CHUCK CUNNINGHAM

Float Flying - Spring is about to get started in many parts of the country, and with spring comes daylight saving time. giving us longer hours in the afternoon with flying time firmly attached to the end of the day. Why not plan ahead this spring for some flying from a water site. This is one phase of R/C action that has gained a lot of new fans in the past four or five years. It is time to delve back to some of my earlier columns and once again talk about taking the secrets out of float flying.

Getting your aircraft ready to fly with floats attached is not hard to do, but there are several things that need to be considered when flying from and landing on water. Just about any aircraft flown from water will take a dunking sooner or later. A high wing cabin job is the most likely to be flipped over by the wind because the wing is located far above the water. Because the wing is located high on the model, when it is flipped over by the wind it floats on the wing, keeping the fuselage, including engine, radio, battery, and servos high and dry most of the lime. A shoulder winged aircraft is harder for the wind to flip, but when it does, the radio and servos tend to stay dry. The engine usually gets wet. A low winged model is harder for the wind to flip, but when it docs, the entire fuselage generally winds up in the water, with everything getting wet.

The first thing that we need to do is to waterproof the equipment as much as possible. Start with the battery pack. wrapping it in plastic wrap, then a layer of closed cell foam, then wrap it again in plastic wrap with only the lead sticking out. Use a 'twisty" to cinch up the plastic around the lead. The same for the receiver wrap with plastic, then foam, then plastic again, tying all of the servo cable with a twisty. Let the antenna exit from the other end of the receiver pack, and tic off this exit with a twisty. Servos are a bit more difficult to waterproof. Futaba makes servos that are waterproof, but we can do a bit of waterproofing on a standard type servo.

Remove each servo from the servo tray and remove the servo arm from the servo. Drape a piece of plastic wrap over the gear that protrudes from the top of the servo, then replace the servo arm on the gear, forcing the thin plastic wrap over the gear. Wrap the servo with the remainder of the plastic wrap, again tying it with a twisty at the servo lead. Do this same operation to all of the servos, re-install in the servo tray, connect back to the receiver, and you've done about the best that you can do to protect the radio equipment.

In case of a dunking, always remove the wing and dump out any water that may be trapped in the fuselage. Look at the equipment to be sure that no water is in the plastic wrapped items. Your engine needs immediate attention when dunked to ensure that the bearings do not have a chance to get rusty. Pour all of the fuel out of the fuel tank. Chances are that in the dunking, some water got mixed in with the fuel: do not put this contaminated fuel back in your fuel can, dump it out! Take the glow plug out of the engine, turn it upside down and drain all of the water out of the engine and muffler. Then with the plow plug still out, put a -starter to the engine and blow all of the rest of the water out of the glow plug hole. Just a thirty second application of the starter should clear it out. Blow the water from the glow plug, re-install it in the head. fill the lank with fresh fuel. then fire up the engine and let it run for several minutes until the oil in the fuel has a chance to be distributed around the engine. If you're going to make another flight, the engine will be fine. If that was the last flight of the day, then treat your engine with some after-run oil. When looking at your dunked aircraft, make sure that the wings and stab did not take on any water. Chances are that some got into the covering. Poke a couple of holes with a pin and drain out all of the water. Nothing will mess up a good flying model more than having a wingtip full of water — almost a sure thing to cause another dunking on the next take-off.

The prop that you use on your aircraft is also very important. A wood prop is not good when it comes to flying from water. Spray can eat up a wooden propeller more rapidly than you can realize; therefore, a plastic prop is a necessity. What generally happens is that the lake waters get a little choppy, you gun the engine for take-off and the floats cause a lot of spray to get kicked up into the prop, and your aircraft is hurdling across the water trying to pick up flying speed. Something seems wrong to you. but you're not sure what, so what the heck. haul back on the elevator stick and get that bird in the air. So back you haul, the aircraft struggles into the air. then flops back like a dead fish. When you finally get the aircraft back to shore. you see that what once was a pretty, well balanced wooden prop is now just a splintered stick. It's no wonder the aircraft would not get airborne.

