PMY
POWER & MOTORYACHT

BOATS

A Boat Is Born

By Capt. Patrick Sciacca

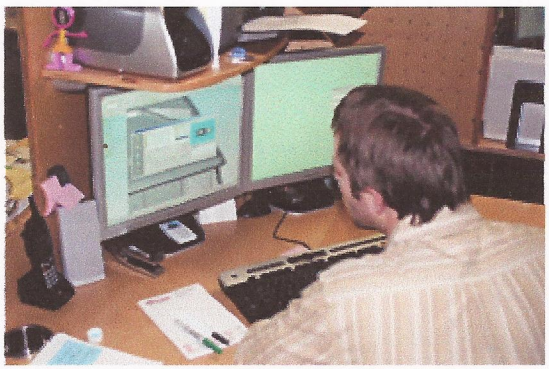
Welcome to the first of a five-part series in which we follow the creation of a brand-new sportfishing boat from conception to launch. PMY *has been granted exclusive access to the birth of Makaira. For now we'll keep its parent company anonymous, but as we get closer to launch, we will reveal it. Of course, we'll conclude the series with an exclusive first test of this exciting new convertible.*

The clock never ticks backward. if you're in an industry that thrives on change while you remain static, you could wind up part of history instead of writing the next chapter. taking that lesson to heart, one boatbuilder decided three years ago that it had to push the limits of boat design, construction, and performance—a bold and high-risk move that it hoped would produce the next great leap in sportfishing boats.

Builder: Makaira

What resulted was a new boatbuilding company called Makaira. The name, which has Latin roots, means marlin, and for many anglers marlin is the ultimate quarry. It's an animal that has evolved into a powerful, speedy, sleek underwater predator. If you've ever seen one, it's an awesome, jaw-dropping sight. This builder, after deciding it wanted to launch the ultimate, sleek, and speedy mid-60-foot on-water predator, bestowed the same name on the new company and boat. But while the marlin has had millions of years to become what it is today, Makaira had to fully evolve in just three years.

The



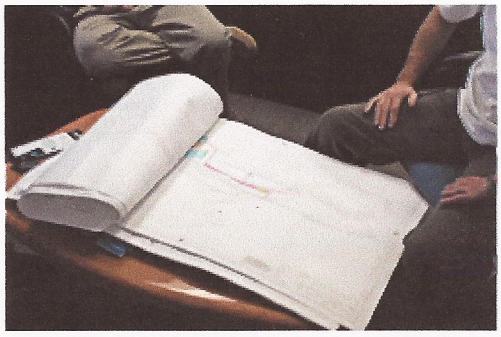
As of presstime, Applied Concepts Unleashed had logged more than 6,000 hours of design time working on the Makaira concept. project naturally started with the hull form. What design would offer the best combination of seakeeping and speed? The Makaira team was looking to build the fastest vessel in her class. (Similiar-size vessels are currently hitting speeds in the high-40-knot range.) To accomplish this, the designers chose a variable deadrise hull form. This shape provides a deep forefoot and head-sea splitting entry and flatter aft sections to create lift and thereby increase speed and efficiency.

This variable-deadrise hull shape, called Waveform, came from Stephen French's well-known design firm Applied Concepts Unleashed out of Stuart, Florida. The name refers to the cross section of the hull, which is, well, wave-like and provides a blend of concavity and convexity. This combination manipulates the forces of buoyancy, pressure, and suction and ultimately determines the vessel's behavior in varying sea conditions. In addition, to minimize drag and maximize speed, a sea chest reduces the need for multiple through-hulls and other gear protruding into the water.

French's company has been working on variations of this hull design for more than 20 years and is behind a lot of the fastest and most eye-catching custom sportfishermen on the water today. Some of the notable names using Applied Concepts Unleashed designs include Garlington, Spencer, Whiticar, Briggs, Tribute, F&S, and Rybovich. All have built boats noted for their flowing lines, speed, and soft ride.

But unlike the companies above, which regularly take up to two years to complete a boat, Makaira will be built on a production-boat timeline. So how does one build a custom-feel sportfisherman over the course of months, not years? Makaira couldn't be cold-molded like many of those custom brands; it would take too long. The key, the builder says, is the right combination of high-tech materials and advanced construction techniques.

