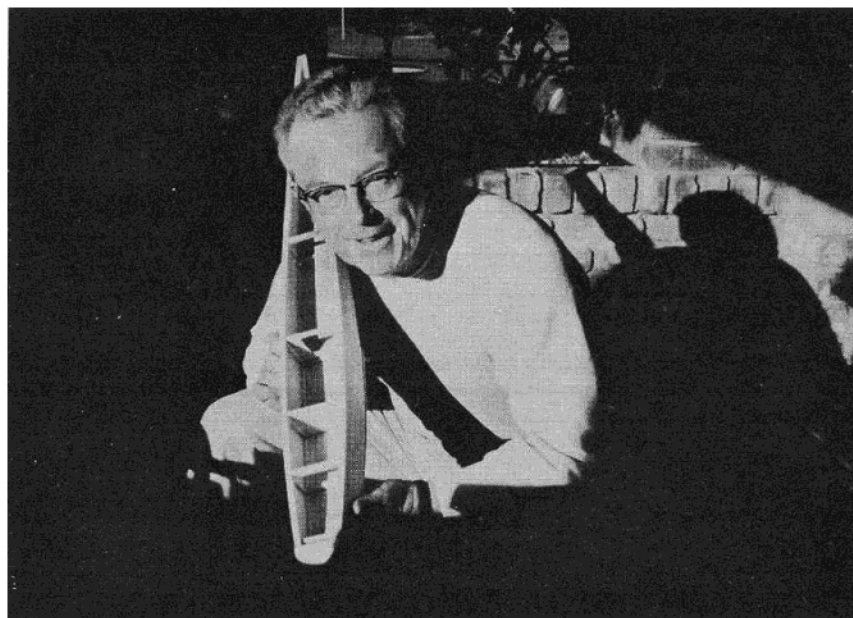


KEN WILLARD'S
SHEARWATER





RCM's Chief Sunday Flier with semi-completed Shearwater fuselage.

BY KEN WILLARD
RCM CONTRIBUTING EDITOR

FLYING boats have always had a special appeal to me, and judging from the number of requests I get for flying boat designs, a lot of you modelers are similarly inclined.

There's nothing prettier to see in aeromodeling than the sight of a model flying boat taxiing out from the shore, with the bow wave curling out and leaving a rippling wake, then, as full power is applied, the boat surges up on the step, picks up speed, skips a couple of times, and then lifts into the air with the water dripping off the hull and punctuating the end of the boat's wake with a series of little splashes.

Or, maybe it's just as pretty at the end of the flight to watch the flying boat gliding in over the water, particularly if the latter is smooth, and seeing the boat come down, meet its reflection and destroy it with the wake as the ship slides over the water, slows down, and sinks into floating position to taxi back to shore.

In between the takeoff and landing, the sleek appearance in flight with no landing gear hanging down, adds to the overall beauty of the flight of the flying boat. No wonder they're popular. And there are some real beauties on the market, too. Jetco's "Navigator" is a classic, and you can still find a Berkeley "Privateer 15" in some shops. But man! The work involved! Great for the dedicated modeler who loves construction detail, and a chore for those who don't! I'm one of the latter — a disciple of simplicity in construction.

So, I established an objective for a new flying boat design — it should be as simple as possible to build, yet be seaworthy and airworthy. And pretty, too!

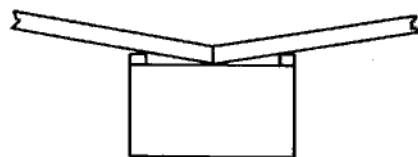
What's the simplest fuselage to build? The "box" type — sides perpendicular to the top and bottom. Okay. Do away with the sloping side and "V" bottom of earlier flying boat designs like the "Dreamboat" and the "Li'l Swell." I knew the flat bottomed hull would work — the "Hydrohoney" proved that — so a profile was sketched.

A flat bottom makes a bow wave that doesn't curl away until the boat is on the step. Instead, the wave breaks forward, like the bow wave on a barge. So, a long nose with a gentle upswing on the bottom will minimize the spray from the bow wave when the boat is taxiing. It also helps the model to rise to the step.

