

The Making of a Wakeboard Boat

A look at how Skier's Choice puts it all together

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Author: Marty "McFly" Head

Photos: Marty Head, Skier's Choice and BoatMate

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With the boat show season behind us and the wakeboard season getting started, more and more discussions will arise concerning the different types and lines of boats. Common questions will begin to cycle and we are almost guaranteed to see some long "boat war" threads on the Internet message boards. We all know that, although very humorous, "boat war" threads can contain incorrect information that is very misleading to potential boat buyers. I am hoping that, by writing this article, you will find it as a source of information as to how Skier's Choice constructs their Supra and Moomba Boat Lines.



Supra Launch SSV

I was fortunate enough to visit Skier's Choice's brand new facility in Maryville, Tennessee last December. I was given two tours, the first one after hours when the plant was already shut down for the evening and again during the day when the plant was in full operation.

In 2003, Skier's Choice expanded from their 65,000-square-foot facility to a new, 140,000-square-foot facility in Maryville, Tennessee. Everything is now under one roof, including all of the molds that are used in the boat building process. It was finally time for SC to make the move, especially since their 98+ dealers are turning in a record number of orders.

2003 Proved to be a great year not only for the dealers, but also for SC. They built approximately 1,500 units, moving them to third in the industry in the ski/wakeboard boat-building category, right behind Malibu and MasterCraft.

Skier's Choice builds boats to order. This means that once they receive an order from a dealer, the boat is given a spray date (the day that the boat will first go into production). The boat is then built to the specifications that are requested by that dealer. SC is already looking to increase production numbers since there is such a high demand for their boats by their dealer network. There is very little down time for the factory given that dealers send in orders almost every day of the year.

The key thing to remember in boat construction is that a boat starts from the outside and is built inward. A boat starts with the color first. But, before the color can be applied, there has to be something to apply it to. This is called a mold.

A mold is a mirror image of the hull or the deck of a boat. The hull and the deck of a boat are two separate pieces that are joined together at the rub rail. So, when the boat is first started, it is built in two pieces that travel down the lamination line.

Molds that are not in the production schedule are shown to the right. The actual part of the mold that is waxed and sprayed is the green part of the mold. The molds are braced in steel to ensure that they retain their shape. SC believes that a quality finish starts with a quality mold, so the molds are cleaned and waxed on a regular basis.



Storage of the boat molds



Taped off mold before getting sprayed

Once mold maintenance is complete, the mold is taped off with paper in preparation for the gelcoat to be applied. It is then rolled into one of the four-gelcoat spray booths. The color of the boat is sprayed in first, thus building the boat from the outside in. The base color of the boat is sprayed into the mold and then the tape is removed and the accent colors are sprayed. SC uses Armourflex Gelcoat by Cook Composites and they spray the gelcoat 20-22 mils thick to maximize durability and minimize fading. Each color is sprayed from its own gelcoat gun, instead of using the same gun for each color.

The more colors per hull and deck, the more labor cost. This is why with fewer color options available for Moomba, SC can keep the cost down, but not the quality. Fewer colors equal less cost.

Once the gelcoat is completed, another process is performed to give the hull and the deck more durability. This is called a Vinylester Barrier Coat, also by Cook Composites. This is sprayed in on top of all of the color and it dries black. It helps to reduce blistering and print-through.



Vinylester Barrier Coat

Once the Barrier Coat is applied, it is time to roll the mold out of the gelcoat booth and begin to apply the glass. A skin coat is applied first, which is made of a 1.5 oz mat fiberglass. This helps to produce a smoother finish with no print-through. SC uses a LHP Cook Resin to bond the glass to the Barrier Coat. It is all 100% hand laid. SC has found that hand laid fiberglass is much more consistent than fiberglass applied with a chopper gun.

A Ceramic Barrier Coat is then applied, which is produced by Magnum Industries. This is a spray application that helps eliminate print-through and seams. It adds stiffness to the laminate schedule and it aids in crack prevention.



Glassed in strip of HDPE (in black) where the windshield will be installed

Once the Ceramic Barrier Coat is cured, SC adds more glass to the mold. There are four types of glass: Mat, Biaxial, Quadaxial and Woven Roven. Each one is applied to the boat to add strength in key areas. This glass is bonded by the use of a DCPD Blend Resin by Cook Composites. Each Deck is reinforced in the tower mount areas with biaxial glass and bulked up with Coremat whether that boat is going to receive a factory tower or not.