The Makaira team and French's crew burned the midnight oil to find that combination, going over the boat literally inch by inch and pound by pound. (As of presstime, about 6,000 design hours had already been invested in the project.) Makaira was born to be a premium brand, so while the cost of materials was a concern, the builder was willing to spend more than a typical production company (though it won't release exact costs) to get the desired result. After all, Makaira hopes to leapfrog the industry in terms of both design and build with this boat. To date the principals says they're satisfied with the progress towards that goal.

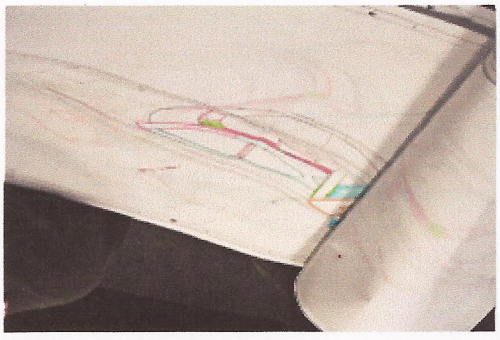


AFter each meeting between Aplied Concepts Unleashed's crew and the Makaira team, there are always some refinements to make.

Makaira's parent company has more than three decades of open-molding experience, but for this project a conventional lay-up would have resulted in too much weight. Makaira's team also considered vacuum-bagging, but, like the cold-molding process, it would take too long to work on a production schedule. The new builder came to the conclusion that vacuum-infusion would be faster, provide the required strength and reduced weight needed to hit the performance benchmark, and meet the strength requirements for bluewater duty.

I wondered how different the two vacuum methods were, and Makaira's staff explained that with vacuum bagging, the gelcoat and skin coat are laminated using traditional open molding. Afterwards, a dry laminate is layered in the mold and wetted out using rolled or sprayed resin. The vacuum bag is draped over the wet resin/laminate and then sealed. The vacuum removes the air, applying pressure to the laminate, trapping the resin, and enabling even distribution of it. With infusion, a vacuum bag is draped and sealed over the entire part, with all laminates layered into a mold dry (except the gelcoat and one skin coat, applied using traditional open molding). The vacuum draws the resin into the bag and the laminate via feed tubes. The hull is fully infused in one shot with an optimal glass-to-resin ratio.

The infused hull will be fully cored with Corecell, and the vacuum process will ensure that it is light yet strong. The weight issue is so tied into this boat's performance goals that the same meticulous care was given to deciding the vessel's stringer and bulkhead arrangements.



As for stringers, a standard male-mold system would have required significant filling and fairing to get that highly finished custom-boat look, which would eat up time on the production line. And to maintain the philosophy of this being a premium boat, a finished look was necessary. A vacuum-bagged stringer system could've worked, but it would require the same amount of finish work as the male mold, says the builder. So Makaira looked into constructing a female-mold stringer grid.

A conventional stringer grid would actually weigh more than the other two options, but if the grid were infused, the weight could be comparable. And it would still offer significant backbone while providing a finished look without countless man-hours of fairing. To save more weight and provide thermal and acoustical insulation, honeycomb coring was chosen for all bulkheads.

Makaira's team now knows how they'll build their boat and what the hull bottom should be. But they still need to figure out external lines and accommodations. Next month we'll see how technology and hull form drive those decisions and how the look and layout evolve. (Hint: I've just returned from Applied Concepts Unleashed, where I saw Makaira Concept #16, which should closely resemble

I'm learning more about the intense endeavor that is launching a new brand, and in the process I discover that though Makaira is a new brand, the build team aims to make her a new idea.

It wants her to stretch the design, performance, and construction boundaries in the sportfisherman genre. For example, while some builders are using resin infusion and top-notch coring materials, the team is trying to bring *all* of the boat's elements together to create a next-generation convertible that will set a benchmark.

Builder: Makaira

And that's the feeling I get as I sit in Applied Concepts Unleashed's (ACU) Florida office and thumb through a plethora of potential exterior designs. The endless supply of images ranges from a somewhat-recognizable version of a modern convertible complete with a flowing, powderhorn sheerline to the you-must-be-kidding bubble-shape boat. While no angler I know would want to troll from a bubble boat, all of these were designed for a reason. ACU wanted to present Makaira's team with an initial set of concepts that ranged from "mild to wild" to light its imaginative fire and help it feel secure in letting go of tradition.

