TOMORROW IS TODAY

In one bold stroke, Hatteras has taken the future and molded it into this hot new 41.

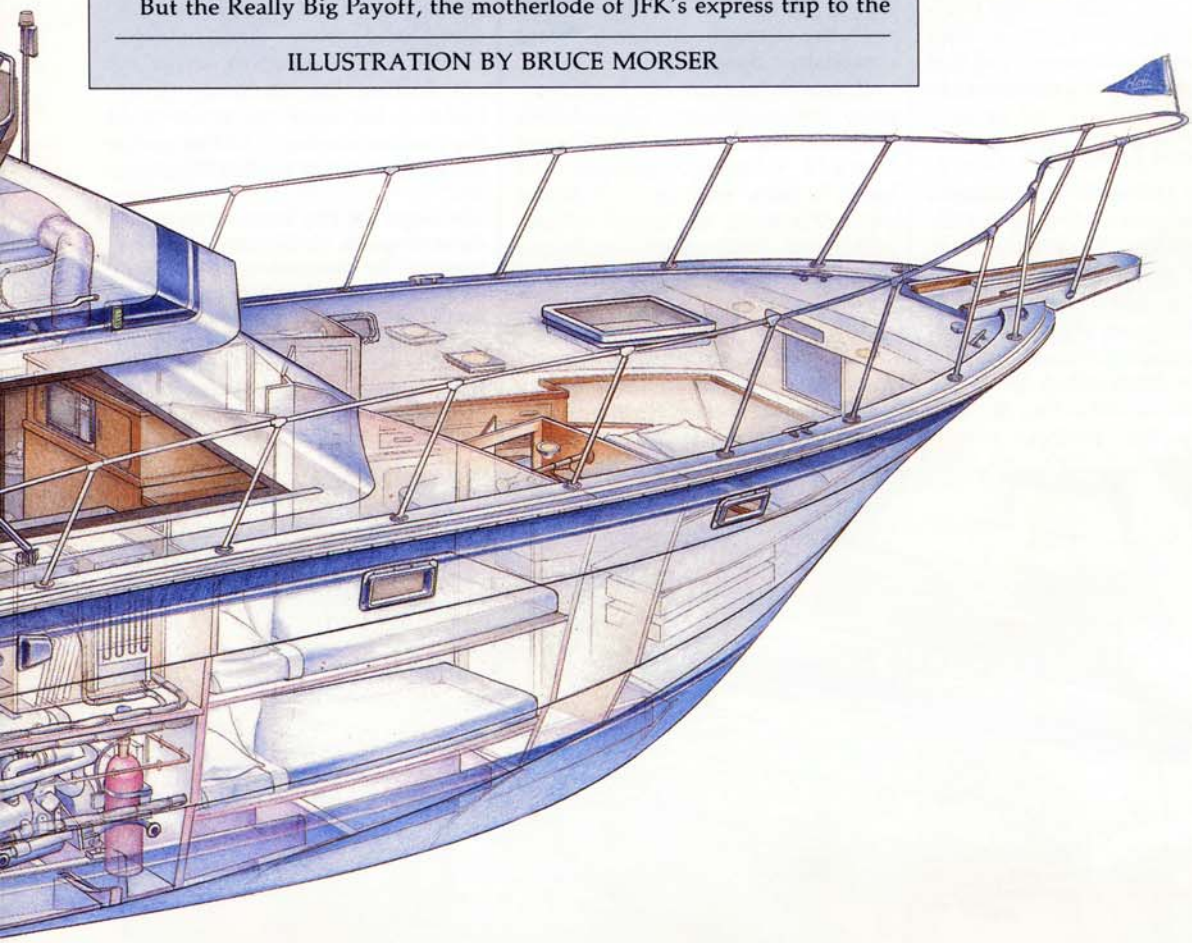
BY DOUG SCHRYVER

In 1960, Jack Kennedy took us all by the hand and told us we were going to the moon. Those next nine years went so fast, against a background of assassination, war, unrest . . . and then Tricky Dick. Seemed like the next minute we were *there*.

On the moon. We did it—for the prestige, for the military advantage, for the advancement of our knowledge of the universe. At least that's what they told us in high school.

