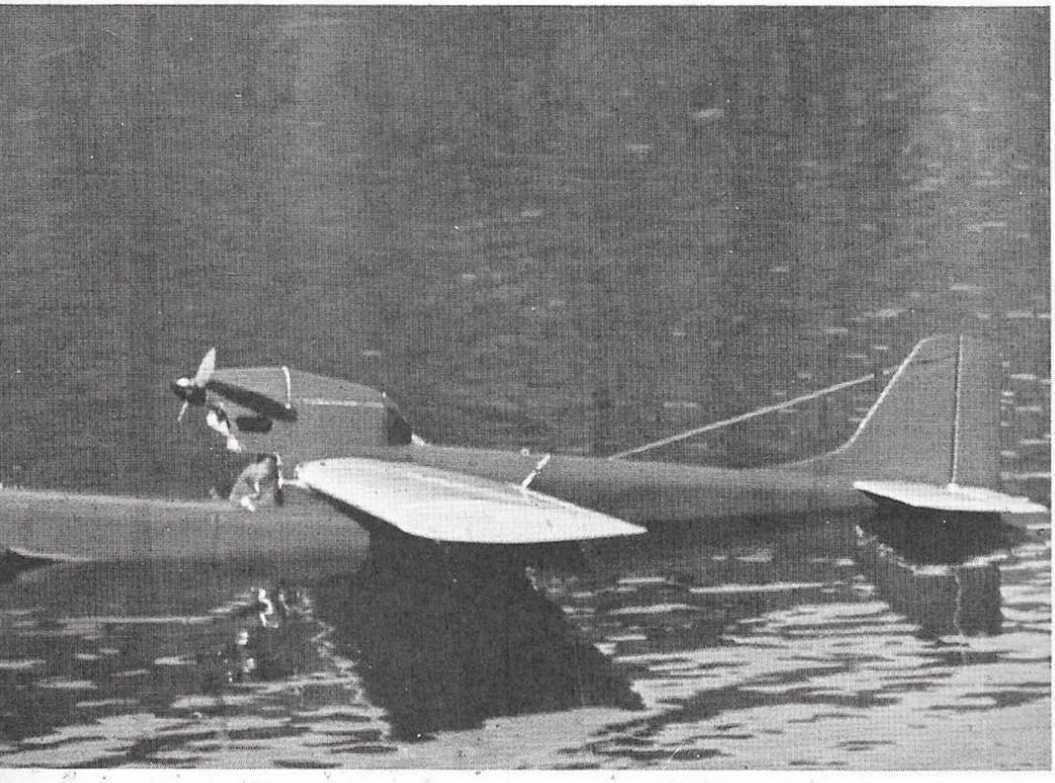
# PLATYPUS

by Roland G. Bernier

*An aerobatic seaplane is unique. Foam construction for quick building and fail-safe buoyancy.*



THE PLATYPUS IS the fulfillment of an ambition, after three years of frustration.

Although I had flown RC for ten years, my interest in flying off water began in 1966 at the first NERCM Hydro Meet, Brimfield Dam, Brimfield, Mass. I installed a set of floats on an Aeromaster and spent the day trying to get it off. These efforts made the cover of *Flying Models* (Jan. 1967), but the caption indicated that the Aeromaster didn't quite make it.

The challenge now was greater but I didn't fare much better the next year. The ship managed to get into the air, but that was about all.

In 1968, I installed a set of floats on a Kwik-Fli II and put in some practice flights. Back at Brimfield in September, radio trouble on the first flight resulted in a semi-controlled crash on the lake shore! The second day of the meet, I returned with the repaired, hopefully flyable, airplane. The radio worked fine, but the ship flew poorly, apparently due to misaligned floats, a result of the previous day's damage. So much for 1968.

During these round trips to Brimfield, I noticed that flying boats had much better water handling characteristics than float type planes but were much less aerobatic. So why not build a flying boat which was as clean and aerobatic as the land-based hot multis?

The Platypus was designed around this idea. A low- to midwing provides equal (if possible) distribution of weight and lateral area, above and below the wing. Having the wing near the water eliminates struts, since tip floats always seem to come off the usual flying boats. A low profile gives better water handling characteristics, especially in crosswind taxiing.

