OCEANIC CONSULTING CORPORATION 15

Celebrating 15 Years of Commercial R&D

Making Waves

Newsletter of Oceanic Consulting Corporation

Spring 2008

Evaluation of a New Sea Borne Crew Transfer System Design

Lockheed Martin and VIKING Life-Saving Equipment Norge AS have joined forces to provide a safer, more efficient, and cost-effective offshore Crew Transfer System capable of operating in heavy sea conditions. By combining Lockheed Martin's advanced hullform designs with VIKING Life-Saving Equipment Norge's patented embarkation systems, offshore platform operators will be able to quickly and safely transport their work crews in all weather conditions.

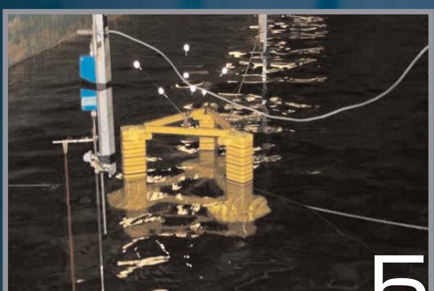
Continued on page 3...

In this issue...

Charting the Course

3

4



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It gives me great pride to announce that Oceanic Consulting Corporation is celebrating 15 years of Commercial Research and Development in 2008.

Established in 1993 as Marineering Limited, the firm has become a worldwide leader in commercial research and development in hydrodynamics and Arctic engineering. Oceanic's business model is to use public sector research facilities based in St. John's at the National Research Council of Canada and Memorial University as a unique selling proposition in providing hydrodynamic services to the global marine industry. In 1998, to mark greater integration locally and to allow for better brand differentiation internationally, the firm began operating under the Oceanic name.

Internationally recognized for its expertise in the areas of vortex induced vibration (VIV) research, Arctic and ice engineering, commercial shipping, and its work for clients competing in the America's Cup, including two-time champion Team Alinghi, Oceanic also has carried out research for a wide range of projects, including liquefied natural gas carriers, semi-submersible drilling units, production spars, floating production storage and offloading vessels, articulated tugs & barges, and a number of super yachts.

As company founder and president, I believe that the firm's success is due to its experienced group of researchers, engineers, and technical personnel; everyday I witness the tremendous dedication and teamwork of everyone in our company. This, combined with its access to one of the world's most comprehensive collections of hydrodynamic research facilities, is what makes Oceanic a world leader in commercial research and development. For the past 15 years, Oceanic's mission has been to provide clients with the expertise, sophisticated facilities, and technology to realize even the most ambitious projects. We remain committed to this mission for the next 15 years and beyond.

To mark this anniversary, Oceanic has many exciting plans in development including a website re-launch, new company promotional material, and new partnerships. I invite you to see us at the Offshore Technology Conference in Houston for updates.

As a last word, I would like to take the opportunity to thank all the readers of our newsletter, Making Waves, clients past and present, our employees, and to all of those who have given support, advice, and kind wishes to our company over the last 15 years. Each contribution has helped make Oceanic Consulting Corporation the success it is today.

