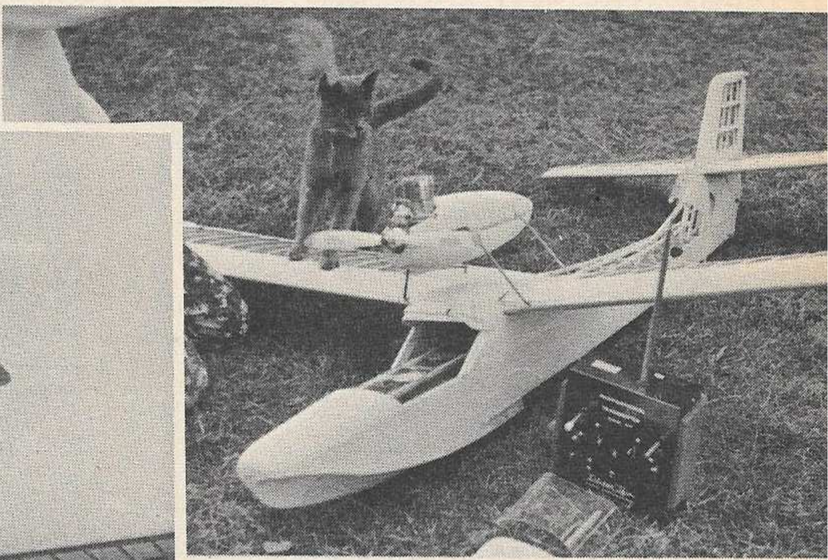
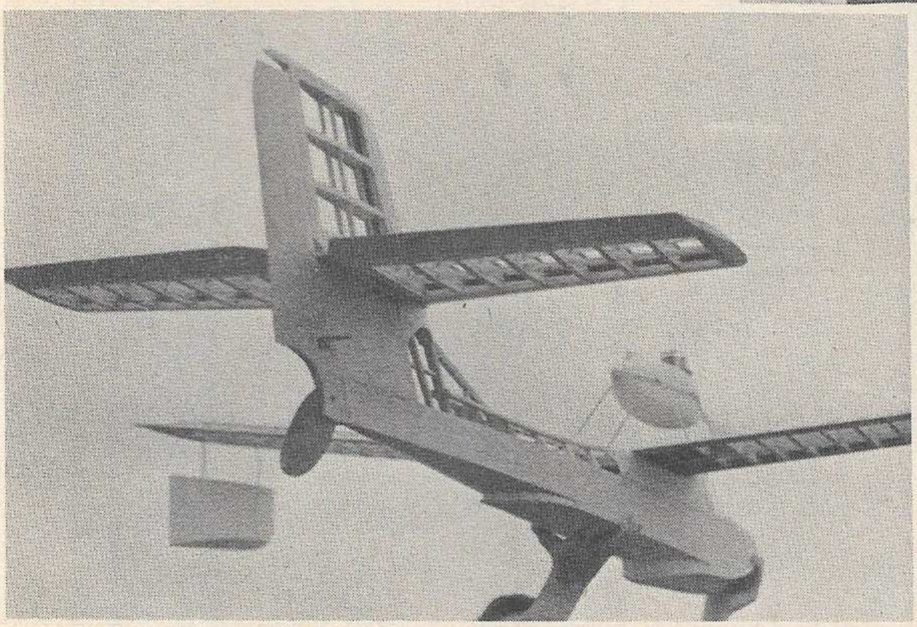
Don McGovern's