When you install floats on your model for the first time, you may not realize that the weight distribution of the floats will change the balance of your aircraft. Generally, the weight will be added aft of the center of balance, thus causing your model to become tail heavy once the floats are mounted. Prior to removing the landing gear. and with the fuel tank dry, locate the balance point of your model. If you've been flying this particular bird for some time, you are used to the way it flies at this balance point. Once you have completely attached the floats, complete with whatever water rudder system you are using, install the wing and see where the aircraft now balances. Bet you dollars to donuts that it is now tail heavy. Bring the balance to its former location with the addition of lead weights added to the floats, *not to the aircraft*. Once you have added the correct amount of weight to the floats, be sure that the weight is permanently attached. Now you will be able to switch back and forth from land gear to water gear without worrying about the balance of the model. Again, I've seen too many fliers overlook this balance pre-caution and wonder why their aircraft either flew very poorly or crashed. Most blamed the poor flying on the floats, never realizing that it was a simple matter of C.G. location.

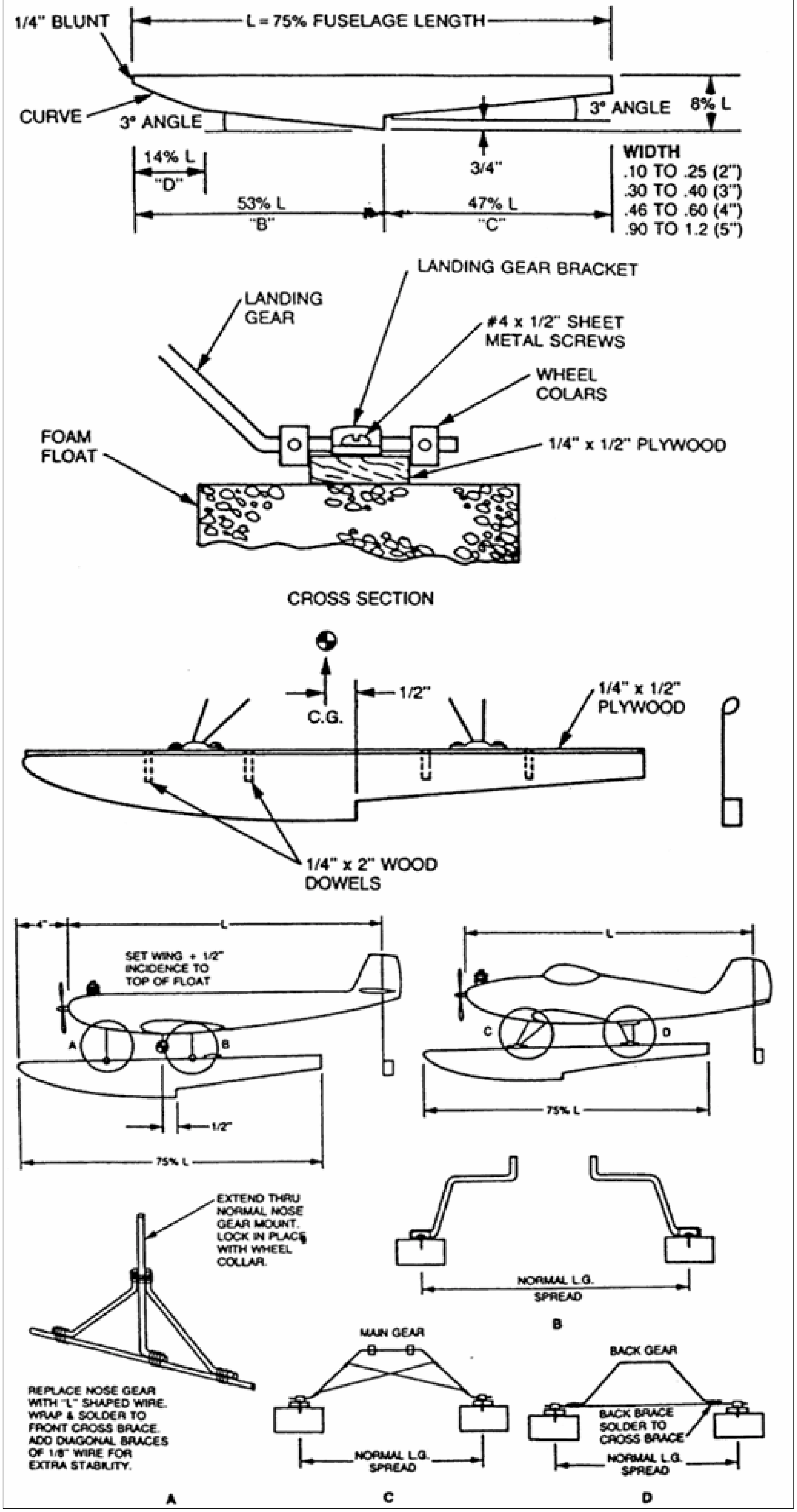
Engine power is another considera-tion, most of our aircraft today are pretty much overpowered. If your model is overpowered as a land plane, it should have no trouble when con-verted to a water plane. But. if your model just barely staggers into the air from a grass or paved runway, then it's going to have a tough time trying to take off from water. If in doubt, go to a larger size engine.

