U~95

Mike Chervenak's fifty mile an hour plus scale RC model of the famous Thunderboat – the U-95 Unlimited Hydroplane, a delicate blend of airplane and boat, mind and machine. Its roostertail arching long and low, the U-95 is a water-borne banshee in full flight.

BY DAVE SPEER

An Unlimited Hydroplane is a delicate blend of airplane and boat, mind and machine. The tempermental ladies, nicknamed "thunderboats" by some public relations whizz, are three tons of potential mayhem snarling at 165 miles an hour, roostertail arching long and low, a waterborne banshee in full flight. The summer circuit of bright colors, flambouyant personalities, media, and speed rolls from Miami to San Diego before a million fans. The next best thing, according to a growing band of enthusiasts, is a radio controlled scale model. And, it's a lot less expensive.

Since the turn of the century man's quest for higher water speed has paralleled the development of the internal combustion engine. As the gasoline motor developed more muscle the enterprising builder flattened the bottom of his round bilge "pickeral chaser" to climb on top of the water's surface. Next, horizontal breaks, or "steps", in the hull reduced wetted surface to increase speed. And, finally, the prop riding 3-point hydroplane as we know it evolved. Today that evolution incorporates aerodynamic principles and space-age technology; indeed, a singular boat with an abbreviated name — **U-95** — has successfully introduced a new era of big-time boat racing: the era of the turbine.

The late Jim Clapp, a Seattle, Washington industrialist, believed the turbine the engine of the future. His choice was easy. A turbine is the simplest machine to turn fuel into rotative power and their ability to develop tremendous velocity with low weight, low vibration, minimum manitenance, and high reliability made it a natural to replace the traditional unlimited power plants — the Allison and Rolls Royce V-12. Several previous turbine powered U-boat projects had failed, but Clapp had the foresight, organizational ability, and finances to retain the required experts.

Designed by Ron Jones — the current dominating Unlimited hull architect — the futuristic speedster was lofted to accommodate twin Lycoming T-53 axial flow turboshaft engines. The T-53 had gained fame powering the Bell Huey helicopter used in Vietnam as a tactical transport. Originally rated at 700 H.P. each, continual factory modifications boosted the output to 1,400 H.P. A sophisticated gear box, regarded as a design masterpiece, coupled the turbine to a single propeller.

The hull configuration is commonly termed a "pickle fork", or in engineering jargon, "an aerodynamically recessed bow." The concept was developed as a method of moving the boat's center of lift rearward, closer to the hull's Center of Gravity. This improves stability and cornering speeds. Broad turning surfaces on the sponsons and after-plane assist the airfoil shaped body into flat controlled corners with a minimum loss of speed. Topside, the unique tri-fin verticals support a cockpit controlled hydraulically actuated horizontal wing. The airfoil trims the attitude of the hull, providing an additional — at least theoretically — safety factor. And Chuck Lyford, an experienced hydro and Unlimited air racer, supervised the installation of onboard systems, including engine protection devices, driver to shore radio communications, and video monitoring and recording of all engine instrumentation.

In 1974, the **U-95** made its debut and became, at once, both the first successful turbine powered Unlimited in history and a scale modeler's delight. Attracted by the clean lines and space-age appeal of the 28-foot hydroplane, Mike Chervenak scaled his R/C from original hull drawings. Mike, a professional modeler, points out that it isn't actually "true" scale since minor modifications to the bottom allowed for engine mounting at an optimum shaft angle, and set the boat up for circle competition.

While the technology of the full size **U-95** is as complex as it is interesting, Mike Chervenak's approach to model building is as simple as it is unique. The entire hull is shaped from foam surrounding a plywood frame covered with a bonded ply skin. This technique has its advantages over the usual frame and stringer model boat construction. First, it is faster. The deck will be free of unsightly and troublesome wrinkles, and the bottom lines will be "true" — extremely critical in a hydroplane. Although only slightly lighter in weight than its framed counterpart, the foam shell withstands any assault by an overzealous competitor quite well. Repairs are fast and it won't sink. An attractive feature is the complete concealment of the engine under the cowling.