"MORAY" Monster

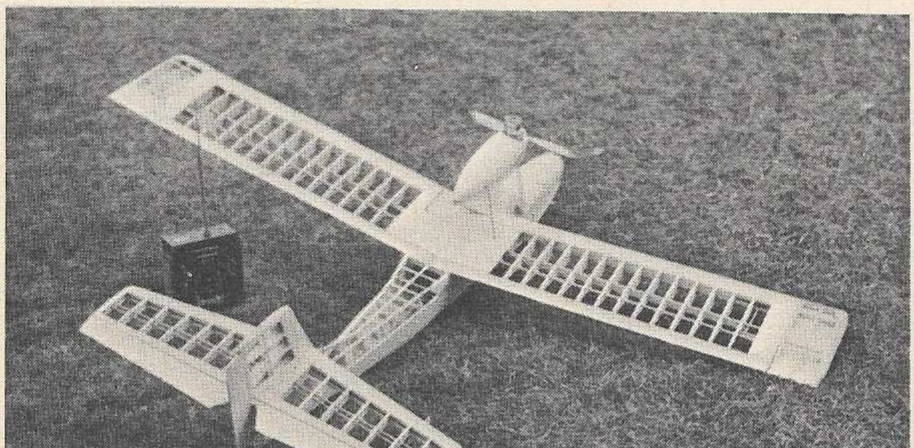
Rudder, Elevator, Engine Speed and Positionable Floats. Citizen-Ship Digital in an exotic, double-stepped Flying Boat. Spray rails, forward hatch, Canister-shielded R/C. Six feet in span, Enya .60, muffled. All the power you need.

Wing float structure will form the tip, pivot.





Stab assembles flat, then capped and airfoiled.



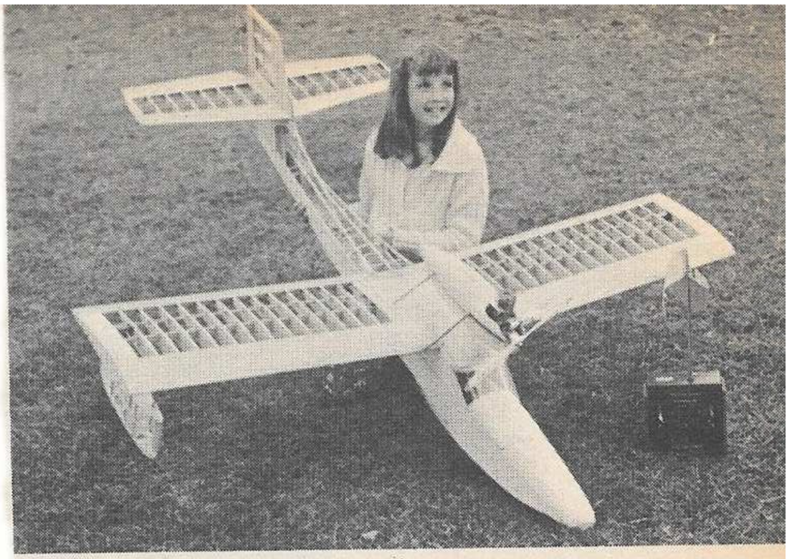
The assembled frame, awaits the covering. Design will do well in deep snow. Fly year 'round.

♦ **The stain on the rug** broadened and took on a slushy look. You can always count on an overflow tube when you top-off a tank. The new "Moray" rested there in quiet dignity, while I stood back to admire my craftsmanship. Finished at last, a great new beast of the sea, a thing of beauty, sculptured to cleave the water and rise on high into the setting sun.

Unless the light hit it just so, you could hardly even see where Jane threw the strainer of wet spinach at it last week. The lady folk don't always understand the great advancements we make to the state of the art with these things, but nevertheless the "Moray" rests upon its keel, deep in the soft and yielding fibers.

"It is leaking that guk" she yells, "all over the floor." That's not quite accurate. Only half of it is fuel, the rest chlorine from the tank test. Besides, rugs can be shampooed, and I must not scratch the hull on the driveway. It is here only for final balancing and family appraisal. It just shows you how unreasonable they can get until you explain things nicely. Today it is pumpkin pie, but I think most of it will wash off the cylinder fins the first time it hits a wave.

What we have here is a nice experi-



Six feet in span, the size a seaplane should be to cope with moderate surface wave conditions.

'MORAY'

. . . continued . . .

mental beast. It is related to the '67 vintage "Piranha", with some shortcomings rectified and a few more problems in their place. (Which will be discussed.) I think a review of the earlier "Piranha" is in order, to set your thinking in motion on the features incorporated in this "Moray" design.

