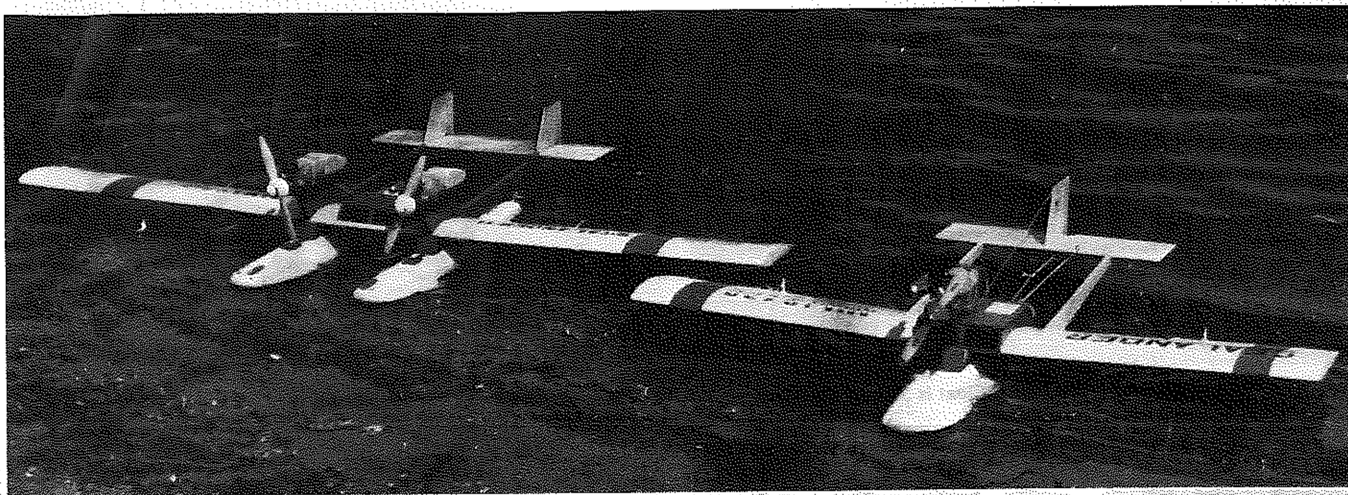


PHOTOS BY THE AUTHOR

SEALANDER I & II

By GEORGE A. WILSON, JR. . . . In a two-for-one article, we present two very functional seaplanes by a modeler who specializes in water-based R/C aircraft. Both ships employ the molded Gee Bee Mk. IV float.

• The "Sealander" designs are outgrowths of the author's "Seasquare GT" and Don Foster's "Islander". Both of the parent designs are highly successful in their own fields. Seasquare GT is fully aerobatic and Islander is a stable sport plane. The Sealander design, with its semi-symmetrical wing (Bill Northrop's SSS-302 airfoil, modified for 15% thickness) and low profile can be a stable sport plane when built for three channels as "Sealander I" or a full bore stunt plane when built with four channels either as the "Sealander I" or the "Sealander II", with twin motors. In any case, Sealander is a design that includes *no* frills. It would appear to be the simplest configuration that can be devised that has all the features that go into a good seaplane: low profile for best water landing, full water-proof RC installation, good performance in the air, and minimum building time.

Although land gear can be added to these designs, it is the author's opinion that a good seaplane belongs on the water. If you must, add land gear. We'll bet you get more "dings per flying season" by a factor of ten when land flying. Water is softer than the ground no matter at what speed you hit it! We learned to fly off water. It is a great way to learn if you have proper waterproofing and a good (inherently stable) trainer.