The corners between the sides of the hull and the bottom should be sharp, but the corners at the top can be rounded to minimize the boxy appearance. $\frac{1}{4}$ " longerons the full length of the hull allow you to round the corners off — and suddenly the hull doesn't look boxy! Like so:



Next simplification — mount the engine pylon directly to the hull instead of the wing. Makes it easier to set up engine control and easier to build the wing. Then, put runners along the top of the hull so the wing is cradled to allow a simple dihedral joint. Like so:



Sheet balsa for the tail surfaces is as simple as you can get, so use it.

One of the easiest wings to build is the Schoolmaster wing, so that's what's shown on the plans. However, you'll note from some of the photos that I used a built-up wing. Why? Because I had it on hand. It is the prototype wing for the Schoolmaster before we went to the full sheet construction. Like I say — do it the easy way.

Before going into the construction, let me tell you about the name. I showed the profile to my son, Don, and said "How do you like that? Don't you think it'll slice through the water real nice on takeoff?"

Don is interested in shore birds, such as Terns, Curlews, etc. He disappeared into his library, and came back in a few minutes and said — "You should call it the Shearwater. That's a fast flying bird that lives around water and is sorta' long and sleek."

So I did. It fits.

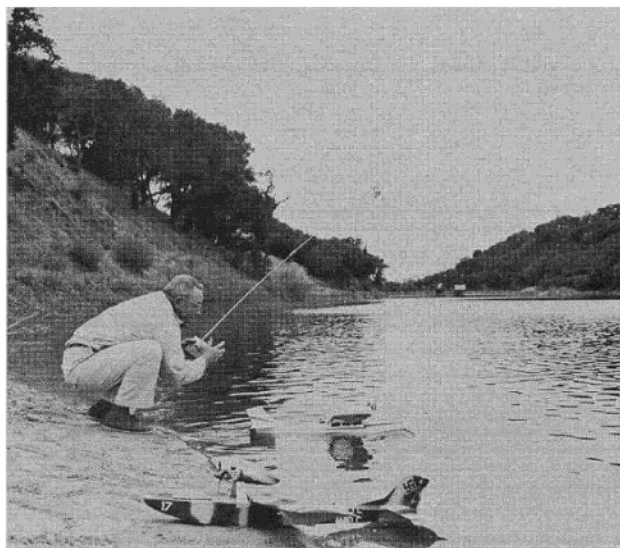
You'll also get a kick out of the story behind the beautiful Shearwater in German patrol boat markings. Scott Christensen, a local modeling friend, built it, without plans, by copying mine — and then he drew the plans after the plane was finished! And we're using his plans because they're excellent to work with.

Now, a few words on construction.

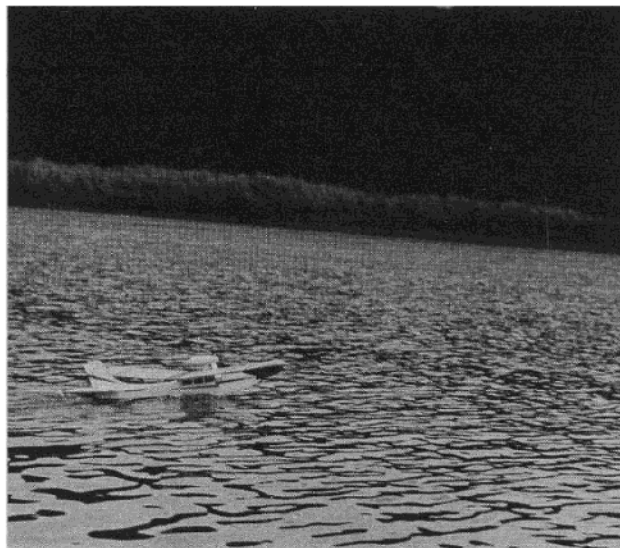
Hull

This goes together real easy. Only one part is a little tricky, and that's pulling the sides together at the nose. The two sheet sides should be of the same consistency balsa so they will bend equally. But, to be absolutely sure the forward bend is equal, pull the sides in, hold them tight against the crossbraces at the nose, either clamped or with rubber bands as the photo shows, then check the curvature of both sides. If it's not even (mine wasn't), then put in a temporary diagonal brace which is just long enough to force the sides to equal curvature. Now, glue the crossbraces and the nose block firmly in place and let dry thoroughly. Leave the brace in until you've sheeted the bottom of the hull — and thus the equal curvature is assured.