Going back 15 years to the "Privateer" design, I found the hull design excellent, but the big bird lethargic on the turns. Thus, over the years I kept chopping excessive bow volume away in the hopes of having an aircraft which could negotiate a turn over the same state. On the earliest "Piranha," I went too far, and soon found it plowed through the waves with a sinus condition. A modification bulletin went forth to extend the nose 2" or more, with spray rails added. Made a big improvement. It did however take off moderately well as it was first de-

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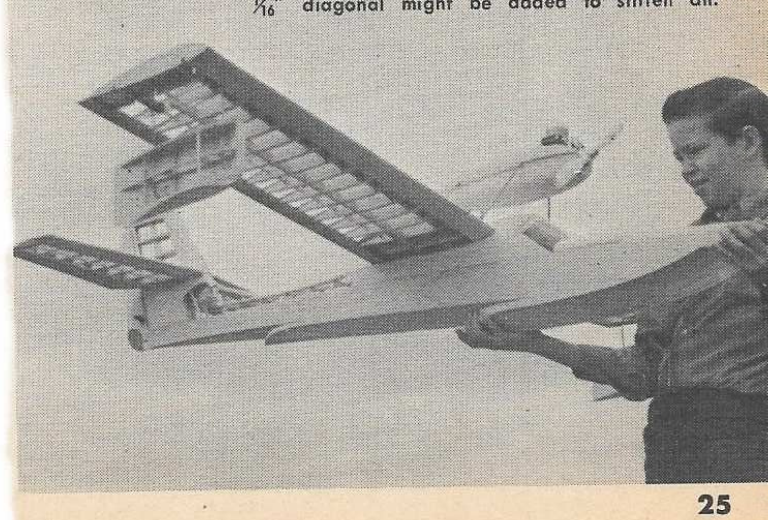
Ideally, wire nacelle mounts should be plated, even primers and paint will curtail the rust. 1/16" diagonal might be added to stiffen all.



"Moray" Monster

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signed, with .45 power and up. The extended nosed versions handled waves in better fashion however and the kit version in production soon to be released will have none of these shortcomings.

A later "Mako" design explored the idea of a vented hull inconclusively, in that suction is not a problem with this type step design anyway, and the venting as on the "Mako" drives the tunnel right through where you are barking your knuckles on the pushrod connections as it is. And the main problem remained, the tendency of a Flying Boat to hook a wing float on a passing wave. Unless level and true on a take-off, a wing float can grab onto a wave and yank the model from its path. The same is true of a landing, a hard touchdown sinks wing floats deep in the water, wrenching them out of their mounts. They are designed to pop free, and no damage ever occurs from any of these troubles, but it sends you out retrieving flotsam and such, contributing in general to your grouchiness.

Thus, the "Moray" was born, whether you like it or not. Since you already bought the issue, you might as well make the best of it. It is similar to the "Piranha" and earlier "Mako" in many ways, with improvements in bow displacement, nacelle design, internal structure and a higher stabilizer location. Power has been upped from a .45 to a muffled Enya .60. However, the main feature of the design is in the retracting wing floats.

With wing floats in the retracted position, the aircraft is as clean as can be in the air, for wing floats are a perfect continuation of the basic wing airfoil. The usual drag of the dangling wing floats and their strut mountings is eliminated completely. As a side advantage, the "Moray" can land without hooking a float, and can plane across the water at high speed, banking on the turns and lift off again. The wing floats serve no useful function on the take-off or landing of a Flying Boat, other than to keep it from heeling over at slow speeds. They are in fact the biggest liability to the take-off of any portion of the airframe. Torque and wind pressures tend to force one or the other too deeply into the water, transforming a skimming action into a plowing of the waves.

You could do pretty well without wing floats. A handlaunch from the beach, fly about to and fro, cut back on power, make an approach, flair out, touch down and pour the coal to it. The ship, with luck, would skim around and lift-off again with a touch of elevator. Not so however if you chop throttle. Sooner or later the wing will plunk into the water and it will sit there rotating in circles, sinking ever deeper with each drop absorbed. At speeds under that at which the aircraft balances itself on its wing, the wing floats are a very necessary evil.

