OCEANIC CONSULTING CORPORATION

Making Waves

Newsletter of Oceanic Consulting Corporation
Fall 2005

300,000-barrel Articulated Tug and Barge

Oceanic Consulting Corporation recently completed a test program which evaluated a proposed 300,000-barrel articulated tug and barge (ATB) for Ocean Tug and Barge Engineering Corp. and CT Marine. The tug model featured an advanced propulsion system design driven by a single motor (ensuring uniform thrust), and an optimized notch interface with the barge. Calm water resistance, self-propulsion, and Planar Motion Mechanism (PMM) maneuvering were all tested in the Institute for Ocean Technology's 90-meter Ice/Towing Tank.

In the first phase of testing, the ATB's appended calm water resistance in ballast and loaded conditions, was evaluated. Self-propulsion tests in calm water, to determine the delivered power requirements and propulsive coefficients were included in the second phase of testing. In the final phase, IOT's PMM was used to assess the controls-fixed straight line directional stability of the ATB and provided input data for Oceanic's in-house numerical maneuvering code Ship Maneuvering Laboratory (SML), which evaluated the ATB's response during standard maneuvers.

Throughout the three-phase program, alternate stern profiles were tested to optimize the ATB's measured resistance and maneuverability. Flow visualization tests provided intimate knowledge of the water flow at the tug-barge interface for various ballast conditions and stern arrangements. Model testing results and computer simulations showed that the ATB design had favourable resistance characteristics in loaded conditions as well as excellent directional stability and maneuverability. The design passed the required criteria for maneuverability prescribed by IMO Resolution MSC 137(76).

"This program has been a huge success for all, advancing the state of the art in Articulated Tug and Barge design."

Bob Hill, President, Ocean Tug and Barge Engineering Corp.

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In this issue...

Charting the Course

One week ago, I had prepared an editorial highlighting our work with the America's Cup syndicate teams, advancements in the ATB sector, and the development and design of a specialized multi-hull towing apparatus. All of this was exciting at the time. A week later, however, everything has been changed by Hurricane Katrina.

We at Oceanic would like to extend our sympathy and support to those on the Gulf coast who have felt the devastation wrought by Katrina. To our friends and clients, along with their families and entire communities, who have lost homes, livelihoods, and, even more tragically, loved ones, we offer our thoughts and condolences.

To our friends on the Gulf coast, we hope that you and your immediate and extended families are together, and safe.

For Oceanic Consulting Corporation
Best Regards,

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

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Motor Yacht Testing for Queenship

Oceanic Consulting Corporation has recently completed a test program to evaluate a motor yacht for Queenship Marine Industries.

The test program consisted of calm water resistance testing of several hull variants. All testing was completed in the 58-meter Towing Tank at the Ocean Engineering Research Centre (OERC) at Memorial University of Newfoundland.

The yacht model featured two length variants with interchangeable stern sections incorporating or excluding dual propeller tunnels. Two ballast conditions were tested for each hull configuration. As well, several trim angles were tested to investigate optimal longitudinal centre of gravity positions.

The capability of the towing carriage to reach speeds of up to 5.0 meters/second allowed for testing the model up to a full-scale 27.5 knots.

Testing at OERC allowed for an economical and efficient test program to be completed within a tight schedule.

Trinity Yachts: A New Course

Oceanic Consulting Corporation recently evaluated displacement motor yachts for Trinity Yachts.

Calm water resistance and flow visualization of several hull variants were tested in the 90-meter Ice/Towing Tank at NRC's Institute for Ocean Technology (IOT).

The first test program utilized a model of a 189-foot vessel, purpose built of Corecell structural foam. Three ballast conditions were investigated in resistance tests. Flow visualization tests at one loading condition examined the flow around the bow thruster area, along the bilge near the engine exhaust, and in the vicinity of the skeg.

The second model was wider than the first, and featured two length variants with a removable midship section. The primary vessel under investigation was 179 feet, with a 196-foot variant. Three ballast conditions were tested for the short hull configuration, and only one for the longer variant. Flow visualization for the second test program investigated flow in the areas surrounding the proposed exhaust location as well as the skeg and rudder areas.