For Oceanic Consulting Corporation,
and with best regards,

Dan Walker, Ph.D., P.Eng.
President

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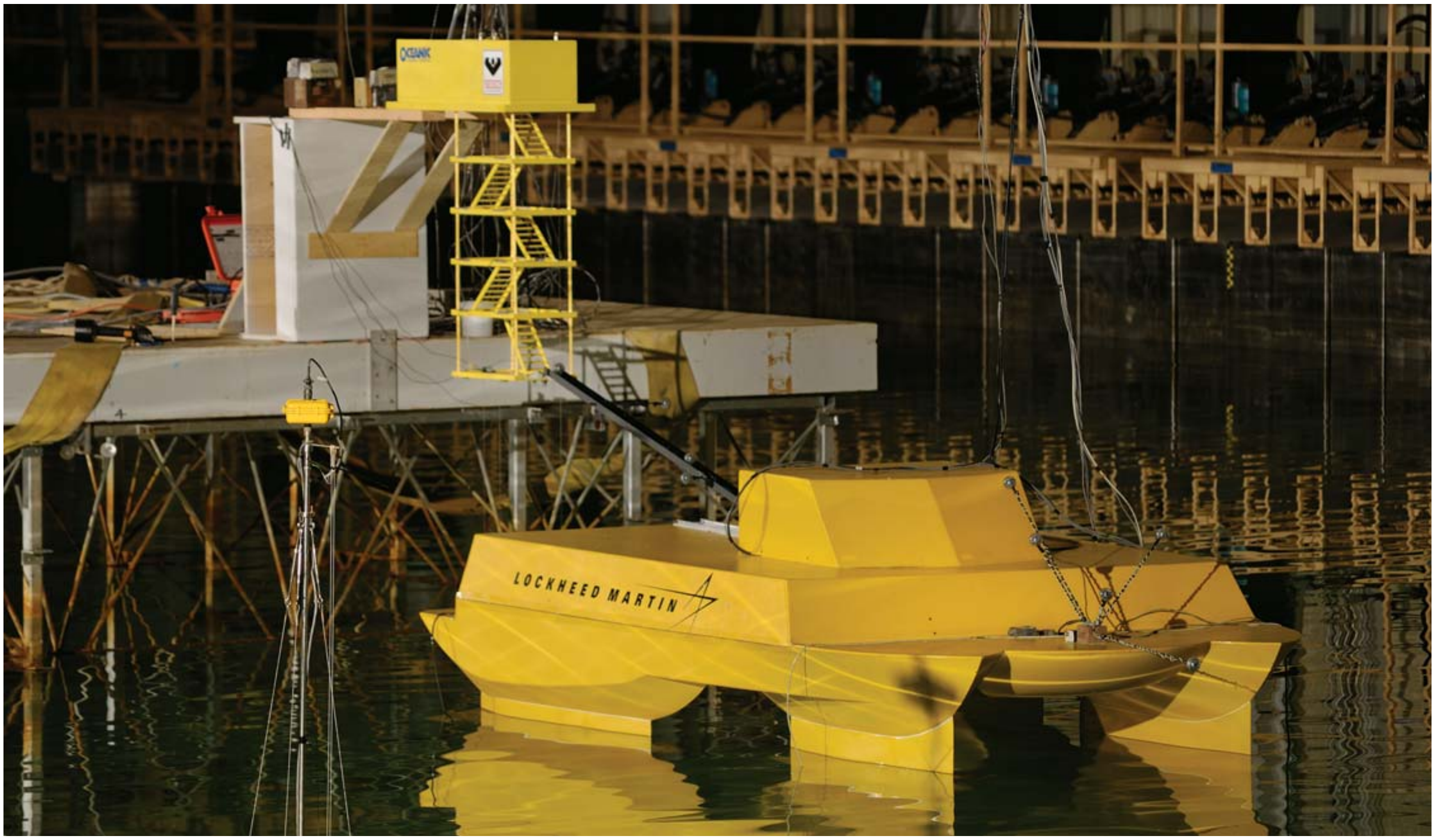
Evaluation of a New Sea Borne Crew Transfer System Design



SLICE® Crew Transfer Vessel with Selstair system.

Continued from cover...

Lockheed Martin's SLICE® vessel design and VIKING Life-Saving Equipment Norge's newest generation of Selstair will be linked to form an innovative new transfer system. Selstair features a collapsible staircase capable of being lowered to a convenient height in order to allow safe, controlled, and convenient access to a waiting vessel. The new transfer system will make it easier for platform workers, maintenance crews, and others to move safely between the transport vessel and the offshore platform in less time than current maritime methods and at less cost than helicopter transport.

Oceanic was contracted by Lockheed Martin to provide the physical evaluation program of this proposed Crew Transfer System. The intent of the model tests was to quantify the degree of motion that would occur between the component systems with the ship operating in a seaway of up to Sea State 5. As the system will be used for the embarkation and debarkation of work crews, the motions of the system must fall within acceptable ergonomic limits for the crew members actively transferring to or from the platform. As well, the motions of the transfer vessel at zero-speed must be comfortable for the workers that would be on board and awaiting rotation.

For this program, Oceanic built for VIKING Life-Saving Equipment Norge a 1:10 scale model of their Selstair retractable ladder system. The stair system consists of several platforms connected with flexible elements. Each component (platforms and stairs) and the flexible linkages of the Selstair were modeled to provide the correct dimensional, mass and inertial properties. Also modeled accurately was the underwater stabilization frame.

The entire crew transfer system, consisting of the VIKING Selstair model, and models of the Lockheed Martin designed gang-way (dubbed the Crew Embarkation Way or CEWay™) and the Lockheed Martin SLICE® Crew Transfer Vessel (SCTV), were extensively tested in waves of up to Sea State 5 to assess the interactions of the three primary components of the system.

