Radio controlled power boating has rapidly gained in popularity the last few years primarily due to the K & B 3.5cc outboard engine. The Stingray is an easy to build and easy to run little daycruiser designed as an entry level R/C boat using the small K & B outboard.

Back in the fifties, I began water skiing and playing with fast boats in Southern California. I even built my own little fifteen foot "Crackerbox" powered by a big Buick V-8. Several of my friends had ski boats and we skied as much as possible. Ski boats at that time were developing in Southern California with the advent of the V-drive and cheap, big automobile V-8 engines. The SK type ski boat evolved as a completely new and exciting type of boat. The new boats were sleek and fast and were the forerunners of today's exotic inboard ski boats. Of course, the hot rod new ski boats began racing, first informally, but soon organized drag races and oval racing became very popular.

At the same time, cabin cruisers were evolving from the old displacement hulls to planing hulls built from plywood. Late in the fifties, two brothers, Bill and Bob Campbell designed the Campbell Cruiser. The Campbell Cruiser is a classic, as modern today as it was revolutionary in 1959. The Campbell Cruiser was the first (to my knowledge) daycrusier combining a simple streamlined cabin on a 24' SK type flatbottom hull. The result was a 24' cabin cruiser-ski boat that would go over fifty miles per hour. Over the years the bottom of the boat has changed to a more comfortable riding deep vee, but the Campbell Cruiser is still being made in Lake Havasu City, Arizona.

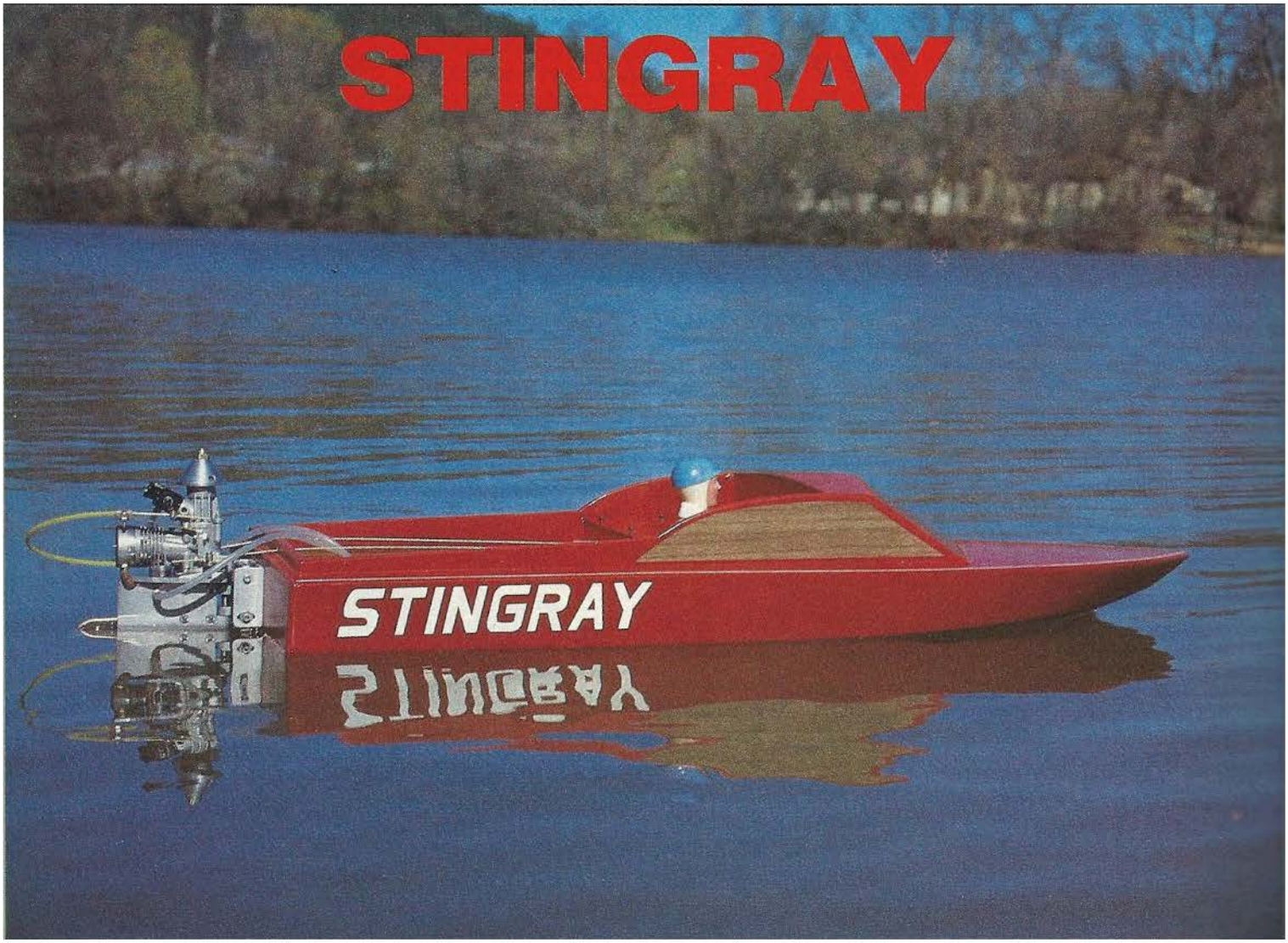
When Dick Kidd asked me to do another boat for the K & B 3.5cc outboard as a beginner boat, the old Campbell Cruiser came to mind. The Stingray is not a Campbell Cruiser, but is a combination of features that typify current twenty foot daycruisers. Many of these, including the Campbell, are available powered by outboard engines.

The Stingray was designed to be simple to build, fast and attractive, but not be fussy or require extra running hardware that runs the cost up and complicates trimming. I decided that the old flatbottomed SK type hull would be the easiest to build and run. The flatbottomed hull does not need strakes or trim plates as on the deep vees which saves many hours and dollars.