The basin towing length allowed multiple speeds to be tested in a single run. The 90-meter basin length and a towing carriage speed of up to 4.0 meters per second enabled the testing of high speed vessels of moderate scale.

Of note, Trinity Yachts is currently building two displacement vessels based on the designs tested during these model test programs. Oceanic is proud to have contributed to the growth of Trinity Yachts in the displacement motor yacht sector, as Trinity are best known for their semi-displacement vessels.

The Race for the 2007 America's Cup

Testing Models for America's Cup Challenger Mascalzone Latino Capitalia

Oceanic Consulting Corporation (Oceanic) has recently begun testing models for the Mascalzone Latino Capitalia America's Cup Challenger Syndicate. Mascalzone Latino Capitalia becomes the third America's Cup syndicate to use Oceanic's services and the Institute for Ocean Technology's 200-meter Towing Tank.

Oceanic is also currently working with BMW-Oracle Racing and Alinghi on model testing hull designs for the 2007 America's Cup and Louis Vuitton Challenger Series to be held in Valencia, Spain. Oceanic was involved with both teams in the 2003 America's Cup Campaign.

Oceanic built models for BMW-Oracle Racing, while Alinghi used both its model building and testing services. Oceanic's current work builds on the reputation it established with Alinghi and BMW-Oracle Racing in their preparations for the 2003 America's Cup, when Alinghi defeated Team New Zealand in a 5-0 knockout. Alinghi's competition in that series did not come from the Cup's defender, but from BMW-Oracle in the Louis Vuitton Challenger Series when it won race four and came close to winning two other races in the best of nine series.

Placentia Pilot Sea Trials

Oceanic Consulting Corporation recently completed sea trials to evaluate the performance of the fast pilot boat M.V. *Placentia Pilot*.

These trials provided baseline performance data for the vessel, the design of which is to be used as the basis for a new design by Lengkeek Vessel Engineering for the Atlantic Pilotage Authority. The vessel operates on an as-needed basis in Placentia Bay, Newfoundland and Labrador.

The *Placentia Pilot* was purpose built for the service and is designed and constructed to operate as a pilot boat in heavy weather, under severe sea conditions and icing, to travel at speeds up to 25 knots, and to transfer pilots in winds up to 45 knots. The vessel is equipped with heated decks and handrails. Its superstructure is built as a separate module fitted with flexible mounts and a hypalon seal skirt to dampen vibration and noise.

The vessel is powered by twin Detroit Diesel/MTU 2000 Series V12 engines, each of which produces 1,600 horsepower.

The objective of the sea trials was to gain insight into the effect of weight on the performance of the vessel and to study the effect of bow strakes on the dynamic roll angle at speed. Trials included speed runs, high speed turns, and dynamic inclining experiments. Oceanic installed instrumentation, logged vessel performance data, and analyzed results from two vertical accelerometers and a roll and pitch angle indicator. In addition, Oceanic visited the vessel during a haul-out and provided an overview of the design, with suggestions for enhancing the performance of a new vessel to be designed for the same service.

The results of these trials will aid in understanding the performance envelope of the *Placentia Pilot* and in ensuring that Lengkeek Vessel Engineering is sufficiently cognizant of its performance to incorporate improvements into the new design.

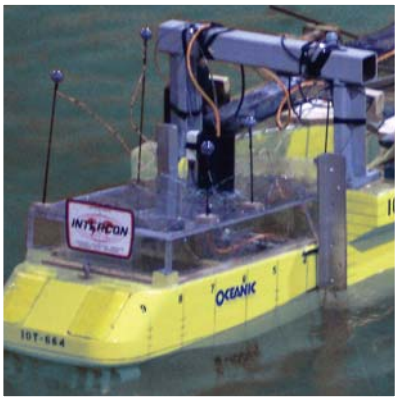
An Innovative *ATB Connection System*

Oceanic Consulting Corporation has completed a test program that evaluated the design concept of a novel Articulated Tug/Barge (ATB) coupler connection system developed by Intercontinental Engineering-Manufacturing Corp.