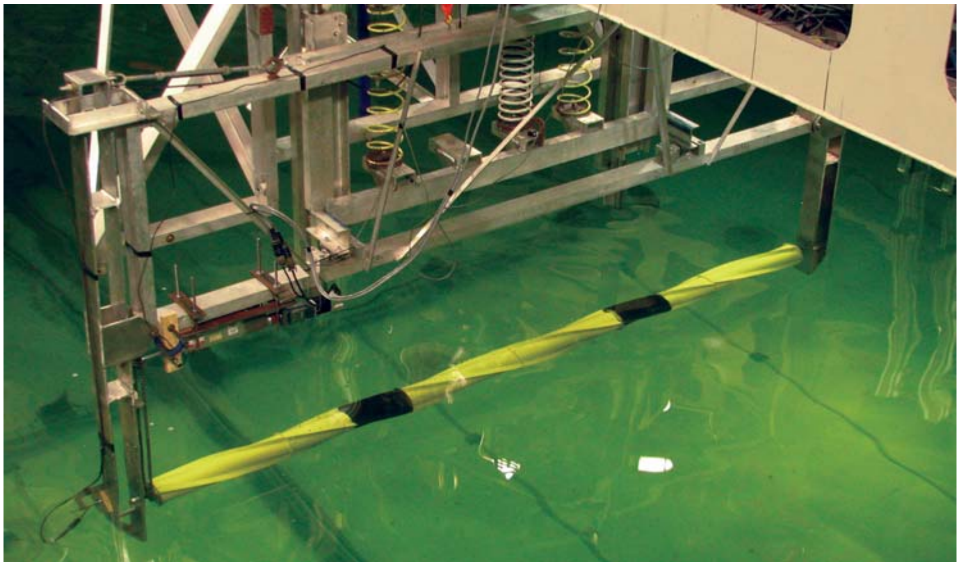
In addition to the question of ergonomics, another project goal was to quantify the lateral thrust required from the four tunnel thrusters that provide the dynamic positioning capability (DP2) for the ship. To provide this information simply and economically, the model was connected to linear mooring springs and the mooring loads were measured during the stationkeeping tests. Oceanic also conducted resistance experiments on the SCTV model to provide Lockheed Martin with powering predictions for the vessel.

"Lockheed Martin is an innovator in developing fast, stable hullforms, and VIKING Life-Saving Equipment Norge is a world leader in developing embarkation, evacuation and safety equipment for the maritime industry," said Dan Schultz, vice-president and general manager of Lockheed Martin's Maritime Security & Ship Systems line of business in Baltimore. "By coming together, our two companies will provide a solution that reduces the risk inherent in the transfer of personnel between a ship at sea and an offshore platform."

"Our success depends on a team effort, with shared values and common goals," said Bjorn Tormod Akselsen, managing director of VIKING Life-Saving Equipment Norge. "Together we are committed to raising safety standards and determined to lead the way for a safer life at sea."

Alex Boon of Lockheed Martin said, "We are very pleased with the conduct of the test program and with the performance of the system in these tests." Mr. Boon attended the tests with other representatives of both Lockheed Martin and VIKING Life-Saving Equipment. Also attending the tests were representatives of a major oil company who have shown interest in the system for their offshore installations.

Hydrodynamic Study of VIV Suppression Devices on a Rotating Drill String



Strake model installed on VIV test rig.

In August 2007, Oceanic Consulting Corporation evaluated vortex induced vibration (VIV) suppression fairings for GeoProber Drilling Ltd. Three 15D triple helix strake models were assessed, with strake heights representing 10, 15, and 20% of the shell diameter. The VIV experiments were undertaken in four test modes: (a) the typical fixed mode, with the strake connected rigidly to a non-rotating pipe; (b) the strake fixed to the pipe, and both rotating; (c) the strake free to float and rotate on a non-rotating pipe; and, (d) the strake free to rotate on a rotating pipe.

A simple rope wound around the pipe and a commercial dual fin fairing (ADFS) from AIMS International were also evaluated; non-rotating and rotating bare pipes were assessed to obtain a baseline curve for comparison.

Oceanic's small VIV rig was installed in the 90-meter Ice/Towing Tank at the National Research Council's Institute for Ocean Technology. The test apparatus allowed for vertical motion of a spring-mounted sub-frame which was free to slide vertically on two rails with linear circulating bearings.

A 3.5-inch aluminum pipe, with a 4-inch outer diameter (102 millimeters) and a length of 3.42 meters giving an aspect ratio of 34, was selected for testing. The pipe was mounted on an axle through its center, with ball bearings at each end. A servomotor was connected to the pipe through a chain drive and a torque dynamometer. For some tests, the pipe was rotated at speeds up to 200 rpm. The strakes were either rigidly connected to the pipe or free to rotate with it. Similar tests were conducted with a stationary pipe.

A bare rotating pipe showed suppression of VIV; however, the addition of strakes did not demonstrate any significant benefit. The ADFS units were very effective in reducing VIV and had low drag. The addition of a simple rope to the bare rotating pipe showed promise; however, further work is needed to determine the specific function of the rope. A surprising finding was that there may be a point where the size of the strake and the reduced velocity may lower the driving torque to zero or may even change sign. In conjunction with these experiments, an extensive Particle Velocimetry Imaging program was conducted by Memorial University researcher Jie Xu (results reported in OMAE 2008) and included cases with bare pipe, rotating bare pipe, strakes, and ADFS fairings.