CONSTRUCTION

Using the templates as a guide, cut 2 sides, 2 box sides, 1 sponson rear bulkhead, deck bottom formers, sponson formers, and bottom from 1/8" plywood. The transom is double cut and epoxied to form one piece. The hull's leading edge is hand carved from a solid piece of hardwood. Next, epoxy the deck bottom formers onto the inside surface of the sides (Figure 1). Assemble and glue together the sides, box sides, nose piece, bottom, and

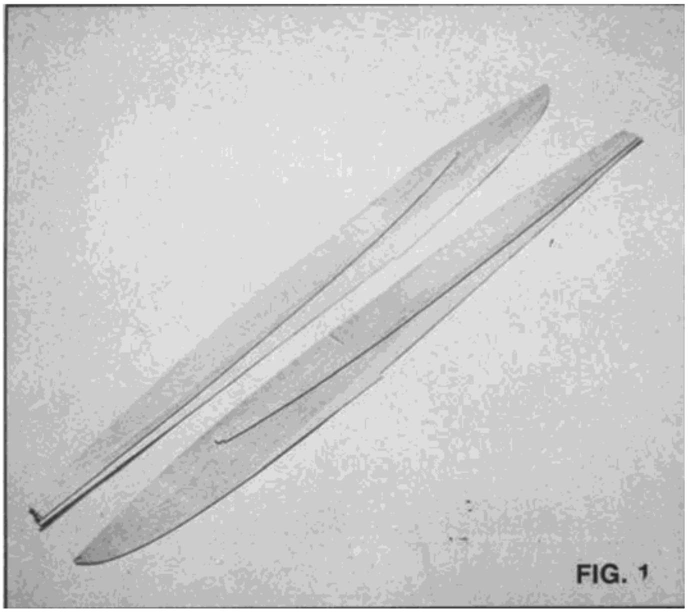
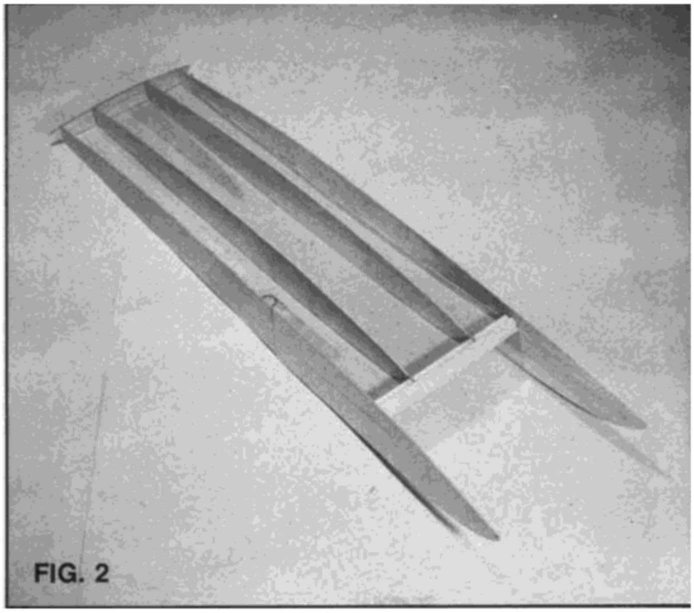


