





Photos by the Author

"Seaweed"

If you think your tail is dragging, take a look at this float riding bird that dunks its tail for steering.

If you live on Long Island, fly radio controlled models and happen also to know Don McGovern, the chances are you will eventually fly hydro R/C. After trying seaplane flying just once you will realize quickly what you have been missing for years. Our many fresh water lakes on Long Island provide fine flying sites in an area where population density has severely limited the number of available flying fields. We also have the option of flying off our salt water, Long Island Sound and Great South Bay. Although the salt spray is very corrosive, hydro flying is nevertheless practical if you use a little common sense in your building and waterproofing.

I first flew a hydro R/C about three years ago at our large Lake Ronkonkoma facility located in the central portion of

by Bob Aberle

Long Island. My first subject was a standard Art Schroeder "Eyeball," with twin floats attached. One of the first experiences I recall was the initial engine start up. Normal land based flight procedure for me involved electric starting my .60 engine while at low throttle. Next I would grab the transmitter, pull up the antenna and begin taxiing out for my take-off while checking out the flight controls. Well I started my "Eyeball" at the water's edge on the beach. After reaching for the transmitter I turned around to find my plane

already fifty feet out from the shore. So the first lesson learned is that your floating hydro will drift easily at dead idle, especially if the tide or wind favors the center of the lake. When starting up the engine and checking the controls, keep the floats up on the beach or else have a helper hold on to the plane.

Next great experience is taxiing in the water. If you don't provide a water rudder for steering you won't be able to taxi at all. I employed a Nick Ziroli idea which consisted of a piece of aluminum shaped like a small golf club attached to the bottom of the plane's regular rudder. This "golf club" protrudes just enough into the water to provide good steering. It's true, you do see some modelers with elaborate linkages running from the plane's rudder

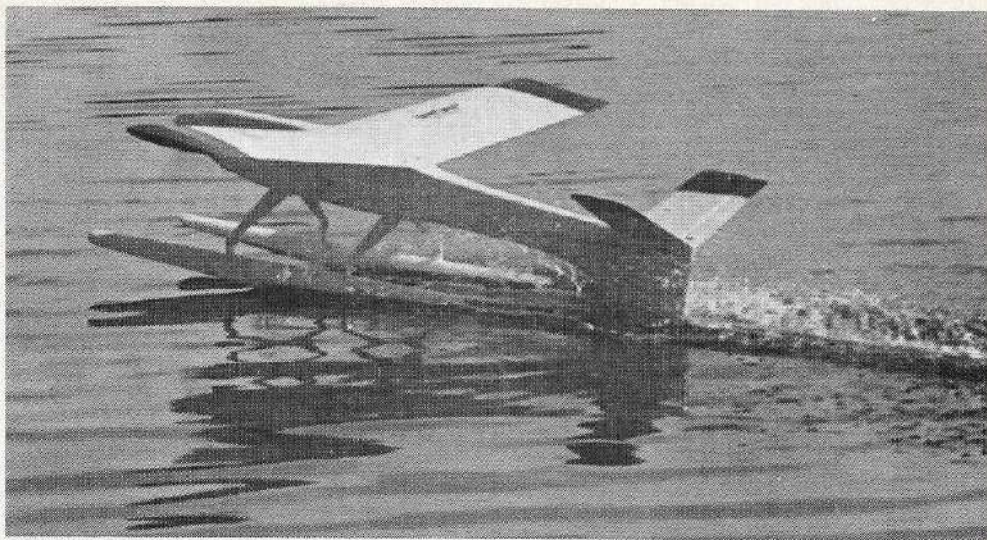
forward along the fuselage and back down the float to a separate water rudder. These fellows are really going through needless effort, believe me. There is no reason to rig a separate rudder on the float.

As I began my take-off run I applied full throttle. Another mistake! The "Eyeball" simply pitched forward with the tip of the prop touching the water just enough to kill the engine. The following dead silence can be exasperating. Instead of walking over to the plane and restarting you must first get into a small boat and row your way out to the plane. Getting back to the starting point again will probably take some fifteen extra minutes. Realizing that I could be all day at this I sought some help from our experienced flyers. Apparently the trick with the floatplanes is to first hold full up-elevator and then apply the throttle. The up-elevator helps keep the nose up and the prop clear of the water. As the plane builds up speed you reduce the up-elevator. When you just about have the correct take-off speed, you should have only a small amount of up-elevator remaining.

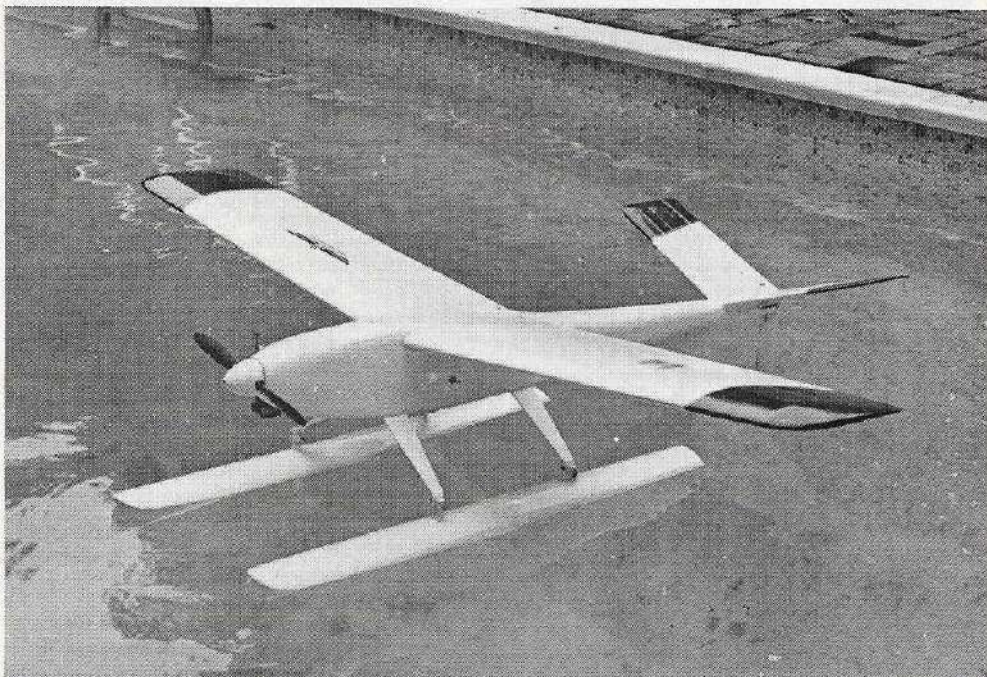
Landings require almost the same technique in reverse. As soon as the plane touches the water, pull back full up-elevator and at the same time bring the throttle from dead idle *back up to approximately half power*. Then proceed to taxi in to the shore line. Taxing at very low or idle speeds makes water maneuvering extremely difficult. Remember to always employ *full up-elevator* during taxi, take-off and immediately after landing.