The idea here is to position the floats by radio. On command, in a variable manner, to suit the condition of the moment. The nearer you can come to this, the more success you will have. So much time has been spent to date on this design, I am still in the throes of solving the finer points myself. There are many types of servos and retracting gear units which can easily be modified to achieve this ideal, however, what I have in progress is a simple wire float mount, pivoting in nylon tubing, within hardwood blocks (cannot rust). An electric motor of moderate power centrally mounted in a waterproof casing, driving a worm gear, which in turn spins a gear very slowly. Say a full revolution every 10 or 15 seconds. Thus, 180 degrees of travel would take just 5 to 7 seconds. If this gear was attached to a plywood drum and cam arrangement, it could drive the floats up and down in a never ending cycle. It could pay out and recall fishline in two directions simultaneously, to retract both and extend both in synchronized fashion. The beauty of this technique is that no limit switches would be necessary, and no machining of any kind is involved. The floats would slowly retract and slowly extend, as long as you command motion of the electric motor from your transmitter. The floats could be stopped in any interim position.

In practice, the flight might begin like so: the aircraft is pre-flighted in standard fashion, floats driven to the full down portion of the cycle. Engine started, run up, throttled back and the ship placed in the water. It taxis out slowly, balanced on its extended wing floats. Swinging into the wind, the leeward wing float will depress more deeply into the water, until the natural bouyancy overcomes the forces of the wind. A model feels this keenly, as the knots of wind do not scale down in proportion. It is as if a full scale aircraft tried to turn in 50 knots of wind.

Swinging into the wind squarely, all is right with the world, the ship well balanced and waiting. Your water rudder will provide all control needed, as if you had a steerable nose wheel, though still subject to drift and current effects. Pouring some power to it the "Moray" will gain speed, floats leaving some wake. As it accelerates to the medium speed range, the serve can trigger the electric motor to start winding the floats up. As the floats rise, so will your speed increase. In seconds you are flight ready, balanced on the wing. As your wing creates lift, the hull rises on the step. Your floats are no longer needed and retraction is but a moment from completion. Just stop the electric motor when a visual pass of the aircraft indicates the floats are more or less fully retracted. Once airborne, you will find the design clean and fast, well stressed for some wild maneuvers. Except maybe for the floats. Observe them with an eye toward flutter or whatever under violent maneuvers. Fishline tension might be a factor here.

What goes up must come down: which is a clue to you to look out! Now it's one thing to retract a landing gear, zoom about, drop the gear and roll in on the runway. Another with floats. What you have here is a nice, fast, heavy, soggy thing, zipping along ever so nicely about 60 knots. All trimmed out. You wheel around on final and lower the floats . . . the wreckage is over in the swamp muck. What you did wrong was you just threw 13% of your wing away, which stuck you 13" in the silt.

What I would suggest instead, at least at first, until you no longer care so much about the beast . . . Make your final approach with floats fully retracted, for this is really the intent of the whole idea. Flair out, hold, touchdown in standard fashion. Maintain rate of descent throttle, then increase to 60% throttle on touchdown, maintaining good planing speed. Now grind your thumb onto the button for floats to descend, and in five seconds you will be nicely balanced on the wing floats, unless you ran out of lake. That's your problem, but fear not, another Flying Boat will follow soon.
tice and development of technique. You will find that little harm can come to your ship while skimming around on the water, so it is easy to get the feel of things. Actually, novice pilots will do well to try their first flights on water. Then too, the time will certainly come when your coordinations get all shot to heck and what with the pressures of the moment, you'll execute the classic landing, with all in order, chop the throttle and watch the wingtip slurp to port into the juice. Still, except for your pride of airmanship, (which only you are aware of) no harm done. With the bubbles oozing upward, you just grind the floats down and the ship rights itself once more. You save the situation with the sage comment "t'was a bit of mud on the port tip, which I have now automatically washed clear, reducing chances of tip vortex." You've got to learn to lie with a straight face to keep abreast of your fellow club members.

Should you wish to try out the aerodynamics of the "Moray" with floats in the lowered position, I'd suggest you try a take-off with them so positioned. If it declines to lift with a .60, forget it until you effect an incidence shim correction or a relocation of the C.G. If you try an airborne experiment, remember that the floats, if drum/cam actuated are committed to a full cycle, over a five second or longer time period. If you're feeding of "up elevator" to compensate is not adequate, if in short, you cannot trim it out, you're then due for a sudden stop. You could dive in a long, long way in five seconds, namely some 600 feet. Naturally, trim will vary from model to model, but we do advise great height and caution first time around. Make sure you have adequate "up elevator" to feed in beforehand.