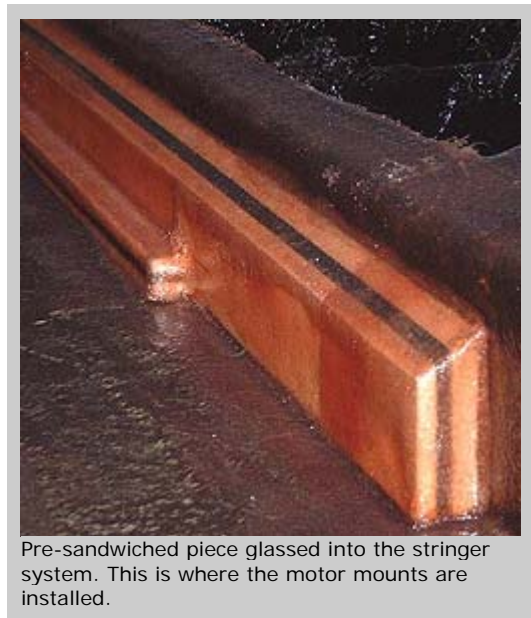
SC uses various reinforcements and backing throughout the mold as well. High Density Polyethylene, or HDPE, is used to back windshields, motor mounts and other anchored parts. It has 10 times the screw retention of plywood. They also use a PVC board, better known as Pro Board, which

adds stiffness to distribute stress loads. It is a very porous material that bonds well with resin. It is found in transoms, motor mounts and other bracing areas.

All motor and pylon mounts are a sandwich composite reinforcement. It consists of two layers of PVC Board and one layer of HDPE. The PVC absorbs the resin, unlike steel or aluminum, and the HDPE has the ultimate screw retention for lag bolts. It also dampens vibration, unlike metal mounts.

There is also a foam board called Divinice that is used in floorboards and other large flat surfaces. It is used for sound dampening, but also has an incredible strength to weight ratio. It has a matrix design that allows resin to seep in for maximum strength.

The stringer system is what gives the hull its strength. It is a composite fiberglass system that is chemically bonded to the hull with a PolyCore resin-based bonding adhesive, creating a solid one-piece structure. The picture shows the stringer system of a Moomba Outback about to be dropped into the hull.



Pre-sandwiched piece glassed into the stringer system. This is where the motor mounts are installed.

Notice the indentation in the center of the stringer system. This is where the in-floor cooler is located in the Outback. Also, notice the tunnels that run along the sides of the stringer system. These are the air induction tunnels that flow fresh air from the air intakes, located on the deck in front of the windshield, into the engine



Supra Launch SSV stringer system

and stringers and helps

with sound dampening. This is a procedure that is not required by the Coast Guard on any vessel over 20-foot, but SC does it anyway on all models.

There are many other key areas that SC addresses during the lamination process. They mold in all bulkheads to increase strength in the walk-through areas while also using them to feed the air induction tunnels. They use PVC piping that is laminated to the backside of the deck to keep wiring out of wet areas near the floor.



Gelcoat spray booth ventilation system

compartment. The dirty air is then forced out of the rear exit vents located on the rear of the boat on top of the deck.

In this picture of the stringer system of the Supra Launch SSV, you'll see a large area in the center of the stringer. This is the "basement" area found in the bow of the SSV under the playpen area.

Once the stringers are installed, flotation foam is injected under the floors and stringers. This is done every 12 to 18 inches. This allows the boat to continue to float in case the boat is somehow filled with water. It also adds strength to fiberglass floors



Stringer System being installed

Once the laminati

on process is complete, the hull and the deck are pulled from their molds and are then rolled into a grinding booth to remove the rough edges and cut the appropriate areas. Both the Gelcoat Spray Booth and the Grinding Booth are located in open-air rooms that are ventilated with state-of-the-art air systems. Clean air is blown down into the room through a circular vent. A large exit vent is located at the back of the room, which removes the contaminated air.

After the grinding booth, the deck and the hull (still in two pieces) are sent down the rigging lines. The deck and the hull of a Supra go side-by-side down the Supra rigging line, while the deck and the hull of a Moomba do the same down their own rigging line. Although the processes are similar, some of the parts are different. There are many standard features on a Supra, while everything is optional on a Moomba. This is where the Supra and Moomba lines begin to separate.

The underwater gear, engine, wiring, ballast system, and Syntec carpet are all installed while the boat is still in two pieces. This makes it much easier to mount and secure various parts in their proper positions rather than having to work in tight places when the boat is one single piece. Also, by installing carpet during this stage, SC can run carpet from wall to wall instead of just carpeting the floor. By looking at the pictures, you'll see how much easier it would be to install upholstery or run wiring at this stage than it would be if the deck were mounted to the hull.