The test program, carried out in the Institute for Ocean Technology's Offshore Engineering Basin (OEB), investigated the motion response of the ATB in several sea states. Key observations were made during engagement and disengagement of the coupler connection system.

The connection system was installed in existing models of a 300,000-barrel barge and mating tug provided by Ocean Tug and Barge Engineering Corp. When engaged, the connection system solidly connects the tug to the barge, limiting the tug to pitch only. Upon disengagement, the tug is free to heave within the notch. The connection system is designed so that tug surge, sway, roll, and yaw are limited during periods when the coupler is disengaged.

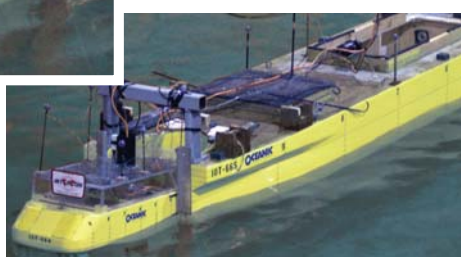
A simple lightering condition was simulated by inducing a draft differential between the tug and the barge, and locking the connection system. Disengaging the coupler system allowed the tug to move up in the notch, reaching equilibrium.



Using the OEB's fixed Qualisys optical tracking system, the motion responses of the tug and the barge were tracked simultaneously. Motion at each coupler was monitored by non-invasive, ultrasonic distance sensors. Model station-keeping was accomplished by soft-mooring the vessel in the centre of the OEB test area.

The ATB was subjected to several irregular wave spectrums at various headings to provide qualitative and quantitative observations of tug response during simulated lightering conditions. Several tests investigated the effects of current on the coupler system. The mechanism released as expected in all environments tested.

The OEB's current- and wave-making ability, in combination with shallow water conditions, permitted a complete modeling of the environments required within an efficient and economical test program. Although not utilized in the test program, the OEB also offers the ability to provide environmental modeling incorporating wind.