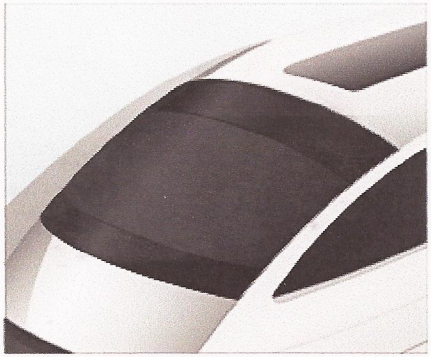
A boat's lines create her character; just think back to the famous Rybovich broken sheerline and the flying-bridge double caprail. The exterior design is the place to make the strongest, most easily understood statement to potential owners. Noting its importance, especially in the sportfisherman market, ACU started drawing this boat's lines in the traditional two-dimensional side view with a design program called CorelDRAW. But it also provided the Makaira team renderings in three-dimensional perspective so everyone could better understand the overall body design. These drawings were close to scale, but they weren't supposed to be spot-on. Once again the idea was to show what was possible.

This exercise also helped the team from ACU stretch its creative legs. Though these industrial designers had a lot of experience (almost 20 years) working with custom boats, even the successful artist types occasionally get bored making variations on existing themes, especially if that's all someone asks for. Once ACU took on the Makaira project, it engaged in a three-hour jam session to review the project scope and define a master vision before the initial assignments and deadlines were set. When I asked ACU's president, Steve French, why it was limited to three hours, he reminded me that if a designer is not given deadlines, the only thing that may get generated are more ideas.

The three-month concept-design phase of the Makaira project was like a tennis match, with ideas about all the potential ideas being volleyed back and forth via Web conferences and face-to-face meetings. From the original notebook of ideas, the builder's team decided on its likes and dislikes, its must-haves, and its giveaways. Eventually this cocnucopia of creativity was narrowed down to "only" 12 finalists (piece of cake, right?).

I saw a bunch of these drawings, some of which featured elements like a raked flying bridge with notes reading "Likes" or "OK, but...." And then there were others, with notes simply stating "No" (in red, of course). The smallest bits of detail received the same attention, too. Take, for instance, the last inch of a tapered side window that was marked with an X. Too meticulous? I don't think so. When you're looking to push boundaries, every one of this boat's 780 inches mattered.

With the 12 potential winners handed back over to ACU, Makaira's crew could take five. Eventually, ACU narrowed the dozen marked-up ideas down to two final designs, an organic whittling process it calls the "design spiral."



Did this look make the cut?

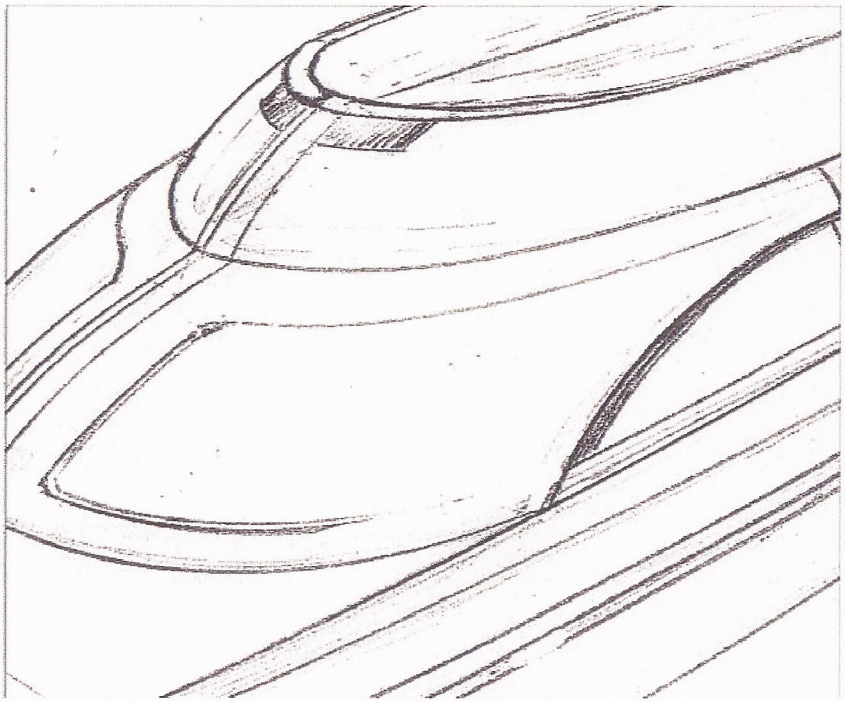
While the exterior was the focus of this process, the builder and ACU had to consider the interior in equal measure. For instance, the team knew it wanted a prominent flare for good head-sea performance, but this would mean reduced room for a fourth stateroom in the forepeak. Still wanting to make a fourth stateroom work, Makaira's team required a creative solution: raise the height of the whole forepeak suite, including the stateroom and head. Doing this enabled the suite's sole to reach farther outboard of the boat, which expanded the available floor space. And because of the boat's sizable freeboard forward, headroom wasn't compromised.

