the DUCKLING

BY
KEN WILLARD

Taking advantage of the throttlable G-Mark .030 R/C engine, our designer has come up with a cute little water bird that's small enough to take along in your fishing tackle box, just in case they ain't biting!

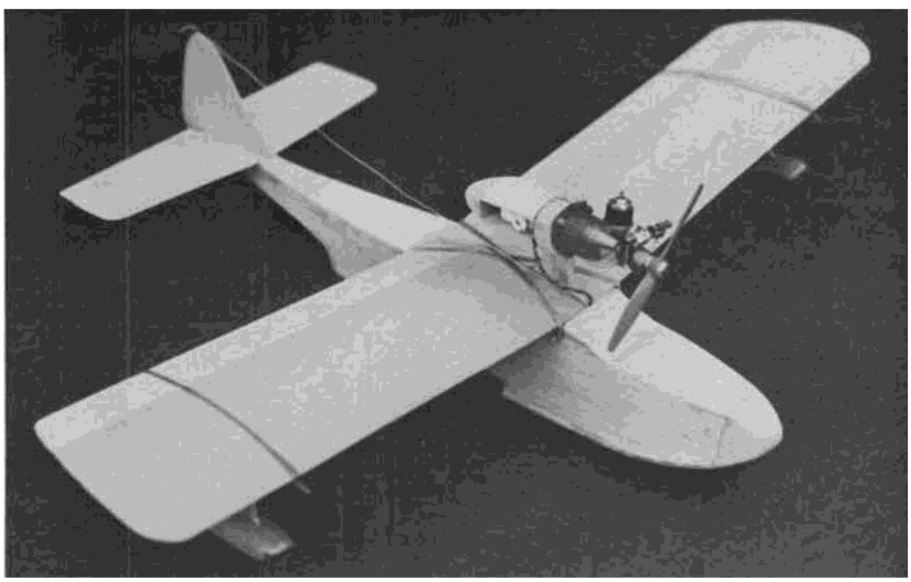
•In the past, the design and development of small radio controlled models has been hampered by the lack of a small engine which could be reliably throttled down so the model could be taxied out for takeoff, then, once airborne, run at a cruising speed rather than zipping around all the time at full power. Some throttles have been made for .049 engines, most notably the Hiscott, but for the even smaller engines, like the .020 and .010 Cox, no throttles exist other than homemade. In my opinion, that is one reason why the Tee-Dee .020 and .010 engines were discontinued: today's radio modeler wants the flexibility of power from idle to full throttle.

When the G-Mark .030 engine appeared, it eliminated the shortcoming of small engines' lack of throttle. The speed range, using a 4-1/2 inch dia. by 2-1/2 inch pitch Cox prop, is from 5,000 rpms up to 20,000 rpms, using Cox "Red Label" fuel, or Sheldon's 40% nitro. Yes, those fuels are expensive, but, as I tell the guys with their .40s and .60s, "You fellows *spill* more fuel in a day's flying that I *use*." So, the expense is secondary. One two-ounce bulbful will last all day.

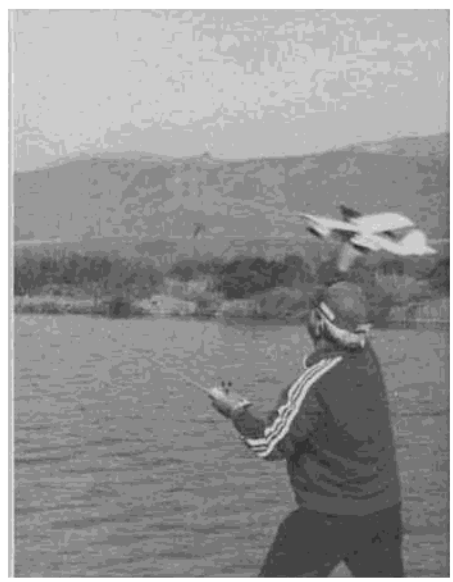
The Duckling was specifically designed to use the G-Mark .030 engine. To make the design even more versatile, a quickly removable landing gear can be installed so the model is "amphibious" and can be operated off a runway as well as a pond. The only thing that I did, when flying off water, was to remove the rear half of the muffler on the .030 to make it easier to prime, and also easier to clear out any water which got into the engine when the Duckling decided to dunk. And it does, occasionally, but usually without damage; a quick dryout in the sun and you're ready to fly again. The all balsa sheet construction, when waterproofed with an overlapped Super Monokote covering on the outside, and clear dope on any exposed wood, makes it shed water "like off a duck's back."