The Evaluation of Ship Maneuvering

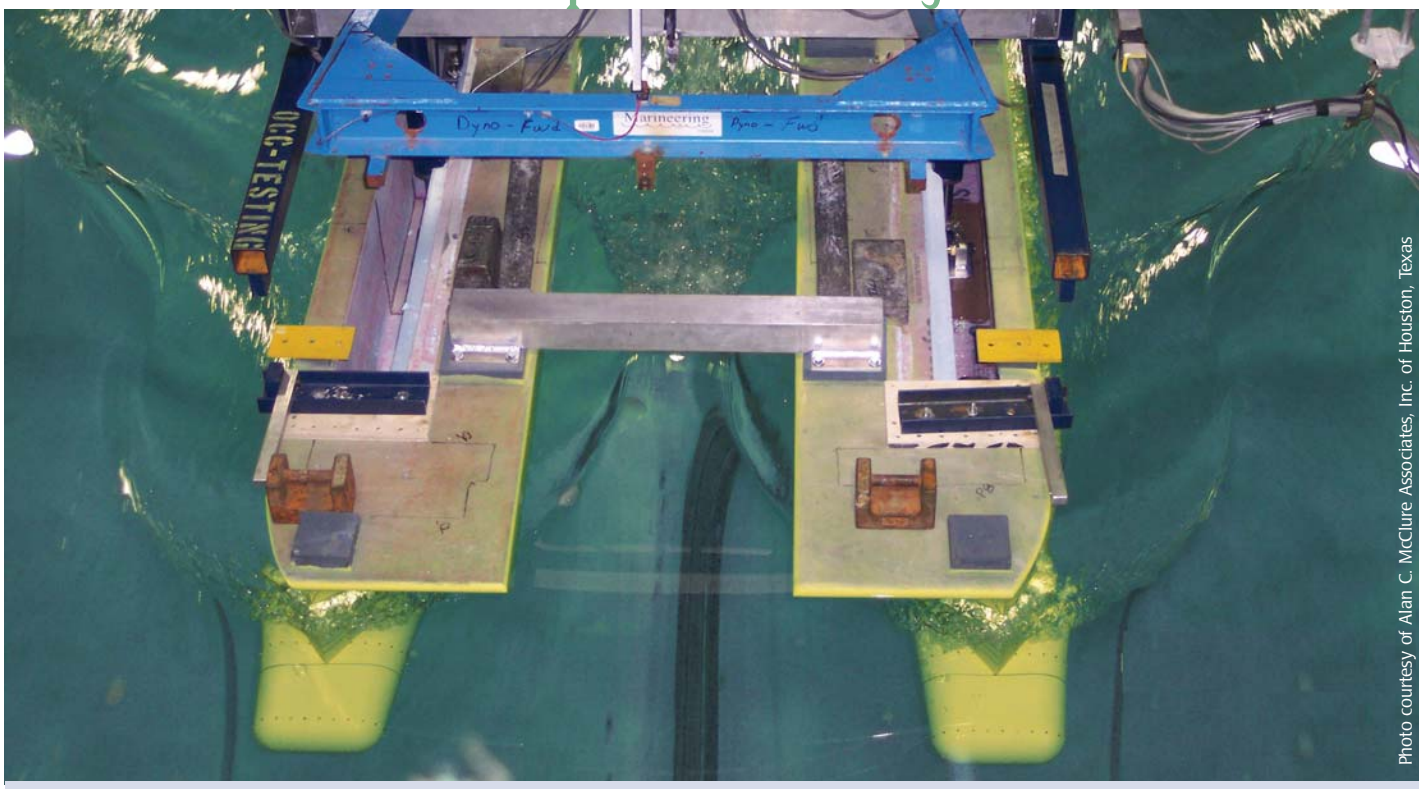


Photo courtesy of Alan C. McClure Associates, Inc. of Houston, Texas

Meeting Increased Industry Demand Through Coupling Physical & Numerical Modeling

In December 2002, the International Maritime Organization (IMO) adopted Resolution MSC 137(76) - Standards for Ship Maneuverability. This resolution is to be applied to ships of all rudder and propulsion types of 100 meters in length and over, and chemical tankers and gas carriers regardless of length, constructed after January 1st, 2004. Since the passing of this resolution, Oceanic Consulting Corporation has noted a dramatic increase in the number of clients requiring a demonstration of compliance of their new vessel designs with MSC 137(76). To predict the maneuvering characteristics of a new vessel and to ensure compliance with IMO MSC 137(76) requirements, Oceanic employs a combination of captive physical model tests and mathematical models and tools ranging from desktop fast-time simulations to full-mission bridge real-time simulations.

The Planar Motion Mechanism (PMM), a specialized model test apparatus for performing maneuvering studies in ice or open water, is the primary tool for physical modeling. Movement of the scale model is controlled in exact, pre-programmed patterns of sway and yaw while forces and moments are recorded. The PMM is designed to measure drag, side force, roll moment, yaw moment, dynamic trim, and sinkage of the scale model; additional instrumentation can be added to measure propulsor or rudder forces. The physical model testing yields the hydrodynamic maneuvering coefficients of the vessel and the quantification of the complex hull-propulsor, hull-rudder, and rudder-propulsor interactions.

Oceanic Consulting Corporation's in-house maneuvering code, Ship Maneuvering Laboratory (SML), may be used to numerically simulate vessel maneuvering. SML is a PC-based computer code that simulates the maneuvering of a ship or any floating body. It solves rigid body motion in three (surge, sway, and yaw) or four (including roll) degrees of freedom using a time step solver. The program has three basic modules, SML-Engine, SML-Environment and SML-Bridge, that communicate through a shared simulation database. The software allows single- or multi-vessel simulations to be completed for a range of environmental and bathymetric conditions. The vessel controls may be operated interactively, or an input control file may be recorded to run the simulated vessel maneuver. The maneuvering coefficients determined from PMM model tests are used in establishing the SML numerical model. The experimental determination of the maneuvering coefficients is an important step in model definition, as mathematical maneuvering models can be sensitive to ship-specific hydrodynamic flow over the hull and control surfaces.