But the Really Big Payoff, the motherlode of JFK's express trip to the

ILLUSTRATION BY BRUCE MORSER



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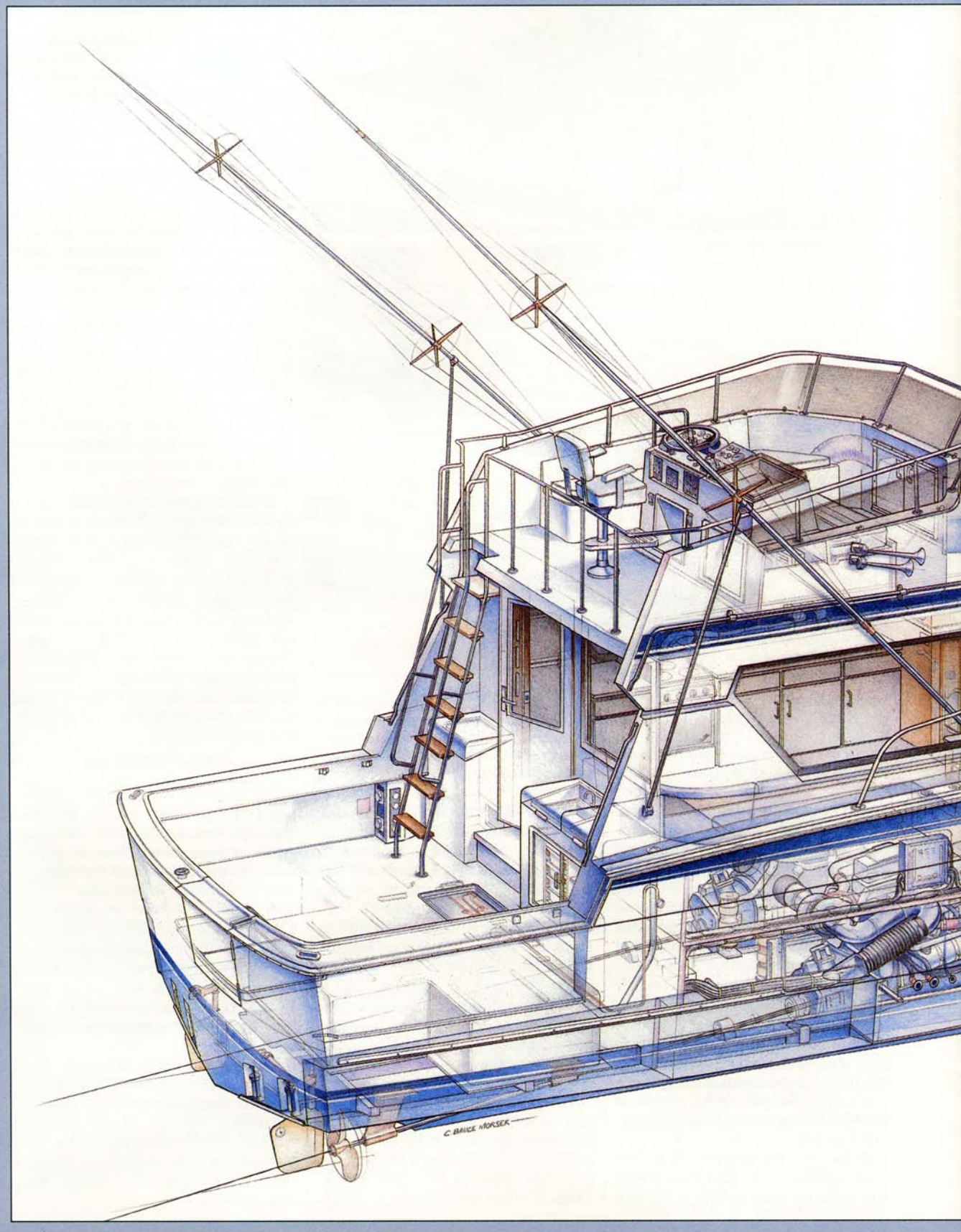
BOATING


C. BRUCE MORSEK

moon, was technology. Bags of it. Zillions of dollars of it. It went *everywhere.* So much so that now even the Russians are "beyond polyester". And it's still coming.

After sifting through all the trickle down, we happily discover that this new Hatteras 41 we're about to explore *is* the Space Age. If we had not taken that ride back in the 1960s, we would not be looking at this beautiful, wondrous boat.