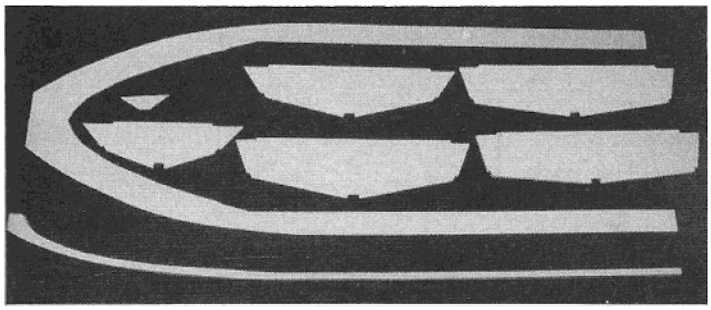
The Stingray, like my Schiada SS-20 deep vee for the 3.5 outboard and my Ski Vee 40 for the 7.5 and 11cc outboard, is made mostly of 1/8" balsa

A snappy easy to build and run sport daycruiser for the K & B 3.5cc outboard motor

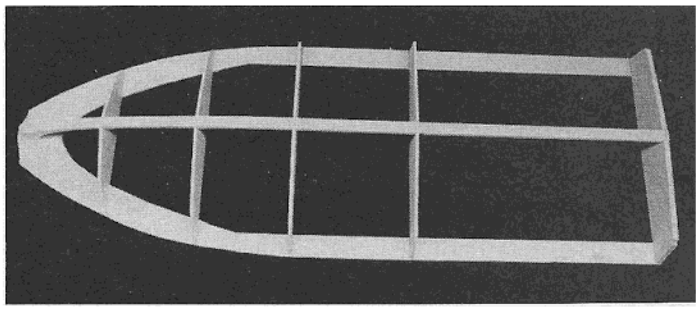
STINGRAY



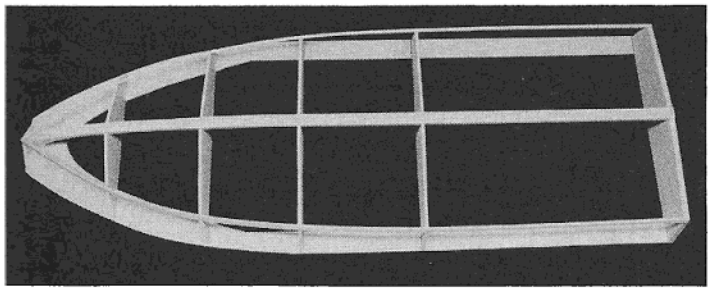
By Fred Reese



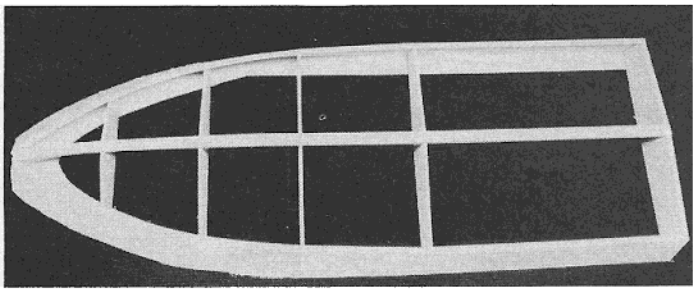
Cut out the bulkheads, crutch and the keel.



Glue the transom and keel to the crutch and glue in the bulkheads.



Glue on the 1/8" x 1/4" chine strips.



Glue on the 1/8" balsa side sheeting cross grain to the length of the boat.

covered with fiberglass. The balsa boats are not expensive, compared to the all fiberglass kits, and they build up very fast. My Stingray was ready to glass after just three evening's work. I have used the same structure as my first boat but I have refined it some and have eliminated the trouble spots. Construction is straightforward and there are no tricks.

"How does it run?" you ask. Well, I couldn't be happier. The Stingray met all of our goals. On the first run in a small pond, it zipped along, turning easily and did not spin out in the turns. Since then, I have made many adjustments on the engine height and thrust angle and even reworked the bottom to correct a building error. The Stingray has always run well, it has just gotten better.

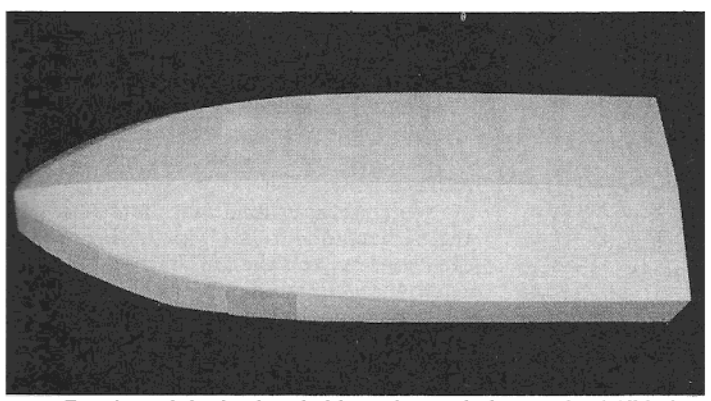
The little boats are fun as they scream around the lake at about thirty miles per hour with a big roostertail of spray flying out from behind. Even simple boats go fast. Build one or, better yet, get a friend to build one with you. It is more than twice as much fun to have another boat racing alongside.

STINGRAY
Designed By:
Fred Reese
TYPE Of BOAT
Outboard Daycruiser
LENGTH OF HULL
31 Inches
LENGTH OVERALL
36 Inches
WIDTH
11 Inches
TYPE OF HULL
Flat-Bottom (A Mono)
DEPTH OF HULL AT TRANSOM
3 Inches
RADIO COMPARTMENT SIZE
(L) 5" x (W) 8" x (H) 3"
ENGINE
K & B 3.5cc Outboard
FUEL TANK
6 Oz.
REC. NO. OF CHANNELS
2
CONTROL FUNCTIONS
Rudder & Throttle
BASIC MATERIALS USED IN CONSTRUCTION
Balsa and Plywood
Wt. Ready To Run ..... 4½ Lbs.

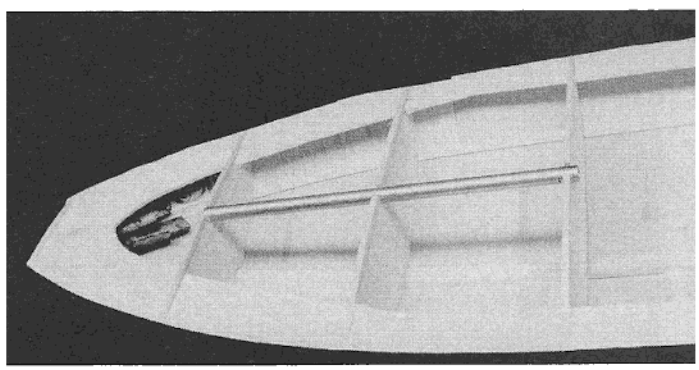
CONSTRUCTION

The Stingray is not a scale boat so I have made the structure as simple as possible, but I wanted a very sleek look. I have used the curved deck since it looks so much better than a flat deck and it does not present any problems when building. The extra layer of wood over the crutch in the rear greatly strengthens the boat as this is where the boat is usually grabbed when lifting it out of the water. The boat needs to be strong enough for routine handling. The Stingray is the third all balsa outboard boat I have done for RCM and they do work well. I have crashed them into rocks and logs and have been hit by other boats, resulting in only superficial damage that was easily repaired. The balsa boats have withstood all of the handling and banging around in retrieval boats without breaking or being damaged. The balsa boats are strong.