A short, wide, and concave hull provides fast planing, with minimum spray, for quick takeoffs and keeps the profile low. The upper and lower angle of the hull are equal to minimize air effects and to prevent hunting as the flight angle of the plane changes. A high step gives easy release from the water and a five-degree aft fuselage angle allows rotation for takeoff.

An NACA 2415 airfoil provides good wind penetration, excellent stall characteristics and low drag, coupled with a low aspect ratio (5 to 1) and plenty of wing area for low wing loading. Zero-zero incidence gives fast, groovy flying. Moments and area are those standard to normal multi-stunt planes. Plenty of foam is used for water integrity.

All these ideas were great, but would they work? This was my first plane completely designed and built from scratch. The first test hops were from hand launch and the ship flew right off the board. To have it perform that well the first time was most satisfying.

The next step was water tests. Taxi tests indicated that the buoyancy factor was cut too close. When the ship went from standstill to flying speed as the throttle was opened, water came up over the nose and killed the engine. However, if the plane were held when the throttle was opened and then released, it got up on the step immediately and took off.

The first flight was routine until the landing—a collision with a boat dock support. Result, one sheared wing and no hobby shop within 50 miles (we were on vacation in northern Vermont). The foam wing came in handy. It was repaired with epoxy, pieces of foam from a portable radio package, and several balsa wings from ten-cent gliders. The

Author holds a much-flown Platypus. Note large stabilizer to compensate for wide bow area and neatly cowled engine.

MonoKote then was ironed back on and the plane was ready to fly.

Further tests and flights indicated a modification of the hull was definitely required. After alterations, a test hop was made the week before the 1969 Brimfield meet. The plane flew great until a wire let go in the elevator servo. Net result, several pieces of fuselage and another broken wing. Back to the workbench and then another test hop the night before the contest. Fuel line trouble developed. By the time that was remedied, it was too dark to fly! So off I went to Brimfield, with an untested plane.

The day of the contest was beautiful–a light wind, slight chop, perfect for flying–and I finally had time for a check flight. And then, at last, I won first place in the flying boat class! The Platypus, with both excellent water handling and flying characteristics, was a breakthrough toward high performance seaplanes.

### Construction

The fuselage is made in two sections: the foam hull and the main fuselage-nacelle structure.

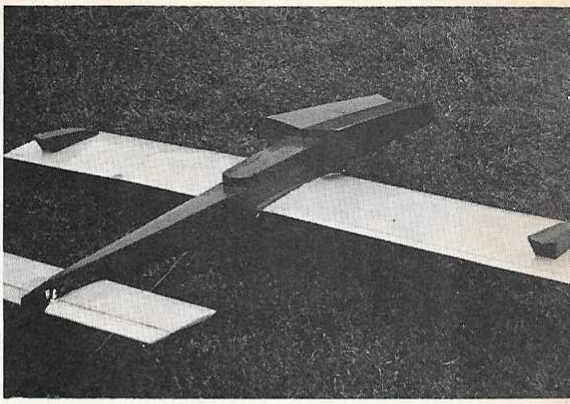
Hull: Formers 1 and 2 of 1/4" ply are used as the pattern. Mark the fuselage opening of F2 but do not cut it out at this time. A four-inch thick block of foam is required. (I used blue styrofoam, but white beaded foam should work as well.) Use small nails through pre-drilled holes to pin F2 at one end of the block. Be sure it is squared and centered. Now, carefully center F1, both vertically and horizontally, at the other end of the block.

The top of F1 is 1/2" lower than the top of F2, which results in a tapered hull, both top and bottom. The inverted V or concave portion of the hull is a flat V at the front and V-shaped at the rear, which requires some care when cutting the foam. Using the standard hot wire technique, start at the top center and cut around the formers. When cutting the bottom, hold the wire at the V until the flat portion of the front is cut, then proceed on around the hull. Remove F2 and make the fuselage cutout. Then epoxy F1 and F2 to the foam.