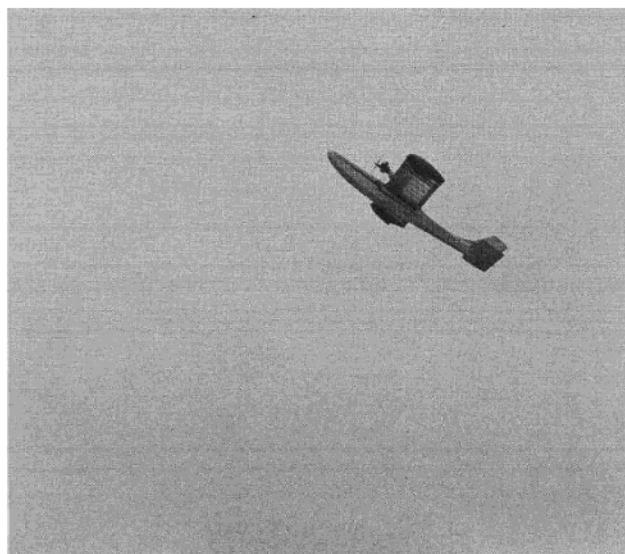
Leave the top of the hull open until you've mounted your guidance equip-



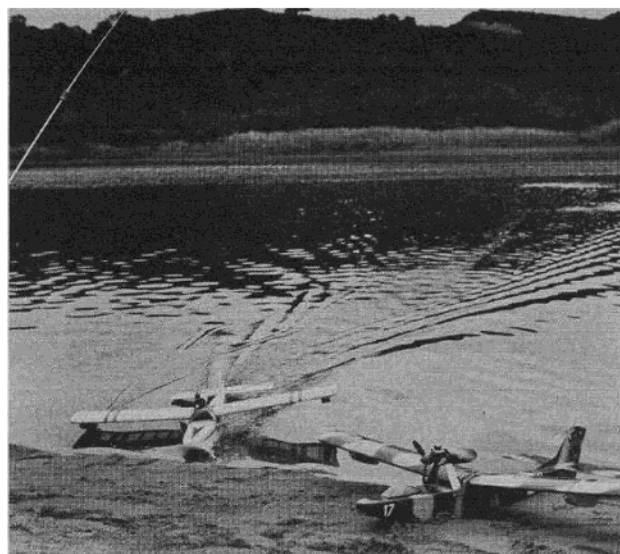
The start of a flight. Note bow wave along hull.



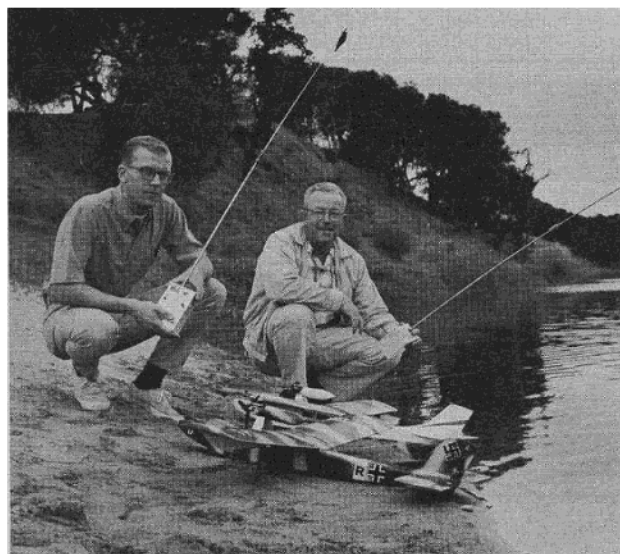
Taxiing out, the Shearwater gains speed for lift off.