The main rule when taking off from water is to never force the take-off. If your aircraft isn't up to flying speed when it is running on the water, then a forced take-off can be deadly. Re-member that the addition of floats to your model has increased the weight, and of course the wing loading and the drag a considerable amount. If you added that much weight and drag to an aircraft taking off from a paved runway, you would realize very quickly that take-off speed needs to be much higher to prevent a stall. One last thought on making a take-off. Flying from a glass smooth pond seems like an ideal situation; how-ever, it's almost impossible to lift off of that glass smooth surface. A take-off is much easier when there is a slight ripple to the water. The ripple breaks up the suction between the water and the floats. If you're flying from a glass like surface, taxi out. then make a big circle in the water, letting the turbu-lence of your taxi maneuver break up the water. Then turn into the wind, shove the throttle stick full forward, and bounce off over the ripples that your aircraft created.

Designing And Building Floats

There are several types of floats for use on aircraft. All full size airplanes use V-bottom hulls on their floats. Some early aircraft such as the Sop-

FIGURE 1
BASIC FLOAT DESIGN



with Bipe used flat bottom type floats, which act more like water skis, while the V bottom acts more like the hull of a boat. In model type aircraft either float design works well. The flat bottom float is much easier to construct. and will let your model fly from, and land on, water very easily. The V-bottom looks more scale, but is a bit harder to build. However. the basic layout of the float styles is still the same. The overall length, location of the step etc.. will be the same for both the flat and bottom type floats. Generally speaking, floats constructed from Styrofoam are easier to build, and more damage proof to use than the floats that are built up from balsa. It all depends upon the type of aircraft you are going to be flying from water. If it's a real scale machine then you should build floats that duplicate the full size aircraft's floats. If you are going to be flying from water for the fun of it, and you're going to put floats on your normal fun machine, then the flat bottom foam material floats will be easier and faster to build, and will give you excellent service.

The starting point in designing the floats that we are going to use is to determine the length of the fuselage of your aircraft. I always measure the fuselage length as that distance from the back of the prop to (he hinge line of the tail feathers. Some aircraft have a different hinge line for the rudder and elevator, so in that case, use the hinge line farthest to the rear as the measuring point for the fuselage length.

The float length should be at about 75% of the fuselage length. This measurement isn't cast in stone. The length can vary from 70% to 80% with no problem. If you're trying to determine what length floats, then work in the 70-80% range. If you're going to build your own floats, then use the 75% figure. It doesn't make any difference to the overall float length if your aircraft has one wing, two wings, or ten wings, the float/fuselage relation stays the same. For example, if the fuselage length is 47", 75% of this is 35”. So, what the heck, round it off to 36". Some commercial floats are available in this length, so don't pick at nits. buy whatever is close. Same for making your own. standardize a little bit. The only time that this length might not be correct is if the aircraft for which you are designing floats has an unusually long nose (the distance from the leading edge of the wing to the back of the prop). Some of the smaller trainer type aircraft do have an extra long nose, so the next thing that we need to consider is the location of the balance point of the aircraft. This should always be shown on the plans, but. you should also check the balance point on your aircraft to see if your model (with no fuel in the tank) balances at the same point. It's possible that you have been flying with the balance point different from the designer's location. Mark the balance point on your model for use now. and in the future when we are going to rebalance after the floats have been installed. The step of the float should be located right on the balance point, or not more than a 1/2" aft of the balance point. If your model is one of the long nose type then our 75% float length may not be long enough.