The following year I flew a regular "Kaos" on floats and again really enjoyed the thrill of R/C hydro. This past season I decided it was time to put all my experiences together into a design of my own. Before getting into the construction end of the "Seaweed" I thought you might be interested in how I arrived at this particular design. One of the first problems that surfaced with both the "Eyeball" and the "Kaos" was the method of float attachment. On any low wing or even mid-wing plane you usually have to connect the rear of the floats to the main landing gear wires which are mounted on the wing. The front of the floats then get connected to the nose gear which is mounted on the fuselage. What this all means is that the floats have to be removed each time the wing is removed. Since you must disassemble the plane to transport it you end up constantly mounting and removing the floats. This problem was eliminated by going to a shoulder wing configuration where the wing mounts on top of the fuselage. In this instance both floats mount permanently to the fuselage. I always objected to all the wire bending necessary to connect the floats. Bending $\frac{5}{32}$ " or $\frac{3}{16}$ " diameter wire is no easy job. To simplify the float mounting I chose two Halco aluminum landing gears. True, they cost considerably more and in fact they weigh more, but they sure make the float mounting easier. By the way, I received another benefit from the Halco gears. Because of the rigid mount provided, it was possible to eliminate all the cross wires which usually are required to prevent the floats from moving outward under load. I had been told that all those cross wires create considerable drag. The elimination of these wires made a much cleaner design for water maneuvering.

You are probably wondering what happened



Floatation and taxi tests, to get a feeling before flying. Prop is well clear of foam and spray. Left: It's a seaplane Bob, you're supposed to kneel in a creek. A Kraft system makes it behave.



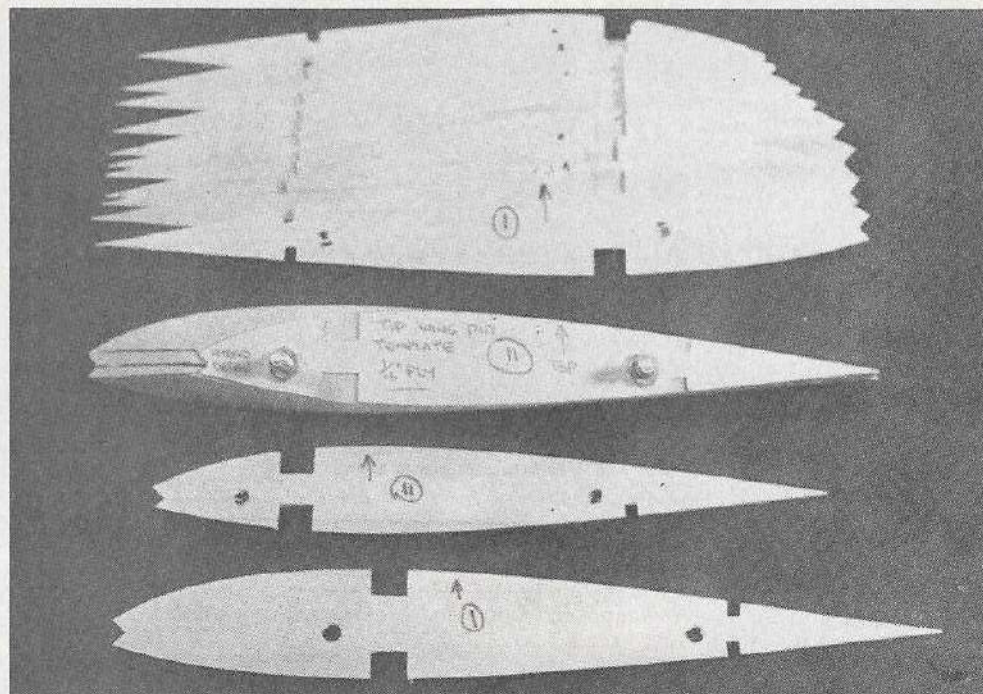
pened to the ailerons. Well, our local hydro contests call for all kinds of crazy things, except rolls. To separately waterproof an aileron servo in the wing only creates additional problems. Hence, no ailerons and instead a wing with 5 degrees dihedral on each side. Basic flight steering is performed by the rudder.

Speaking about that rudder, why underneath? I always wanted to build an R/C job with an inverted rudder reminiscent of my old Free-Flight days. For a land based plane this is impractical since you would need an extremely long landing gear to clear the rudder on take-offs. Since this design is dedicated strictly for hydro use I finally got my chance. With the rudder inverted like this it was easy to establish its height such that about an inch or so actually protrudes into the water. Thus the plane's rudder performs the steering function while it is in the water.

The partial "V" tail, with 20 degrees of dihedral on each side, came about after a discussion with fellow clubmember, Nick Zirol. I had originally wanted a very small amount of dihedral in the stabilizer purely

for appearance sake. Nick suggested that the greater dihedral angle might provide for some additional stability at the moment the plane is rotated for take-off. Well at any rate it sounded good so I added what appears more like a conventional "V" tail. The elevators operate as normal. They do however, require a "tee" connection at the rear of the fuselage.

The final consideration was waterproofing the plane and radio. My "Kaos" had the usual control rods which exit out slots near the tail, connecting to the rudder and elevator. As the daily flights progressed, water would penetrate these control rod slots and as a result the unpainted balsa wood inside the fuselage would absorb water like a sponge. The more water, the more tail heavy the "Kaos" got. The last flight of the day would almost end in a snap stall on take-off since the C.G. had been moved so far aft. This problem was easily corrected by using Sullivan Gold n' Rods (nylon rod within a rod). Of course the radio also had to be protected. This proved to be a simple job. I actually built a waterproof box in the fuselage directly under the wing.



Wing ribs at the top of photo are ready for assembly. Stack in the middle contains plywood templates on each side, bolted together. Balsa ribs are then cut for No. 1 and 11 positions. Accurate ribs!

All the R/C equipment goes in this box, even the battery. The radio antenna was actually placed inside a Gold n' Rod (outer sleeve) which was glued along the inside of the fuselage all the way out to the tail. This internal antenna installation, although not optimum, did prove quite reliable and is complete waterproof.