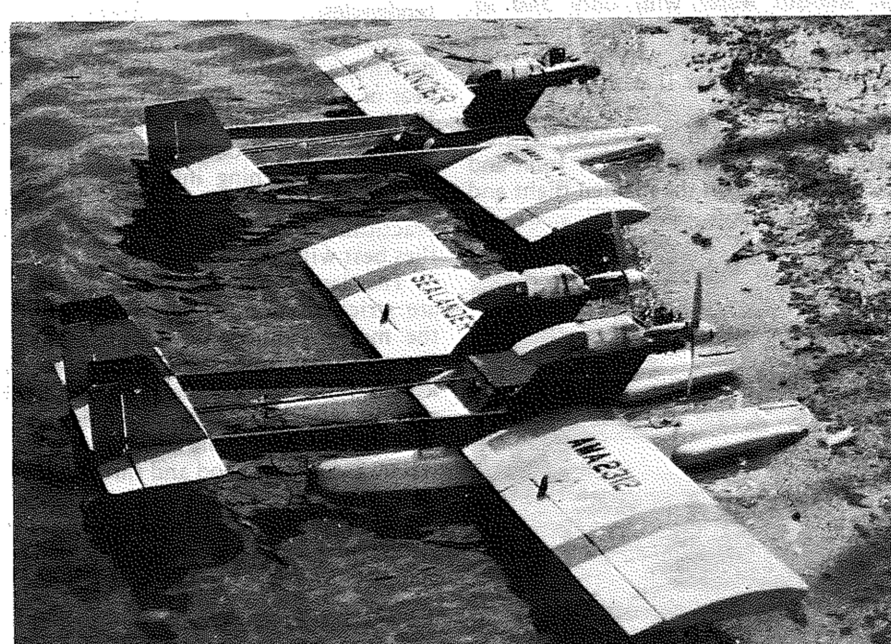
Both the I and II designs are quite similar. Except for special details, the construction information that follows is applicable to either. No attempt has been made to reduce the construction information that follows to the novice level.

Both versions of Sealander have been built and test flown and we have tried to incorporate the products of experience gained during the process. Sealander I was built by Charlie Pitts and the author. Sealander II was built by the author. John Ross and Ed McCarty were the test pilots.

Sealander II was built and flown first. Its test phase was not an easy exercise. It took off and flew well with two O.S. 20 engines . . . this certainly bears out the theory that two engines are better (more powerful) than one engine of equivalent displacement. On the other hand, if you really want to stunt this model, a pair of 30's would not be unreasonable.

Once in the air, the expected set of "gentle" maneuvers including loops and rolls were performed easily at full throttle. The problem came when John cut the power back and eased the stick forward. At this point, the model wanted to glide like a brick. Landings were hard and frequently preceeded by a snap roll. We added wing area . . . ten inches to each side to give a span of 74 inches (740 square inches of area), changed the angular difference between the wing and stabilizer, and added vertical fin area. All these changes did effectively nothing.

We were about to write the design off when John was giving a demonstration flight and tried a shallow dive which followed its normal course but even more violently: as the model approached the water at about 20 degrees the author suggested that John quit showing off, to which he replied, "I'm holding full up, what else should I do?"



Sealanders I and II sitting at the water's edge. Note lead weights on front tips of Sealander II's floats. Like all models, Sealnders "groove" better with a forward C.G.

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The model pulled up in the nick of time and subsequent examination turned up an elevator servo that would produce down elevator easily but was sluggish in returning to neutral; sometimes sticking in the full down position.

This explained the problem. Even the snap rolls before landing were explained: full up control at the last minute to prevent diving into the water resulted in a delayed full up elevator, a stall and a snap in the direction of the torque. With a new servo installed, flights have been routine with no bad habits. Single engine operation has not been attempted but should be no problem. The use of counter-rotating propellors was decided against for reasons of cost, convenience in starting, and safety.

The final plan shows Sealander II with a 68 inch wingspan. This should provide all the area necessary for reasonable wingloading, good takeoffs, and fairly low flying speed. Bear in mind that the original tests were done with a 54 inch span. Takeoffs occurred with no trouble on smooth water with only 540 sq. inches of wing area. For those who like hot flying machines, why not try a 54 inch span Sealander II with a pair of 30 engines?

Unlike the twin, Sealander I "flew right off the drawing board". John and Ed both flew it on the maiden flight and put it through the full set of standard stunt maneuvers. The only changes that were made were 1/16 inch down trim in the elevator and three ounces of lead was added to the front of the float to move the CG a bit farther forward for more "groovy" flight characteristics. Even with no change in the CG, the model was easy to fly and had no bad tendencies.