The new Hatt, like much recent technology, is a simple story of imagination. It also is a tale of pride, of zeal, of strength, and of no little courage. And when its impact is felt, the way those in the business of building boats look at their art will never be the same. And that will make one hell of a difference to us.

New From Old

The men and women of Hatteras Yachts have paid their dues for the new technology. They have done it—as our good friend and colleague, Dex Hart, would say—*right.* No skipping steps; no stealing assumptions; and no reliance on information from other fields for confirmation of data. No, sir, this was a "zero-plus" project.

To begin, faith in the concept was important. You don't build one of the best boats in the world without it. And you don't keep building it by abandoning your essential methods of operation.

Hatteras always has been a conservative company, building boats for a conservative clientele. "Make 'em run fast, gentlemen, but you'd better make 'em strong, too." So a premium always has been placed on beefy construction—something that usually has extracted a penalty in weight.

The trick was to get the whole program around to where the buyers got the speed they wanted along with the strength. And that meant composites. Space Age.

If you're just any old boat company, you might say, "Okay, here's graphite and here's Kevlar and here's a vibrating squeegee and here's a foam core an . . . ." But if you're Hatteras, you owe it to your customers—your *clients*—to follow your heart and mind and be true to your usual style.

You earn it.

You plan to spend several years in experimentation, in R&D, before you're close to something workable. And maybe there'll be a few steps along the way, some evolution to show the world you're not lagging.

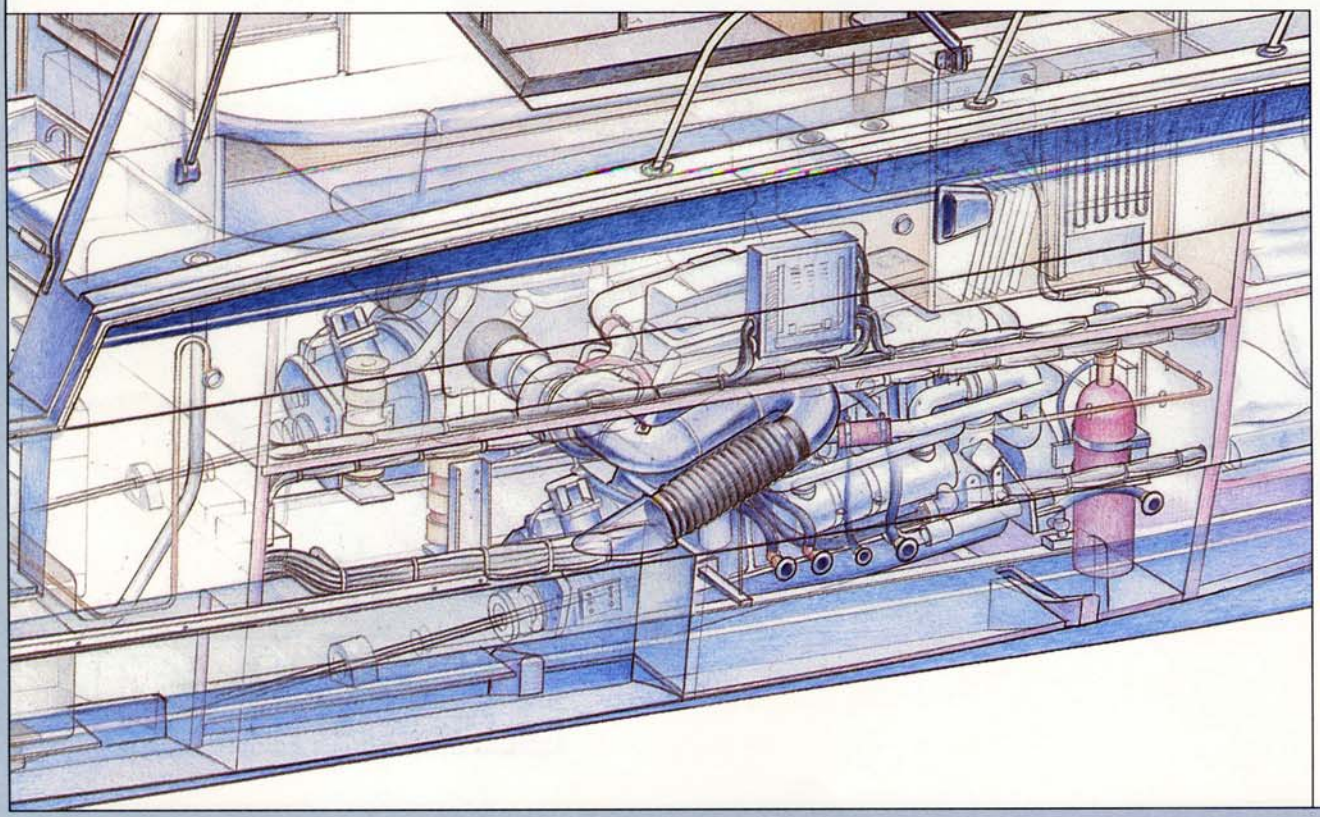
Meanwhile, you begin laying the groundwork for a complete overhaul of your technology.