For detailed real-time full-mission bridge simulations Oceanic Consulting Corporation will employ its partner, the Center for Marine Simulation (CMS) of the Marine Institute at Memorial University of Newfoundland. CMS has numerical ship model building capability and a Full Mission Ship Bridge Simulator with full motion articulation and a 360° visual screen. Hydrodynamic data from physical model tests can be combined with three-dimensional geographic images of ports to provide a tool to assist in the evaluation of the maneuvering performance of the vessel as well as to provide a platform for crew and pilot training on a new vessel prior to vessel construction.

In response to an increased demand from clients, Oceanic Consulting Corporation has successfully employed a combined physical and numerical modeling approach to allow clients to demonstrate compliance of their new designs with IMO MSC 137(76). Oceanic continues to develop and refine both physical testing methods and numerical prediction tools in order to remain a leader in marine performance evaluation.

Photo: Courtesy of Alan C. McClure Associates, Inc. of Houston, Texas

Preliminary Design Evaluation of the NOAA SWATH CMV

Oceanic Consulting Corporation has completed a model test program with Alan C. McClure Associates, Inc. of Houston, Texas, to evaluate the performance of a preliminary design for a U.S. National Oceanic and Atmospheric Administration (NOAA) small waterplane area twin hull (SWATH) Coastal Mapping Vessel.

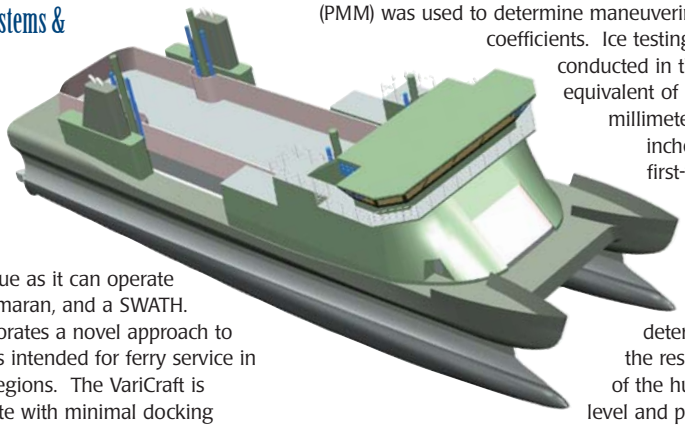
The 1:11.8 scale model of the hull built by Oceanic had a representative propulsion system, and included the measurement of torque and thrust at each propulsor. A specialized towing arrangement that allowed measurement of the towing loads in six axes with the model at a fixed trim, or in three axes while allowing the model to trim, sink and roll, was utilized.

Testing of the preliminary NOAA SWATH design was conducted in Oceanic's 90-meter Ice/Towing Tank during May 2005; it included visualization of the flow across the hull, measurement of the resistance in free and fixed (full restrained) modes, self-propulsion tests with stock propellers to determine propulsion coefficients, maneuvering experiments with and without rudder sweeps, and numerical maneuvering predictions.

Oceanic's SWATH/Catamaran towing dynamometer, which was used for the tests, is designed for testing twin hull vessels in calm water, head seas, and ice environments. It incorporates a six-axis force balance to measure the forces and moments on the hull in full-captive or semi-captive (free to sink and trim) modes. Oceanic's Planar Motion Mechanism (PMM) determined maneuvering coefficients of the hull, and its in-house numerical maneuvering code, Ship Maneuvering Laboratory (SML), predicted the vessel's maneuvering performance.

The Evolution of the Lockheed VariCraft

Oceanic Consulting Corporation has completed multiple test programs with Lockheed Martin Maritime Systems & Sensors to evaluate designs during the evolution and development of a VariCraft vessel.



This vessel is unique as it can operate as a barge, a catamaran, and a SWATH. The design incorporates a novel approach to ice-breaking and is intended for ferry service in remote northern regions. The VariCraft is designed to operate with minimal docking infrastructure and in coastal ice. The physical test programs were conducted in two phases: the first with a 1:15 scale model of a four-pod design variant propelled by propellers and the second with a 1:10 twin hull model propelled by four waterjet propulsors and fitted with a structural hull girder dynamometer.