A few other features: The nacelle is of hollowed block, a fibreglass motor plate (say goodbye to the teeth on your jig saw) with a ¼" ply crutch. It mounts upon two 5/32" diameter wire struts bonded forever into the wing with Hobbypoxy Formula I. The water rudder takes over the directional end of things at speeds of sluggish to stopped. (Above 10 knots, the air rudder is effective.) The wing could easily be modified to take ailerons, though if four servos are your bag of tricks, you might wish to use the last for float retraction. The double step design is also a feature, though it is hard to judge the merits of small changes in our less than labratory methods of advancing the art.

While all this hits you around the yuletide season, be not faint of heart. We know the dumb lake is all frozen over, but so what, it flies better off snow and ice than ever, thus you have year-round flight capability, if your fingertips can stand it. In all seriousness, these hulls carve a "V" for 200 feet in soft snow and it is almost more fun than water. They work far better than skis, in that they never trip. Wing floats can remain retracted for winter use.

Radio equipment: Citizen-Ship DP-5 served us ideally in both the "Piranha" and this design, without ever a glitch. The newer Citizen-Ship DP-4 systems are even more suitable, and other systems too are ready and able. Virtually any equipment made can be housed within the extremely roomy hull. The hull is 5" wide on the exterior, suitable for a one-handed grip. When all else fails, hand launch. Your radio system should be made with quick disconnects, free to pull out of the hull after a day at the beach. Keep it in a drier environment. Package silica gel within the casing to absorb dampness.

Engines: One screaming good .60 will do just fine. You could certainly do well with anything in the .56 range, assuming it to be a modern mill, or possibly down into the .45 ranges, if you do not overload the plane excessively. The "Piranha", of like size, flew well on a .45, but worked hard for a take-off. I'd call this beast somewhat heavier, with less wing lift, particularly so with floats down, thus a .45 is to be considered marginal. Go .56's on up.

Tools required: a vise, pliers, screwdriver, razor plane, electric drill with sanding disc, gouges, and a ten pound sledge hammer (in case you get annoyed at mid-point). There are many itsy-bitsy pieces for which I am famous, (McGovern, the "Bridge Builder" and other derisive comments) but you won't see 10 at a time if you like a degree of originality. Parts in profusion yes, but the ship is not difficult at any stage. It assembles in the standard manner, though the forward bottom hull planking requires some effort, as does the bending of the nacelle mounting struts. Still, a builder of moderate skill will have no real problems.

Wing Assembly: Select firm, straight stock, check for warps. Stack and cut all ribs of 3/32" stock, with ribs nearer the center notched in addition for plywood gusseting. Assemble and align carefully, inserting some spars after removing from the plan, if you find this more convenient. Block up the trailing edge and align carefully during construction.

The Hull Structure: Layout the two basic sides of 1/8" sheet balsa. Build one on top of the other for exact uniformity. Use matching sheets of wood, from the same log. This insures equal bending when assembling. Spruce (or 1/8" x 1/4" balsa) is suggested for the longeron reinforcements, with softer balsa uprights as detailed. This stage of structure is easy, and each piece insures a well shaped sagless hull design when fully doped. Keep weight down!

Space out sides in standard fashion, install crosspieces, cut two at a time, of uniform lengths. Plan gives these lengths exactly. Cut and mark pairs and pre-cement end grain. Seaplanes melt slightly, do good goo job.

The bottom keels pieces of 1/8" sheet are now easily cut. See plan side view, the full length of hull to nose block, just above hull bottom planking line upward to darker chine line. These keel pieces are now installed, carefully centered and aligned vertically. Sight down the length.

The "V" bottom: You must work from the aft end forward. Install triangles of sheet, or 1/8" x 1/4" strips as you go forward to fill in the "V" angle between chine edge and keel. Fit them exactly, to simplify the sheeting to come. Work up to the aft step, and a little beyond. Now 1/16" hard aft sheeting is applied, up to the most forward sweep of the aft step. The aft step formers of 3/32" sheet are now cut (four in all). Fit two to this step, and cement to sheeting applied. The remaining two are now positioned to fair into the top edge of the step, meeting the others as they go forward. 3/32" soft sheet, with grain vertical, easily covers the step sides and may be trimmed flush when dry.