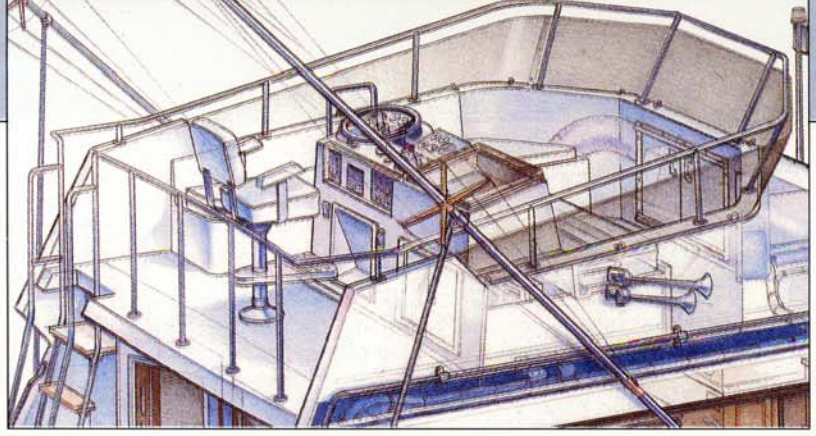
Today, the new Hatteras 41 is the formal announcement of the completion of that overhaul.

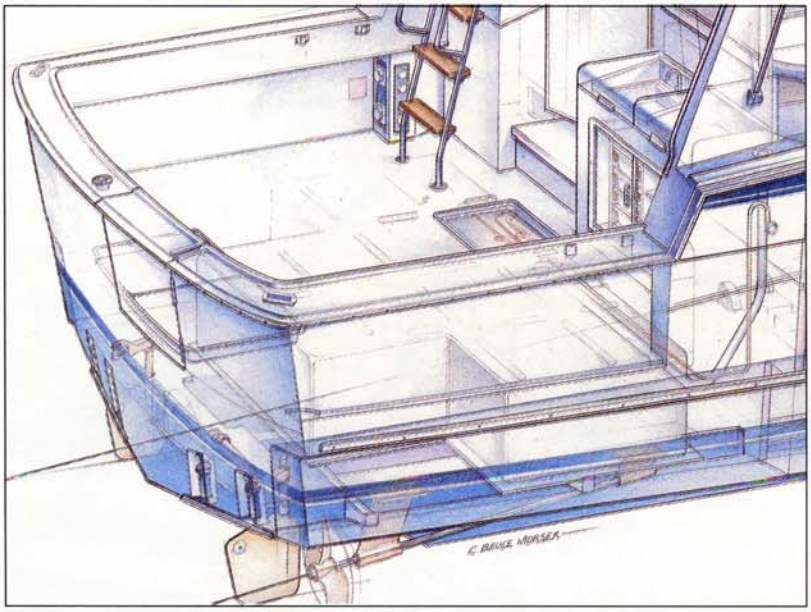
Foundation

It would be easy if we could lay all the developments leading to the new 41 at the feet of one man; but we can't. Former president at Hatteras, Dave Parker, certainly deserves some of the credit for extending the faith to new, hitherto unexplored areas. And marketer Chuck Kauth deserves credit for not fearing the challenge of rebuilding the Hatteras myth to fit the new technology. And of course the engineers, led by Bob Bienvenu,

The Heart Of The Beast—The machinery spaces on the new 41 reflect some subtle changes—such as the inside/outside exhaust dump (a section of the chine is notched to form a wet muffler box leading aft), fully adjustable engine mounts to allow perfect alignment on the all-composite beds, Halon system instead of CO_2, and more.