To summarize the final design, I chose a 700 square inch wing with a 65" span. Airfoil section is a semi-symmetrical 15% thick section, both at the root and tips. Fuselage length worked out close enough to permit full use of the Sig 48" length balsa without the need for splicing. Design weight of the model was set at 7 lbs. complete, which would result in a wing loading of 23 oz. per square foot. In actual practice my original weighed 7 lbs. 12 oz. for a wing loading of 25.3 oz.

The radio installation consisted of my 1969 Kraft 4-channel outfit using KPS-10 servos. This particular radio has over 500 logged flights and yet still contains the original transmitter battery pack which is over five years old. Since I did not use ailerons I took the opportunity to hook up the fourth servo as a separate bomb drop release. Many of our Long Island R/C hy-

dro contests have a "Sink the Bismark" event pioneered by the Suffolk Falcons and Don McGovern. My transmitter is a single stick, so the obvious choice was to operate the bomb drop release servo by twisting the third axis control on the end of the stick. This works out real nice. Normally I would release a bomb using low throttle. The problem with that approach is that you can't lower the throttle for taxiing purposes for fear that the bomb will release prematurely. The separate release enables more "precision bombing." The bomb release itself is simply a piece of Gold n' Rod which protrudes out one side of the fuselage.

Construction

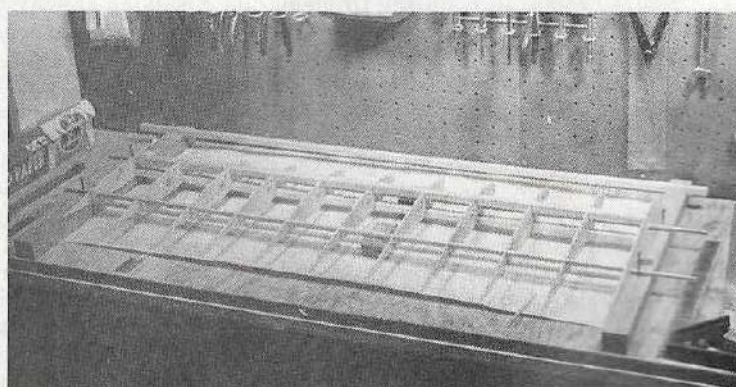
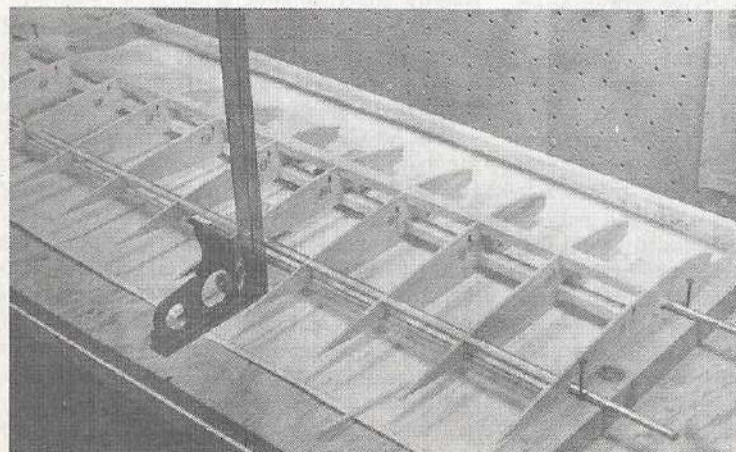
The wing is obviously the easiest part of the entire plane. After years of hooking up ailerons, mounting servos in the wing and landing gear trunnion blocks, this particular project was a pleasure. In fact the wing can easily be built in three nights of work. To start out, make a $\frac{1}{16}$ " plywood template of both rib #1 and #11 (root and tip ribs). Prepare a stack of nine pieces of $\frac{3}{32}$ " balsa, all approximately the size of rib #1. Spot glue the plywood rib #1 to the balsa stack

(it may also be a good idea to spot glue the balsa blanks together as well). Using a drill press, drill two $\frac{1}{4}$ " diameter holes through the plywood rib (as marked on the plans) and also through the balsa stack. Drill two more $\frac{1}{4}$ " dia. holes in the plywood rib #11 as indicated, then bolt the entire stack of balsa with the plywood rib templates on each end together. Carve down to the templates and sand and mark the spar locations on the ribs. Separate the ribs and number with a Magic Marker then repeat this process for the other wing half. Cut all the spar notches at this time to the proper depths.

When assembling the wing, insert all the ribs on two $\frac{1}{4}$ " dia. steel rods. Suspend the rods over the plans, using several small spacer blocks of equal thickness. After the glue dries you simply withdraw the two steel rods. Do not install the center wing sheeting at this time. Join the wing halves using the two $\frac{3}{16}$ " plywood dihedral braces as shown on the plans. Use epoxy glue for this operation. Do not drill the holes for the wing hold down dowels at this time. Put the wing aside for the time being.

The fuselage is quite straightforward. Cut two sides out of $\frac{3}{16}$ " x 4" x 48" balsa. You will have to splice a small piece up forward because it is a little wider than the 4" sheet. It's a good idea to spot glue the two sides together. Mark off the outline of the side with a ball point pen and then proceed to cut both sides at the same time. When finished, separate the two pieces. The resulting sides will end up being identical, which is the best way to start on a fuselage.

Cut out two $\frac{1}{32}$ " plywood doublers and epoxy in place. Remember you need one right and one left side. Then glue in the $\frac{1}{2}$ " sheet balsa tripler in the area of the fuselage where the wing seats. Next is the $\frac{1}{2}$ " triangular shaped balsa in the rear and the $\frac{1}{4}$ " triangular balsa in the mid and forward sections. Epoxy a $\frac{1}{8}$ " x $\frac{3}{8}$ " piece of spruce in the tail area for extra reinforcement. Finally add the $\frac{1}{4}$ " x $\frac{3}{8}$ " spruce side pieces which will form the top of the waterproof box. Cut out the various plywood formers and proceed with the assembly of the fuselage. I can't give you any tips here as I don't use a fuselage jig or holding fixture. I simply glue the fuselage sides together at the tail, insert the formers and align everything by eyeball. If you are inclined to use a fuselage jig, go to it. I added the top $\frac{3}{16}$ " sheet from the trailing edge of the wing to the leading edge of the stab as soon as possible. This gives the entire structure a little more rigidity