Top half of a boat on the rigging line



Example of a jig

bolts will not pull through.

All holes are drilled by using a jig template to ensure consistency from boat to boat. This is a better fit for upholstery and handrails and is also a better fit for replacement parts. Aluminum backing plates are used behind lifting rings, swim platforms, tow eyes and tower feet. This spreads the force and pressure over a wider area when stress is applied, which helps prevent stress cracking and ensures that

All hardware on the tracking fins, struts, steering arms, pylon brackets and rudder boxes are all through-bolted. This allows them to be more impact resistant than traditional screws into fiberglass. All screws, nuts, bolts, washers and staples are all made of stainless steel. Obviously, this is longer lasting for the life of a boat since the boat is surrounded by almost constant moisture. There are recessed shaft log and water pickups on the hull to give the boat better water flow and less drag.

The actual floorboards of the Supra and Moomba boats are made of boxed aluminum to guarantee no rotting and no warping, a major problem many older boats have had. They also protect the plastic gas tank that lies under the floorboards. SC uses roto-cast (a form of plastic) tanks to eliminate any chance of corrosion or rust.



Super reinforced direct drive pylon bracket



Deck about to be set into a hull

Once the hull and the deck are finished with their separate rigging, it is time for them to be joined together. "Shoe box assembly" is the method that SC uses to mount the deck to the hull. This means the deck fits over the hull like the lid of a shoebox. The result is that the fiberglass is double thick at the deck and hull joint where the rub rail will run. The deck is attached to the hull by running a stainless steel screw every 3 inches through the rub rail, through the fiberglass and into a strip of HDPE that is located behind the hull to make sure that the screws will not back out. This process also allows the deck to be removed in the future in case

a major repair is ever needed.

The upholstery is another interesting feature of SC. Although the upholstery looks different between a Supra and a Moomba, they are very similar. In fact, they are the same. Both Supra and Moomba use a 34 oz. vinyl. It has an 18-mil SRT (stain resistant topcoat) and is laminated at the surfaces. This topcoat is the thickest wear layer used in the industry. On the Moomba line, the vinyl is double stitched and laminated on all horizontal surfaces. This makes it easier to install and keeps the cost down. On the Supra line, all vinyl surfaces, both horizontal and vertical, are laminated, which allows the upholstery department to add curves, extra detail and more design to the interior. The stitching is also done in a French seam, which means it is triple stitched.



HDPE behind the lip of the hull where the stainless screws will bite

Supra is then finished out with stainless steel grab handles, while Moomba uses less expensive automotive handrails. All upholstery uses HDPE backing to eliminate the chance of rot. The driver's seat in both lines is made of roto-cast seat bases for durability with a riser (built in booster seat) found in every boat as a standard feature.

Once the boat is lake ready, it goes through a 10-point "high risk" test to check all electrical, fuel and steering systems before the boat is actually dropped in a lake. A second 35-point tank test is performed to make sure there is proper operation of the engine, gauges, drive train and other systems.

After the test is complete in the tank, the boat is then ready to go to the lake for a 30-point lake test. This test gives SC a chance to see the fiberglass in natural light (a lot of blemishes cannot be seen under florescent lighting). Once the boat is dropped in the lake, numerous tests are done. SC must check the overall running attitude of the boat, check for any vibrations, check to see if the boat pulls hard one way or another and double check all electrical, fuel and accessory systems, such as ballast systems, heaters, showers and Perfect Pass. They also make sure the boat is watertight.

When the boat comes back from the lake, it enters the "final finish." The boat rolls through this line for one last check up. All blemishes will be addressed, all systems will be repaired if there were any problems during the tests and all decals will be installed along with a final coat of wax. Then, there are a series of signoffs that must take place before the boat leaves the factory.

Obviously, there is an installer signoff to make sure that the particular boat in question received all of the features that were ordered on it. Then there is a Final Finish signoff stating that the boat did go through and graduate from Final Finish. Next are a Quality Control signoff and, finally, a second Quality Control signoff by one of the SC managers to assure the purchasing dealer that the boat is ready to go.



Ready for a trailer

Trailer

BoatMate Trailers builds a custom, matching-colored trailer for each of the completed boats. It is timed in such a manner that the boat and the trailer are completed at almost the same time. Supra comes standard on a tandem axle trailer, which includes stainless steel fenders, front disk brakes, surge brakes and a Boat Buddy. Moomba is standard on a single axle trailer with all other options available.