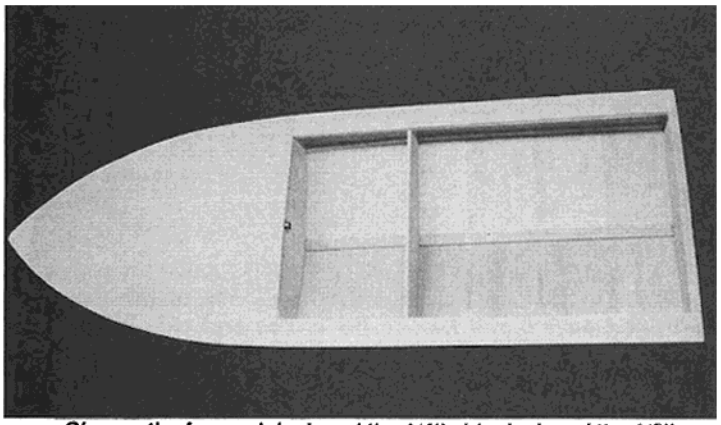
I used Zap CA Plus for all



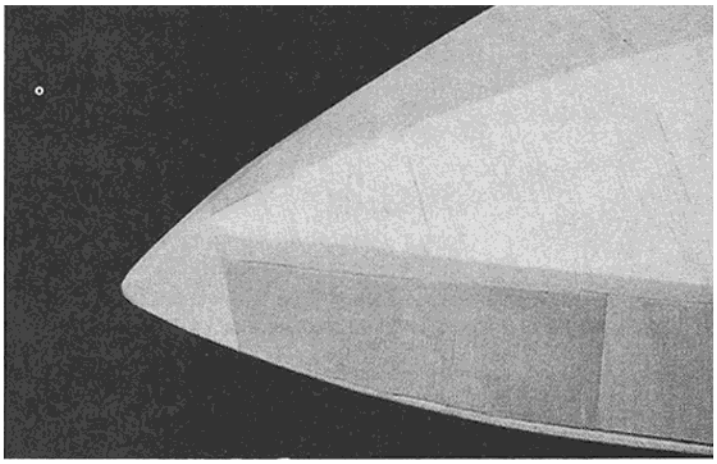
Bevel sand the keel and chine edge and glue on the 1/8" balsa bottom, also cross grained. Sand the bottom even with the sides.



Glue on the top portions of the bulkheads A through D. Install the aluminum ballast tube flush with B. Give the inside of the forward part of the boat a coat of resin or varnish including the underside of the deck.

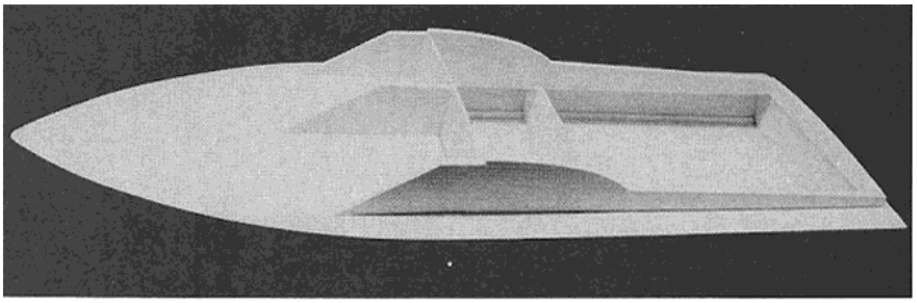


Glue on the forward deck and the 1/4" side deck and the 1/2" sq. over the transom and the nose block. Carve, plane and sand to shape. Match the curve of the deck.

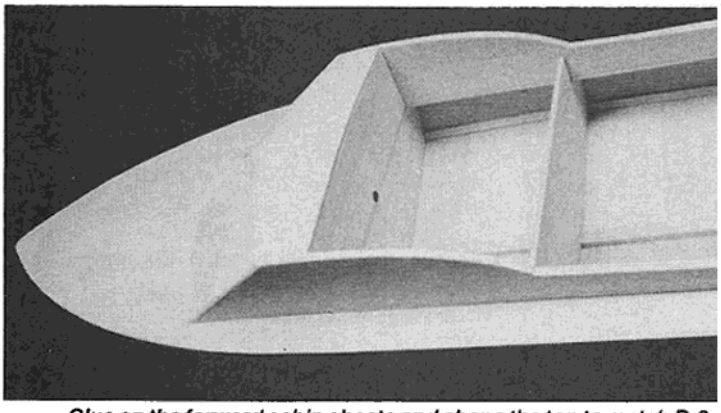


Close-up of the shape of the nose block and side sheeting.

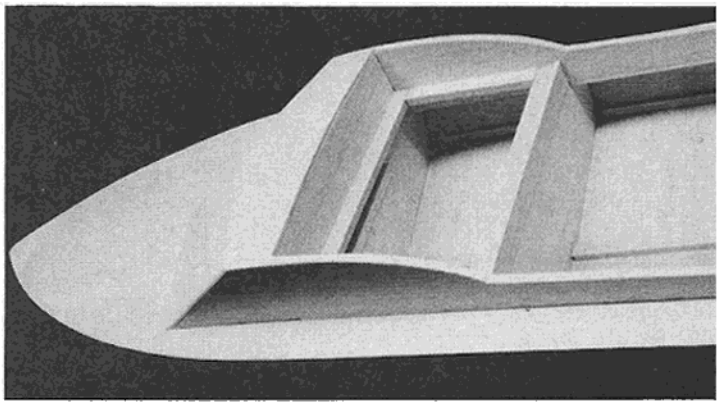
construction. The boat is built on a flat 1/8" balsa crutch in the shape of the deck. The crutch is shaded on the plan. The bulkheads are glued to the crutch followed by the keel and then the chine strips. This basic framework is then sheeted with 1/8" balsa. The deck and cabin structure is then added and the boat is covered with fiberglass cloth and resin. Once the parts are cut out, the construction goes very quickly.



Glue in the cabin sides and D-3. Add the center cabin former G and F-2.