In phase one, the hull model was built by Oceanic; it included a representative propulsion system, with the measurement of torque and thrust at each propulsor. A specialized towing arrangement was utilized which allowed measurement of towing loads in six axes with the model at a fixed trim, or in three axes while allowing the model to trim, sink and roll. Testing on the model during this phase was conducted during July and August 2004 in Oceanic's 90-meter Ice/Towing Tank. Prior to evaluating the ice-breaking performance of the hull, open water tests determined the hull resistance of the hull propulsion characteristics in calm water. Oceanic's Planer Motion Mechanism (PMM) was used to determine maneuvering coefficients. Ice testing was conducted in the scale equivalent of 600 millimeters (24 inches) of first-year ice. Ice tests determined the resistance of the hull in level and pack ice, while maneuvering loads were evaluated using the PMM. Propeller-ice interactions were also measured using propulsion torque sensors and underwater video.

During phase two of the VariCraft design evaluation program, a 1:10 scale model of the revised hull form was fabricated and fitted with four scale model waterjet propulsors outfitted to measure motor speed and shaft torque on all four units. To acquire structural loads, the model was fitted with six-axis dynamometers to measure the hull loads on each demihull as well as the loads on the bridge deck structure in both SWATH/catamaran and barge modes. Phase two tests were conducted in several basins: the 200-meter Tow Tank, 90-meter Ice Tank and the Offshore Engineering Basin (OEB) were all used to conduct experiments in resistance, propulsion, added resistance, ice resistance, speed loss in waves, and seakeeping while motions and hull loads were being measured.

In the resistance portion of this phase, the model was fixed and free to sink and trim. Propulsion testing focused on self-propulsion performance comparisons in various operational modes. Added resistance testing was performed for head and following seas in several sea states and for multiple operational conditions. Ice testing was conducted in level ice, and broken ice of 9/10 and 8/10 concentrations. The model was self-propelled during the speed loss in head seas testing, and the performance was verified for multiple speeds, sea states, and hull conditions. The seakeeping portion of the program was extensive, incorporating various regular and irregular wave conditions, multiple headings, and all operational modes of the vessel. Motions and global loads on the primary hull components (port demihull, starboard demihull, bridge deck) also were measured to verify the extreme hull girder design loads.

Oceanic is continuing its work with Lockheed Martin, and is currently preparing for a new phase of tests. These tests, with a new model of the refined hull form, are expected to focus on seakeeping.

Profile: J. Michael Doucet

Since 1998, Mr. J. Michael Doucet has been a Consultant with Oceanic Consulting Corporation and has developed an extensive background in assessing various aspects of ship performance. He has undertaken numerous seakeeping evaluations in which various vessel types have been assessed, with and without motion stabilization systems, to determine motion characteristics. A particular area of interest is habitability and methods of improving on-board comfort through the reduction of vessel motions and accelerations. Other tasks he has undertaken at Oceanic have included resistance analysis, flow assessments using Computational Fluid Dynamics (CFD) codes, and propulsion system analysis. Mr. Doucet has acted as project manager for various projects, including assessments of new propulsion system designs, and has completed propeller design tasks involving parameter optimization to match propeller and engine characteristics. He has also undertaken the conceptual design of a totally enclosed motorized lifeboat and has been involved in the design and development of seakeeping, maneuvering, and propulsion software tools currently being used by Oceanic.

Prior to joining Oceanic, Mr. Doucet was employed as a Project Engineer by both Memorial University of Newfoundland and Marineering Limited, performing several cavitation tunnel and towing tank experiments to assess propeller performance. He was also involved in the development of proposed Arctic Shipping Machinery Regulations. Mr. Doucet is a Professional Engineer and holds a Master's degree in Engineering (Ocean Engineering) and a Bachelor's degree in Engineering (Naval Architecture), both from Memorial University of Newfoundland. His Master's thesis research examined cavitation erosion of ice-class propellers resulting from flow blockages that occur during propeller/ice interaction. He is a member of the Professional Engineers and Geoscientists of Newfoundland and Labrador (PEG-NL) and of the Society of Naval Architects and Marine Engineers (SNAME). He has served as the Treasurer of the SNAME Canadian Atlantic Section since 2001.

Mr. Doucet's work has been disseminated through publication and presentation at various conferences, including several editions of the Canadian Hydromechanics and Structures Conference and the International Conference on Offshore Mechanics and Arctic Engineering, as well as in reports for Oceanic clients and Transport Canada.