Of course, the size of the Duckling requires that you use small radio equipment. The plans show the Cannon Super Micro unit, but by some rearrangement of the receiver, servos, and battery pack, other small units can be installed. They may be a bit heavier, but the .030 has plenty of excess power for this size model. One minor problem is that the model is so small that a full length antenna trails too far aft. Solution: shorten the antenna, but get someone with the right equipment to retune your receiver to your transmitter with the short antenna installed. Another solution: run the antenna back to the top of the fin, then over to one wing tip, and let it trail from there a few inches. In any event, the model's size means it can't go too far out or you'll lose sight of it.

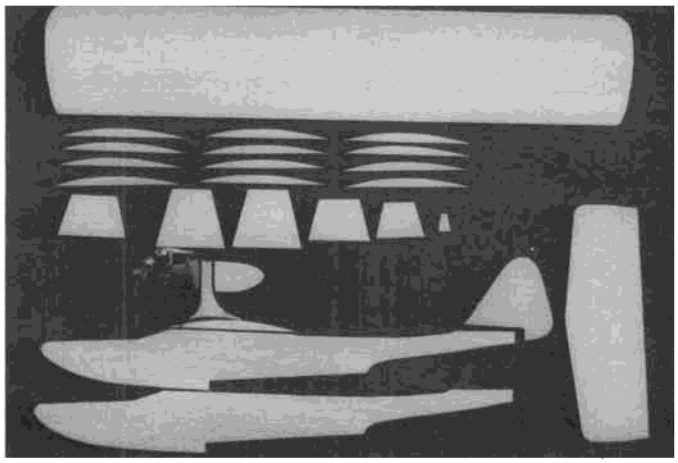
The construction technique is, to say the least, ultra simple. The sheet balsa structure, with some small amount of block balsa carving on the engine pod and the tip floats, can be Hot Stuffed together in a couple of evening's work. As you can see from the photo of the cut out parts (a few are not shown) there are only about 35 pieces in the whole



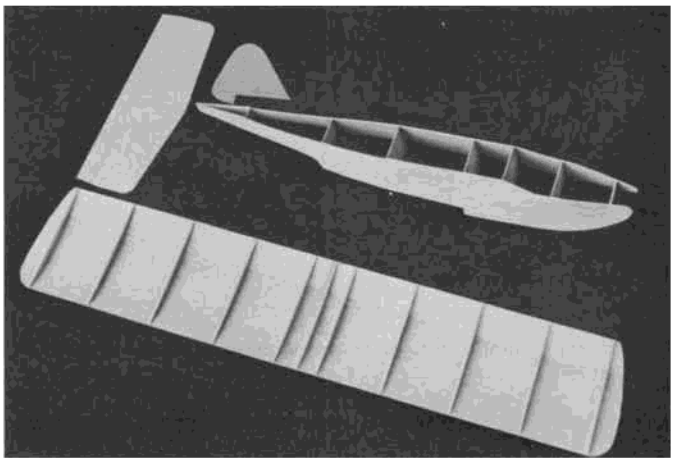
Proof that a little color and decorating go a long way in improving looks, here's the Duckling all ready for plastic clothing and make-up. G-Mark .03 R/C engine.



Ken gives his Ducling the old heave-ho over a local pond. Cannon Super-Micro.



Best way to build a model of this type is make yourself a kit (or two!) of cut-out parts first. Assembly then goes quickly.



See? Just a few moments later, with a little C.A. glue, and things are taking shape. Waterproofing interior a good idea.

model. So let's put them together.