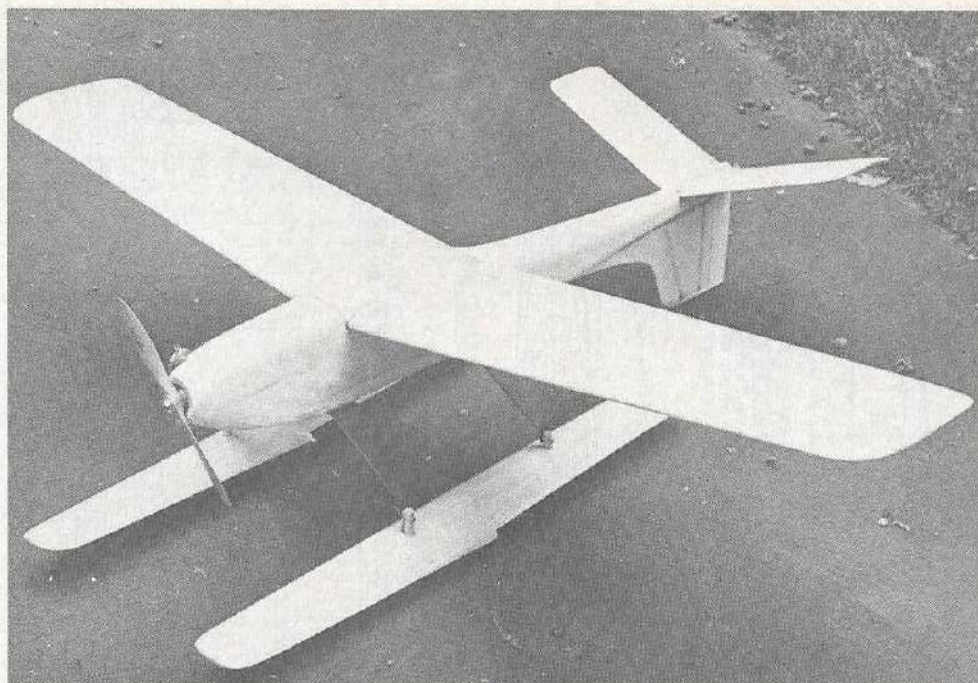


The wing partially assembled in homemade jig using $\frac{1}{4}$ " dia. steel rods. Left: The wing jig. Keep steel rods supported in center to prevent sag.

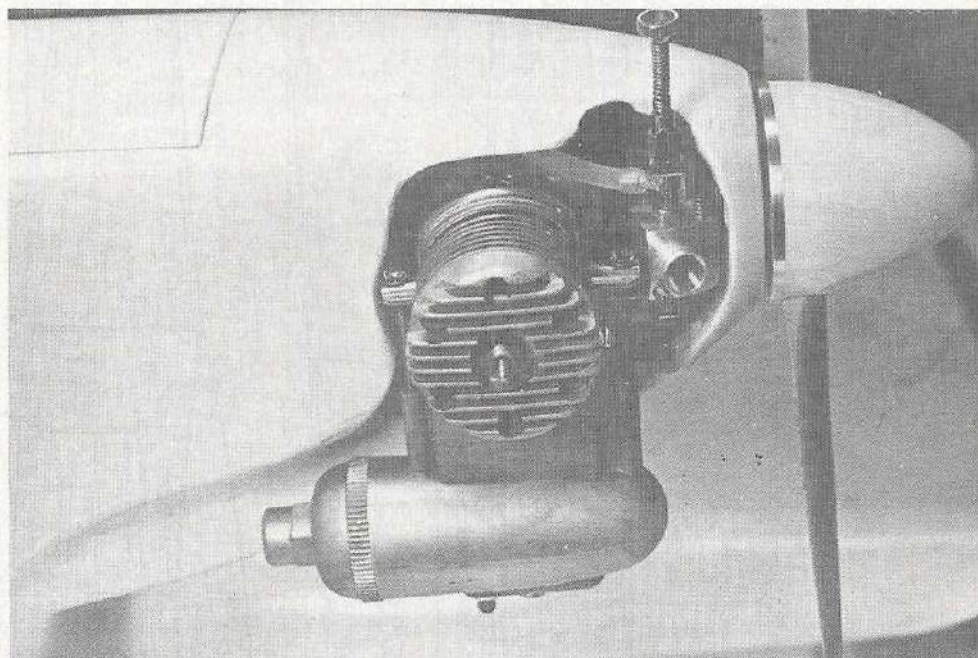
during the assembly steps.

Drill out the firewall for the Kraft-Hayes radial mount or use a Tatone mount if you prefer. It's a good idea to use 6-32 hardware with blind mounting nuts attached to the firewall. At this point you can install all the outer Gold n' Rod tubes for the various controls. One rod goes forward through former F-2, passes through the tank compartment and firewall F-1. Let it protrude an inch or so beyond the firewall. This will be the throttle linkage control. Run two Gold n' Rods to the rear, one for the rudder and one for the elevator. Remember with the elevator you will have to provide a "T" connection at the rear of the fuselage so that separate rods can be routed to each elevator. This is necessary because of the "V" tail configuration. I hope my photographs will explain this more fully. One additional Gold n' Rod is run from the bomb drop release servo out to the side of the fuselage several inches behind the wing trailing edge.

The waterproof radio compartment is next on our assembly list. You already have the $\frac{1}{4}$ "x $\frac{3}{8}$ " spruce glued on each side of the fuselage. Add two more crosspieces of the same material which makes a frame around the top of the radio compartment. When this is finished, line the frame with foam seating tape (adhesive on one side only). I made a cover out of .063" Lexan which is a clear plastic material. It is sold at storm window stores as a replacement for glass. The Lexan cover is held down against the foam tape with a series of sheet metal screws which make the compartment essentially water tight. Since you can look through this cover it is easy to observe the servo operation and also note if any water penetrated the compartment. The only access that must be provided is to charge the receiver battery. My solution was to cut off the top of a 35 mm film can and glue it into a hole cut in the Lexan cover using Dow-Corning Silicone Rubber Bathtub Caulk. To charge the battery I simply unscrew the film can cover, reach in for the battery connector and pull it out for charging. The only slight problem encountered was to provide a switch actuator which would be waterproof. I couldn't use the Gold n' Rod here because the length would be too short. Water could easily penetrate a 2" length of the rod. For this application I decided to use one of the G.E.M. Models silicone seals. These devices are advertised in Flying Models and are normally intended for R/C boat use. I mounted the seal on the side of the fuselage. A $\frac{1}{4}$ " diameter hole will accept the seal. On the inside of the radio compartment I connected the shaft portion of the seal directly to the new Kraft Switch Actuator which is mounted to the servo tray. The three KPS-10 servos handling rudder, elevator and throttle were also mounted to the Kraft S10M-2 servo tray. The remaining KPS-10 servo used as the bomb release was separately mounted on hardwood rails. As mentioned before I ran an outer Gold n' Rod from the front, top portion of the radio compartment, all the way out to the tail (inside the fuselage). I actually push the radio antenna up into the tube as far as is necessary. With this set up water can't run down the antenna and into the receiver, shorting out the R.F. coil. We believe this happened to John Roth (Scale Champ) several



Prior to finishing. Final weight worked out to 7 lbs. 12 oz. Hydro birdies pick up extra pounds. Downstairs: Special sculpture for the muffler clearance. Enya .60 II happy choice of mill.