Repeat as before, with 1/8" x 1/4" "V" strips, the bottom sheeting (3/32" hard) between aft and main step, and cut four more main step formers. Build up the step in like manner. Forward of this, the "V" soon starts to flair into a concave shape, so use more wood and sheet for the formers between chine and keel near the bow. Check contour with a test strip and trim and sand the concave bow flair as you see fit.

Somewhere around here, cut your bow blocks roughly to shape, leaving substantial excess. Epoxy in place, clean up glue slurps and allow to dry. Time epoxy work to cure as you snooze. When installing the bottom bow planking, the nose bow block serves as a handy anchor to pin down the planking strips. These are under quite a bit of tension and it helps to have half a tree to nail them down. Bevel and fit carefully. We suggest you use a hard 1/8" x 1/2" as the first strip along the siding edge, extending out from the siding 1/4". This will serve as a start for the chine spray rails. An epoxy or putty filler will later help fair it in. A 1/4" drill and sanding disc will dress down bow block nicely.

The spray rails are really added as the hull is completed, but serve to deflect the bow wave clear of the prop arc. Your prop tips are rotating somewhere in the neighborhood of 400 mph or better, which means a drop of water hits with the force of a B-B. It will shatter soft wood props in one taxi run, but does not damage nylon. In fact, dampness is good for nylon. The great sheets of spray that can fly into the prop arc at certain points in the models take-off run will seriously retard the take-off, or if in excess, completely prevent take-off acceleration. The spray rails then serve a very useful function. It will take-off without them, but it will perform noticably better with them.

It should be noted, none of the bottom planking edges are to be trimmed flush with siding until the last minute. This will protect the sharpness of the edges while building.

The cabin builds up in a self explanatory manner, but carry the strength up to the wing saddle with ample lumber and epoxy. I used Tatone Wing Hold-Downs at the trailing edge, with internal rubber tieing the leading edge to the fuselage. Dowels align.

The Windshield: Lots of fun here. I tired of having seawater blast my windshields in, it sort of hits them like brushing your teeth with a fire hose. I grubbed some 1/16" plexiglass off a buddy, (best way to get it) and drapped it over a one quart rectangular can of typical turpentine can proportions. Warm it a few minutes in an oven, until it softens. Press it around with balsa blocks or other non-scratching straight-edge. It is easy to shape this windshield, and it may be adjusted if need be. Spend time to fit it in place nicely. If celluloid is used, use a heavier grade than usual, and reinforce with windshield battens.

The forward hatch is made removable, with the plexiglass windshield notched into it, epoxied and if possible, reinforced. The windshield and hatch remove as a unit for radio servicing and possibly wing rubber attachment. The windshield bolts to the cabin framing and a silicone rubber sealing strip will discourage water entry. It is not perhaps a perfect way to keep water out, but with a Canister surrounding the radio, a few stray droplets within the hull are to be expected and do no harm.

Fin and Rudder: The fin is assembled directly on the fuselage end, and must be firmly braced beneath the stab rest area. As the stab is mounted at mid-point in the fin, the fin must stand up to the forces exerted upon it in flight and on modest impacts. Use epoxy for the stab platform and key joints.

Build the fin in one piece, with cut-out for stab to fit. It is later sawed free at leading and trailing edge and mounted atop the stab. The alignment will then remain pardonably close. Generally, fin structure follows that of the stab. Top off with triangular block to match other tips.

Rudder: Similar in structure to the elevators, but notice the hinging, the

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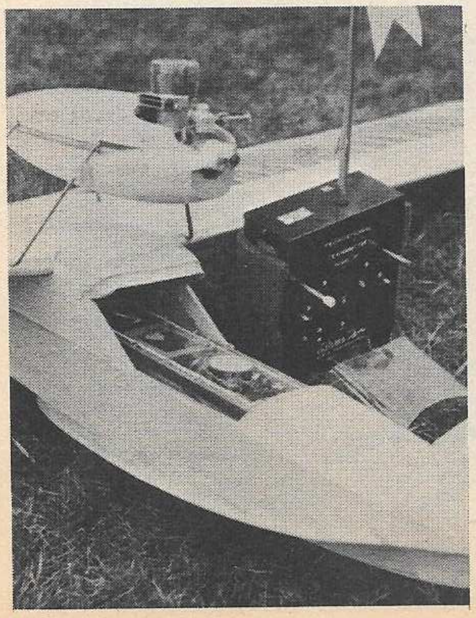
water rudder and horn placement. The brass sheet water rudder pivots on one bolt, a friction fit, which holds it down at all times, unless it skids in against a beach. Or, it may be manually tucked up and bolted in a retracted position for land flying. It partially disappears from view when fully retracted.