Battle Stations—Classic Hatteras design is clearly seen on bridge and in cockpit. Huge T-shaped fuel tank sits firmly on fat composite floors and stringers beneath cockpit sole; topside controls and cockpit bait-station cabinetry are immaculately designed and positioned. Note that all deck and bulkhead components are also of composite, foam-cored construction.

deserve much for spending all those hours in blind alleys chasing shadows and de-bugging systems, until one day they emerged with all the answers.

But that's just not how it was. What happened was that a *process* managed to work smoothly and correctly enough so that a set of objectives could be achieved—one by one, designed, described, plotted, implemented. Hatteras, during those years of development, was (and still is) the living definition of the term "good company".

It's like NASA. Who made it work? Nobody; and everybody. The System.

To be fair, the technology is just too beautiful not to take a front seat and actually may prove to be the star of the show after all. At the heart is a closed-cell foam, varying in density according to its place in the boat, known as Divinycell. The technique for application of the foam in a sandwich laminate is vacuum-bagging. And the way all the skins and cores and parts go together and are stiffened to form a strong boat—the overall picture, as it were, right down to the last screw and washer—is controlled by computer; several, in fact.

The way the technology surfaced is a story in itself:

First, you have to understand how a design begins at Hatteras. Normally, the marketing group decides what it thinks will be received well out there in the real world. Then it takes the concept to engineering and the whole bunch sits down and bats around various notions of form and shape and size until something is agreed on.

Then The Architect is called.

In the case of the 41, that's Jack Hargrave. Hargrave has worked with Hatteras long enough to know what the company wants and how much input he can and should have. He knows to provide the nuts-and-bolts groundwork and knows when his input stops and the Hatteras engineering team steps in.

In the case of this new boat, Mr. Hargrave knew his weights and knew where bulkheads were going to be and where engines would live and what the bottom would look like and a lot of other things—but the engineers, with Bob Bienvenu running point, were going to *build* this boat.

After Hargrave comes Ron Riley. In fact, Ron gets involved in much of the conceptual work right from the start. Riley is product-design manager and as such is responsible for modeling the boat so marketers and engineers can get together and see what they're doing in scale. Spaces are shifted, cabinetry sampled, stowage refined, and other ergonomic considerations made until there's agreement that the project can go to full-size.

CAD/CAM, Gee

For thinking in full-scale, nothing beats a computer. It will be showing you a neat little drawing on its screen or on a piece of paper from its plotter, but all the time it will be thinking in full-size.

A whole lot was made of the CAD (computer-assisted design)/CAM (computer-assisted manufacture) system Hatteras spent megabucks for a few years ago. Wow. Finally, somebody in the boat business was stepping into the 20th century.

To be brutally honest, the CAD/CAM back then was a toy that the engineers at Hatteras were learning about. They slowly worked it into manufacture by implementing it in small jobs requiring a great degree of accuracy and repeatability.

In fact, today the system is still most valuable—according to its keeper, Dick Minnich—for pattern cutting, albeit extremely sophisticated.

But the wonders of the "design" side of the thing become apparent when Dick boots up and keystrokes the codes for the big picture. When he's showing off, Dick asks Mr. Machine to draw the boat, layer by layer. As the lines squiggle around, and as the drawing progresses, you begin to feel as though you're looking at the proverbial glass onion. Minnich claims there are 256 separate layers possible in each drawing—like layers of Mylar on a draftsman's table. And each layer has much information on it and can be viewed separately. Note that the "transparent" artwork for this story was in no small part aided by the many views and perspectives available on the CAD system.

And these perspectives, of course, can be changed with the stroke of a few keys. Two profiles, two plans—one bow-on, one stern-on—and two other (auxiliary) views at the programmer's option. Each little thing the machine draws on the screen can be checked by eye on the screen from eight different angles.

More importantly, all the lines of the boat can be checked and faired by the computer. Each time the architect or the engineers shift a chine or flatten a buttock or aftersection, the computer takes a few seconds to make all the other lines defining the hull's shape conform to that new shift. Magic. And it solves a problem designers hitherto have had to fix by hand—laboriously.

But, you say, so what? So the engineers get to go home at five. What does this do for The Boat?