WING

Build the wing out of one piece of 1/16 sheet balsa, 25 by 5 in size. Cut out the 12 ribs to the shape shown on the side view of the hull, place them in position on the plans, with a sheet of wax paper on the plans to keep the ribs from sticking to them. Place the sheet of balsa over the ribs, and hold it in place while Hot Stuffing the ribs to the sheet by piercing the wood with a pin at 1/2 inch spacing along each rib. Be sure the sheet of wood is flat on the table top (which also must be flat) at the leading and trailing edges. Then, when you lift the wing off the table, it is all formed except for the dihedral. Slice the wing in half between the two center ribs, Hot Stuff a piece of 1/2 inch trailing edge stock between them, and viola, instant dihedral! Wing structure done.

ENGINE PYLON

This is probably the trickiest part of the construction. Cut out the length of 1/2 by 1/8 inch plywood and insert it in a 1/2 by 1/8 inch hole cut out in the center of the wing so the bottom of the plywood pylon is flush with the bottom of the center ribs. Next, cut out the 1/2 inch thick pieces of basswood which serve as the mounting surface for the backplate of the engine. Hot Stuff them to the sides of the plywood pylon, then, using small pieces of balsa block, build the housing for the servo behind the pylon. The plans show the sizes for a Cannon Micro-Mini servo, but you can adapt the size to fit a slightly larger size if necessary. Note that one side is left open so the servo can be inserted and removed easily. To hold the servo in place, wedge small blocks of balsa which will fit under the servo mounting lugs. The vibration of the .030 is so small that the wedge fit will retain the servo in place. Cover the opening on the side with tape, as shown in the photo.

Finally, add the balsa fairings to the plywood pylon and sand to a streamline shape. These fairings also serve to increase the strength of the pylon in the longitudinal axis.

HULL

This is easy. Just remember one thing . . .the inside of the hull must be waterproofed. Here's how I did it. Cut out the hull sides, Hot Stuff the bulkheads. Next, glue the bottom in place. Then, before going any further, apply a couple of coats of dope to the *inside* surfaces. Following this, attach the servos to the hull sides with servo tape, make the necessary holes in the bulkheads aft of the servos and route the flexrods back to the openings at the rear. Where the flexrods exit the sides, seal the holes so water can't enter. This can be done with either Hot Stuff and baking soda, or with epoxy.

Depending on the weight of the balsa you use for the tail feathers . . . and use medium weight for the best compromise between weight and strength . . .you'll have to put the receiver and batteries in the forward compartments. To determine where, temporarily assemble the wing, tail feathers and hull, with the engine mounted on the pylon, and balance so the balance point is as shown on the plans. You may find that instead of locating the batteries and receiver where I did, they will have to be in the forward compartments. Or maybe the receiver in the compartment just behind the servos, and the batteries up behind the noseblock. Whatever you do, be sure the balance point is where

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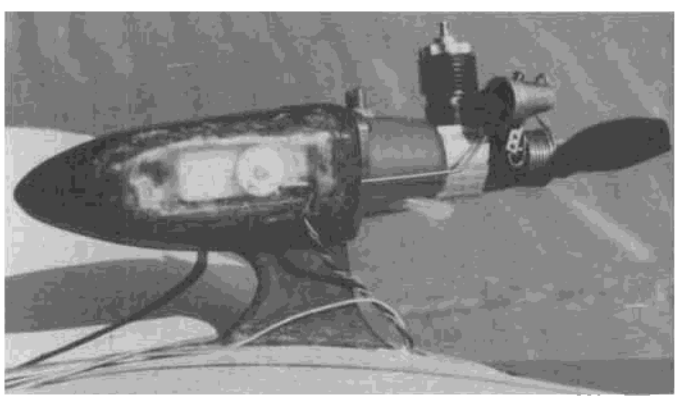
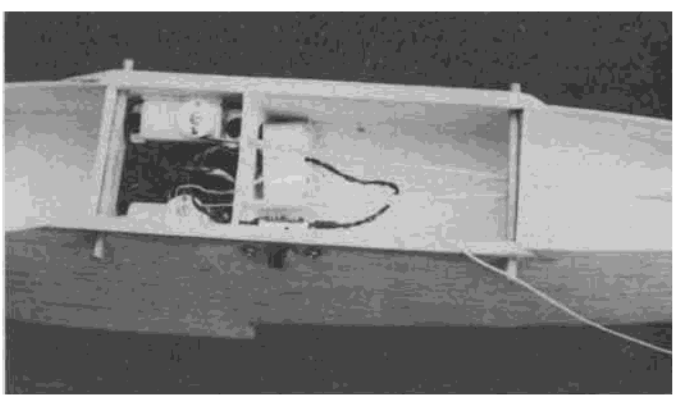
Ken checks throttle prior to making a flight on land. Yes, it was a Sunday!