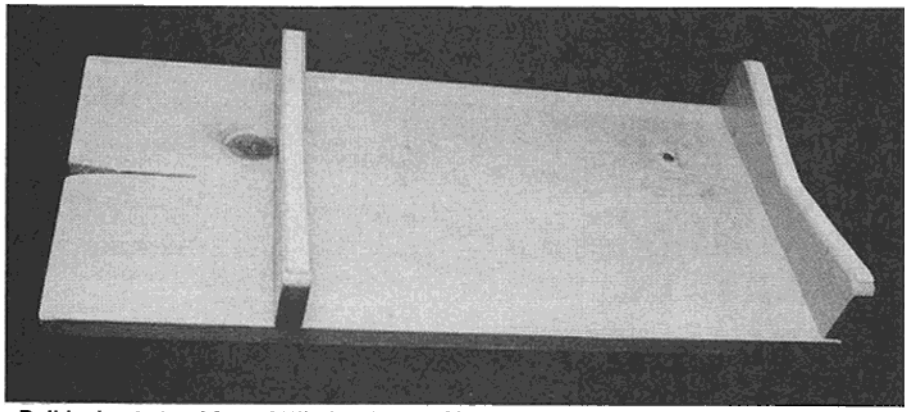
Glue on the forward cabin sheets and shape the top to match D-3. Glue on the cabin top and sand to shape. Glue in D-2.



Add the 1/4" sq. servo tray rails and the 1/4" x 1/2" spruce hatch rails.

Make photocopies of all the parts at the top of the plan and roughly cut up the photocopies into the part shapes. Glue the photocopies to the wood with spray contact cement or rubber cement and cut out the parts. I glued two pieces of wood together for the crutch halves and they were cut out together on my Dremel jig saw. Bestine or Carter rubber cement thinner will remove any contact cement or loosen the paper from the wood if it gets really stuck.

Glue the crutch parts together (shaded on the plan); first, the sides to the front. Shape the side pieces to match the plan where they join in the middle and then join the two halves at the front. Lay waxpaper or Saran Wrap over the plan and pin the crutch down over the plan. Glue F-1, the 1/4" plywood transom to the crutch. The transom should be perpendicular to the keel, not the crutch, so it should be angled back about 1/16" at the keel. Glue the keel and the 1/2" balsa stem together and finish shaping the keel to the stem. Glue the keel and stem to the crutch and the transom. Glue in bulkheads A-1 through E-1. Do not let the keel be bent by pushing it down into any one bulkhead. The keel must be straight from C to F. Glue the

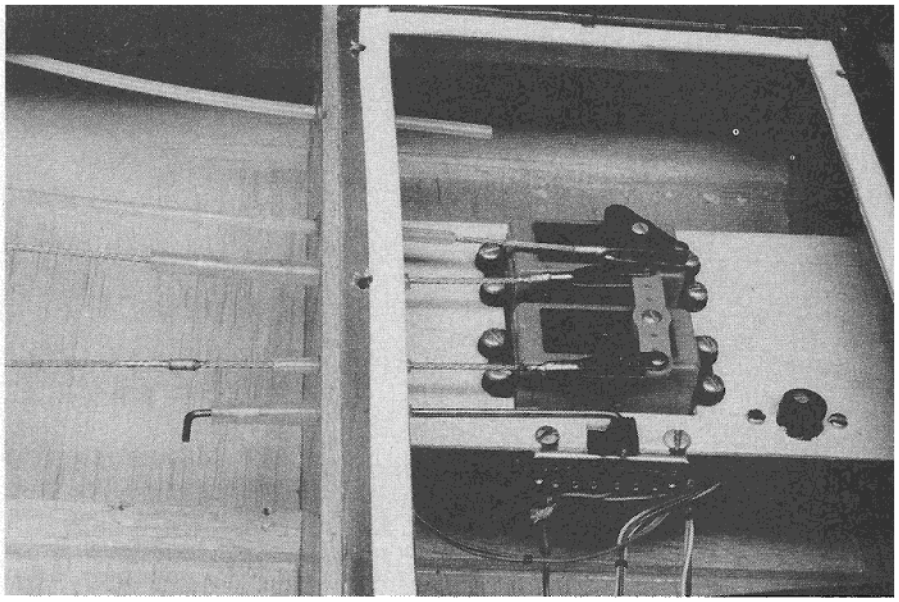


Build a boat stand from 3/4" pine 1 x 12. Give the stand a couple of coats of varnish or urethane. Glue on foam cushion tape and cut a slot for the engine skeg.

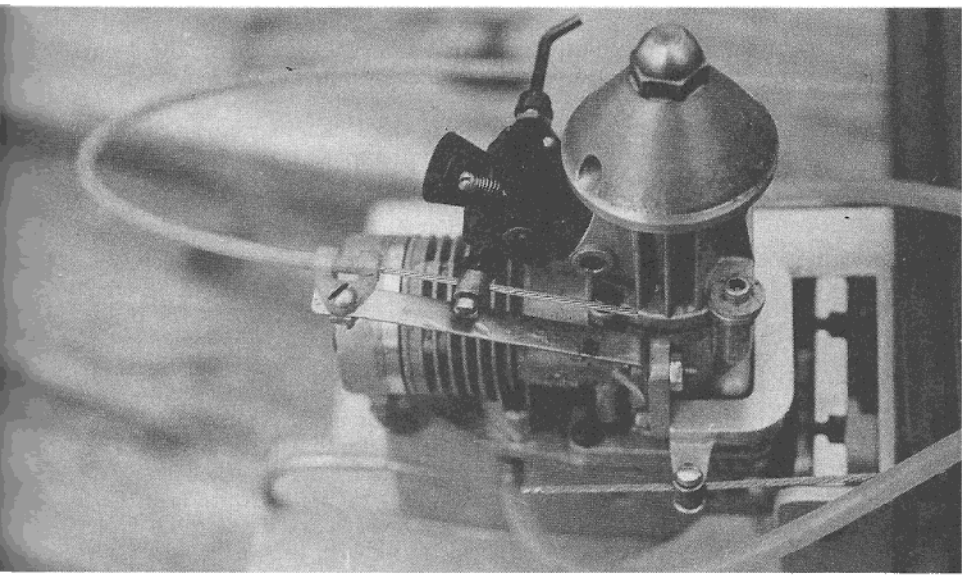
1/8" x 1/4" chine strips in place from A to F.