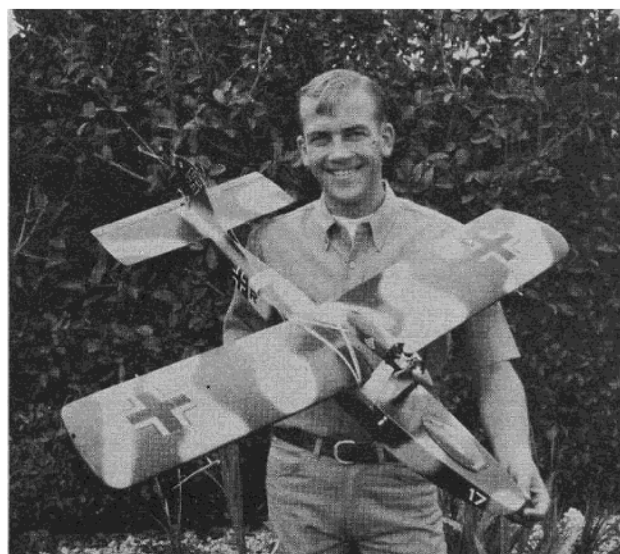
Airborne — up and away.



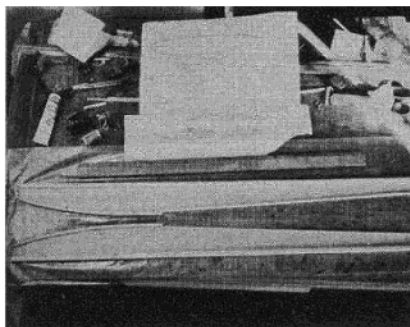
The return to shore after the flight.



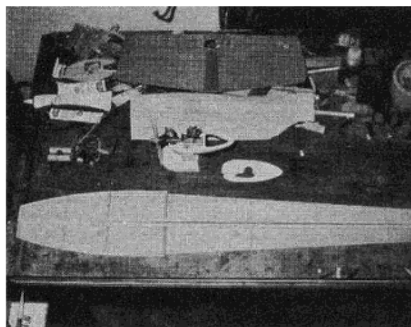
Two happy flying boat fans.



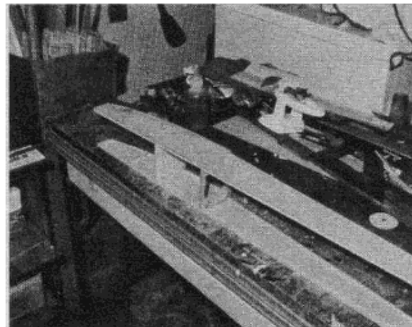
Closeup of Scott Christenson and Shearwater.



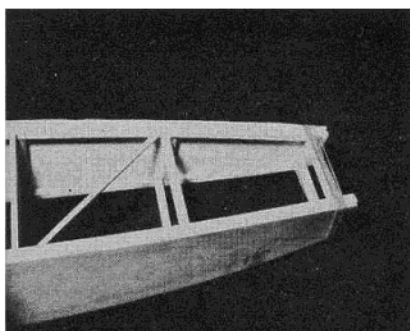
Layout sides and glue on longerons.



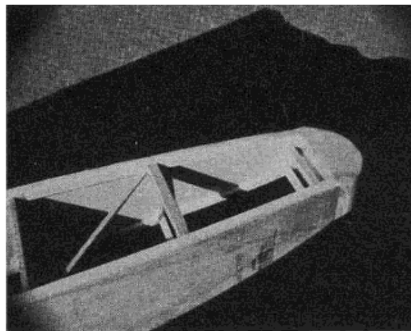
Add all uprights to sides.



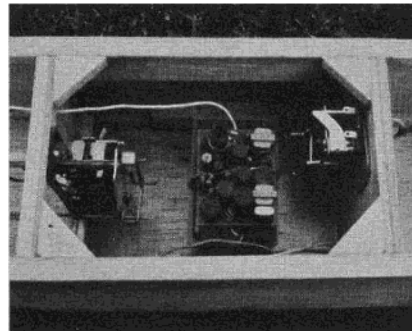
Join sides together with bulkheads.