The hinging requires comment. A ⅛" dia. music wire hinge pin protrudes from its epoxy home in the aft end of the hull. A 1" length of Nyrod tubing is set into the rudder, with fiberglass cloth wrap-around. The assembled rudder drops down over this hinge, and by raising it one inch, it comes off the model. It is never permanently attached in the usual fashion. The top of the rudder has a 1/16" dia. wire pivoting in the top fin block, which is also bushed with the smaller diameter of Nyrod. Thus, the rudder is locked in place when the stab is in position. The idea of this is to provide adequate hinge distance on a split fin type model. It works well. Install the horn and sand smooth ready for doping.

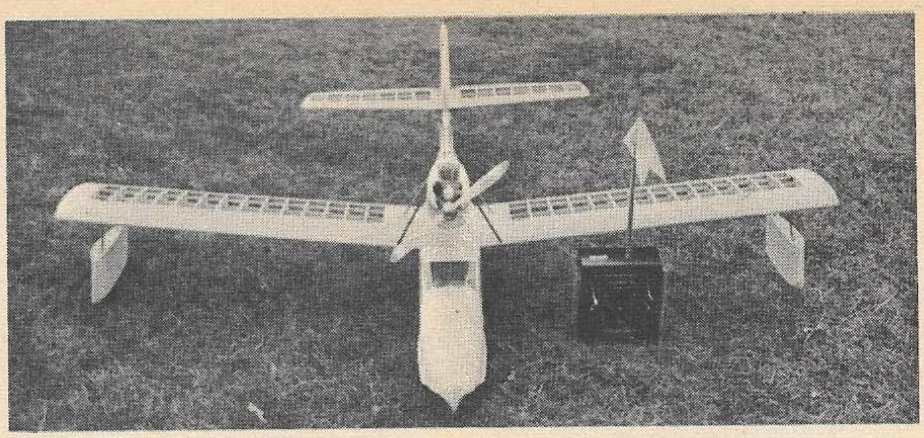
Elevator Hinging: Almost any type can be used, but Tatone brass hinges and Sterling's polyethylene hinge material will not rust. If salt water is intended, rust must be considered. We suggest hinges be installed after covering if possible, depending upon type.



Engine Nacelle: The fun part. Chonk out a ¼" ply crutch on a jig saw, then bandsaw blocks to top and bottom, side outlines. Carve to a rounded or semi-rounded configuration to suite. A ¼" fibreglass engine mounting plate was fashioned, though aluminum, phenolic plate or plywood can do as well. Cut to ply crutch outline as indicated. Bolt your engine to this mounting plate, with machine bolts and lock washers. Drill out ply crutch to clear these engine mounting nuts. The engine mounting plate is in turn bolted to the ply crutch with eight bolts. Secure 4-40 blind mounting nuts beneath with epoxy for good measure. Now, the ply crutch is fitted against the wire nacelle mounts projecting from the wing, and bracketed to the wire. Use at least four bolts per wire and rugged brackets. 4-40 blind mounting nuts again are installed beneath.

The bottom block may now be epoxied in place on the crutch. When dry, top and bottom blocks are hollowed to a reasonable degree. Follow nacelle crutch outlines in hollowing the bottom block. More meat remains here to absorb vibration. The top block should be hollowed to about a ¼" thick shell. The fuel tank will fit with ease within. I am using a deBolt 8 oz. clunk tank, good for 15 minutes hops. Larger tanks can be fitted. The nacelle as designed is removable from the wing with the twist of a few bolts.

Engine Speed: This linkage will vary with servo placement. Mine is not ideal in that the servo used is in extreme front of the Canister, deep in bow where it should not be. A bellcrank reverses motion aft, a rod takes motion to a second right-angle bellcrank on cabin end of Canister, tense upward to nacelle, to a third bellcrank, passing motion forward to the carburetor. Horrible yes, but it is not hard to fashion and works well. What is not so hot is the quantity of wing water the vertical rod opening can drink in two minutes. As water runs down a wing, it pours like a faucet into such openings, enough to half sink the hull. So beware, a lesson learned from the "Piranha."