The builder calls this tweaking of vital elements the "iterative process." The idea is to make many small refinements on the way to achieving the final design—like playing chess, where you decide your next move but are also cognizant of the potential effects on the rest of the game. If at any point an area is not working in terms of form and function, adjustments must be made. Every move has a ripple effect on the whole. During the evolution of this boat's design, bulkheads were moved again and again and bunks were repositioned sometimes by only a fraction of an inch. Indeed, after all was said and done, about 30 different interior layouts were considered.

Makaira's exterior look was eventually fleshed out, but the devil is in the details. As the overall concept was entering its final stages, the ACU team also had to be mindful of the boat's technical and philosophical missions. For instance, the galley was set up during the concept phase, but the layout was deemed impractical for the final design. A less conventional arrangement was presented to Makaira's crew and became an instant favorite (a benefit of the iterative process). While it may seem inconvenient to not know this ahead of time, these designers said they don't start with the details for fear it may inhibit creativity. Oftentimes the two phases overlap, as was the case with Makaira, and it meant reconfiguring an area of the boat.

This same design philosophy was applied to the flying bridge, cockpit layout, tackle stowage, fishboxes, and rigging areas that sportfishermen are known for as well as amenities, such as a cockpit mezzanine. Function came first, but form also played a key role.

In our next installment, we'll see form and function fully embraced as Makaira's team prepares for final design and tooling and turns its wish list for tomorrow's sportfisherman one step closer into a tangible reality.



To this point the builder has made literally thousands of decisions to get the vessel ready to build, like where to put the cabinetry, livewells, fishboxes, cockpit freezers, and galley appliances, with each decision impacting the others. It's been an epic undertaking, especially since the goal is to surpass all the high-end sportfishermen that have come before her in both form and function.

Months of planning are paying off as the hull's shape comes to fruition.

Builder: Makaira

But finally these decisions have been made, and now comes the final design stage where it all must come together. With the construction drawings finalized, every item from door hinges to push-pull latches is being positioned to optimize both functionality and build efficiency. Wire and plumbing runs have been laid out to both expedite the construction process and maximize accessibility, because while running hard, fast, and far is key, so is being able to quickly access and fix all systems on the fly.

Integration of her design, systems, and construction is at the heart of this vessel. One example is the 64's interior module, which is being cut with a CNC router. Its precision enables the planning and creation of locator tabs and slots for the lightweight honeycomb bulkheads, which will expedite production by enabling the cabinetry to index during assembly.

A second piece of the integration puzzle involves creating a clean, nearly seamless look. The team is trying to anticipate—and where possible eliminate—every fiberglass joint and juncture. This differs from a typical production boat, in which seams between molded fiberglass components may be in clear view and silicone sealant or other fillers are used to try to hide them.

One place where seamlessness is obviously critical is the hull, so the team relied on a CNC router to construct its one-off plug, which was then used to build the hull mold. The router cut numbered and sequenced notched plywood jig frames (called the CNC jig system) similar to those used for a cold-molded vessel. The notches ensure proper alignment, which was double-checked by a laser level. Once all the frames were in position, "bead-and-cove" foam planks were butted and screwed to them. A more traditional plug-building system would've seen the builder laying wood planks over the jig, but these foam planks are more easily shaped and don't require putty to fill gaps and copious hours of hand sanding.