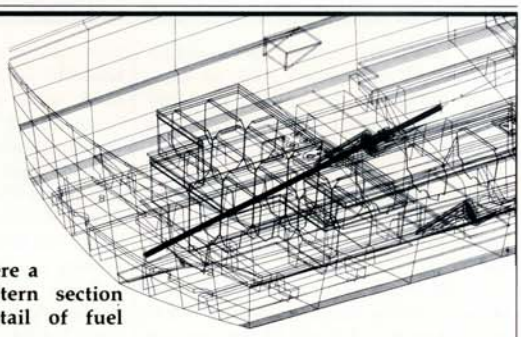
That's where the CAM side comes in. All the major structural components in the new Hatteras 41 are made of various densities and thicknesses of Divinycell foam, overlaid with some form of fiberglass—either unidirectional or less-noble weave, depending on how critical the part is in the overall structure. Now, let's say you want to build a bulkhead:

- First, you go into the overall drawing of the boat, and you pull that bulkhead off "the lines" at the corresponding station.
- By having the machine account for skin thicknesses and other specifics (like superstructure cross-section, deck level, and so on) at that station, you derive the pattern for the bulkhead itself.

If Hatteras were only partially into the CAD/CAM program, it would stop here and simply have the computer-directed router cut the pattern out of a chunk of foam, and Hatteras would sheath it and be done.

But, not so simple:

- Now you have Dick Minnich sit in front of the machine's green screen and fiddle with the bulkhead's shape until he comes up with more patterns. These will become strips of a thick, hard PVC that perfectly define the bulkhead's borders.
- Once these border "dams" are designed—so precise that they all come from a single sheet of the PVC—the router is instructed to cut them. This it does to within *four* decimal places.
- Now workmen build a big table, topped with a huge sheet of hard PVC overlaid with parting film, to which they affix the machine's PVC border patterns, all of which also get parting film. When all the pieces are put together, they perfectly outline the bulkhead (or whatever part) you wish to build. *Now* the router cuts the Divinycell foam for the bulkhead, and workmen lay it on the big table, into this new "mold" we've built, along with the resin-impregnated fiberglass material for the sandwich. It's wet, gooey—but it's our bulkhead.
- Now we lay a sheet of parting material over the top, and cap it all off with a plastic "tarp". We then connect our vacuum pump to a fitting on the tarp and pull vacuum until whole part catalyzes.



Computer As Artist—Here a drawing of the 41's stern section showing marvelous detail of fuel tank.

Hatteras engineers already have been "through" one set of computers. What's next?

Presto, we have a strong, light, foam-sandwich part that's been vacuum-bagged so as to keep resin content within reasonable limits and foam/glass bonding to near-perfect levels. Not a mind-boggler, exactly—aircraft component manufacturers have been doing this sort of thing for some time now—but certainly a big step for boatbuilding.

And it's made even more beautiful by the fact that this big "mold" we've built to within a four-point tolerance becomes a permanent part of the Hatteras 41 assembly line. No more will workmen cut-and-fit plywood bulkheads. Someday, whole modules will be built outside the boat this way.

Of course, Hatteras has ways of constructing parts other than simple flat shapes. Its stringers, for example: Gone are the heavy foam hat sections. Now, special male/female molds have been built (using the accurate CAD/CAM to pattern the inside of the hull's bottom), to which is applied the Divinycell/glass composite via vacuum bag. Now, all stringers are hollow hat sections.

As a postscript to the computer age at Hatteras, you will note that the engineers have already been "through" one set of machines. A new generation has just been installed, built around the Gerber Sabre, a 32-bit machine with color capability and other new tricks the boys haven't even figured out yet. Trust they will, though.

The Materials

For each operation in building the Hatteras 41, there are specific materials designated—and specific ways of using them. Some involve vacuum-bagging, some do not. Some involve cores, some do not. It all depends on the part each plays in the overall picture.

The hull, for instance, is laid up according to tried-and-true lamination practices for composites. Skins of tri-axial fiberglass (34-oz. yarn is unwoven, loosely-stitched fabric), with very light mat between layers, surrounding the foam core.

A layer impregnated with a modern polyester resin goes down, is allowed to kick over, and the process begins again until the coring stage is reached. Then, a wet-out layer of mat goes down, the foam is laid in, and a poly sheet (our "tarp" again) goes down for vacuum. Almost a perferct vacuum (1 atmosphere) is pulled, and the core is left to bond to the outer skins.