NRC Institute for Ocean Technology - Ocean Energy Update

The Institute for Ocean Technology (IOT) provides Canadian developers of ocean energy extraction devices with the performance evaluation tools required to develop their concepts. These tools include numerical simulation, physical modeling, and field trials. Additional complementary and overlapping expertise exists in other research organizations across the country. Canada has a wealth of ocean engineering knowledge that could be focused on the needs of Canadian ocean energy developers. IOT encourages collaboration with these organizations to benefit the Canadian ocean energy effort.

Currently, the Institute is working with several Canadian ocean energy technology developers to arrange model experiments in the IOT facilities over the next several months. The Offshore Engineering Basin, Towing Tank, and Ice Tank can all be used to investigate hydrodynamic issues affecting ocean energy devices. The ocean energy development process will typically involve many model-scale experiments, as different issues are investigated and concepts evolve. Development will also iterate between laboratory tests and open sea experiments. IOT has the expertise and equipment to conduct long duration field trials that gather both device and environmental data.

While the Institute's main focus is on assisting developers with technical issues, it is also an active advocate for a concerted, national effort towards the development of the Canadian ocean technology industry. IOT staff regularly participate in the workshops and symposia organized by the Ocean Renewable Energy Group (www.OREG.ca). OREG is a sector association promoting ocean energy in Canada, and IOT's Director General is a member of its board of directors.

The Institute also advises government and regulatory bodies on their ocean energy activities. IOT is represented on the International Electro-technical Commission TC 114 National Committee, and the NRCan Ad-hoc Ocean Energy Technical Advisory Committee. IOT also participated in the technical evaluation of proposals for the Nova Scotia government's In-Stream Tidal Energy Demonstration Project. The Institute was also involved in an ocean energy technology screening report for NRCan, and co-authored a report on the presence of ice in the headwaters of the Bay of Fundy.

As part of its internal research program, the Institute is investigating the effect of scale when modeling simple ocean energy devices. IOT is also planning a project to compare numerical and physical model results related to farm array orientation of wave energy converters.

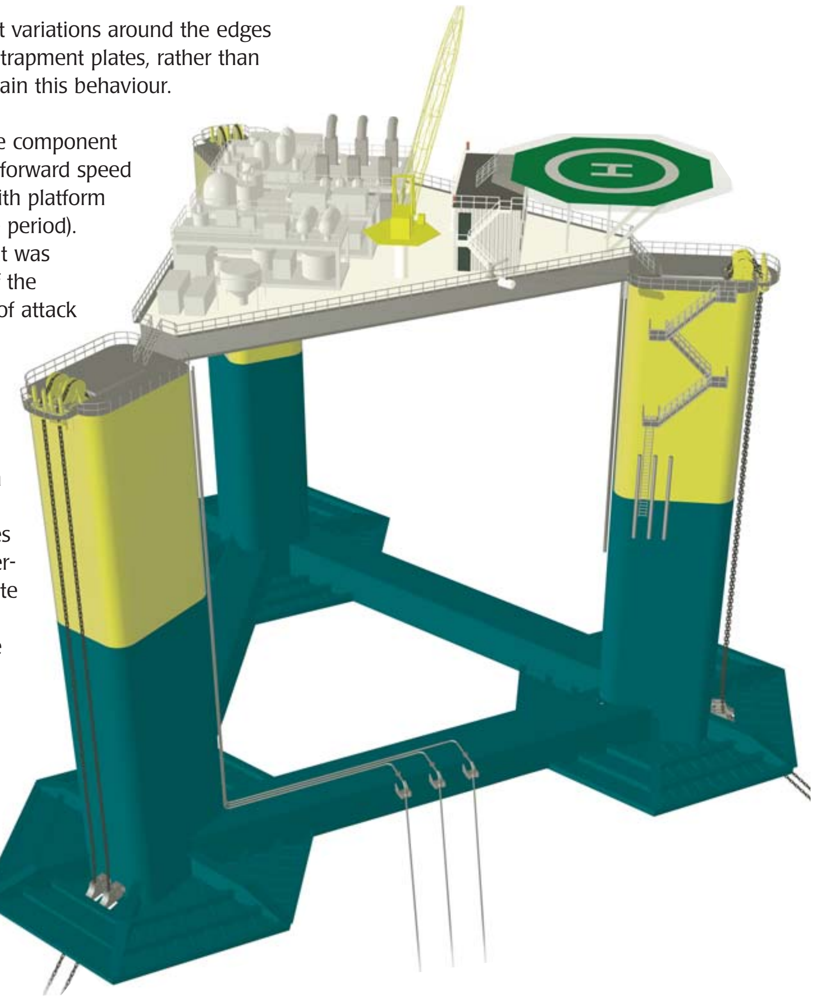
Evaluation of the MINIFLOAT III Platform

Marine Innovation and Technology (MI&T) of Berkeley, California, contracted Oceanic to study the hydrodynamic interaction of waves and current with the platform water-entrapment plates on its MINIFLOAT III platform. Model evaluations were carried out in Memorial University's Ocean Engineering Research Centre's 58-meter Towing Tank in St. John's.