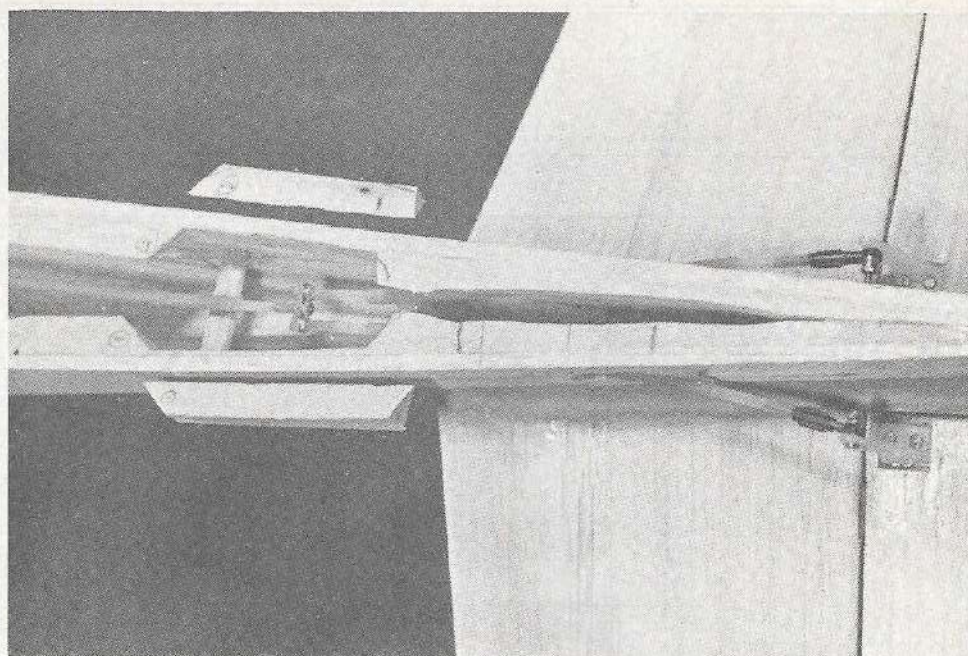
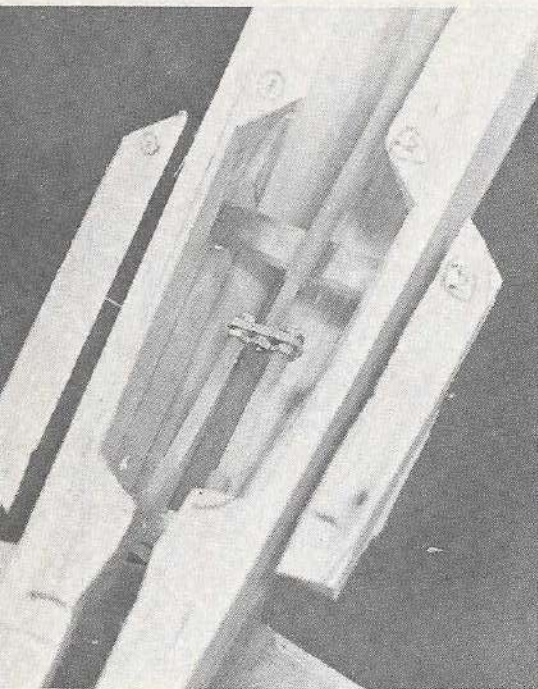


years ago, costing him an airplane and almost an entire radio.

To complete the fuselage I added the $\frac{3}{16}$ " plywood inserts to accept the two Hallco aluminum landing gears. Add the front blocks and the $\frac{1}{16}$ " plywood ring which is the same $2\frac{1}{4}$ " diameter as the spinner. Remember the top hatch must be removable for access to the tank. Make this a good fit so that water can't penetrate too easily. Some water will of course enter, for example, it may be forced in through the holes in the firewall for the fuel tubing. It is therefore a good idea to paint the entire tank compartment. This will be covered in detail later.

With the nose section now shaped and rough sanded you can proceed with the wing mounting. First epoxy the two rear hold down blocks ($\frac{3}{8}$ "x $\frac{3}{4}$ " engine mount stock) in place. Temporarily put some foam rubber seating tape in place on the wing saddle area. Rest the wing on top of this

tape in its normal mounting position. Mark off and drill two holes (#7 drill) through the wing and the hardwood blocks. Make sure you drill at right angles to the wing's upper surface. Remove the wing and tap the hardwood in both places with a $\frac{1}{4}$ -20 tap. Drill clearance holes now in the wing so that the nylon bolts can easily pass through. To proceed, place the wing back in position and bolt the trailing edge in place. Hold the leading edge down firm against the seating tape. Now drill two holes of $\frac{1}{4}$ " diameter through former F-2 and continue on through the wing leading edge until the drill breaks out just beyond the main plywood dihedral brace. You will need an extra long $\frac{1}{4}$ " dia. drill bit for this operation. Remove the wing at this point. Cut two 5" lengths of $\frac{1}{4}$ " dowel, coat with epoxy and insert into the wing until only $\frac{1}{2}$ " is left exposed at the leading edge. When dry, try fitting the wing one more time to determine that it seats properly. Leave the



Note "T" connection. Triangular longeron stringers are cut only for photo clarity, you don't do! At left: More of the "T" details; a small aluminum plate and three 2-56 studs with pairs of nuts.

bottom rear fuselage sheet off until after the tail is installed and the elevators are hooked up. You may now complete the wing sheeting.