FIG. 1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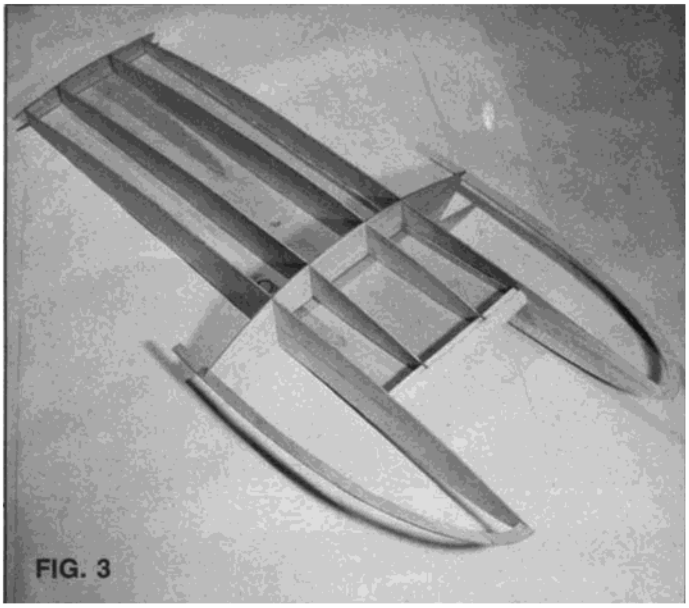
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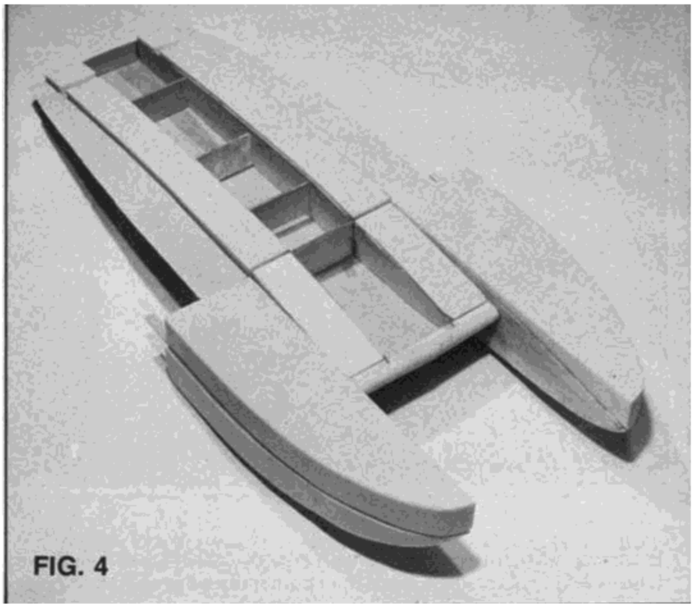
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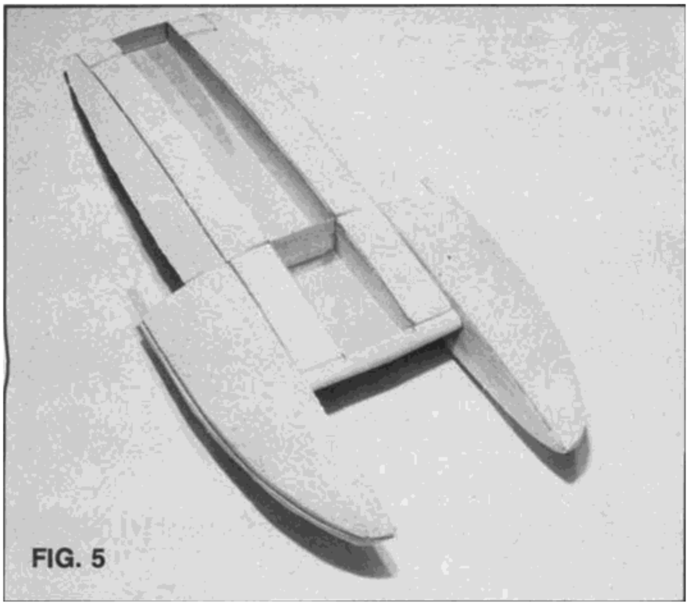
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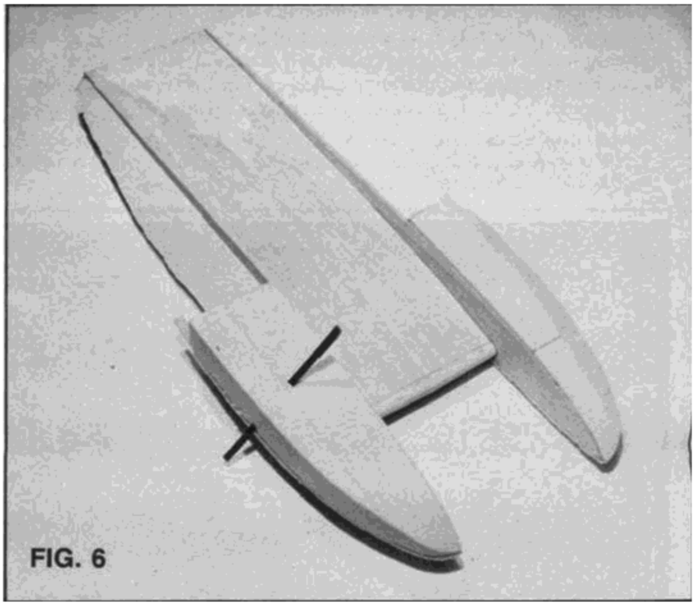
