. 6 or 7, spaced about 2" apart; 2) into transom, transom framework and inside stem, a double row of 1" No. 7 or 8, spaced about $1\frac{1}{2}$ " apart; 3) into sheer battens, $\frac{5}{8}$ " No. 6, spaced 2" to 3" apart. Screwheads should be left flush or countersunk very slightly, to be covered later with Wood Dough, Plastic Wood or a similar product. Wood should be compressed under each screwhead. If corrugated nails are used instead of screws, the lengths and spacing should be about the same as for screws. Fastenings should be staggered, particularly along the chines, to prevent splitting. You should take care not to pull the framework out of line while applying the side planking.

After the side planking is in place, plane down its edges along the chines to make a perfect fit for the bottom planking. It will be well also to make a final check of the planing surface before applying the bottom

planking. Then a sheet of plywood is simply clamped in position over the framework and marked and cut to shape. The surfaces of the transom and transom frames, chines and inside stem must be now coated with glue, and the bottom planking is fastened with the same-size screws and same spacing as described for the sidepieces. The bottom planking need not be fastened to the frames, except for the transom frame, but should instead be fastened to the bottom battens with $\frac{5}{8}$ " No. 6 screws spaced about 6" apart. Next, the excess planking can be trimmed off flush all around.

The boat can now be removed from the keel form and turned right side up. Next, the deck carlings can be installed, the surface of the deck faired up and the bevels checked on the top of the transom. The deck fairing can be done with a straightedge from Frame 2 aft. Upright deck braces are also installed, as shown in the drawing, and are fastened to the frames and deck beams with screws as desired. The coaming pieces can be cut out approximately as shown and fastened to the deck carlings with $\frac{5}{8}$ " No. 6 screws spaced 3" or 4" apart and to the transom and motor boards with $1\frac{1}{4}$ " No. 7 or 8 screws spaced about $1\frac{1}{2}$ " apart. The coamings and plywood afterdeck are the most important parts of the transom bracing; a regular transom knee cannot be used in a boat of this sort, because then motor thrust might pull a hook into the planing surface of the bottom.

When the afterdeck surface is all faired up and the coamings installed, the plywood afterdecking can be put into place. Some kind of waterproof

List of Materials

Woods

	No. Pieces	Size
Plywood: mahogany or Douglas fir		
Bottom, sides, deck, coamings and gussets	2	1/4" x 3' x 8'
Transom and floorboard	1	1/2" x 2' 8" x 3' 6"
Sitka spruce, mahogany, white oak, Douglas fir, red oak or other		
Deck beams, motor pads and steerer mount	1	3/4" x 10" x 8'
Bottom frames, side frames, transom frames and chines	3	3/4" x 1 3/4" x 16'
Sheer battens, carlings, bottom battens and deck braces	3	3/4" or 1/2" x 1 1/4" x 16'
Deck battens	2	1/4" or 5/16" x 1" x 16'
Inside stem	1	1 3/8" x 3 1/2" x 2'
White oak, mahogany, red oak, yellow pine, Sitka spruce or other		
Keel	1	3/4" x 1 3/4" x 8'
Gunwales (half-round optional)	2	3/4" x 1" x 8'
Outside stem	1	3/4" x 1" x 2'

Fastenings

Monel, bronze, brass, aluminum or galvanized-iron flathead wood screws

	Quantity
5/8" No. 6	1 gross
3/4" No. 6 or 7	2 gross
1" No. 6 or 7	3 gross
1 1/4" No. 7 or 8	4 doz.
1 1/2" No. 8	1 gross
Copper tacks 1/2" No. 4	1 box

Miscellaneous

Canvas 10-oz. 4'x4'	1 piece
Steerer with filler line and pulleys	1
Remote throttle control	1
Liquid marine glue or resorcinol resin glue	1 pt.
Canvas tightener and filler	1 qt.
Marine paint or spar varnish	2 qts.

Types of materials are listed generally in order of preference.

*Approximate net size

glue will be as necessary here as on the bottom, because the after part of the deck will often be underwater. The decking can be fastened to the transom and transom frames with 1" No. 7 or 8 screws spaced about 1 1/2" apart and to the sheer battens, carlings and Deck Beam 2 with 5/8" or 3/4" No. 6 or 7 screws.

The decking from Frame 2 forward will be made of light canvas or muslin stretched over the small battens shown in the Construction Plan. This will help reduce weight; also, plywood would be difficult to bend over the foredeck surface. The foredeck battens should be notched into the plywood decking at Deck Beam 2 and a little way into the inside stem, but not notched into Deck Beam 1. These battens can be fastened in position with 5/8" No. 6 screws or small corrugated nails. After the battens are in place, the cloth decking can be stretched into position and tacked all around to the sheer battens, inside stem and Deck Beam 2 with copper tacks spaced about 1" apart. Later, the

cloth deck can be given several coats of canvas tightener and filler or clear nitrate dope (sometimes called wing dope), which will stretch it tight and improve its strength. The row of tacks will be covered by the gunwales and outside stem and by the 1/4"-plywood dashboard at the forward end of the cockpit. At Deck Beam 2, they can be covered with a small strip of aluminum or wood.

The gunwales can be fastened in position with 3/4" No. 6 or 7 and 1" No. 7 or 8 screws. The outside stem can be fastened to the inside stem with 1 1/4" and 1 1/2" No. 8 screws. The floor and steering-wheel mount can be installed as desired. The outside keel can be fastened to the frames and inside stem with 1 1/2" No. 8 screws and fastened from the inside with 3/4" screws.

Large-scale blueprints (1 1/2" to 1'), made from the original drawings shown here, are available for \$2.50 a set. Send orders to Bruce N. Crandall, c/o SPORTS AFIELD Boatbuilding Annual, 959 Eighth Ave., New York, N. Y. 10019.

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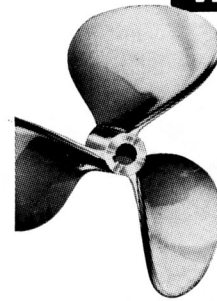
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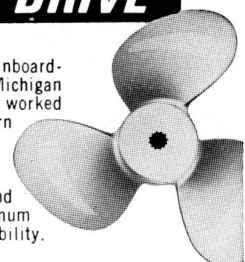
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