With a large flat sanding block, sand the crutch and chine strips down the sides even with the bulkheads for the side sheeting. I use #80 grit sandpaper contact cemented to a piece of 1 x 4, 11" long. Glue on the 1/8" balsa side sheeting, starting at the rear. I glue on oversize pieces and sand or cut off the excess wood. This takes less time than carefully fitting each piece. Trim the side sheeting flush with the crutch and even with the chine strip. Make a straight line mark down the center of the keel and do not sand away this line. Sand the keel to the line and at the same time, with the large sanding block, sand the chine and side sheeting even with the bulkheads. Glue on the cross-grain bottom sheeting, one 3" or 4" piece at a time, beginning at the transom. Each piece spans between the keel and the chine. Fit each piece to the centerline on the keel, beveling the edge as you go. Trim away the excess wood at the chine. I did not glue any of the wood sheeting pieces to another, but rather just glued them along the keel, chine and crutch. After all the sheeting is in place, put a drop of glue on each seam from the inside of the boat. Otherwise, you will create ridges of glue that will be hard to sand off. Eventually, resin will get into all of these seams and will seal and glue them together.

Six to ten ounces of nose ballast will be needed to balance the boat. I put in ten ounces, thinking it would need more, but I feel it may have been a little too much. You don't have to put any nose weight in now and just add BB's, poured in through the ballast tube later. I suggest that you glue in about six ounces now and add BB's for the final trim. I used old wheel weights cut up into smaller pieces for the main ballast. Don't add any more weight than is necessary to make the boat stable in the turns.



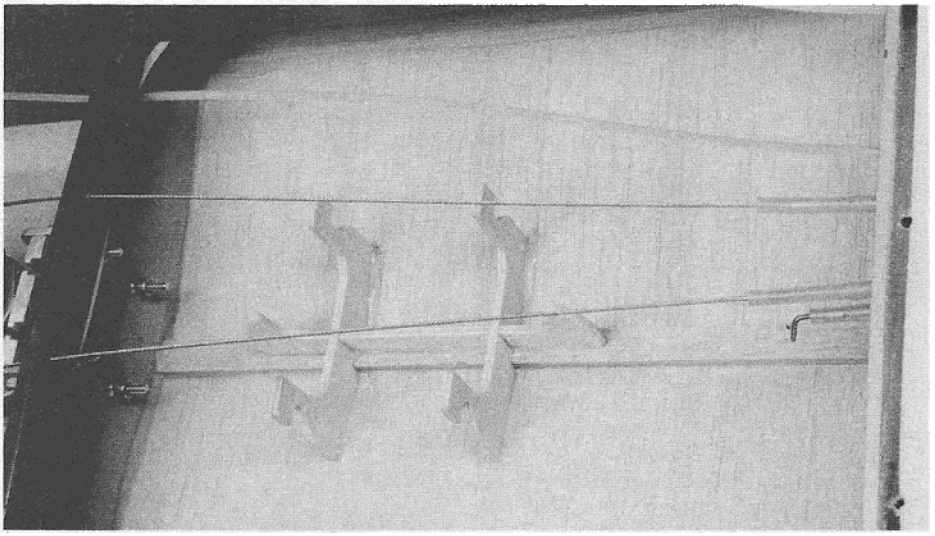
Install the servos and radio, switch and charging jack. Make the simple water seals as described in the text.



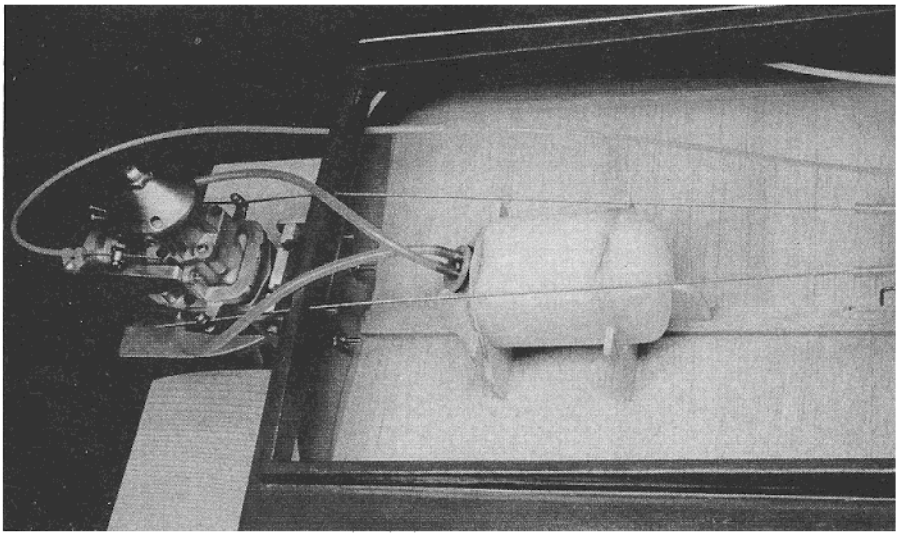
Close-up picture of the throttle linkage and steering cables using EZ connectors. .032 x 1/4" brass strip and a Du-Bro aileron connector hold the end of the Gold-N-Push rod tube. The engine is mounted on a Prather adjustable motor mount which really makes it easy to trim out the boat.

Glue on the tops of the bulkheads A-2, B-2, C-2, and D-2 and cut out the slots for the 3/8" aluminum or brass ballast tube. The ballast tube should be flush with the forward side of bulkhead B so excess BB's can also be poured out of the compartment between bulkhead A and B. The BB's are not stored in the tube. While running, plug the tube with a little piece of foam rubber.

All of the inside wood must be sealed to prevent water or moisture damage or swelling. This includes all of the sheeting, bulkheads, and the underside of the forward deck. Do the forward part of the boat now and the cockpit and radio compartment later. I use K & B finishing resin to seal the wood brushed on. Use the resin to glue



The fuel tank is held in the 1/8" ply tank support by two rubber bands.



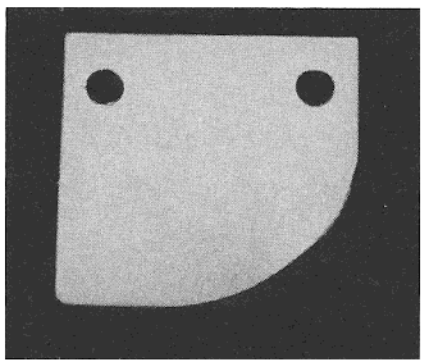
Two lines from the fuel tank, one to the carburetor and the other to the pressure fitting on the other side of the engine. Throttle linkage loops around behind the engine so the throttle does not change when the engine is turned.

on the forward deck as you seal it and the resin is still wet. When everything is coated, pin the deck in place and let it dry. The forward deck is applied in one large piece and it easily makes the gentle curve over the bulkheads. When dry, glue on the 1/4" x 1¼" side deck pieces and the 1/2" square piece over the transom. Glue on the balsa nose block. Using a razor saw, a plane, and the large coarse sanding block, shape the nose and deck and the 1/2" square piece over the transom to match the curve of the deck.