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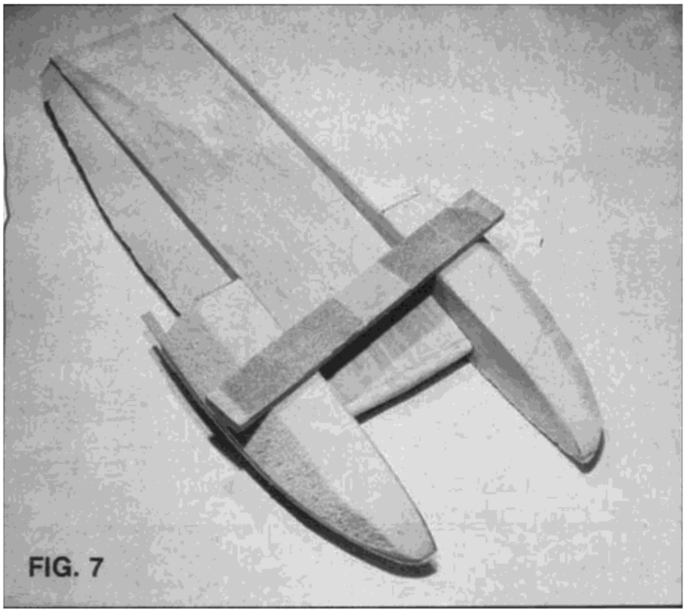
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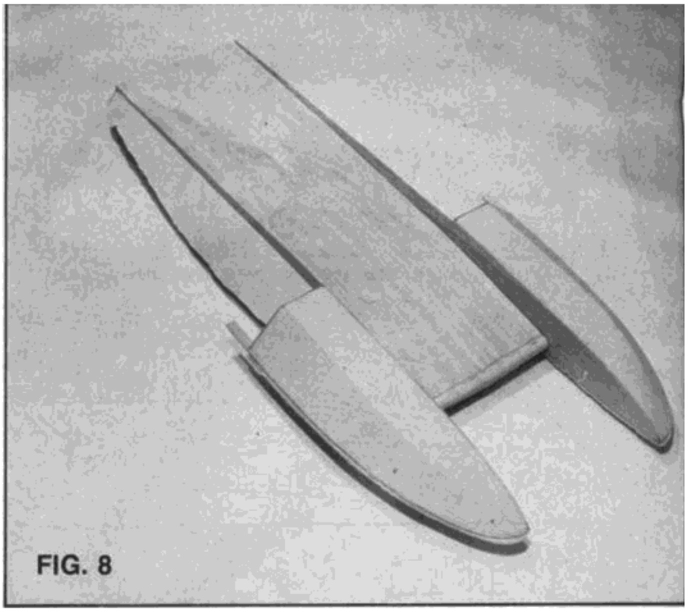
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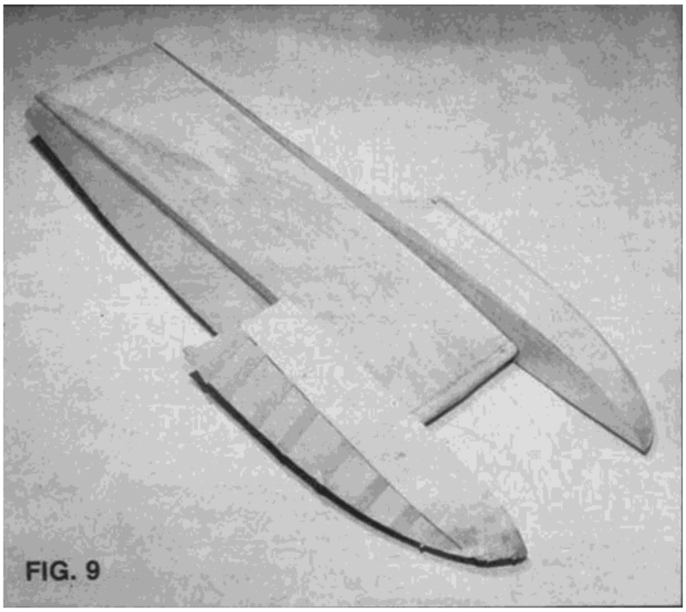
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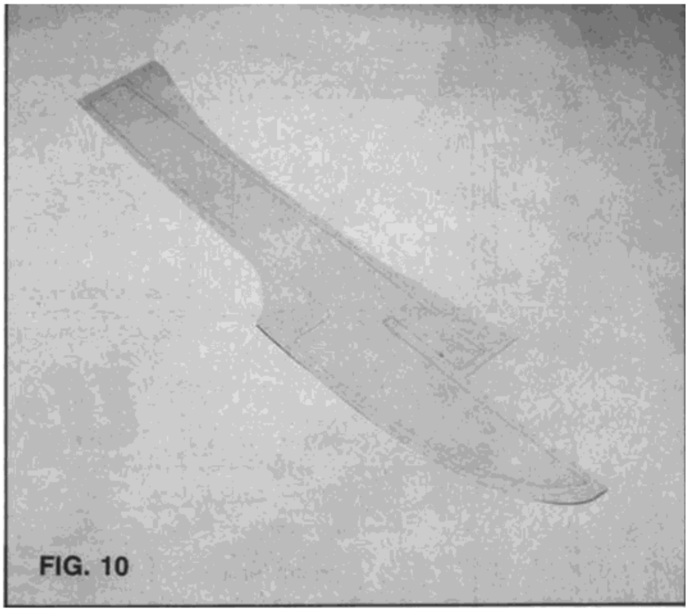