The 1:80 scale acrylic model platform was built by MI&T and was evaluated in head and following seas for a fully loaded configuration with an 85-foot draft. From the results produced by Oceanic, MI&T was able to make various conclusions concerning the performance of MINIFLOAT III.

System identification tests validated the model and mooring arrangement against target values. Tow tests showed that the drag coefficient, based on the projected underwater area of the hull, was 1.1 and MI&T concluded that vortex induced motions (VIM) were not significant. The model was then evaluated in regular waves with two different wave heights for periods ranging from 8 to 28 seconds. The pitch, and to a lesser extent the heave responses, showed small non-linear variations with wave height. Particular attention was given to vortex-shedding and hydrodynamic lift effects in regular wave tests due to the interaction of waves and current with the platform water-entrapment plates. The tests were repeated with two towing speeds and after imposing a positive and negative 3.5º static trim angle to the model.

The Response Amplitude Operators (RAOs) showed no significant variations in the surge or heave responses, but more significant effects of the mean trim angles were apparent in the pitch RAO for periods between 10 and 25 seconds. These effects came from the static trim angle and were independent of forward speed. Drag coefficient variations around the edges of the water-entrapment plates, rather than lift effects, explain this behaviour.

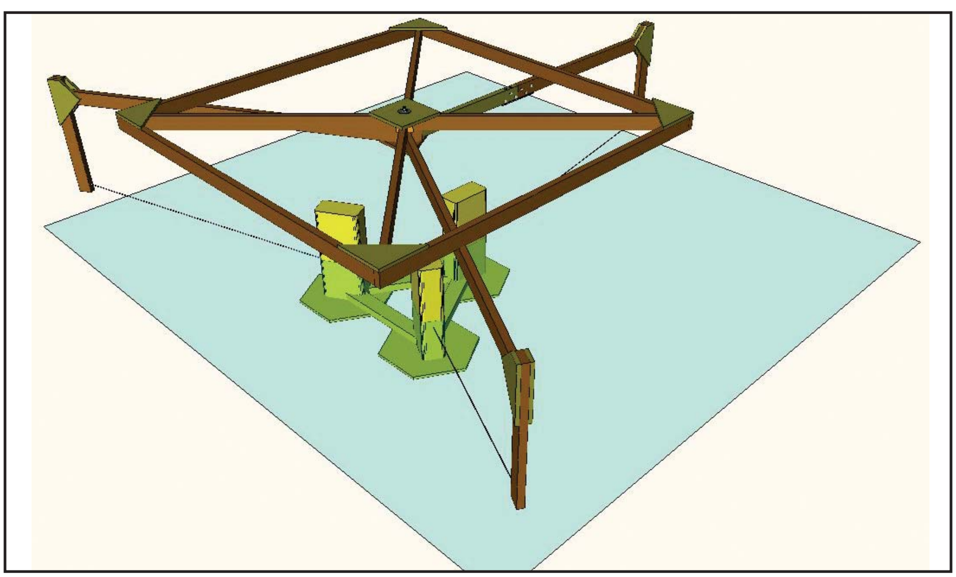


A small sinkage component increased with forward speed and reduced with platform heave (or wave period). This component was independent of the model's angle of attack (trim), and, therefore, was not related to lift. It was, however, associated with the effect of higher pressures above the water-entrapment plate due to the presence of the columns.

The 100-year hurricane Sea State was examined with forward speed to model the effects of the current. In this case, a weight and pulley system modeled the mean current force and wind force. The 100-year three-hour-long wave train had a significant height of 46 feet and a peak period of 14.6 seconds. Forward speed runs lasted 30 minutes in full scale. These experiments, which were repeated four times, exposed the model to two hours of the three-hour-long Sea State, including the most significant wave events. The 100-year results showed a maximum pitch below 10º, a maximum heave below 20 feet, and a maximum offset of 3.1% of the 7,000-foot water depth.

A comparison of the motion spectrum both with and without forward speed showed a significant increase in low frequency horizontal motion due to forward speed. Forward speed also increased the low-frequency resonant pitch, but reduced the first-order wave induced pitch. Similarly, first-order wave-induced heave was smaller with forward speed, partly due to a shift in the encounter period.

The difference in results with and without carriage velocity was also significant. The maximum relative wave height was almost 10 feet higher with forward speed. This was consistent with the observations that the Doppler effect decreased the peak period when the carriage moved. This, in turn, led to a larger wave crest at the platform mean waterline. The current increased platform sinkage and increased maximum pitch. As a result, the clearance between the wave crest and the deck was reduced.



Mooring set-up for the MINIFLOAT III platform.

Detailed Evaluation of an Ice-Strengthened Coastal Ferry

Model during resistance evaluations.