Glue in the two cabin sides and bulkhead D-3 to get the sides in straight. The bottom of the cabin sides should be even with the bottom of the crutch in the cockpit and should glue down to the deck in the front. Glue in E-2 and F-2 and add G, the center cabin former. Cut and fit the 1/8" balsa cabin front. Sand the top of the cabin front to match the curve of D-3 and glue on the cabin top and sand to shape.

Glue in the 1/4" square balsa servo tray rails and the 1/4" x 1/2" spruce hatch rails. Glue in the 1/8" plywood fuel tank support.

The boat is now ready to sand in preparation for glassing and this is the most important step and will determine how well your boat will run. At speed, only the back eight inches of the boat should be touching the water and the boat should run level and smooth. If the bottom of the boat is concave (hooked) or has low spots, it will hold more of the boat bottom tight to the water and will slow it down. A boat with a hook will run smoothly but will never reach its speed potential. If the boat bottom is convex or rounded, from front to back, near the back (rocker), the boat will porpoise or slap the water, again slowing it down. Carefully and lightly sand the bottom to remove any ridges in the sheeting and then check the "trueness" of the bottom with a metal yardstick or straightedge. Sand off any high spots. Be sure individual pieces of wood are not flexing as you sand them. Glue them from the inside if you notice any flexing. The 1/8" thick sheeting gives you plenty of material to sand out the bottom of the boat. Round off the chine edges and the transom edge so the glass cloth will make the bend without pulling away as the resin sets.

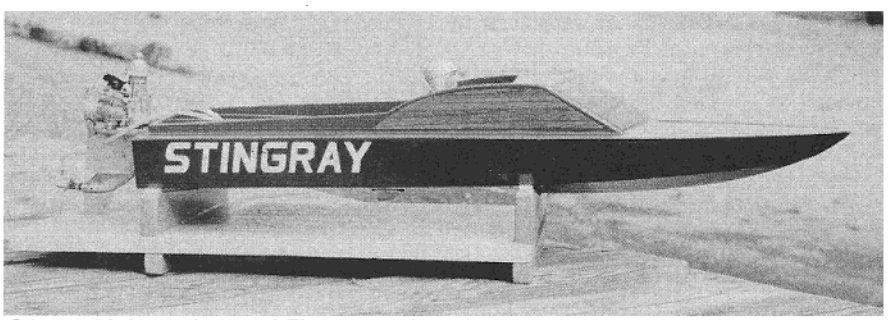


Cut turn fin from .032 x 1" K & S brass. Cut a slot in the bottom of the boat and epoxy the fin into the keel.

Glass the bottom and sides first with heavy glass cloth and then cover the deck and cabin with lightweight glass cloth. Cover the bottom, sides and transom with one large piece of glass cloth. Lay the cloth over the bottom and smooth it down over the sides. Trim off most of the excess cloth, but leave at least an inch all the way around plus enough for the transom. Brush the finishing resin into the cloth, starting along the keel and work forward. Leave the rear edge dry until the rest of the bottom is wet and smoothed out. With scissors, make a cut in each side of the cloth at the transom so the cloth can wrap down over the transom. Some of the side cloth will wrap around the transom and the excess transom cloth will wrap around the sides. Finish brushing the resin into the cloth around the back of the boat and brush out any puddles that may have formed. When the glass has set, but is not fully cured and is still leathery, trim off the excess cloth with a razor blade. When the resin is harder, sand off the edge at the deck and sand down any other rough edges or bumps.

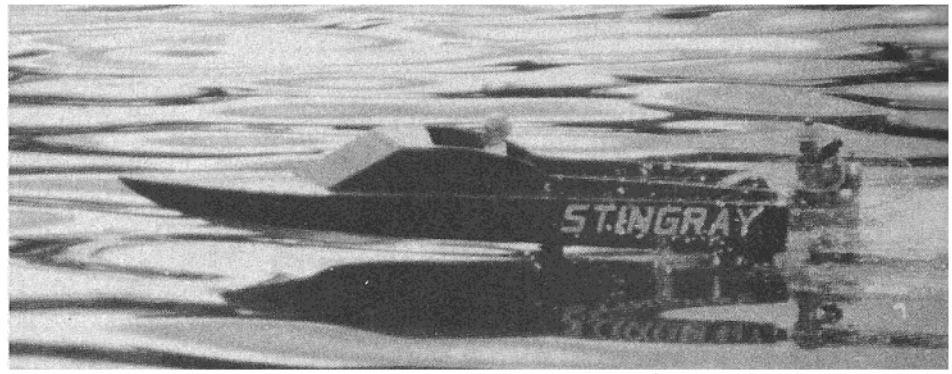
Cover the deck and cabin sides with lightweight glass cloth. Cut a large piece of the silk weight glass cloth that will cover the top of the boat and lay it in place. Add about an ounce of acetone to the catalyzed resin to thin it slightly for the lightweight cloth. Begin brushing the resin at the front of the cabin and work forward. Then work rearward up over the cabin and down the sides. As you start down the sides, cut the cloth down the middle over the cockpit. After the sides are done, the cloth can be worked over the cabin sides in the cockpit. Trim the sides of the deck and overlap the cloth down the sides of the hull about 1/2". Let the resin cure until it is pretty hard, then trim the excess cloth with a razor blade. Sand off any bubbles or wrinkles in the cloth and open up any blisters in the heavy cloth. Sand off the high spots where the cloth was doubled over. Brush another coat of resin over the entire boat inside and out.