But while a lot of new technology was utilized in this build, like resin infusion (see "A Boat Is Born, Part I," June 2008), some things were done the old-fashioned way. For instance, once the flat areas of the planks were sanded to the required shape, Makaira's team applied a thin layer of fiberglass, which was subsequently sprayed with a low-density sanding primer called Duratech. After the fiberglass cured, the hull was sprayed with a surface primer and sanded down by eight-foot-long, two-man longboards. That's right, two guys sliding a board against the hull to help fine-tune the form of this high-tech boat. Why? Because it produced the smoothest possible surface: a high-low surface differential so small, it's virtually imperceptible to the naked eye. After a second session with the longboard, Makaira's crew sprayed the hull with a higher-density foam, which was sanded and buffed. Any remaining high spots, particularly along the sheerline and at the chine, were then faired out. (Smaller parts such as the fishboxes, freezers, livewells, and

mezzanine seating were also jig-framed and foam-shaped.)

If this were going to be a cold-molded boat, the hull would have first received significant internal structural support and then been 'glassed inside and out. Since this is a disposable plug, the hull was only semistructural. The creation of the hull plug was done by Makaira at its factory in Weekstown, New Jersey, also home of Makaira's parent company, Ocean Yachts (yes, now you know).

But the company also utilized subcontractors. Cape Coral, Florida's Marine Concepts was brought in to build molds for some of the more intricate components, such as the deck and parts of the flying bridge, mainly because the company has a bull's-eye-accurate five-axis router. In fact, this massive profiler carved the 64's top deck out of foam in three dimensions to the precise size and shape of the final structure. While such technology is costly, the expense is offset by a reduction in man-hours and is vastly more precise, as it creates one homogeneous part as opposed to one made out of multiple materials. Plus employing subs to do some of the work allowed Makaira to focus on other areas of the project, like the stringer system.

The stringers were also created using a jig-frame. A female mold produced the male part, which because of the router accuracy required no fairing and filling, a first in a vessel in this size range, according to Makaira.