In 2007, Oceanic Consulting Corporation was contracted by Poseidon Marine Consultants Limited (PMC) to evaluate different hull and propulsion configurations for a 16-car RO/RO ferry design. Designed under a "Safe Ferry" concept, PMC intended to maximize aspects of stability, accessibility, functionality, and environmental stewardship. The overall goal of this evaluation project was to provide supporting information that could aid in optimizing the final design of this vessel, and, where possible, to gather knowledge that could be applied to future ferry designs created in accordance with the established "Safe Ferry" principles. The ferry, which is being designed by PMC for the Department of Transportation and Works of the government of Newfoundland and Labrador, will operate year-round in the coastal waters of the province.

Given the province's location, its northern coastal waters are exposed to varying ice conditions in the spring and harsh North Atlantic wave conditions at any time of the year. To assess vessel design options identified by PMC during the initial design process for these wide-ranging environmental conditions, Oceanic devised a broad evaluation program encompassing both physical tests and numerical assessments.

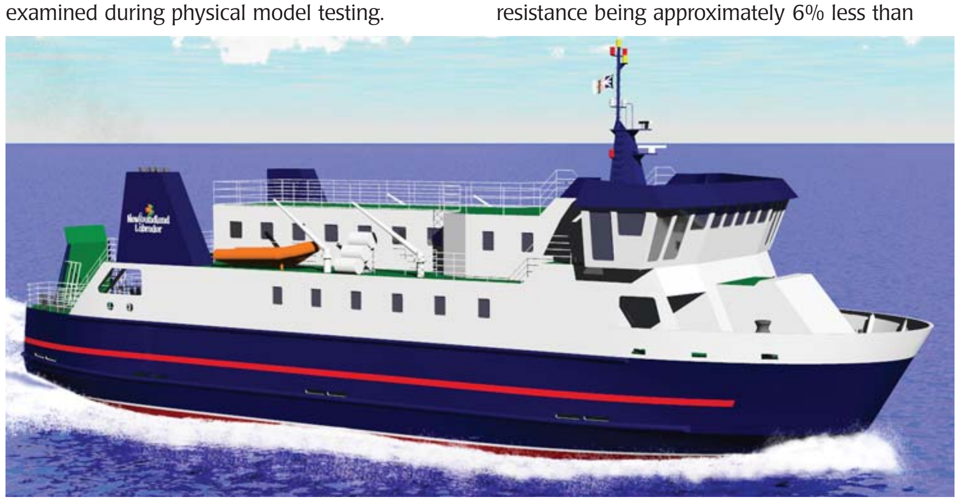
Various bow geometries were considered to ensure that the ferry could operate effectively in ice. However, as ice may be experienced for only a few months each year, it was essential that open water performance not be compromised. The propulsion arrangement for this twin-screw vessel was also under consideration. Both right-angle drives (RADs) and traditional shafting arrangements were in contention. The former was desirable because of the increased vessel maneuverability that would be achieved, while the latter was considered because the inclusion of RADs on this particular hull design might not be well suited to operation in ice. Also, given the vessel's small size, it was desirable to ensure that the selected hull options would permit the vessel to have acceptable seakeeping characteristics in order to provide passengers with comfortable transportation.

At the outset, PMC devised various preliminary hullforms for consideration. Oceanic reviewed the lines and provided comments and recommendations on both the hydrodynamic performance and the performance in ice of the candidate hulls. Based on PMC's revised lines, four candidate hulls were examined using a CFD (Computational Fluid Dynamics) code to assess wave-making resistance. From this analysis, one hull was discounted immediately as it was clearly shown to have higher resistance than the other candidates. Most importantly, the ice-clearing bow, which was intended to optimize performance in ice, did not appear to be detrimental to open water performance. Thus, by using the CFD results, it was possible to narrow the field of candidate hulls to be examined during physical model testing.

Two distinct phases were considered in the physical test program: the first examined operation in ice while the second assessed performance in open water. At a scale of 1:10.5, the hull models for the 42-meter ship were constructed with interchangeable bow and stern sections so that four different hull configurations could be created.

Three appended hull configurations were evaluated in ice. Testing included resistance in level ice, self-propulsion in ice, and backing in pack ice. The ice was modeled to match thin first-year or land-fast ice that would be experienced on the north-east coast of Newfoundland. Using both under- and above-water video cameras made it possible to study the ice movement around and under the models. These qualitative observations allowed additional recommendations to be made concerning local stern modifications that would further improve ice-clearing when backing. The test results showed that the performance of the RAD units would be acceptable in ice, with little possibility of ice blockages occurring. PMC concluded that it would not be necessary to continue evaluation of the traditional shaft-driven propulsion arrangement. The quantitative results also showed that the ice-clearing bow provided superior performance in ice, resulting in over 20% less resistance at a speed of 4 knots in ice.