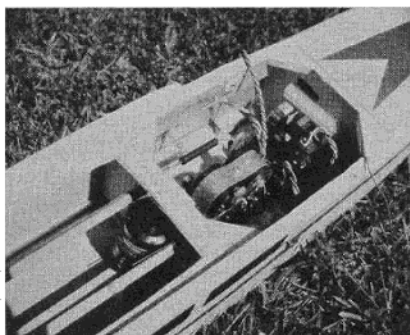
Pull nose together and glue.



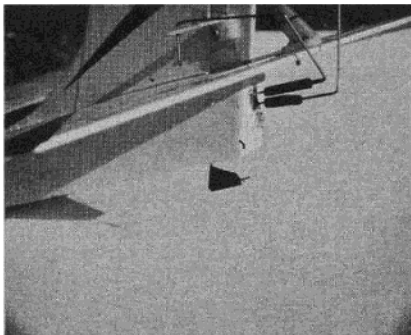
Add noseblock and pull tail together.



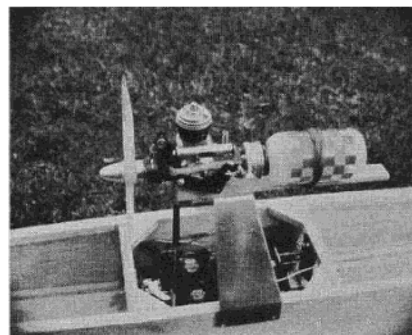
Install equipment (escapement version).



Install equipment (Airtrol version).



Jury Rig' pushrod for Airtrol. Adjust by slipping wire into tubing.



Make and file pylon.

ment and checked it out to be sure everything works without binding.

As for the guidance, you have many choices. My original installation is shown in one picture — Babcock Mk II escapement, C&S 'Finch' receiver, O.S. Minitron motor control escapement. The other photo shows the more recently installed Airtrol RE-1 setup. But the compartment is big enough to take any of the galloping ghost units like Rand, Tomoser, World Engines, etc.

The engine pylon takes a little doing, unless there's a machine shop near you with a cutter and press to cut and shape the aluminum. If not, you can make up a pylon from $\frac{3}{32}$ " plywood and aluminum cut from a landing gear blank.

Note the photo showing details of the engine, tank, and exhaust control linkage. It shows how the engine bearers bolt to the aluminum. With a one ounce tank, the .049 runs long enough for sport flying, and the mounting behind the engine just fits inside a standard

ENGINE BEARERS BOLTED THRU PLYWOOD AND ALUMINUM



Fig. 1 CUT OFF L.G. HERE

toilet paper cardboard roll. Add a balsa tapered block at the rear, and Voila! Instant cowl.

Wing

Nothing new or difficult here. Just decide whether you'll use escapement or servo control for higher dihedral, or GG proportional for lower dihedral as shown.

Tail Surfaces

Straightforward sheet construction. Longitudinal stiffeners in stab add strength.

Wingtip Floats

These are made from soft block balsa, carved to shape, and held on with rubber bands. If you use the dihedral for escapements, drop the float lower with $\frac{1}{2}$ " spacers so the tip of the stab doesn't drag

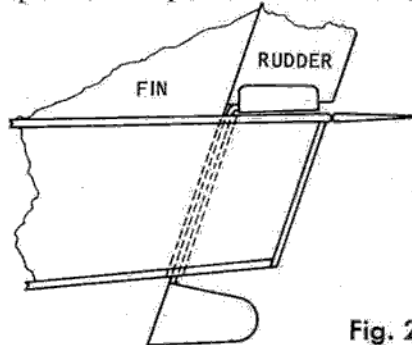


Fig. 2

(Continued on Page 83)



SHEARWATER

when the model lays over and rests on the tip float.

Finish

Optional. My original prototype was HobbyPox. Scott's camouflage job is sprayed AeroGloss dope, purposely kept at a matte finish for realistic appearance. (A flat finish can be accomplished by mixing talcum powder with colored dope.)