Engine mounting pod is built up to enclose throttle servo. Plastic cover sealed with tape. Note tank mount, spring starter.



Simple and compact radio installation. Servos double-stick foam taped to fuselage sides. Good exit angle by crossing pushrods.

the plans show it to be . . . or maybe a tad forward. If you let it get back of that point, you'll find the model very skittish on the elevator.

With the balance established, and the servos and flexrods installed, you can now Hot Stuff the top sheeting in place. It isn't absolutely necessary to waterproof the inside of the top sheeting, but you can do it by brushing some dope on the inside surface before you glue it in place.

EMPENNAGE

In case you don't recognize the term, empennage is French for "tail surfaces." Just thought I'd keep you alert. These are cut to shape from sheet balsa, and the stabilizer and fin combination glued to the top of the aft end of the hull. The rudder and elevators can be attached later, during the covering process.

ASSEMBLY

A quick look at the plans shows how the wing is held in place with rubber bands. I get a kick out of one manufacturer, who says "rubber bands went out with high button shoes." Mebbe so . . .but high button shoes kept a lot of feet dry when later, "more modern" fasteners let the mud and slush into your shoes and gave you a sniveling cold. So, I still use rubber bands. If you have a better way, use it.

Since the Duckling is amphibious, it must be water resistant in the covering. Doping the surfaces will accomplish this; alternatively, covering the surfaces with Super Monokote overlapped, will also do the trick. Either way will work.

To hinge the rudder to the fin, and the elevator to the stab, I used Monokote trim strip. It's simple, it's quick, and it does the job. Here again, the process is a matter of builder's choice. You like hinges? Use hinges.

TIP FLOATS

These are built up from small pieces of scrap balsa which nearly every modeler has in his balsa box. Just cut them to shape, Hot Stuff them together, and then attach them to the rib at the location shown on the plans. Dope them to waterproof them.

LANDING GEAR

This is an optional feature. If you only plan to use the Duckling as a flying boat, don't bother. But if you want to fly off a runway, just make a main gear axle out of 1/16 wire, put one inch wheels on either end, and Hot Stuff the wire to the bottom of the hull. Then, Hot Stuff a Goldberg wingtip skid to the center of the bottom of the hull at the rear step, as shown on the plans, and you have a "traildragger."

FLYING

The Duckling has a very standard type of plan form, with wing and stabilizer surfaces at normal differential angles of incidence relative to a reference line, and the vertical fin and rudder area is also within the usual relationship of wing area and dihedral for rudder controlled movement. As a result, the flight performance can also be best described as "normal." Just one word of caution; the model is small. Thus it reacts very positively to control surface actions, so keep the movement of the controls limited to small angles. As a starting point, set up the linkage to the elevator so that maximum travel is about 3/16 inch up and down from neutral, and maximum travel of the rudder is about the same, or maybe a bit less, around 1/8 inch to either side of neutral. Later on, if you want more violent action, you can realign the control horns and servo wheel offsets to suit your taste. But the Duckling is very "zippy" and if you aren't ready for it, it will snap roll right now.

Finally, one last word of advice. When you go out to the pond to fly the Duckling, be sure to take along some kind of "retrieval" vessel. All seaplanes and flying boats are subject to water spray getting into the prop and stopping the engine . . . usually just out of reach (Murphy's Law) . . . so be prepared. But if you taxi out, line; up into the wind, apply full power, and keep the Duckling going straight, she'll come up on the step, take off (maybe with a bit of up elevator) and then you can throttle back and cruise around for about four or five minutes. Or, leave the engine at full power, and do aerobatics. Whatever turns you on.

And I'll guarantee you. When you fly the Duckling, it'll turn the crowd on. It's fun to fly, and fun to watch.

What more can you ask?

Let me know how yours turns out •