



## It looked like a tough job

After our initial meeting with the client, this job looked like it was going to be tough. The client felt that it was the subtle refinement in the design that make large yachts feel comfortable, yet this refinement was missing from the designs he had seen. He felt that most large yachts felt sterile and cold and were void of the small, personal details that make them enjoyable to use. He had not yet found a designer who could deliver what he was looking for.

After meetings with the client, we determined three major goals:

- To deliver an extremely high level of refinement in design and construction
- To make a statement with the design about the new millennium
- To keep costs under control by re-using existing tooling where possible

## The Project

Aerie, a 128' motor yacht design for the new millennium. The design would be based on the same hull used to create the award winning Ste Jill.

## The Company

Jonathan Quinn Barnett Ltd is an award winning yacht design company. Their portfolio includes:

- 124' Delta M/Y Ste Jill
- 115' M/Y Regency
- 115' Scorpio

## The Team

The main members of the design team were:

Jonathan Quinn Barnett – Designer

Frank Woll – Computer modeler

Delta Marine Design

## The Software

Rhino for 3-D modeling

Adobe Photoshop for 2-D illustration

## For more information visit:

- [www.rhino3d.com](http://www.rhino3d.com)
- [www.jqbltd.com](http://www.jqbltd.com)
- [www.deltamarine.com](http://www.deltamarine.com)
- [www.janikimachine.com](http://www.janikimachine.com)

## Freedom to design a yacht for the new millennium

The client wanted the design of this yacht to make a statement about the new millennium. We had to deliver a yacht design that was refined beyond all previous yachts. This demanded a new level of control and quality assurance.

New design and manufacturing techniques were required to deliver this quality. We needed to be able to communicate every aspect of our design concepts and get all the detail built without a prohibitive amount of hand work or shop time.

The builder, Delta Marine, was using a new manufacturing process incorporating a giant 5-axis CNC machine to create full-size plugs of the parts. Using this new, almost completely digital manufacturing process in conjunction with Rhinoceros we felt we could deliver the detail to accomplish our goals. Rhino's robust geometry capability, unlike other products we have used, let us design every part of the boat. We could now design shapes that previously would have been impossible to build without an enormous amount of hand work.

## Constrained by existing parts

To keep costs down, Delta Marine and the client decided to use some existing tooling from the very successful 124-foot motor yacht "Ste. Jill." The existing hull mold could be lengthened and broadened. We also had to integrate a mold for parts of the fly bridge decks into our new design.

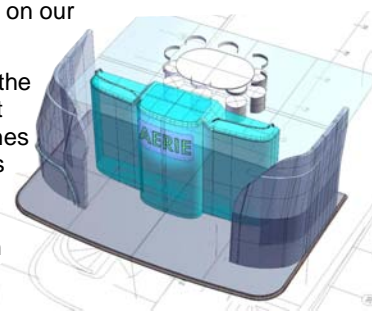
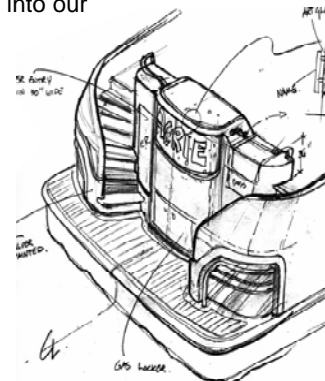
Integrating with this existing mold would be difficult. No complete documentation on the old mold existed. However, we did have an IGES model and a set of laser-shot points, and we could use a tape measure to piece together the information we needed.

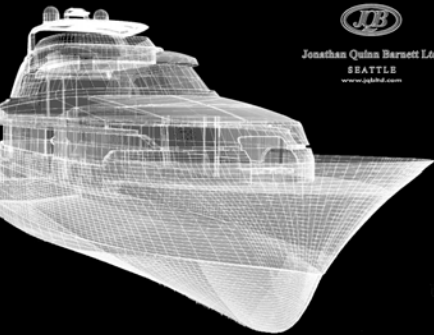
Documenting the mold and fly bridge would not have been possible without Rhino's ability to take incomplete data from many different sources and use it to accurately produce a model. Once we had digital models of the existing parts, we were able to match our new parts to them in Rhino.

## Designing while keeping the client informed

Since our client was very concerned about detail, we found using Rhino's rendering capability and curvature analysis tools valuable for showing off the subtleties of the design. Our evolutionary design style has been well received at Delta Marine. This digital building process has afforded us the confidence to know that refinements made on our drawing tables will be accurately executed on Delta's shop floor.

JQB uses a fast design process that allows designer Jonathan Barnett the freedom to design while delivering the accuracy needed to execute that design. Using traditional paper and pencil drawing methods, Jon sketches a general arrangement, perspective, or profile drawing. These drawings are used to create a 3-D computer model. Several views of the model are printed on which Jon pencils in refinements and changes by hand. Then the process starts again. This way, the form quickly converges on a solution, and when that solution is reached, the 3-D model is accurate and complete.