Just one thing. Make sure the finish is completely sealed so the balsa won't soak up water. You'd be surprised how much water will seep through a pinhole! Also, make sure the hatch fits snugly when screwed down in place. Coat the bearing surface for the hatch with a thin layer of Vaseline before tightening down — it'll help keep water out.

Control Rod Exits

A slot is impractical on a flying boat for control rod exits. Too much water will enter these areas, so some other means is required. No problem with

escapements since the rods merely turn in the bearing holes and a little Vaseline will both lubricate the bearing and make it water resistant as well. The photo shows how I "jury rigged" pushrods to use the same holes for my RE-1 proportional installation that I used with escapements. Not very neat, but very practical.

Another way to keep the control rod exit hole snug would be to use the new flexible shafts in nylon tube housing. The tubing could be epoxied to the hull where it passes through.

Be sure and waterproof the guidance compartment under the hatch. Water is bound to seep in there a little bit, no matter how snug a fit you have.

Cockpit-Canopy

This is an appearance feature that is optional. Most of the time I flew the prototype without the canopy installed. I have one which fits just forward of the wing and behind the prop, and fair the leading edge down to the hull. But Scott chose the Dornier type — out in front of the prop as shown on the plans. Take your pick.

Flying

Since the Shearwater is designed for both water stability and air stability, a certain amount of compromise is necessary. The long nose is necessary for good water characteristics, but it does tend to make the model hang in a turn when airborne. You'll find it necessary to fly it out of turns, and when you do, the air pressure on the bottom of the upswept hull makes the recovery have an attending zoom. You can overcome this with a little down elevator if you're using the Airtrol RE-1 proportional system or a Galloping Ghost setup. With an escapement, you'll learn to bring it out of the turn part way, then let up for a second before bringing the model all the way out.

But let's talk about water handling first. Using a setup with motor control, turns can be made at idling speed if your rudder throw is around 20 degrees in either direction. At cruise or high speed, the long aft section of the hull tends to overcome the rudder action. You can make gentle turns, but if the model gets headed downwind, it goes through the water so fast that you have to reduce to idle in order to turn into the wind. When I installed the Airtrol RE-1, which doesn't provide for engine control, I also added a small water rudder tied in with the air rudder, by running an aluminum tube through the hull in line with the rudder axis. A wire was then inserted, and bent to fit the bottom of the rudder. Then I soldered a thin sheet copper rudder to the wire, like this: (see Fig. 2 on page 27.)

This makes the Shearwater very maneuverable on the water, but it added a lot of drag, and the model would not take off until I changed the cylinder and piston on the Medallion to the higher power combination that is on the Tee Dee .049. Then there was no trouble in taking off, but two things happened — the idle characteristics became very poor, and at full power, after the Shearwater is airborne, she really scats! These characteristics can be minimized by using a GG setup where you can adjust power as needed.

Try to keep the all up weight of your model at 24 ounces or less — then the stock Medallion .049 will be fun for takeoffs and flying. If you use medium weight balsa and don't "overdope" or "overpoxy" you should hit pretty close to 24 ounces. Scott Christensen's Shearwater came in at 28 ounces — but as you can see from the photos, he really put a finish on his model. No problem — you just need a little more power like the Tee Dee .049 will give.

The Shearwater is very sensitive to elevator trim. And if you happen to trim out a little tail heavy, watch out! She'll take off, nose up sharply, stall, and dive back in before you can correct. However, with the CG as shown on the plans, the elevator should trim right out in line with the stab. About 2 degrees down-thrust also helps the trim.

In contrast to some single channel designs, which will do a pretty good job of free-fighting, the Shearwater has to be "flown" when under power, since the big fin and long nose tend to make the model want to spiral once it gets into a turn. In the glide there's no problem, though. Just get it headed into the wind and it will land on the water without having to be flared, although if you have proportional elevator, a flared landing is beautiful to watch.

So, build yourself a Shearwater. It's simple to construct, relatively easy to fly — a little harder with escapements than with proportional or GG — and one of the most thrilling models in the sport category that you'll ever build.

Tell me about yours.

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