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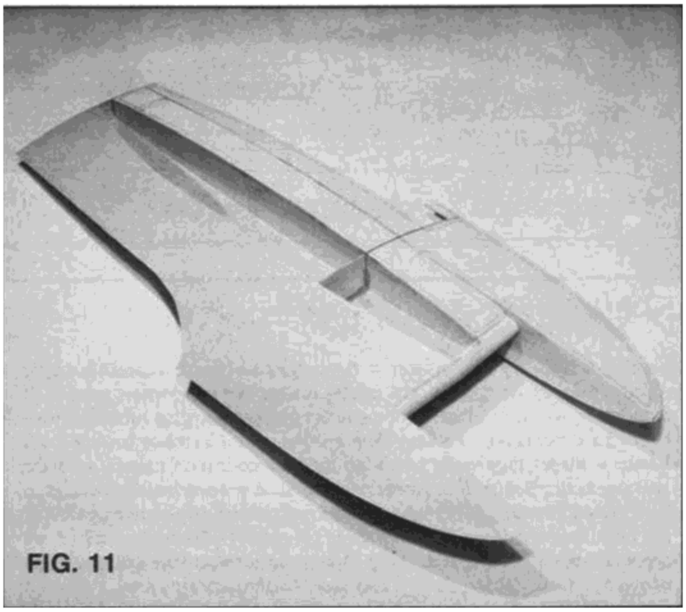
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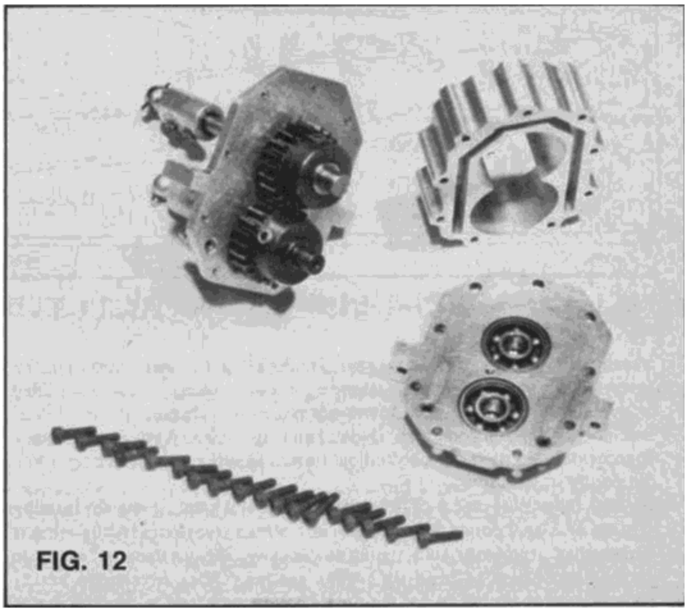
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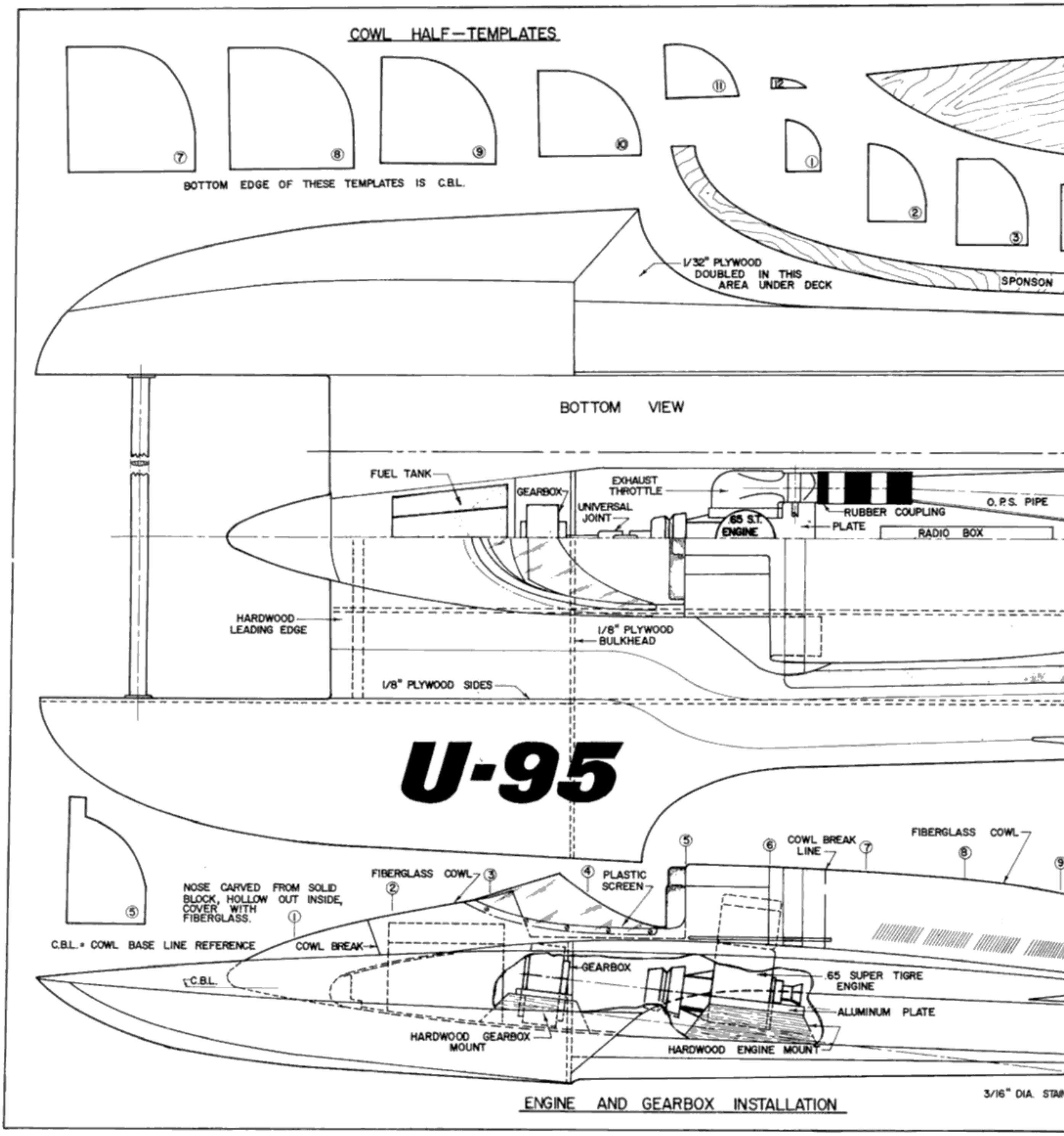
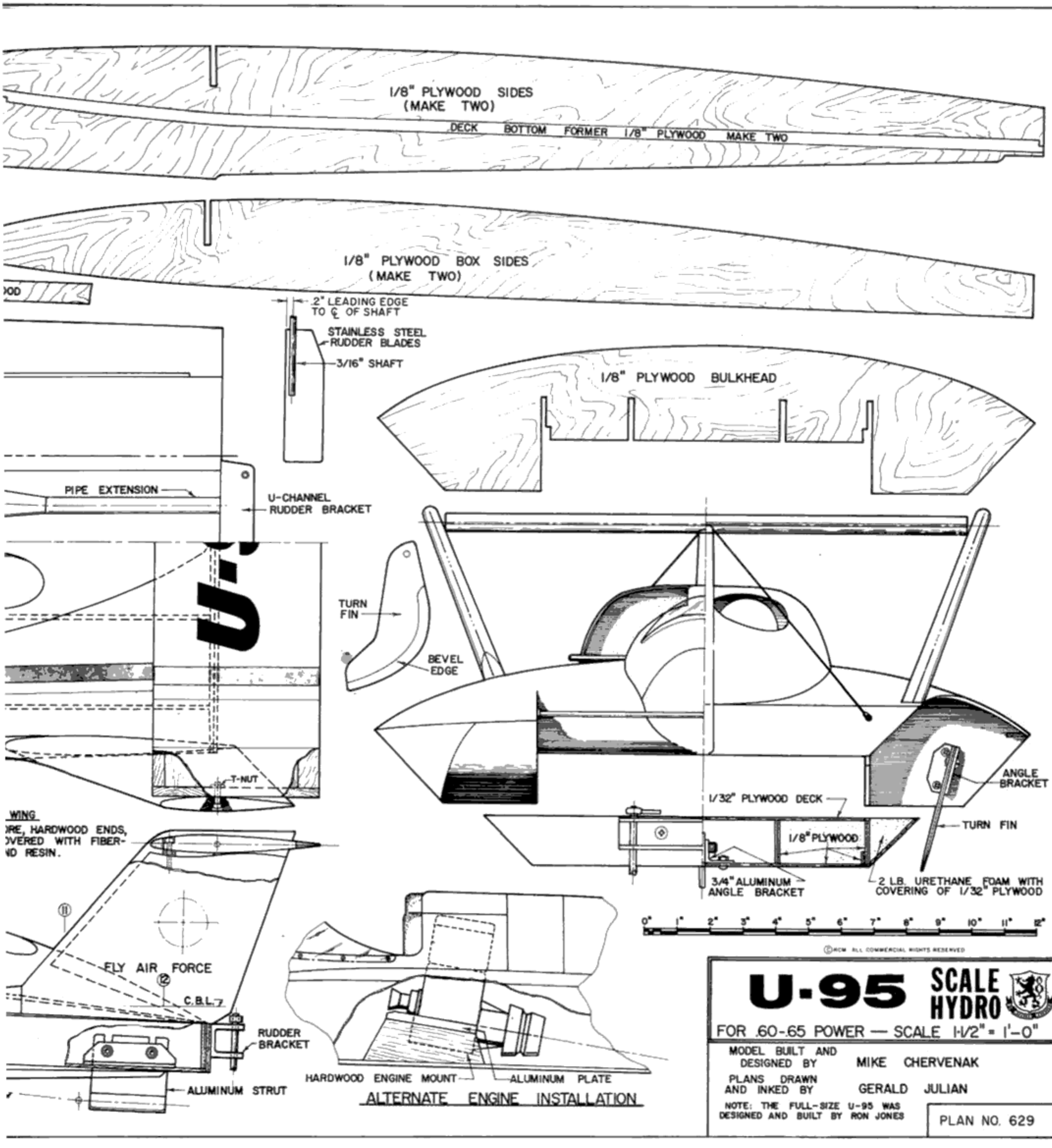


