

Real-time simulations to test propulsion alternatives

MARIN helps yacht owners make vital decisions about the propulsion and thruster configurations best suited to their yacht by using virtual reality.

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If a motor yacht of 112x16 m has to sail a 20 m channel and turn in a basin of 120x16 m, what manoeuvring characteristics are required? This was the challenge a Dutch yard was facing for a new yacht, which was on the drawing board.

Several options were considered for the main propulsion, bow and stern thruster. For example, are fixed pitch propellers (FPP) or continuous pitch propellers (CPP) better for the main propulsion, and should these turn inward or outward? FPP and CPP were also the alternatives for the bow thruster, while three options with retractable azimuthing thrusters were considered for the stern thruster. To investigate the influence of the different alternatives on the ship handling characteristics, the yard and owner's representative decided to test the options in virtual reality using our full-mission bridge simulator, so that they could experience the difference first hand.

Nine models Using the results of a series of powering, seakeeping and manoeuvring tests that had already been carried out at MARIN, a mathematical manoeuvring model was prepared using SURSIM. The options

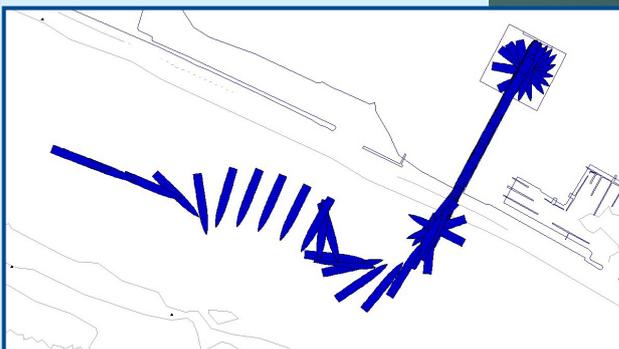
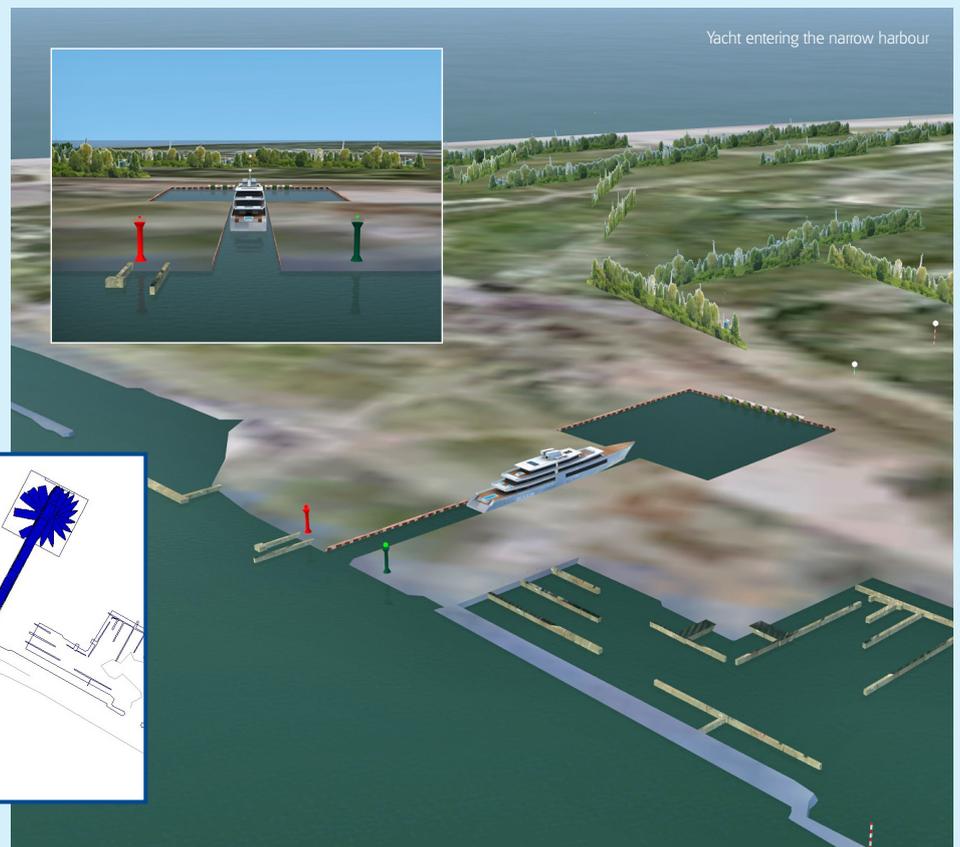
for the propulsion were made as accurate as possible, based on specific details such as the combinator curve for CPP main propulsion, the time-thrust diagram of the bow thrusters, the time to turn 180 degrees for the retractable stern thrusters, etc. In total nine ship models were prepared.

Simulations at the design stage

A harbour basin of the required dimensions was prepared in the database of the Port of Rotterdam, which is available at MARIN. During a 1-day simulator workshop on MARIN's Full-Mission Bridge 1, the owner's representative and the captain sailed the

various yacht models in this database, witnessed and supported by representatives from the yard and one of MARIN's simulator instructors.

By carrying out these real-time simulations during the design stage, the participants were able to select the most suitable propulsion options for the yacht. Considering the extremely confined waters, it is probably not surprising that the bow thruster with the fastest build-up of thrust and the retractable stern thruster with the shortest time for 180 degrees azimuthing were selected as the preferred options. ▢



Sailed track from one of the runs