Normally, I use a figure of 53% of the float length forward of the step location, while the length aft of the step is 47% of the total float length. It is very important to have the nose of the floats at least several inches forward of the prop on your aircraft. If the floats are not extended beyond the prop. then the model lends to rotate down under power, first swamping the floats and then the aircraft. Draw a line on the plans for your model parallel to the "normal" fuselage line; not the thrust line nor the chord line, but the fuselage "line." On this line locate the balance point. Then measure forward along this line to a point that is 53% of the float length. In our example we are using an overall float length of 36", 53% of this yields about 19". Locating the step 1/2" aft of the balance point yields a float length line that ends about 21/2" ahead of the prop. Just about perfect. If your long-nosed model has the float nose just even with the prop. or a bit aft of the prop, extend the float line until its forward point (or the nose of the float) is at least 5% of the fuselage length ahead of the prop. Leave the tail length of the floats alone at 47% of the original float length.

Once you have determined the overall float length, then use the diagram to lay out the rest of the float dimensions. Using our 36" long float, we find that the overall depth of the float will be 8% of the length or 2.88" (let's say 3"). The width is actually a factor of the overall weight that the floats have to support, so use the table in Figure 1. For our example we will use a width of 4". The nose and tail upsweep angles are as low as you should go. Increasing the aft sweep from 3° to 5° will allow the aircraft to break the water suction easier but also the aft end of the aircraft may ride lower in the water. I have used both angles and think that in the future I'm going to stick with about 4°.

Now that we have arrived at our basic float design we need to decide on constructing the floats from balsa or foam. Of course, you can use either material but since I'm very partial to foam. that's what we will talk about this time. There are two reasons why I like to use foam. The first is that it is much easier and faster to use. while the second is that you cannot poke a hole in a foam float allowing it to Fill with water and sink the aircraft. I've seen this happen several times. The aircraft was not lost, but it sure got wet, and it sure ended a day's flying early. You may think that the only way to work with Styrofoam is with a hot wire and templates. You can go this route but then you need to build templates for each size set of floats that you wish to build.

Rather than do this, use a saw to cut out the floats. If you have a band saw this is very easy to do. 1 use a metal cutting blade on my band saw for just about everything, balsa, pine, metal and foam. It always gives a very smooth cut in any material. If you don't have a band saw, or a friend with one, then you can use a regular hand held saw, or coping saw to cut out the float. With a hand saw you will have to do a bit more sanding. but it's still pretty quick to do. It is also a very good idea to wear a dust mask when sanding Styrofoam, or whenever you are doing any type of sanding.

After the pair of floats are cut install the plywood stiff back to the top of the foam. Use a strip of 1/4" plywood about 5/8" wide, running the full length of the float for .60 and .90 powered aircraft. 1/8" ply will do nicely for .40 size and smaller aircraft. If you don't have any long pieces of plywood, then use 1/4" x 1/2" spruce or pine. If you want to build a pretty set of floats then you will need to cut a slot in the top of each float large enough to accept the stiff back piece. This slot can be cut with a knife, or a table saw. You can also make a heavy copper wire fitting just the right slot size and fit this into your soldering gun. if you have the type that has multiple heads, and melt a slot into the foam. If you really don't care about a perfect look, and just want to go flying, then glue the stiff back to the top of the foam float and forget the slot. Use epoxy glue or Elmer's Probond polyurethane glue.

The next step is very important, and should not be overlooked. Set the floats on your workbench and position your aircraft on the floats so that the step is located where you determined on the line you drew on the plans. Mark the location for the existing landing gear, and whatever aft or forward brace gear will contact the stiff back. Remove the fuselage and drill a 1/4" hole through the stiff back and into the foam float a total of 2" deep for each hole. A minimum of four holes in each float. Be sure not to drill through the float, but if you do, simply fill the hole from the bottom side with scrap foam and epoxy. Fill each hole with epoxy and insert a 1/4" x 2" dowel in each hole.

You may need to tap these dowels into place with a hammer. These dowels lock the stiff back to the foam. If you neglect to do this then do not be surprised when the stiff back rips away from the foam in a hard landing. If you're building long floats for a larger aircraft, then add one more dowel at the forward and aft ends of the float.