transom for the hull frame (Figure 2). Add the bulkhead and sponson formers (Figure 3). The frames must be cut, trimmed, and assembled accurately. Warps do not promote normal riding characteristics. A trial assembly or two is a good idea. (Note: you may want to fabricate temporary spacers to fit between the longitudinal frames to support the assembly while the epoxy is setting up.)

Now, individual pieces of foam must be cut and hand fit into the framing (Figure 4). Use 2 pound polyurethane rather than styrofoam. Although it is denser than styrofoam and, therefore, heavier, the urethane is easier to contour and doesn't "bead up" when sanded. Other advantages are its resistance to corrosive fuel if the deck is punctured, and allows the use of contact cement to hold the foam in place. Begin with the afterplane non-trips beveled at 45°. If you use more than one piece of foam to make a single assembly do not use contact cement between the butt faces where sanding or contouring will take place — the contact cement leaves a rubbery sticky edge. Trim the excess urethane with a super coarse hacksaw or skip tooth bandsaw blade (Figures 5, 6) . With the hull resting on its top, sand the sponson bottoms with #36 garnet paper affixed to a sanding block (Figure 7). Finish contouring of the sponson bottoms and non-trip areas is, perhaps, the most creative phase of construction (Figure 8). The trailing 8'' of the sponson bottom must be flat, sharp edged, and correct to the dihedral angle of attack indicated in the plans. Taper and flare the non-trip ahead of where it breaks flat. If it looks right, it usually is. A properly shaped forward sponson assists in recovering the boat if the nose digs in. A too flat, or shallow, flare