Covering and Finishing: Silk, double Silkspan, Coverite, MonoKote or almost any other standard model covering material may be used. The finish should be well doped and glossy, preferably color doped. A very slight loss of tautness may be experienced while at the water, but it will retighten as soon as removed to a drier climate.

Sig Celastic is recommended for the bottom hull reinforcement forward of the main step. Or, fibreglass may be applied here. Something is needed if you intend to skid in on land at any time. I have found a layer of Celastic to follow the contours and do the job nicely, it is tough and durable, stands up to over 100 landings on sandy dirt, which is very abrasive. I have less experience with fibreglass, but I suspect it would sand off faster, due to its greater hardness.

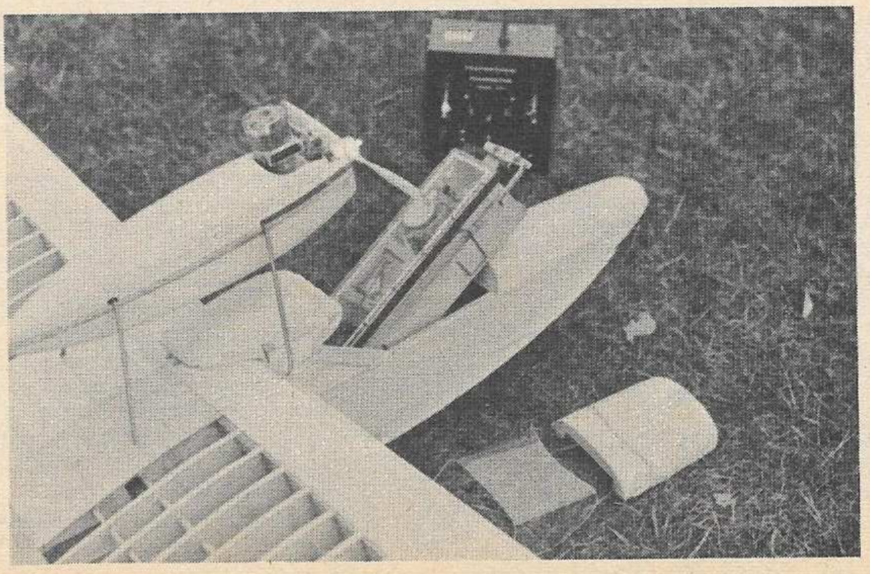
Wheels: For extensive land use, wheels may be fitted in a number of ways. The easiest method is to rig a two-wheeled gear with axles beneath the leading edge of the wing. They can be fitted into tubing sockets, retained with rubber lashing or any such modification.

Flying: Spread out a blanket on the beach and assemble the thing, check balance and alignment. Go back home for the transmitter. Test flying will be safer than for a landplane, though tricky in other ways.

Briefly, you can taxi at any speed all over the lake, getting the ship up on the step etc. with perfect safety, and even lift it off a foot or two, chop throttle and land again. Landings are easy and forgiving of minor faults. Actual airwork will also be routine with this aircraft, save for lowering wing floats in mid-air, which we think you should do with caution. Land with them retracted, then lower. With .60 power, expect a spirited aircraft. It will move!

Seaplane flying differs in minor ways. As seen from above, a landplane flys a near circular path around the modeler, who can turn and face the model at all times. He usually lands it near his feet, where he can judge the flair-out and tickle it onto the runway. With a seaplane, the shoreline and trees thereon often limit the approach and tend to force mid-lake landings. Much further from you in many cases, which the wind direction demands. A little harder to flairout with finesse. Also, the wind direction a hundred feet out from shore is quite liable to differ from what you feel on the shoreline. Learn to judge this by wave ripples, or set up a windsock offshore. Flying boats are sensitive to wind direction, due to the dangling wing floats which can dig in.

I've found that my wife doesn't need to buy suntan oil. As she lays blistering on the beach. I just aim the greasy propwash in her direction. Instant oil job. ●



The totally waterproof "All Dry" Canister, it makes flight on salt water possible. Unlike the fresh water lakes, salt corrosion is severe.