Again, the amount of power will determine whether either Sealander is a bear or a pussycat. A hot 40 in Sealander I will make it a full-house stunter. A 29 will make it a good transitional trainer for those switching into seaplanes. In either case, build the models as light as practical. It is true that any design flies best with minimum weight.

The large sponsons on Sealander I are strictly functional. At five pounds, the model requires the extra displacement to float properly. The extra width keeps water out of the propeller, and gets the model up on the step quickly.

Both models handle very well on the water. Steering is good and three or four inch waves are no problem for them. Their "low profiles" make them very stable on the water under windy conditions.

WATERPROOFING

Structurally, Sealander has two built-in waterproofing features. First, the RC gear is all mounted in a waterproof cabin, or in a waterproof housing inside the tank fairing. These compartments are sealed with 1/8 x 1/8 strips of closed-pore neoprene sponge rubber. (Some scuba diving shops stock this material for repairing wet suits.)

Second, the control rods pass in and out of the sealed compartments through nylon tubing (Nyrod) seals. A 1/16 music wire rod is used and, where it passes into the compartment, it has a piece of 1/16 I.D. nylon tube over it and fastened to it. If desired, 2-56 threaded rod ends can be screwed into each end of this piece of tubing. The piece of tubing just described slides in a mating piece of tubing which is epoxied to the compartment wall where it passes through. To eliminate binding, the outer tube should not be epoxied in place until the linkage from the servo to the control horn is installed and working freely. Enlarge the hole in the compartment wall as necessary to allow the rod to work freely. Then, fill any gap that exists with balsa and apply the epoxy.

We recommend Titebond or equivalent as a general cement. Its ideal working time for wood, its fuel proof nature, and its non-brittle characteristics make up for any possibility of it dissolving in water. We have successfully repaired several water-soaked seaplanes built with it. In any case, if you get water inside the model, get it out as soon as possible and make sure the inside is dry before you seal the structure again - better still, fly *over* the lake and stay out of the trees!

The insides of open structures (e.g., the wing) should be doped or epoxied before they are covered. This includes the parts of the wing that are balsa covered. Before the top sheeting is added, the inside of the wing and the bottom of the top covering should be doped (thin slightly to make the dope flow easily) or epoxied (dilute Hobby-Poxy Formula II 1:1 with thinner or 90% pure isopropyl alcohol).

If you use heat-shrink material for covering, make absolutely sure all the seams are tight. Polyeurethane varnish has been recommended as a sealant.

Half the fun of water-plane flying is being able to be at the lake all day without worrying about your RC equipment getting wet or the CG shifting because you have water slushing around in the model. Do a good waterproofing job! It doesn't take much time as you build, and it's almost impossible to do a good retrofit job.

CONTROL LINKAGES

The control linkages shown on the plan will have to be varied to mate with your particular brand of RC equipment. Before you start putting things together, you should try your system to see if your servo rotations are like those used in the original model and to modify the plan accordingly. Typically, for proper aileron motion, you may have to run the aileron nyrod farther from the bottom of the wing to pick up the top of the servo arm rather than the bottom as shown.

Sealander I may use a throttle linkage similar to that shown for Sealander II, where the throttle servo is mounted in the cabin. In this case, all the RC equipment is mounted in the cabin; the servo extension cord and the waterproof housing atop the pylon are not necessary.

Less "exposed" linkages were considered but simplicity, minimum binding, and minimum weight won out. Nyrod can be snaked throughout the wings and booms for the rudder and elevator linkages if you prefer a less visible linkage system. *(We'd prefer a system that eliminates the long, unsupported wire pushrods, especially since "up elevator" is a compression motion rather than a pulling motion. wcn)*

With the exception of the "coordinated" rudder system required in Sealander II, the linkages can be standard installations. The coordinated rudders work as follows: the left-hand air and water rudders are linked using a standard horn/clevis/rod system on the left (outer) side of the rudders. The right-hand side is similar with the linkage on the right (outer) side. The two water rudders are linked together with a horn/clevis/rod link that runs at right angles to the model's centerline. The foregoing linkages make all the rudders wiggle in unison. The servo is linked from the cabin to the left water rudder and drives the other rudders through the linkages previously described.