The stab and rudder are straight forward construction. I like to select hard $\frac{1}{4}$ "x $\frac{1}{2}$ " balsa for the stab leading edge to give it some strength and soft for the trailing edge so that it will be easy to install the elevator hinges. The elevators are carved out of $\frac{3}{8}$ " balsa. When finished they should resemble the cross-section of regular trailing edge stock. After the two stab halves are complete you must bevel their root sections for the correct dihedral angle. Use epoxy to join the halves. Next step is to glue the completed stab to the fuselage. You will need the wing mounted on the fuselage at this time so that the correct alignment can be made. Again I do this strictly by eyeball. Final step is to install the $\frac{1}{4}$ " balsa inverted fin using plenty of epoxy glue. Don't forget those spruce spar reinforcements which are essential to the strength of the fin. When dry, cover the bottom of the fuselage on either side of the fin with $\frac{3}{16}$ " balsa, then proceed to final shape and sand the fuselage. Use the cross-section views supplied on the plans as a guide. Round all the corners as much as possible.

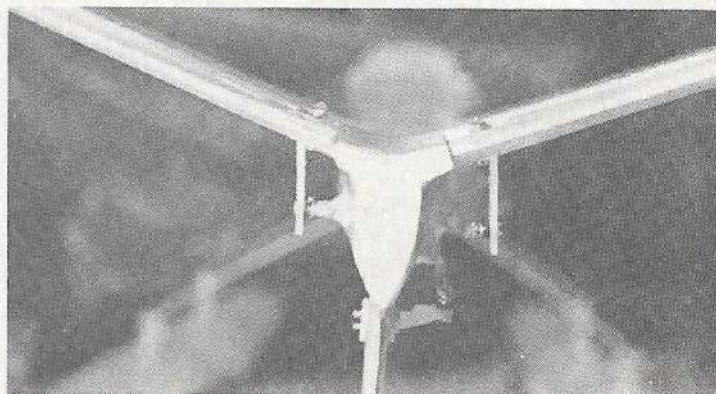
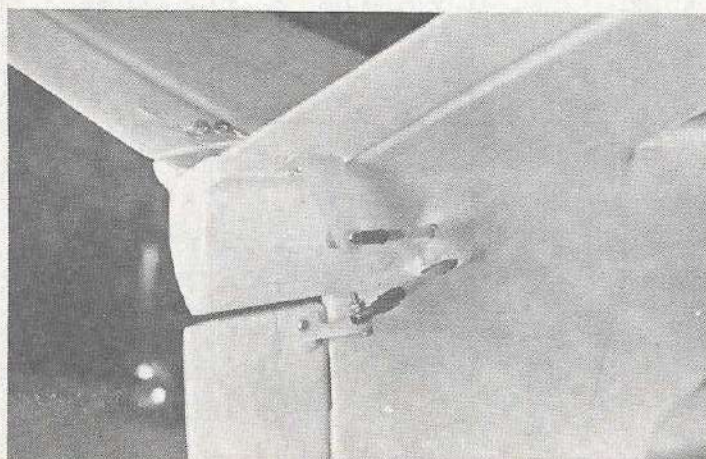
This is also a good time to build up the wing fuselage fairing. You will have to mount the wing to the fuselage for this job. I simply glued several pieces of block balsa in place and then carved it until a streamlined shape was obtained. Sig's Epoxylite also helps in this wing fairing application. Remove the wing and proceed to add Epoxylite in the fillet areas of the stab and fin.

It is also a good idea at this point to hook up the elevators and the rudder, with their hinges and control horns, to determine that everything works smoothly. Because of the angle of the elevators it was necessary to use the Rocket City "Missing Links" on each elevator. This gadget is actually a small ball joint which is essential for proper operation of the elevators.

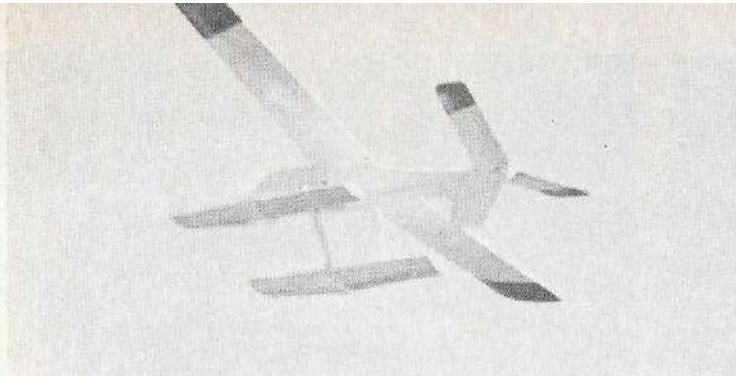
Now we must talk a little about the floats. As pictured my original employed foam core floats manufactured by Tom Wenzel, under the name, "Aqua-Lift." These cores are "skinned" with balsa in the same manner as foam wings are covered. The top sheet is $\frac{3}{32}$ " balsa while the bottom is $\frac{1}{8}$ ". When completed I covered both floats with Midwest $\frac{6}{10}$ oz. fibreglass cloth and K&B polyester resin. For this application the glass cloth is essential because I found you can easily remove the balsa on

the bottom of the floats by taxiing up on to a sandy beach. A hard, resistant surface is a must. Unfortunately these foam cores are no longer available. I did include cross-sections of the cores on the plans for those inclined to cut out their own foam. As alternatives you can use the Gee-Bee line of ready made floats. The Mark IV, 33" floats which sell for \$19.95 a pair would work fine and are quite popular at our local flying sites. Gene Rogers had a float construction article called the "Unsinkables" with greater buoyancy which appeared in the September 1967 issue of Flying Models. Regardless of the type float you choose, the most important consideration is that the float step is right on the plane's center of gravity. If you don't follow this prime rule you will never enjoy R/C floatplane flying.

In the case of the foam floats I simply drilled $\frac{1}{2}$ " dia. holes into the foam and inserted $\frac{1}{2}$ " dia. dowels which were coated with epoxy glue. The rear dowels were allowed to protrude about $\frac{3}{4}$ " above the float. I usually leave the front dowels protruding approximately $1\frac{1}{2}$ " to 2" initially. When the entire plane is completed, and all hardware is installed, I mount the rear float dowels to the rear Halleo gear. I then place the plane in a swimming pool and let



Rear view of the elevators looking forward. Note angle of control rods. Left: Rocket City "Missing Links" perfect for connections to surfaces.



it float. The nose of the plane is supported by hand while the proper attitude is established. If you study the plans you will notice that the plane has a positive angle of attack of several degrees with respect to the level floats. This alignment is as important as placing the float step on the center of gravity. Your instinct may tell you that that upon landing, if you are not careful, the floats might dig into the water abruptly. I promise you that will not happen. But that positive angle of attack while floating will greatly improve the water maneuvering of the plane. When the proper attitude is determined place a mark on the front float dowels. Drill and mount the front dowels to the forward Halco gear. Then cut off the extra dowel length which is not required.