A mixture of resin and micro-balloons is the best filler to use



Stingray sitting on its stand. The support is under the transom and under bulkhead D. Use the bulkhead plan to get the bottom angles of the boat for the stand.

over a resined surface. They can be mixed so the mixture is thin and can be spread over a large area as a filler or they can be mixed into a dry paste so it can be built up. Just add enough of the featherweight powder to the catalyzed resin to get the consistency you want. I like the Prather or K & B white micro-balloons in the tall plastic squeeze bottle. Micro-balloons are so light, you will think the bottle is empty. Use a thin mixture to fill the glass cloth weave and any air bubbles or pockets. Use a stiffer mixture to build up the rounded transom and chine edges until they are sharp. While the curing mixture is leathery, it can be carved or sanded quickly to rough shape and then be finish sanded when it is hard. The mixture is hard and more difficult to sand once it has fully cured in a couple of hours. Recheck the bottom of the boat with a straightedge. Sand off any high spots and fill any low areas with the micro-balloons and resin. Gradually fill and sand off the irregularities in the finish until you are ready for primer. If you have spray equipment, K & B Super Poxy or Hobbypoxy is the best finish you can use and then use K & B primer. Presently I do not have spray equipment so I used Pactra Formula U paint and auto primer in spray cans. Apply a coat of primer over the boat. Before sanding, apply auto body spot putty over any remaining pin holes or irregularities. Sand off the excess putty and then wet sand the boat with #220 wet or dry sandpaper. Apply another coat of primer and retouch anything needed with auto body spot putty. Reprime and wet sand the boat but leave the boat overall white or light gray for the finish paint.



Stingray doing what it does best. The boat is riding smoothly but the turn fin is showing. The minimum amount of the boat is touching the water.

Carefully dry and wipe off all dust then spray on the finish coat of paint.

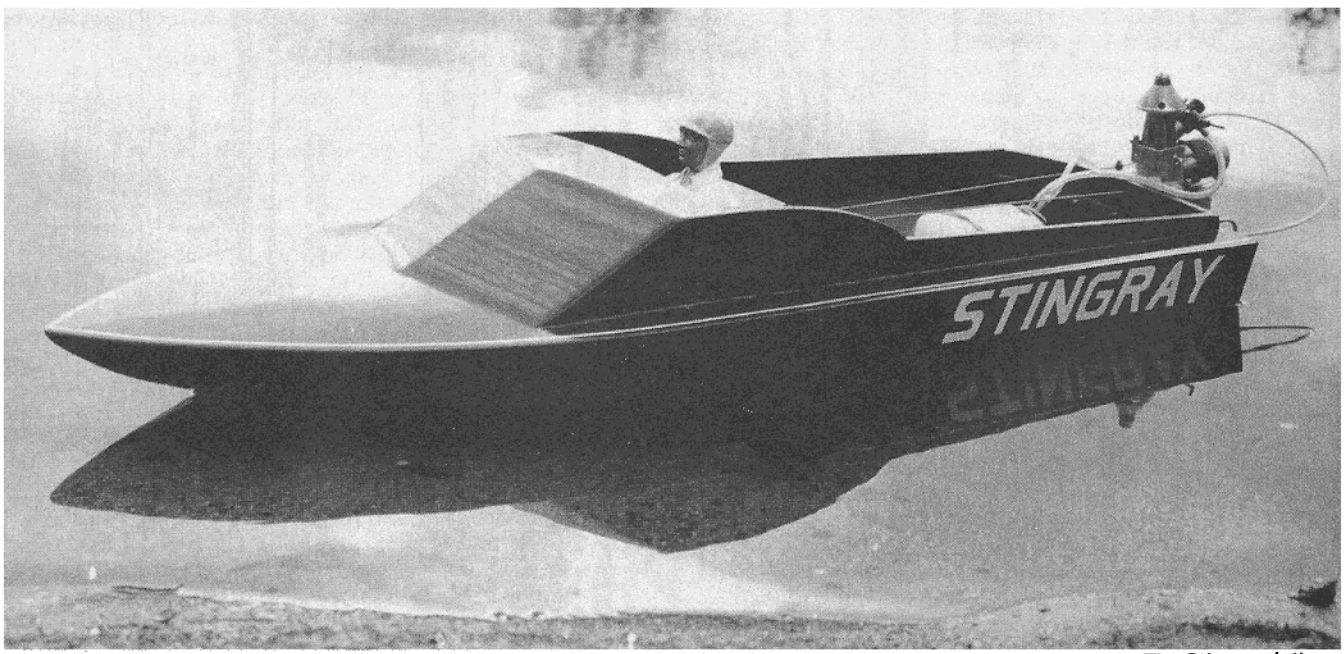
The Stingray letters were cut from white MonoKote trim. The letters were left in place on the backing just as they are to appear. The excess trim material was removed from between the letters. Apply Scotch Tape completely over the letters and the entire word can be carefully lifted off of the backing. Apply the letters and the tape to the side of the boat. The MonoKote trim will stick to the painted surface better than the Scotch Tape so the tape can be peeled off. Seal the letters with clear varnish. I used woodgrain contact paper on the cabin sides and front.

Build the boat stand from 1 x 12 pine. The keel should be about 1½" above the base. There should be a cradle under the transom and under bulkhead D. Pad the cradles with foam tape. Cut a slot for the engine skeg in the base. The stand is necessary for starting the boat and to prevent damage to the skeg and turn fin when transporting and storing the boat.

Mount the Prather adjustable motor mount to the transom. Glue in the 1/8" plywood servo tray and mount the servos and radio switch. Bolt the engine into the mount and line up the holes for the steering and throttle cables. Drill out the holes with a 1/8" drill. I used two 36" pieces of .058 Gold-N-Push rods. This is 1/16" flexible cable inside a plastic tube. One cable and tube was used for the throttle linkage. The other cable was used for the steering and the tube was used to hold the radio antenna inside the cockpit. Solder links were used to connect the cable to the servos and EZ Connectors were used at the engine. The EZ Connectors allow quick and easy adjustment at the engine and take up less space than do adjustable clevises. I soldered the washers on to the EZ Connectors in the steering yoke of the engine. Sweat some solder into the ends of the cables to keep them from fraying. Cut the cable with wire cutters.

Insert 1/4" lengths of the plastic tube in the holes through F-2 for the steering cable bushings. The radio switch slide is drilled out with a 5/64" drill. The 1/16" wire switch pull is inserted in the hole. The loose fit prevents the switch from breaking.

The water seals are made from the



A 2" Williams Bros. pilot figure was screwed to the radio hatch cover. Boats need a driver just like planes need a pilot. The Stingray letters were cut from trim MonoKote, see text. Woodgrain contact paper was used on the cabin sides.

plastic tube, 3/32" brass tube and medium silicone fuel tubing. The brass tube just fits inside the fuel tube and makes the seal. I smoothed the fluting off the end of the plastic tube by chucking the 1" length into a drill and touching it with sandpaper so the fuel tube will fit snugly and not leak. The smooth end of the plastic tube should protrude into the cockpit about 3/8". Solder a 1/4" length of the brass tube over the cable about 1/2" from the plastic tube. Slip a 1½" length of fuel tubing over the brass slide and onto the plastic tube for the seal. The brass tube and cable slides freely inside the fuel tube but will keep the water out.