Boatmate Trailer

BoatMate Trailers builds trailers that are custom fitted to the boat for which the trailer is ordered. To obtain this custom fit, BoatMate obtains a pre-production boat from the boat manufacturer. The frame of the trailer is formed to follow the lines of the hull. Whereas many trailer manufactures will bend the frame in an "A-frame" pattern, BoatMate rolls the forward bend of the frame to closely follow the bow section of the hull. There is no structural significance to the roll, but the roll does make the trailer appear more fitted to the boat.

Cross-members that are bent to allow clearance for the hull and any underwater gear are used to tie the two frame rails together. After assembling the frame, the boat is suspended over the frame in the position in which the boat should sit on the trailer. Brackets that support the trailer bunk boards are positioned to support the hull and guide the boat onto the trailer and welded into place.

A bow stop is fabricated and positioned to stop the forward motion of the boat during loading. Then, with the boat resting completely on the trailer, axles are positioned under the trailer. The axles are positioned to provide tongue weight equal to 10% of the gross weight of the boat and trailer combined with the tongue weight not to exceed 400 lbs. From this, trailer jigs will be fabricated which allow BoatMate to fully replicate the trailer in production.

BoatMate builds trailers utilizing structural tubular steel. Because structural steel is typically used inside the walls of buildings, it can have a rough surface. BoatMate contracts with the steel mill and pays a premium for "boat trailer quality" steel. Care is taken during the production of this steel to eliminate mill marks and surface scale. The steel is also handled using straps instead of chains to prevent scarring.



Adding the bow stop



Subassembly saw tubing cut

The steel arrives at BoatMate in mill production lengths. It is cut to size and processed in the subassembly department. In subassembly, the frames will be cut and rolled and the cross-members are cut to length and bent to spec. Several components of the trailer are welded in subassembly such as the prop guard, tongue and bow stop.

The trailer frame is assembled and welded in the welding bays. The frame rails are positioned on stands and the jigs for the particular trailer are positioned on and around the frame. The jigs are used to locate the cross-members, the steps, the bow stop, the axle(s) and all of the bunk board

brackets. All of these components are tacked together and then welded together. Mig welders are used for all welding processes in the BoatMate facility.

When the welders have completed the frame, the trailer is supported on dollies, which keep the frame at a comfortable working height for the rest of the build process. The frame is rolled into the paint prep area where the brake lines are installed and bled. The frame is moved forward

in the prep area where grinders and sanders are used to smooth the weld seams and any imperfections that may exist in the steel.

The last process in the prep area is cleaning the frame. BoatMate sprays a degreasing compound onto the trailer frame that is allowed to soak for a few minutes. A high temperature steam cleaner is used to apply a detergent and iron phosphate mix to the frame. The detergent removes any dirt, grease or other contaminants from the frame. The iron phosphate bonds to the steel on a molecular level and creates a crystalline surface layer on the steel. This crystalline layer provides much more surface area to which the primer can bond. A



Prep grinding

greater bond between the steel and primer provides better chip resistance than applying primer to the steel alone. The crystalline layer also provides a barrier against rust that might spread around a rock chip.



Priming booth

From the paint prep area, the trailer frame is moved into the priming spray booth. BoatMate uses Dupont TuffCoat enamel primer as the undercoating for paint. After priming, the trailer frame is moved into one of two paint booths where Dupont Imron paint is applied over the primer. BoatMate mixes all paint to form Imron mixing colors. Color chips are sent to Dupont and Dupont analyzes the color chips to provide a mixing formula to custom match any color required.

After painting, the trailer frame is moved into a two-stage oven. The first stage is a warm area of the oven where the frame is not subjected to direct heat. This allows the paint to flash, which releases gasses emitted by the catalyzing process of the paint. The second stage is under direct radiant heat

that bakes the paint.

The frame is then moved into the rigging area where pinstripes are applied. Pinstripes are painted on instead of using tape. Once the pinstripes have dried, the remaining components are installed. These components include the winch, jack, wheels and Marathon radial tires, wiring, lighting, non-skid mat and pressure-treated bunk boards wrapped in 20 oz. carpet.

Once the proper authorities sign off on the boat, the dealer is contacted for delivery and the boat is shrink-wrapped and loaded on a truck and sent out.

Conclusion

As detailed as this account is, there are many other smaller procedures that Skier's Choice does to make the Supra and Moomba boat lines distinctive from other manufacturers. While some other boat builders use many similar processes, others use methods that are completely different.

Hopefully, you've come away with a little more knowledge about what goes into the making of a wakeboard boat and will be a little more informed and confident when you go to make your next boat purchase.



Paint mixing center