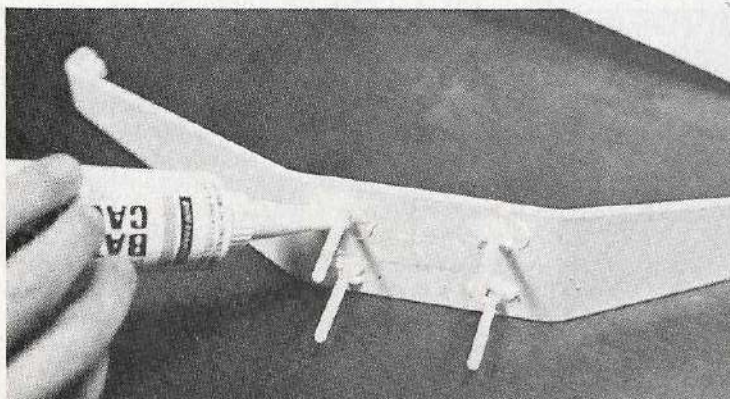
The center-section of the wing receives a partial application (about 6" on either side of center) of the 5/10 oz. fiberglass cloth as do the complete floats. In fact I also applied

the cloth to the lower, forward section of the fuselage. To adhere the cloth you can use either polyester resin or Hobbypoxy Formula II glue. If you use the resin, make sure you don't attempt to use it over epoxy (two part) glues, since it will not cure properly.

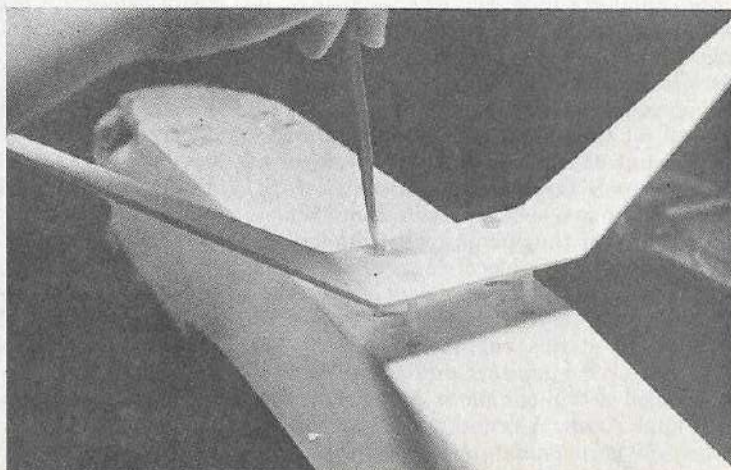
Proceeding along with the finishing, the entire plane and floats were given two brushed coats of Hobbypoxy Clear, using the regular hardener. I sanded after the first coat with #240 dry and after the second coat with #320 wet. Two coats of Hobbypoxy Filler thinned about 50% followed. One coat is placed directly on top of the other in less than an hour. The next day this is wet sanded with #320 or #400 until a great deal of the tan colored filler disappears. One more thin coat of Hobbypoxy Clear is applied. Again this is wet sanded with #400 paper. When dry, wipe the entire plane with a good tack rag to remove

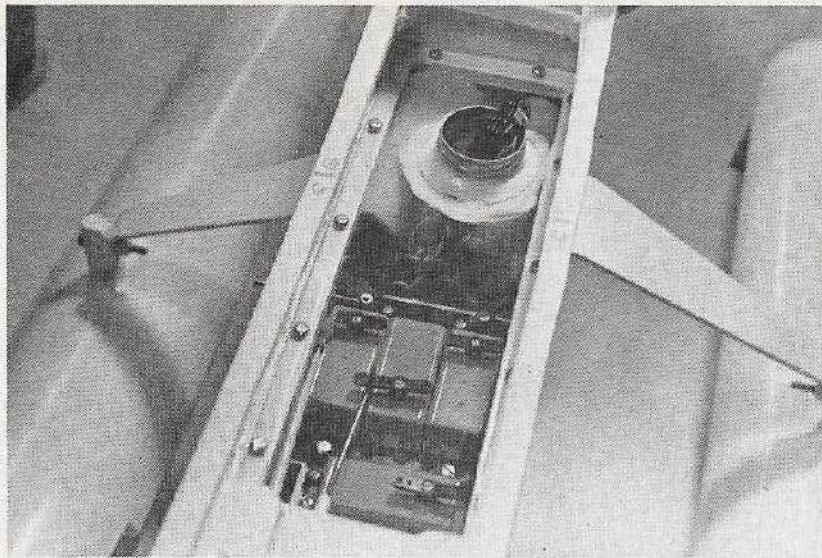
all the dust. I sprayed two coats of Hobbypoxy white for the final finish.

For spraying I usually mix 1/3 Hobbypoxy white, 1/3 H.P. Quick Spray Hardener and 1/3 H.P. Thinner. After the usual 45 minute wait I spray it on using the Miller spray outfit with the siphon type glass jar. Remember to also spray the Halco landing gears the color of your choice. You can wet sand with #600 paper between the first and second coat of white (basic color). I never touch my final coat with either wet sandpaper or rubbing compound. Dark red Hobbypoxy trim was sprayed on to the wing and stab tips (one coat was sufficient). The somewhat uneven masking line was neatly covered with D-J Multi Stripe in 1/4" wide, gold color. It is also advisable to paint the inside of the fuel tank compartment and the R/C equipment area. The full treatment of clear and color Hobbypoxy, mentioned previously, was al-