For the remaining tests in open water, the stern with RAD propulsion was evaluated with the two alternative bow geometries: the conventional bow and the ice-clearing bow. Open water tests included flow visualization of the underwater hull, calm water resistance, self-propulsion, lost speed in head seas, and head seas seakeeping. In this phase of testing, it was necessary to ascertain if the desirable ice-clearing bow would provide adequate open water performance. At a transit speed of 11 knots, the ice-clearing bow did in fact provide improved performance, with calm water resistance being approximately 6% less than



Rendered image of the 16-car RO/RO ferry.

Profile: Carl J. Harris

Mr. Carl J. Harris.

Oceanic congratulates Carl J. Harris on his appointment as Director of Facilities at the National Research Council's Institute for Ocean Technology in St. John's, NL. Mr. Harris has a broad background in experimental hydrodynamics and is a regional expert in numerical modeling capability. His appointment brings complementary strengths to the local marine community by advancing the science behind the art of simulation.

Mr. Harris has built his career around refining physical experiments to provide optimum data and quality at minimum expense. He began his research at the National Research Council (NRC) in 1986; there he implemented efficiency methods in the Towing Tank facility and developed original equipment and techniques for America's Cup Sailing Yacht testing.

In 1995, Mr. Harris left NRC to help form Marineering Limited, now Oceanic Consulting Corporation. As a senior partner and Vice President, Mr. Harris was responsible for the growth of the company's technical capability and for coordinating project schedules, staff allocations, and facility liaisons. This experience led Mr. Harris to Memorial University where he worked with the Centre for Sustainable Aquatic Resources from 2001 to 2004 and the Centre for Marine Simulation (CMS) from 2004 to 2007. At CMS, Mr. Harris established a numerical ship-modeling capability which has allowed the Centre to compete in the growing international market for simulation/evaluation services. In February 2008, Mr. Harris re-joined NRC where he now oversees the Institute's testing facilities and infrastructure.

Mr. Harris is a Professional Engineer and received both his Bachelor's (1986) and Master's (1993) degrees in Engineering (Ocean and Naval Architecture) from Memorial University. He is also a member of the Professional Engineers and Geoscientists of Newfoundland and Labrador (PEG-NL). Mr. Harris has written and co-authored numerous articles on investigative hydrodynamics and has been a featured speaker at several conferences, including Ocean Innovation 2007.

Coastal Ferry Continued

that of the conventional bow. To aid in engine selection, powering requirements were quantified from the self-propulsion tests.

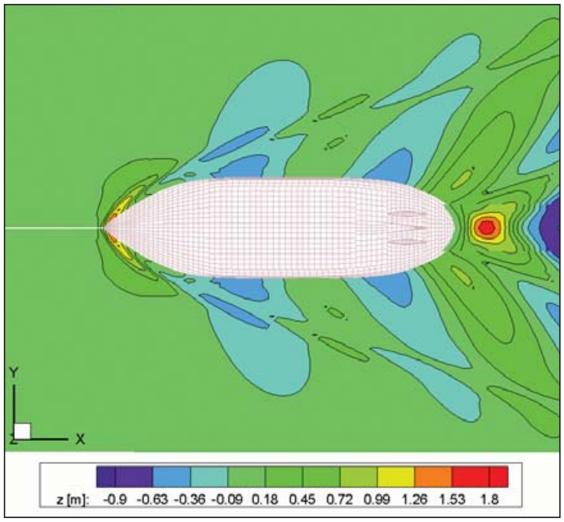
At this point in the program, the ice-clearing bow seemed to be a clear winner, with only seakeeping performance still in question. From the head seas tests, conducted in an upper-end Sea State 4 condition, the conventional bow was shown to provide slightly less lost speed in waves. As this difference was only on the order of a few percent, the margin was not sufficient to warrant selection of the conventional bow for the final design. The motion and acceleration characteristics with either bow were virtually identical.

To provide more in-depth knowledge of the seakeeping characteristics of the vessel, a range of sea states, vessel speeds, and headings were examined with Oceanic's panel method seakeeping code MOTSIM. Using this time-domain code, vessel performance was assessed, both with and without bilge keels, for each bow configuration. The results demonstrated that the ice-clearing bow had no detrimental effects on the ferry's seakeeping performance. Given the small size of the vessel, this assessment clearly illustrated the need for bilge keels and the additional roll damping that would be afforded by their inclusion.