NOTE: A simplification in the rudder system for Sealander II has been suggested such that the water rudders are mounted directly below the air rudders on wire extensions. This system has worked very well on other seaplanes and has the added advantage of providing added rudder moment.

Check any long unsupported linkage runs (with the engine(s) running) to find any vibration resonances or bending that may occur under load. It may be necessary to stiffen the offending rod by doubling it with a piece of wood or by substituting a conventional wooden rod with metal fittings at each end. *(Unfortunately, air loads can only be tested under flight conditions. Again, we'd caution against compression loads on unsupported 1/16 wire pushrods. wcn)*

CONSTRUCTION ORDER

Sealander I should be built in this order: 1) build wing center section; 2) build engine pylon; 3) combine center section and pylon; 4) add cabin; 5) build stab, vertical fin and booms; 6) mount vertical fin on stab; 7) mount booms on wing center section with stab pinned in place for alignment purposes; 8) build and install wing tips (omit top sheeting and tip blocks); 9) install stab/vertical fin assembly (add elevator and rudder after covering); 10) build and install float mount and spray deflectors; 11) build tip floats; 12) install main and tip floats; 13) install control linkages and check out RC installation; 14) add wing top sheeting and tip blocks and, 15) cover, finish, add engine/tank and find a lake to fly from!

Sealander II should be built in this order: 1) build wing center section and cabin; 2) build engine pylon / boom assemblies; 3) build stab/vertical fin assembly; 4) install pylon/boom assemblies in wing center section with stab/vertical fin assembly pinned in place for alignment purposes; 5) install stab/vertical fin assembly (add elevator and rudders after covering); 6) build and install wing tips (omit top sheet until aileron controls are checked out); 7) build and install float mounts and spray deflectors; 8) install floats; 9) install engines 10) install control linkages and check out RC installation, and 11) cover, finish, and find a lake to fly from!

WING

The center section of the wing is built first, with the dihedral braces installed and protruding ready to slip into the tip sections. Note that the plans show 1.5° dihedral for four-channel operation. If you plan to use three-channel control, modify the dihedral braces for 3° dihedral (each side) *before* they are installed.

The wing uses two full-depth spars to provide good bending strength and "D" tube construction both at the leading and trailing edges to provide good overall rigidity. The dihedral angles and the center section are heavily strengthened by doubling the spars with 1/16 inch plywood. The method of construction that follows assures building ease and warp-free wings. The instructions apply to each section; build the center section first; a pair (opposites) of tip sections can be built at the same time. *When you cut out the front parts of the ribs, save the curved scrap from under the front bottom part for later use.*

The following general assembly order should be used; 1) build the sub-leading-edge, main and rear spars by doubling with 1/16 ply and adding joiners (center section only); 2) pin down the bottom front sheeting (3 inch sheet); 3) add the bottom cap strips and middle sheeting; 4) install the main spar; 5) add middle parts of the ribs (make sure they have been trimmed to allow for the dihedral brace and that the holes for the aileron nyrods have been cut); 6) add the rear spar . . . install rear, bottom sheeting (2 inch sheet); 7) install rear parts of ribs; 8) install front parts of ribs but cement to the spar only; 9) bevel the sub-leading edge and cement the front dihedral brace to it (center section only); 10) install the sub-leading edge; 11) moisten the bottom front sheeting; 12) apply cement (Titebond) to the bottom of the sub-leading edge and the bottom of the ribs; 13) slide the curved scrap pieces you saved when cutting the ribs (you did, didn't you?) under the sheeting at the rib locations and the sheeting will curve nicely into place; 14) add pins as necessary and let dry; 15) add tip sections to center section before adding top sheeting; 16) add front and rear, top sheeting; 17) add middle, top sheeting only after aileron control linkages have been installed; 18) add leading edge and trim to shape; 19) add tip blocks and shape (tip sections only).

TAIL ASSEMBLY

The tail assembly is a conventional flat structure. No special instructions should be required, other than a reminder to keep things warp-free. We used rayon/silk covering (like Silray) and butyrate dope plasticized with castor oil (4 drops-to-the-ounce) to cover the stab. The flat balsa surfaces (vertical fin(s), rudder(s), and elevator) were covered with light-weight silkspan before doping.