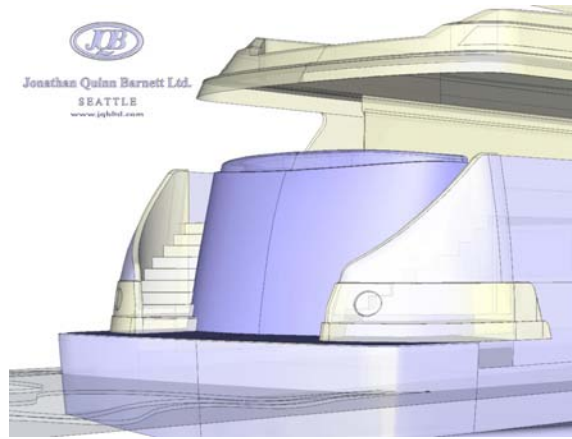




### A yacht for people

In addition to stylistic issues, we were able to conduct ergonomic studies on the yacht. One requirement was that the transom handle people boarding and disembarking while carrying large boxes. By placing a model of a person and his load in various locations on the transom model, we were able to see if the clearances were adequate.

Another area of concern was the complex relationship between the stairs to the bow of the yacht and the fly bridge overhead. Determining the clearances in this area required a 3-D model that we could measure in many different areas. Using Rhino, we were able to control the exact configuration needed to work out the problem.



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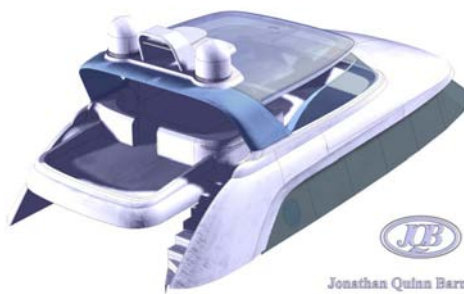
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### Bigger engines?

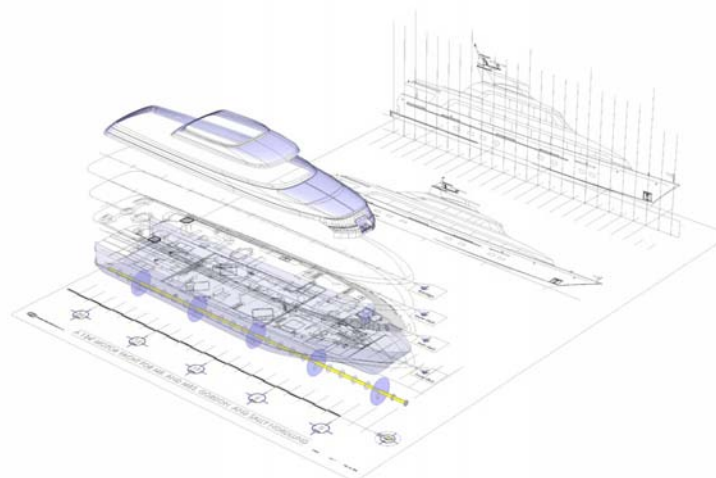
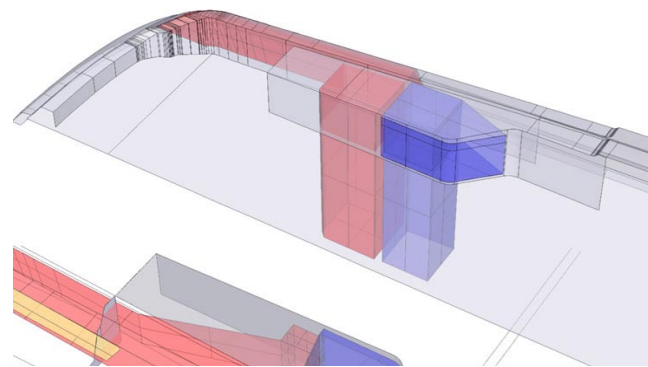
The initial general arrangement drawings were based on preliminary powering information. It was decided in mid-project that larger engines were going to be installed. The larger engines needed larger exhaust and intake delivery systems, which intruded into the interior spaces we had designed. We needed a solution that kept the correct clearances for airflow, yet did not intrude on our existing spaces.

We were able to use Rhino to find a creative solution that satisfied all the engineering requirements while completely integrating the manifolds into the design.

### Balancing the design and engineering

Rhino provided a big benefit in situations such as the radar arch where we needed to balance aesthetics with engineering. In addition to clearance issues, and supporting the equipment that needed to be mounted on the arch, we had to deal with the electrical engineer's requirements, which specified the size of the cables the arch would house.

Using Rhino we were able to work out an arch design that fit the aesthetic requirements of the project and engineering requirements of the vessel.



### Everything fit

Delta Marine contracted the services of Janicki Machine. Using their 68' x 19' x 8' CNC mill, Janicki created full size, high-density foam plugs. Because we designed in 3-D, we were able to send Rhino models directly to Janicki's mill. With very little preparation, Delta Marine was able to pull parts from the "j-mold." This allowed Delta to build many parts in less than half the time it would take using traditional process. It also meant that every last detail of our design was actually built.