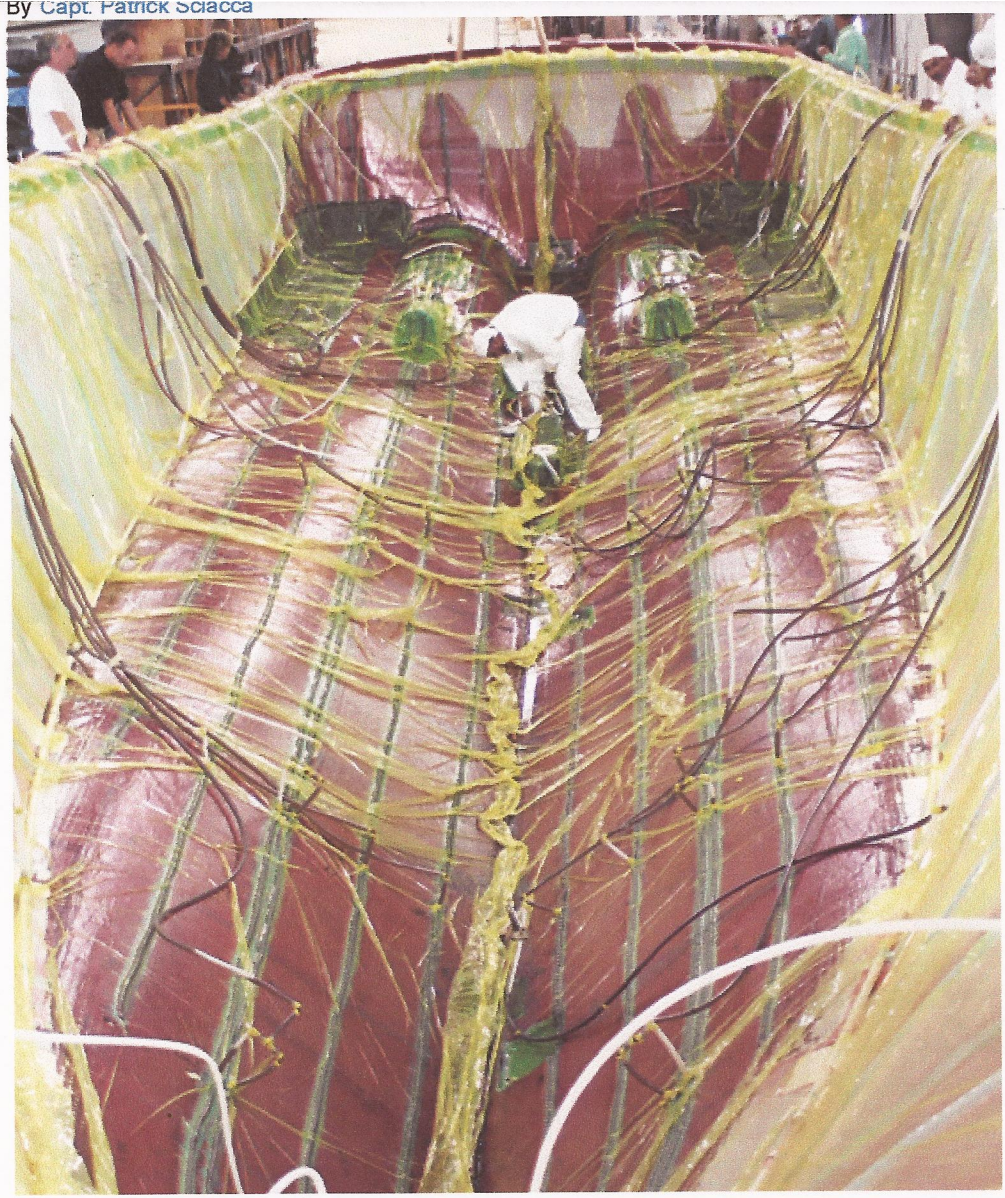
With an array of jig-frame plugs constructed, it was time to make molds. The process started by covering the plugs with a release wax (you don't want parts to stick to a one-off plug) that was sprayed with gelcoat and allowed to cure. The crew then applied fiberglass to the gelcoat and let the laminate cure. Prior to the mold being pulled from the plug, the builder added structural bracing for support. By this point, any imperfections in the molds had been corrected by hand.

Some of Makaira's shapes, such as recessed surfaces and reverse angles, couldn't be built with one-piece molds, as they didn't have enough clearance to allow removal (something called negative draft). So an array of multipart molds were used that featured movable or hinged sections plus clip-ons, bolt-ons, and knockouts (like for fitting a window).

One area that received such treatment was the deck, which came from Marine Concepts. Why? It's impossible to transport a full-beam, 60-something-foot-long deck from Florida to New Jersey. Multipart molds were also used for the flying bridge, allowing Makaira's team to incorporate a toe kick and contour the seating area, providing optimal function and an attractive form with reduced seams.

The one-time ultimate sportfisherman idea is now a bunch of parts spread across floors from New Jersey to Florida, but will they fit together as everyone hoped? Find out in our next article in an upcoming issue.

By Capt. Patrick Sciacca



Makaira's hull is being constructed via infusion. Resin, under a vacuum, is drawn through feed lines. This process results in a lightweight, yet sturdy hull. Note the red resin being drawn up the transom.

This is the fourth installment of an exclusive six-part series in which PMY has been bringing you a first-hand account of what it's like to conceive a new boat model and bring her to market. The idea started with a mid-60-foot-size-range battlewagon and a name, Makaira. The goal: build a vessel that would incorporate the latest design concepts, advanced materials, and efficient construction methods; a boat that would be like nothing that had come before her. There were meetings, ideas were sketched out, revisions made, more meetings, and

even more revisions. Now the time for meetings and revisions is over. It's time to build the boat.

thousands of man-hours have been spent dreaming, designing, and planning the Makaira 64. Throughout its two-year-plus quest to create a next-generation sportfisherman, the builder has addressed myriad issues that will ultimately decide whether or not this vessel achieves the form and function goals set for her.

With a variety of build options and materials to choose from, Makaira's crew entered the construction phase to make its long-awaited vision of this boat into a tangible reality.