There should be a water seal over both steering cables and the radio switch pull. The throttle cable is covered full length so no other seal is used. You can put Vaseline or grease inside the tubes and water seals if you think they might leak. Always open the radio hatch as soon as you are through running your boat in case any water did get into the radio box. If you do have a leak, fix it. Mine leaked initially at the bottom of the bulkhead. I call out 1/8" plywood for the radio hatch, but 1/8" clear plexiglass is used by many boaters for hatch covers so they can see if there is a leak. Even if you can't see water or moisture, open the hatch at the end of the day. Trapped moisture is deadly to your radio equipment.

The throttle linkage to the engine must be flexible, otherwise the speed would change whenever the engine moved. The engine bracket to attach the throttle cable is .032 x 1/4" K & S brass strip. Drill each end with a 1/8" drill for the 4-40 mounting bolts. The Du-Bro aileron connector must be drilled out with a 1/8" drill for both the bolt and the plastic tube. The plastic tube is just a friction fit into the aileron connector. Again, use an EZ Connector on the throttle arm of the carburetor.

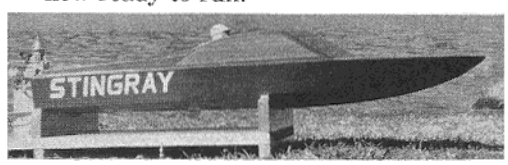
The plastic tube for the radio antenna enters through E-1 on both sides so the receiver can go on either side of the servos. The plastic tube is just friction fit under the crutch which is the widest part of the boat and is above water. I have not had any range problem using this system. The antenna can be slid into the tube from inside the radio hatch. A little Pam or cooking spray rubbed on the antenna will help slide it in.

To seal the radio hatch, use wing cushion tape either 1/16" or 1/8" thick and from 1/4" to 1/2" wide. Be sure there are no gaps between the lengths of the tape. The hatch is held in place with 4-40 x 1/2" bolts into 4-40 blind nuts glued into the spruce hatch rails.

Assemble the fuel tank so that the pickup is at the bottom-rear of the tank and the vent or pressure tube is at the top-front of the tank as is shown on the plan. A flexible clunk is not necessary. The fuel tank is held in the tank support by two rubber bands. Run one fuel line from the pickup to the carburetor and another from the vent to the pressure fitting on the side of the outboard engine. These fuel lines must be just long enough so they don't bind or pull when the engine is turned. Cut a piece of 1" to 1½" thick styrofoam in the shape and size of F and wedge into place ahead of the transom to provide floatation in case the boat flips.

Adjust the engine height so that the top of the propeller housing is even with the bottom of the keel. This is a starting point and the engine may be moved up or down for maximum speed.

Balance the boat as shown on the plan by adding BB's to the nose if needed. Plug the ballast tube with a little piece of foam rubber in the radio compartment to keep the BB's from shifting to the radio compartment during handling. The BB's can be loose and do not have to be glued in. You can't hear them when the boat is running. BB's can be added or removed later if you want. Eventually a little resin can be poured down the tube to stop the rattle. The turn fin should be located at the balance point or just slightly behind it. Cut out a turn fin from .032" brass or aluminum. I used 1" wide brass from the K & S rack. Cut a slot in the bottom of the boat up through the keel with a sharpened hacksaw blade and epoxy the turn fin in place. The boat is now ready to run.



Before you go to the lake you need to arrange for a retrieval boat. You should have some kind of rowboat, canoe, or raft available so you can go get the boat when it quits out in the middle of the lake.

Favorable wind will get the boat back sometimes, but it is not reliable. You should also have a casting or spinning rod to retrieve the boat when it is within reach of shore.

Put on an Octura X440 or JG E-20 propeller on the engine. Do not try to run the propellers that come with the engine. They won't work. The Octura plastic props work almost as well as their metal props but they break easily. Balance the propeller according to the K & B directions in their engine instructions.

Open the needle valve 3½ turns, or according to your engine instructions, for the first run. This setting will be rich. Make short runs and each time turn the needle valve in 1/4 turn with each run until the engine is peaking. ABC engines should not be broken-in rich. If the engine is too lean, it will sag and quit at full throttle. Reliable idle speed on the water is pretty fast. Low throttle or low idle trim should kill the engine on command. This is important when you bring the boat in to the beach.

Start the engine. Follow the K & B instructions. Mine starts best at about half throttle and must be choked to get the fuel to draw. Remember the boat motors run in the opposite direction to airplane engines, so reverse your electric starter leads. When the engine starts, get the boat into the water as quickly as possible or the engine will overheat and the propeller bearing may be damaged. Water is the lubricant. Give the boat a gentle toss forward into the water and advance the throttle to full. At first the engine will probably be running too slow but try a couple of turns, then bring it in. Be sure to cut the engine about twenty feet from shore and let the boat coast in. Don't let the boat run up on the beach. If the boat is running smoothly and turning without spinning out, enjoy it and peak the engine. Problems begin to arise the faster the boat goes. There are always some trim adjustments to make or try. Spinning out is the most upsetting problem because the boat spins in the turns and will swamp or flip and will usually kill the engine and, oh darn, it's out in the middle of the lake again. Spinning out is a sign that the balance is too far back. The boat is tail heavy and unstable. Add ballast to the nose. You want the balance to be as far rearward as possible and still be stable and not spin out.

As you are adjusting the balance, you will be noticing the attitude of the boat as it runs straight. Is the bow slapping or is it glued down to the water? The bow should appear light, moving up and down slightly, but not slapping. You should be able to see the turn fin most of the time while the boat is running. Adjust the riding trim with the engine tilt. Moving the propeller rearward will lighten the bow and moving it forward will push the nose down. If you can't get the bow to lighten, recheck the bottom of the boat with a straightedge. You may have a hook in the bottom. The amount of the propeller in the water at speed determines the speed of the boat along with the needle valve setting. Adjust the engine up and down in 1/16" increments until the boat is running fastest and then peak the engine for maximum rpm.

It will take many runs to make all of the adjustments. However, the hull was designed to be as easy to set up as possible and should give you a nice running boat by the time you get the needle valve adjusted. Optimum trims are adjusted gradually as you feel the need to try to improve the boat. I am still making minor adjustments on my Stingray even though it ran nicely the first time I put it in the water, but far from perfect. I hope your boat will also run nicely and as you learn more about your Stingray, you will make it perfect. □