ENGINE PYLON AND BOOMS (SEALANDER I)

The engine pylon center core is cut from 1/4 inch plywood; we used Fir Plywood because it is light, strong and easily obtained. Lightening holes may be cut in the core to minimize weight. The engine bearers are then laminated to the top of the pylon center core, adding a layer on both sides at one time. We use Titebond for laminating and clamp the assembly while it dries. The hardwood engine rails extend back to near the end of the tank. Hard balsa should be used for the remaining parts of the pylon top platform.

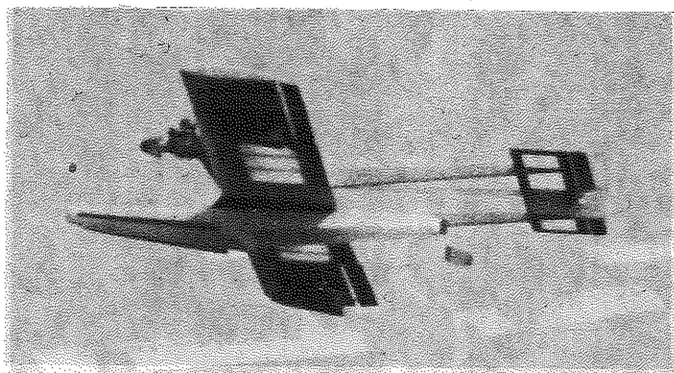
The throttle servo is mounted in the tank fairing of Sealander I. The fairing is built up of balsa block and sheeting, and is slit horizontally to allow access to the servo. A sponge rubber gasket seals the servo in. An "extension cord" is needed for the throttle servo. It should be built into the pylon as it is built. Note its location on the pylon cross section. After the top of the pylon is finished, add the 1/8 balsa sheet sides and the 1/2 x 3/4 trailing edge fairing. Note that the 1/8 sides extend 1/4 inch beyond the center core at the rear to provide a passageway (Sealander I only) for the throttle servo extension cord.

The booms are built by first cutting four 1/8 sheet sides exactly alike. Medium-hard balsa should be chosen for all of the boom parts. The 1/4 square framing is cemented to one side and the other side is cemented to the open side of the framing. Weight or pin the booms down on a flat surface while they are drying.

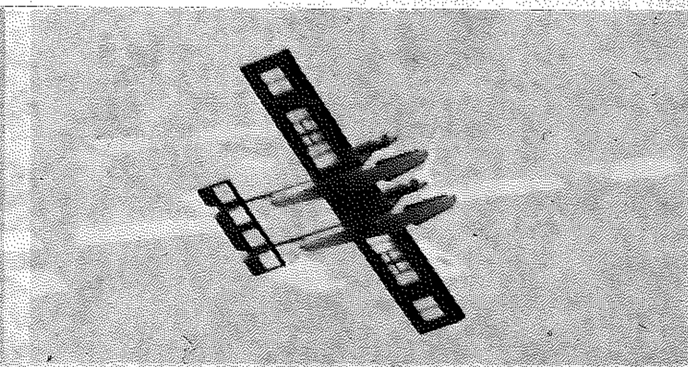
ENGINE PYLONS AND BOOMS (SEALANDER II)

In Sealander II, the booms are integral parts of the engine pylons. The 1/8 sheet boom side extensions become the sides for the lower, rear parts of the pylons. Care should be taken to build the two booms exactly alike and to assemble them onto the pylons such that the stabilizer will end up parallel to the wing center section and with the correct angular difference. Except for the integral boom/pylon assembly feature and the solid tank fairings, the pylons are similar to those for the Sealander I; go back to the previous section for instructions on the common parts.

The foregoing building orders omit certain very important check-out steps. These include eliminating warps, checking out the RC installation for binds and for range, both with and without the engine(s) running. The location of the CG and alignment of the wings and tail, including the angular difference, should be carefully checked before test flights are made: give your test pilot a fighting chance! ●



Telephoto shot of Sealander I in flight. Float is 33 inch Gee Bee molded from tough plastic.



There's nothing like the sound of a twin, as the synched engines drone by overhead.

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