virtually assures head over transom flips. You may change or adjust the sponson angles once you begin to run the hull to trim for your engine weight, placement of accessories, and balance. But, worry about that later.

The final phase of hull construction is the 1/32'' ply skin. Complete the bottom (Figure 9) by fitting and gluing on the afterplane non-trips, sponson chines, **then** the sponson bottoms. If necessary, use a plane or sanding block to trim and shape. Keep all edges sharp! Resist the urge to use fiberglass tape to seal any edges. The gluing technique for skinning requires the use of both contact cement and epoxy (4-hour). Contact covers the central and largest area to hold the part in place. Epoxy seals the edges. A felt tip pen handily outlines (Figure 10) the separate contact-epoxy areas. Hold the positioned parts in place with masking tape; use nylon reinforced tape where extra strength is necessary — perhaps at the sponson tips or any compound curves. Make sure the edges seal tightly with an even, steady pressure. Don't worry, done correctly it will not loosen. After drying, any open spots or mistakes may be filled with micro-balls and epoxy.

The top decking is the last to go on, again fabricated from 1/32'' plywood. Remember to allow for the crown (curvature) of the deck when cutting the pieces. Fit and glue one half of the deck, working one section aft, then the other. Again, fiberglass tape isn't necessary (Figure 11). Where the deck is not supported by urethane foam, glue in a double thickness of 1/32'' cross-grain to stiffen the lamination (such as at the aft ends of the sponson, and where the deck joins the transom over the equipment section).