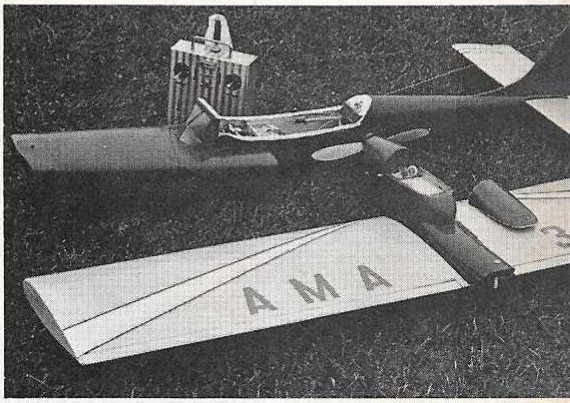
After the epoxy has cured, the 1/32" plywood bottom is epoxied to the foam. Cut a triangular piece of plywood to fit the center, as well as two other pieces to cover the rest of the bottom. The piece of foam block from which the hull was cut is used to hold the plywood in place while the epoxy cures. Cover the foam support with saran wrap to prevent its sticking to the plywood.

Before applying Marvelite to the top of the hull, all edges of the formers and bottom must be smooth and follow the hull's contour. The Marvelite is put on with contact cement on the foam and with epoxy where it touches the formers and bottom. Attach the nose block and carve it to shape. Apply fiberglass to the bottom of the hull, using Ambroid cement. This tough, flexible surface is easy to apply.

Fuselage and Engine Nacelle: The fuselage and engine nacelle are built as one unit, then separated for wing attachment. This assures good alignment and provides a good fit for water-proofing. Begin by cutting out the 1/16" plywood doublers, then use contact cement to glue them to the 1/8" sheet balsa fuselage sides. Make a right and a left side.



Uniquely shaped bow and tip floats are covered foam with MonoKote finish–simple and very effective. Quick takeoffs.




Engine mount integral with wing fairs smoothly into fuselage. Windshield helps keep RC equipment compartment dry.

## Platypus

Next, glue the 3/8" diagonal balsa strips to the upper and lower edge of each side. Allow a 1/4" space at the front for plywood F3 and 1/8" for the plywood base. After the glue has dried, epoxy the plywood base and F3 in place. These parts must be cut accurately and aligned carefully to ensure a square fuselage. The 1/8" plywood base extends beyond the angle of the fuselage but is beveled later. Allow the epoxy to cure before proceeding.

F4 is installed now. Do not get any glue in the area where it contacts F3, since this is part of the removable wing nacelle assembly. Taper the triangular strips at the tail end and complete joining the fuselage sides by installing the formers. Keep the alignment straight.

Install the 1/4" balsa base and the rear ply former of the nacelle, the 3/4" balsa fuselage top, and the balsa nacelle block. Also add the 1/8" balsa sides of the nacelle. Do not cover the fuselage bottom. Carve and sand the top of the fuselage and nacelle block to shape.

Cut out the wing opening, using the 1/16" plywood fuselage doubler as a pattern. Make the diagonal cut in the doubler as a guide, make a similar cut at the trailing edge. Use a Zona saw to cut between F3 and F4 and along the parting line to the wing leading edge. Remove the nacelle to attach the wing.

Install pushrods or Nyrods in the fuselage. The 1/16" cross-grain balsa bottom is glued on after beveling the 1/8" ply bottom at the step area. Using contact cement, cover the bottom with Marvelite.

Make the cutout in the hull, using F2 as the pattern. Accuracy is essential so that the step lines up properly when the fuselage is attached. The bottom of the cutout must be perpendicular to F2, to assure proper alignment of the hull and fuselage. Use plenty of epoxy to glue the fuselage into the hull. The basic fuselage is now complete except for the windshield, which is installed after the plane is painted.

Wing: Make templates from the rib outline on the plan and use standard hot wire cutting techniques to cut the wing from a two-in. thick foam slab. I used blue foam, cored for lightness. Beaded white foam does not require coring.

For covering, join two sheets of 12-in. wide, 1/16" balsa and do the wing in one operation. There is no leading edge. Use plenty of contact cement on both foam and the balsa sheeting. Wet the outside of the balsa at the leading edge and it will go around the foam wing without any trouble.

Square off the trailing edge and attach the 1/4 x 1/2" strip. After the glue sets, bevel and sand to the wing contour. Prop the two wing halves at the correct dihedral and join with epoxy. If the wing was cored, reinsert the cores at the center section before joining.

Bend the 3/32" music wire aileron control horns with the brass tubing on them and install with the hardwood trailing edge center section. Also install the hardwood leading edge insert. Six-inch wide fiberglass is applied all around the center section.