Builder: Makaira

The challenge was picking a manufacturing technique that would provide the strength necessary for a boat that would have to make regular 100-mile-plus canyon runs without incurring excessive weight. In addition, the method had to be conducive to a production-boat pace. After examining a range of options, the builder, along with its design firm Applied Concepts Unleashed (ACU), decided to go with vacuum infusion.

Infusing this 64-footer starts where it does with most boats: the hull mold. Gelcoat is applied to the mold, and then it's skin-coated by hand using fiberglass mat and resin. Once the skincoat has cured, layers of dry laminates are applied to the mold with contact cement securing each laminate. This process ensures even and proper placement both below and above the CoreCell core. One inch of coring goes in the hull sides while two stacked one-inch cores with laminate between (i.e., sandwich construction) cover the bottom. Makaira's crew and ACU decided on a laminate schedule that exceeds that required by American Boat and Yacht Council (ABYC) standards. The result should be a hull with significant weight savings compared to a conventional non-cored one, as well as one that can withstand the rigors of frequent offshore use.

Increasing strength while using less material is accomplished via the vacuum process. After the dry laminates are in place, plastic feed and vacuum lines are installed into the mold. Next the laminate is sealed in a large plastic bag and the vacuum is engaged. Pressures are closely monitored to ensure there are no leaks. If one is detected it can be located with an ultrasonic detector and sealed with tacky tape.

Once it's determined that the tubes are leak-free, suction is applied. The feed lines—as the name implies—carry resin into the laminate while the vacuum lines draw out the air. Resin is pulled through the laminate as air is evacuated. When the laminate is fully saturated, all voids are eliminated and any excess resin is drawn out through the vacuum. Thus the laminate cannot be over-saturated and the optimal glass-to-resin ratio is achieved, creating a strong and lightweight laminate.

Within just two hours, the infused part is fully cured. However, because of the tremendous heat created during curing, the hull will be left in the mold under vacuum until it has cooled to prevent deformation.

This same resin-infusion system is used to create the deck and stringers. To save more weight in the stringer system, it has been designed to pop from the mold completely finished and gelcoated except for the underside where it will be bonded to the hull using Plexus, a methacrylate adhesive. The builder says Plexus effectively "welds" the stringers to the hull. As with the hull, the idea here is to maximize strength and minimize weight. The goal is speed, which the builder hopes will exceed that of similar-size and -class craft. No one has dared mention a hard top-end number yet.

Prior to the Makaira crew's matching and securing the superstructure and the now-infused hull, the team inspects the top of the battlewagon. Interior modules are being constructed simultaneously.

While the 64's major structural parts are being infused, major interior components are constructed in modules. Nidacore has been chosen as the key construction material for interior soles and bulkheads because of ACU's experience with it. A honeycomb-core material, it offers outstanding thermal and acoustical insulating properties and a high strength-to-weight ratio. Individual pieces are first scored, then shaped around a jig. Multiple pieces are epoxied together to form the finished part. Three-D modeling enables the team to build these modules to exact tolerances so that they fit together seamlessly when they are placed into this battlewagon's hull.

After the soles and bulkheads have been created, the next task is constructing large cabinetry pieces and fitting them into the interior module. These pieces, which are cut by a CNC router to precise tolerances, are first dry-fit to ensure proper alignment, then secured with framing stock, epoxy, and good ol' screws. Showers, fixtures, and even countertops are assembled outside the boat and then they are installed as modules.

Once the interior module is complete, the superstructure is lowered onto it and aligned, after which the two sections are fiberglassed

together where they intersect at the bulkheads.

At the same time this is happening, the cured hull and its stringer grid are receiving wiring, plumbing, and hoses, followed by air handlers and water pumps. Also during this mechanical stage, fuel and water tanks are installed and pressure-tested. Finally come the engines and running gear.

The hull and deck are now ready to be joined. The 3D-modeling programs employed during the design process have resulted in precise tolerances; there's just enough room between the two pieces to glass them into one monocoque-like structure.

At last the 64 looks like a boat. She almost is a boat. The crew begins fiberglassing every intersection between the hull, bulkhead, cabinets, and soles.

With bonding complete and cured, the Makaira team prepares to move into the final assembly and construction stage, which includes final joinery, electrical, mechanical, hardware, and soft goods work. Then it'll be time for systems' checks, engine start up, and the anxiously awaited sea trials. It won't be too much longer now.