Fins, Wing & Cowling:

The vertical fins and wing are built of hard balsa cores with trailing and leading edges of hardwood and covered with glass. The vertical "bat wings" are inserted into a slit in the top deck between the foam core and non-trip skin. Apply glue liberally here. Flare and radius the assembly into the hull body with glass cloth.

While the wing assembly is certainly eye catching, it is also delightfully functional. By adjusting the angle of attack with the jackscrew, the attitude of the boat can be trimmed to compensate for balance changes, wind, and water conditions. It works!

The best cowling would be built of fiberglass using the plan templates as a guide for a mold. Hollowed-out balsa, or possibly foam, reinforced with glass cloth and resin will do. The nose cowling is shaped from hardwood, hollowed, and glass covered. A kitchen cupboard snap latch is handy to hold the cockpit cowling in place at the front, while the engine cowl is fastened by flat head screws into a nut plate. The air scoops, immediately behind the driver, are for appearance only, but if heat seems to affect your radio, cut out the upper half of the scoop. (A distinct disadvantage though would be a competitor's roostertail drowning you out!) A piece of foam fastened here and there to the cowl section will prevent its loss if thrown off while running.

Engine:

Mike chose a Super Tigre .65 to power his **U-95,** mounted atop a hardwood and aluminum plate. This particular motor was chosen for its side exhaust port and has been tuned and timed for an OPS pipe and extension exiting within the U-channel rudder bracket. The throttle and elbow are a one-piece assembly. For a stock engine set-up use an OPS .60 which exhausts straight back over the radio box, rather than alongside it. Narrow fiberglass strips reinforce the engine compartment, but don't go overboard. A wood spray shield mounted below the carburetor venturi is a good idea to ward off water sloshing around in the bilge. Vibration whould shear off a metal shield.

Gearbox:

The custom machined gearbox allows for a shallower propeller shaft angle which reduces wear and tear on the strut universal shaft and reduces drag on the engine. The box is based around 2 Boston H24-22 gears modified with a second set screw placed at 90° to the first, not at 180° where vibration would loosen it. Have the gears case hardened at a machine shop. Supporting the 1:1 gears are 4 front bearings from a Super Tigre .40. The gearbox and engine cylinder head are both pressure water cooled from pickups at the transom.

Paint & Trim:

Use K & B Primer as a reference coat for spot sanding and hole filling, followed by another primer coat. Several coats of K & B Gloss White applied "wet" completes the basics. The blue and rainbow striping is airbrushed. Numeral decals, a plastic windshield, detailed instrument panel, assorted Air Force logos snipped from recruiting posters, and a Mattell "Big Jim" completes the detailing. Incidentally, "Jim" scales out at 6'1".

Fuel Tank:

A custom fuel tank should be built to fit within the hollow nose cowl. The vented and baffled tank was formed of .012" sheet metal shaped around a wooden block.

Hardware:

Although the hardware on Mike Chervenak's **U-95** is custom built, most of it could be purchased stock. Use twin rudders — one won't be enough. But build the outboard mounted turn fin (which acts as a pivot point for the boat) yourself. A stock fin will not be large enough to hold the boat in an arc when cornering. Note that the turn fin is mounted to its angle bracket by a single bolt to allow the fin to kick up if it hits an object in the water. The choice of propellers is difficult and never ending. Most experienced R/C scalers trim, shape, and cup their props as experience dictates. A "hot" propeller is usually the difference between a winner and last place. Experiment. The monkey bar between the sponson tips is hollow airfoil shaped aluminum tubing available at most hobby shops.

RADIO INSTALLATION

The radio is a Kraft 3-channel with 15-H servos. While most boaters prefer built-in wooden radio boxes with a watertight lid, Pacific Northwest scalers use a watertight plexiglass box fastened in with rubber bands. The obvious advantage is quick removal to run multiple boats with one radio. An asbestos heat shield bonded to the radio box insulates the electronics from the adjacent hot pipe.

The **U-95** is a proven crowd pleaser at regattas and exhibits the same frantic competitive quality of its bigger sisters. The model corners extremely well, currently clocks over 50 mph, and consistently places high on race day. In addition, Mike's masterpiece scores often in Top Scale and Top Paint judging, a tribute to its owner's craftsmanship and attention to detail. With the untimely death of Jim Clapp, the whisperboat project lost its mentor and momentum. But it had already proven a point: the turbine is fast. This scale **U-95** carries on the short lived tradition and gives onlookers a glimpse at tomorrow's thunderboat. □

LANIER REBEL

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