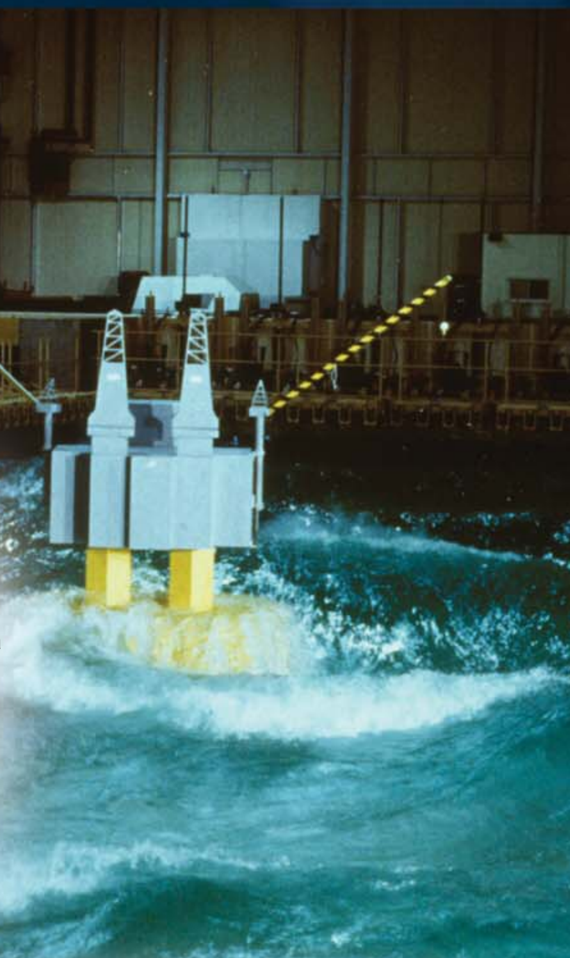
Local accelerations were also determined for the center of gravity, the Bridge Wing, and the Passenger Lounge so that a habitability analysis could be completed. This analysis provided a useful measure of passenger and crew comfort, and indicated particular speed and heading combinations that should be avoided in order to minimize exposure to conditions that could lead to motion sickness and crew fatigue.

Finally, as physical maneuvering tests were beyond the scope of the project, a numerical assessment provided an indication of the vessel's maneuvering performance. Empirical methods were used to estimate the vessel's non-dimensional maneuvering coefficients and simulations using Oceanic's maneuvering code SML (Ship Maneuvering Laboratory) examined various standard maneuvers including turning circles, crash stops, and zig-zags. The results, which were compared against relevant IMO (International Maritime Organization) maneuverability criteria, showed that vessel maneuverability would be adequate for this design.

This comprehensive evaluation program successfully assessed the design and guided PMC in their selection of the final ship parameters. Detailed design is progressing and expectations are that multiple vessels will be built. The construction contract will be awarded in the near future. Oceanic is pleased to have been involved with so many aspects of this project and wishes success to both Poseidon Marine Consultants Limited and the government of Newfoundland and Labrador, Department of Transportation and Works as they continue their work on the project.



Wave contours at 11 knots.



Offshore Engineering Basin Specifications:

Length	75 m
Width	32 m
Max. Water Depth	3.2 m
Wave Making System (Power)	1800 kW
Max. Wave Height (Regular Waves)	1 m
Sig. Wave Height (Irregular Waves)	0.5 m
Wave Lengths	0.5 m to 20 m
Articulation of Waves (Modes)	Flapper, Piston, Combination
Wave Spectra	Regular, Irregular, Bi-modal, Multi-directional
Current Speed	Water-depth Dependent (0.5 m/sec at 1 m depth; 0.25 m/sec at 2 m depth; 0.2 m/sec at 2.8 m depth)
Average Wind Velocity	11 m/sec at 1 m from Fan, 5 m/sec at 5 m from Fan
Turbulent Wind Spectrum Mean Speed	12 m/sec
Wind Spectra	American Petroleum Institute Standard, Norwegian Petroleum Directorate Standard, Other Industry Standards
Optical Tracking System Accuracy	±1 mm Moored Models, ±5 mm Free-running Models

Applications

- Testing of Moored Floating Systems or Gravity-based Structures in Wind, Waves, and Current
- Testing of Free-running and Self-propelled Ship Models

Tests Performed

- Seakeeping
- Maneuvering
- Wave Energy Conversion
- Wave Impact Loads on Ships or Offshore Structures
- Tow-out, Set Down, and Operation of Offshore Structures
- Mooring/Riser Evaluations

Specification Sheets are Available for All Major Facilities, Including:

- Offshore Engineering Basin • 200-meter Wave/Towing Tank
- 58-meter Wave/Towing Tank • 90-meter Ice/Towing Tank
- Cavitation Tunnel • 22-meter Flume Tank
- Centre for Marine Simulation • VIV Test Apparatus • MOTSIM

Specification sheets can be obtained from the Oceanic website or by contacting our office.

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Tugs & Barges 2008	ICETECH 2008	SNAME 2008 Annual Meeting & Expo	The International WorkBoat Show
May 13 & 14 Stamford, CT	July 20-23 Banff, Alberta	October 15-17 Houston, TX	December 3-5 New Orleans, LA