Take a look at the drawings showing float attachment for both two wheel and trike gear aircraft. The normal landing gear will work just fine on floats, you just have to do a little modification on the nose gear for a trike type, while adding an extra rear brace for a tail dragger type. It's easier to replace the nose gear wire with an "L" bend wire of similar diameter, then when you change from wheels to floats, a couple of wheel collars are all that need to be removed to make the changeover. On a tail dragger type landing gear, a mounting plate will need to be added to the fuselage just aft of the wing.

A 1/8" or 1/4" piece of plywood glued to the structure is all that needs to be added.

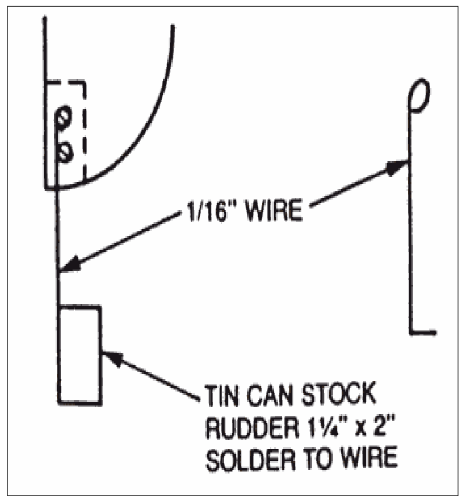
Extra braces are generally not needed as the float load at this point is pushing against the brace, rather than trying to pull it from the structure of the fuselage.

I like to set my floats up so that the wing chord line is positive to the top line of the floats. About 2° positive is good for most aircraft. Measure this on the plans for your model to see just how much positive this will amount to. Mount the main gear to the floats, then shim the fuselage or block it up, so that you can measure the amount of positive that you have for a correct setting. Then make the aft strut, or forward strut for a trike gear job, to the correct length. If you mess up and get these struts just a bit too long or too short you can compensate for this by adding blocks on top of the floats between the gear and the stiff back. The idea for using positive in the wing is because you want the wing to lift the aircraft from the water when on a takeoff run. Nothing is to be gained by an aircraft that motorboats all over the pond because the wing is not lifting the airplane from the water. Remember the friction or adhesion of the float to water is mega times higher than is the adhesion between a wheel and a paved surface. Look at the area of the wheel in contact with the ground compared to the total area of the float in the water.

Covering foam floats can be done in several ways. You can cover the entire float with 1/16" balsa wood, then put on light glass cloth and epoxy resin and paint. Or. you can cover the sheeted float with plastic film. Or you can leave the foam bare and cover with low heat film. Or. you can cover the floats with clear or brown package tape. When I first suggested this type of covering about 7 or 8 years ago, lots of guys laughed, but after trying it, most came to realize that this type of covering is quick, easy, cheap and durable. The final method is to leave the floats uncovered and go fly. Whatever method that you use will work, just remember that the more finish you add to the floats the heavier they become and that the overall wing loading will increase.

The final item we need to discuss is a water rudder. There are two ways to construct a water rudder. One is to attach a rudder to the aft end of either one, or both floats (best for windy conditions), while another simple method is to attach a small water rudder directly to the rudder on the aircraft. *Don't overlook a water rudder*. You are going to need some other steering method than just an air rudder.

The rudder attached to the air rudder is the type that I like to use. A small piece of tin can material or a piece of brass soldered to a piece of 1/16" diameter wire is all that is needed. A piece I" wide x 2" long is large enough for the normal .60 size aircraft. Be sure to set the water rudder so that it is immersed in the water at taxi speed, but is clear of the water when the model is up and running on the step at takeoff speed. When the assembled aircraft with floats attached is sitting on your workbench with the float tops level, make the length of the water rudder wire so that the bottom of the water rudder does not stick



down more than 1/2" below the bottom of the end of the float. You want to make sure that at takeoff speed only the air rudder is used to steer. The water rudder is so effective that if it is in the water on a high speed run. any movement will result in a violent change of direction of the aircraft.

We mentioned about adding weights to the floats to arrive at rebalancing the aircraft at its balance point after the addition of floats. This is very important and should not be overlooked.