Presently, Hatteras has not advanced to bagging the whole laminate at once. In fact, the layers inboard of the core are not bagged at all. When asked whether the process will ever see all-at-once layup and bagging, the engineers avoided comment. But there's little doubt that bagging will evolve to the layers inboard of the core in the not-so-distant future.

The entire superstructure is laid-up like the hull (with cores), but with no bagging at all, presumably because of the diminished need for high-strength bonding. (Note that the deck, deckhouse, after

cabin bulkhead, cockpit, and cockpit sides are all one piece.) And, as mentioned, bulkheads, floors, webs, flats, and other major strength members are cored and bagged on specially fabricated mold tables.

When it comes time to connect everything, parts are laminated together conventionally, with all the proper staggers and fillets.

In the engine compartment, Hatteras has replaced the complex aluminum weldments that have been used for years in way of the engines themselves. In the new technology, fiberglass composite structure has replaced the heavy metal. The hollow, cored stringers take steel plates within the laminate for the engine mounts; and huge webs and floors between the mounting structure help spread the load over the bottom. Just as strong as the old way, and far lighter.

Note that all the skins and cores and panels that go into the new boat are thoroughly tested, and resin-content ratio monitored carefully. While the 41's hull could get lighter with more use of "The Bag" and some other new-tech tricks, the structure certainly lacks for nothing in the strength department. Engineer Bienvenu and his people have done their jobs well.

Product Refinement

New technology doesn't mean changes in other elements of Hatteras construction. All the typical fit and finish will remain on this new 41. Copper fuel lines; aft-placed, fully-baffled fiberglass fuel tank; polybutylene house plumbing; beautiful auxiliary systems; fine joinery (with some veneers glued to the slick foam-cored bulkheads) and lovely Imron-coated external glasswork.

(Note that the gel coat is Glidden's new Blister Guard on all underwater surfaces. Hatteras appears determined to stamp out boatpox in the process of improving the breed.)

We've mentioned the noise-control methodology at Hatteras before, but seeing it firsthand was a revelation. On the 41, practically the whole boat gets the treatment: A Zonic Modal Analyzer is used to develop a picture of the various panels and parts of the boat suspected of being potential transmitters of vibration and, therefore, noise.

To use this thing, accelerometers are attached to various points on any given panel or section of boat; then an engineer takes up a "force transducer"—a hammer attached to the modal analyzer—and strikes the shaft strut on the side closest to the section being anaylzed. The machine records the minute pulses of vibration sent through the structure. On playback, the engineers actually can *see* the panel's deflection, amplified many times through the analyzer's computer and projected on the screen. The information is then used in the placement of stiffeners to damp vibration on the panel.

What we're looking at here is a boat without a lot of extra baggage to carry around—a high-tech product that undeniably shows its lineage, but is completely new under the skin. The bottom line is that a 41′ sportfisherman with all gear and liquids aboard will weigh-in at about 34,000 lbs. And that means 6-71TA diesels (albeit pumped-up 450-hp versions) and a nice 30-knots-plus, if early evaluations can be made to stick.

And speed at sea, after all, is what Hatteras is after. It has seen some other builders take the "speedboat" ethos literally and bite off a sizable market share. Big "H" wants it back.

Hatteras is *serious* about this. Eventually, *all the boats in the line will get the composites treatment.* This is a spreading technology, not one Hatteras sees as experimental.

Most other boats in current production already get cores in the form of Baltek's Contourkore in topsides, decks, and houses—but thus far bagging and modern fabrics have been avoided in favor of building up thickness with standard lamination procedures. The extension of the technology into synthetic cores, tri-axial fabrics, computer-driven tooling design and construction, and vacuum-bagging is what's deemed revolutionary here.

And yet at Hatteras, it has been *evolution*, not revolution. It's taken 16 careful, deliberate years to bring the Space Age to High Point, North Carolina. Now that it's there, the product shows it. And the people at Hatteras are rightly proud of the advancements they've pioneered. We can't wait to see more. ⚓

For more information, contact: Hatteras Yachts Inc., Dept. B, Box 2690, High Point, NC 27261.

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Hatteras 41 Convertible