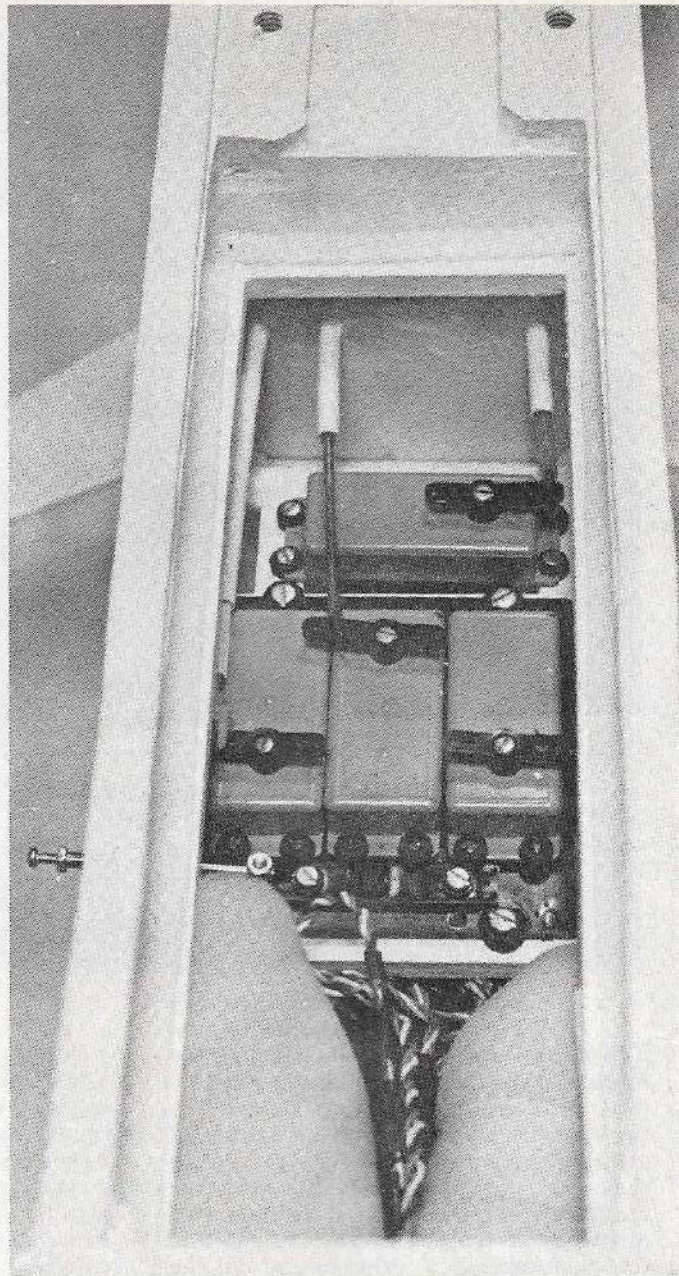
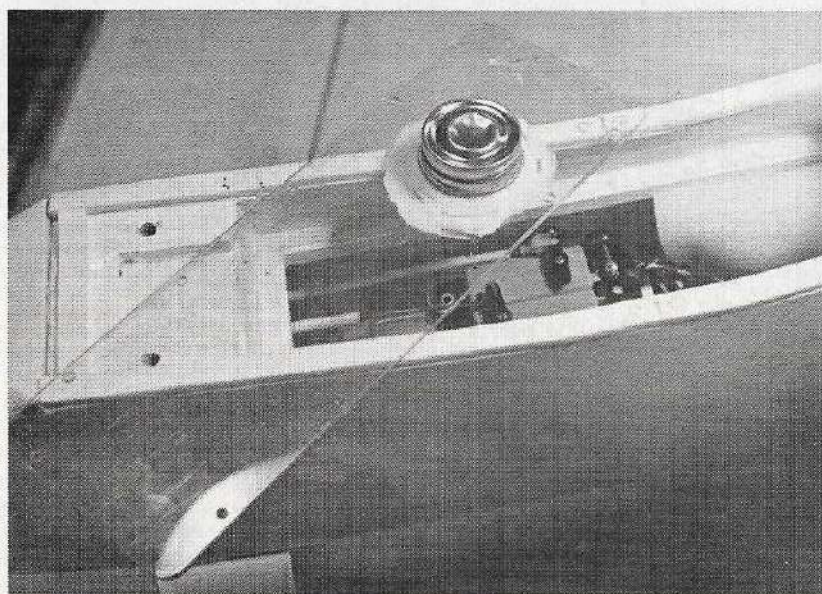


Silicone rubber caulking around nylon screws prevents water penetration. Right: Use Halco gear size per text notation. 8-32 nylon screws used.





Lexan cover on R/C compartment, a can lid for charging. C.G. mark is in error!
Right: Cover removed, a G.E.M. Models silicone seal at right to Kraft Switch.
Below: A Lexan cover seals off R/C. Top of film can is affixed with silicone.



so applied in these areas to insure good waterproofing. Before installing the two Halco gears spread some Dow-corning Bathtub Caulk around the mounting holes. Install the gears using four, 8-32 nylon screws on each. After tightening the screws, wipe off the excess caulk. This will guarantee that no water will penetrate the gear mounting holes.

Before flying the first time it is important that you check the C.G. and make sure it is exactly as indicated on the plans or if anything, slightly forward of the position shown. In the case of my original, it did in fact turn out a little tail heavy. To correct this I added a 2 oz. lead fishing weight to the tip of each float. A cut-out was made in the top of each float with the aid of a Dremel tool. The weight was coated with epoxy glue and set into each float. When dry I covered the opening with Epoxylite, followed later by several coats of the Hob-bypoxy finish. The engine used in my original was a seven year old Enya .60 Model II. I refurbished this engine recently by installing new bearings and found that I could still obtain adequate performance in this application. A brand new \$100.00 plus super .60 is certainly not necessary. Flight

testing has proved this plane to be surprisingly fast even with the 7³/₄ pounds total weight figure. I might add that the best propeller for this big bird is a 12-6 Top-Flite. You will not do as well with the more common 11" diameter props.

As a postscript to the construction article I wanted to mention several items that came to light during initial flight testing. The first taxi tests prior to first flight disclosed a condition which I should have been smart enough to realize during the design phase. My experience with this size model told me that the float spacing should be around 18" (from the center of one float to the center of the other). The largest available Halco gear (B106-6) will provide this amount of tread. Unfortunately I couldn't obtain this size at the time and had to settle for the next smaller size which provides a float separation of only 15". The result being that the plane tended to sink or "dip-in" in the direction it was being turned. This caused somewhat erratic maneuvering at slow and mid range speeds. The plans show the correct Halco gear. Make sure you use only that size and if you can't obtain one I would suggest you bend up your own from .125" tempered aluminum. Despite this

shortcoming, all the original flights were made with the 15" float spacing and were still highly successful. The flight and static photos taken for this article show the smaller Halco gears. One additional item added on the plans, but not in the photos, is a little extra area to the rudder (below the water line). This extra area, in conjunction with the wider float spacing provided the best water maneuvering I have experienced to date in any floatplane. At Nick Zirol's suggestion I also increased the rudder movement since the original got sluggish on final approach for landing. The plans indicate the amount of rudder and elevator throw recommended. I would suggest you use this as a guide for your first flight. Even with almost 8 pounds of total weight, the original "Seaweed" breaks the water after a run of only 60 to 75 feet. It has been looped and even rolled with just rudder/elevator control. The roll, of course, is more of a barrel type than axial, but it still is a show stopper. The final accomplishment is that the radio has remained completely dry after each flying session. When the good weather arrives this spring I'll be out there at the lake, trying to "Sink The Bismark."