Before attaching the wing to the nacelle section, fill in the area between F4 and the wing leading edge, then shape it to the leading

edge contour. For a good fit, also shape the nacelle section where the top of the wing contacts it. Line up the nacelle with the center of the wing, and epoxy the wing and nacelle together.

Put the wing on the plane and locate and drill holes for the 1/4" hold-down dowels, which are glued in place. Maple blocks for the 1/4-20 nylon hold-down bolt are installed and tapped for the bolt.

Finish the nacelle by installing the 1/16" balsa doublers, the 3/8" diagonal corner braces, and the Tatone engine mount. Drill holes for the throttle, fuel line and tank air vent. The nacelle hatch cover is made from balsa blocks.

The wing is completed by attaching the wing tips and ailerons. Make the servo cutout and line it with plywood. The throttle cable is run from the engine through the firewall, to the bottom of the nacelle and the wing, to the servo in the wing.

Rudder and Stabilizer: The vertical fin and rudder are 1/4" sheet balsa. To cover the original stab I used .007" Mylar film, but it was difficult to glue to the foam. The plans now show 1/16" balsa sheeting. A 1/4" sheet stab probably would work as well. Elevators are made from 1/4" sheet balsa joined at the center with a hardwood insert. Glue the stab to the fuselage at zero degrees incidence. Check alignment and then attach the vertical fin.

Tip Floats: Wing tip floats and the secondary step are cut from styrofoam. To keep the weight down, use only two coats of Hobbypoxy II. For a smooth finish, apply saran wrap or the backing release film from

MonoKote over the wet epoxy. It is peeled off after curing. Do this for the second coat only. The hull step then is epoxied to the fuselage and painted with the rest of the plane. Glue tip floats to the wing with contact cement.

Finishing: Carve and sand to shape. Fill any areas or cracks which might allow water to enter the fuselage. Then use MonoKote on the wing and stab and Hobbypoxy on the rest of the plane. Do not seal or dope areas to be covered with MonoKote because this will interfere with its sticking. Give the hull, fuselage, nacelle and rudder three coats of dope, sanding between coats. Then cover the fuselage and rudder with lightweight Silkspan. It is not necessary to paper the bottom of the fuselage, which already is covered with Marvelite. The cowl, nacelle and center section are covered with Silron for extra strength.

Apply three more coats of dope, sanding between coats. Then paint with Hobbypoxy, which will adhere well to the dope if the areas to be painted are washed with alcohol. This removes the plasticizer from the dope's surface and allows the epoxy to get a better bite. The edges of the MonoKote should be sealed with clear epoxy to ensure a watertight seal. The wing seat must be well sealed. I used RTV, but soft rubber tubing, or even window caulking, will work.

If pushrods are used, they must be sealed at the tail where they come through the fuselage. I made a rubber sleeve which fits over the end of the pushrod and is cemented to the fuselage with rubber cement. It is attached to the Kwik-Link by wrapping a

small rubber band around it. A small section of balloon can be used for a sleeve, but allow for pushrod movement by leaving some slack.

Flying: The CG should be approximately one half in. behind the step (see plan). All surfaces must be working freely and in the right direction. Range-check the equipment and the Platypus is ready to go.

The original ship has excellent water handling characteristics, so don't worry if the model looks as though it has sunk. That's normal. The stab sits almost on the surface and the wing isn't much further out of the water.

Taxi the ship around to get the feel of it. Then aim it into the wind and open the throttle. It may be necessary to hold a little right rudder until it gets up on the step but, once it is up, a touch of elevator and it lifts off. This is one seaplane that takes off like an airplane, without fuss or spray.

In the air, it is groovy and quite fast. The first few flights should be made at reduced throttle, since the Platypus will do the pattern at half throttle. Although it does knife-edge flight, reverse spins, inverted spins and snap rolls, the plane has no vicious traits. It can be flown at very slow speed without falling off.

Landing can be a problem, because the model is a very clean and will glide forever if speed is allowed to build up on the final approach, then flaired out. It won't come down! The best approach is to keep the nose up and the speed down with the engine at low idle. Keep the wings level, fly right down to the water and it will land itself.

Taxiing is no problem although the ship may take off if taxied too fast. I have had it lift off at less than half throttle. Because the Platypus is so close to the water it is not bothered very much by the wind. I have had no problems taxiing either crosswind or downwind. I have also taken off and landed crosswind without difficulty.