New Alliances

Chesapeake Marine Technology

Oceanic Consulting Corporation in St John's, Newfoundland and Chesapeake Marine Technology LLC in Easton, Maryland are pleased to announce that they have entered into a strategic partnership. Formed earlier this year, this partnership creates a North American network which will provide testing and consulting services to the international marketplace.

The recently signed Joint Services Agreement will make it easier for US clients to access the facilities and expertise available in St John's, which include 656 foot and 190 foot towing tanks, an offshore engineering basin, a 295 foot ice tank, a cavitation tunnel, a 72 foot flume tank, and a simulation center. In addition, this comprehensive suite of facilities is supported by a broad range of numerical simulation capacity.

Dr. Dan Walker, President of Oceanic, and Mr. Frank DeBord, a veteran engineer with over thirty years of industry experience, believe that with combined capabilities, Oceanic and Chesapeake will be even better equipped to meet the diverse challenges facing clients in the US. Dr. Walker noted that "what's more, our affiliation with Frank brings us the experience of one of the world's foremost experts in performance prediction services and will enable us to provide an outstanding mix of innovative solutions and facilities that are second to none in the industry."

For additional information on the services being offered, please contact:

Mr. Frank DeBord, President Chesapeake Marine Technology LLC at (410) 763-8379 or Mr. Shawn Searle, VP, Business Development, Oceanic Consulting Corporation at (709) 722-9060.

Vizon SciTec Inc.

Oceanic Consulting Corporation and Vizon SciTec Inc. have recently entered into an alliance agreement to market Vizon SciTec's Ocean Engineering Centre (OEC), located in Vancouver, British Columbia.

This agreement will allow Oceanic to jointly market these facilities internationally under the trade name Vizon SciTec Inc./Oceanic Consulting Corporation.

The alliance of Vizon SciTec Inc. and Oceanic Consulting Corporation is one that will create a unified and complementary organization which will more effectively deliver a broader and more sophisticated range of engineering, consulting, and hydrodynamic test services to a growing and increasingly more experienced client base.

Over the past 25 years, OEC has built a strong reputation with engineers, naval architects, and ship builders throughout the Pacific Northwest as the facility of choice for ship model testing and research.

Vizon's OEC is Western Canada's foremost hydrodynamic test facility and offers its clients a 67-meter Towing Tank and a 30.5-meter Maneuvering Basin.

For additional information, please contact:

Mr. Brian Nixon, President and CEO, Vizon SciTec Inc. at bnixon@vizonscitec.com or Mr. Shawn Searle, VP, Business Development, Oceanic Consulting Corporation at shawn_searle@oceaniccorp.com.

Marine Institute's Centre for Marine Simulation: Ship Bridge Simulator

Specifications:

Length	5m
Width	7m
Window Angle	5°
Visual Theater Diameter	20m (approximate)
Visual Theater Height	12m (approximate)
Visual Theater Field of View	360° Horizontal, 27° Vertical

Instrumentation & Equipment:

~ Full-size Modular Ship Bridge
~ Full-motion Platform Base Actuated in Six Degrees of Freedom provides motion cues and special buffet effects including engine vibration, wave impact and collision)
~ Visual Screen with 360° Horizontal Field of View
~ 10 High-resolution Projectors
~ Advanced Computer-generated Imaging System (creates and modifies 3-dimensional full-color visual scenes including target ships and land masses)
~ 4-Channel Sound System (provides realistic sounds of engines, sea, vessel movement and wind)
~ Electronic Chart System
~ Simulated DGPS Positioning System
~ Data Bridge 2000 Integrated Navigation System
~ Array of Working Vessel Controls (including helm, compass, radar, radio, engine, and thruster controls)

Applications:

~ Training in Advanced Navigation, Piloting and Bridge Resource Management
~ Simulation of Ship Hulls and Offshore Structures
~ Training in Ship Handling, Single Point Mooring and Station Keeping

Tests Performed:

~ Seakeeping
~ Maneuvering
~ Motion Studies of Ships and Offshore Structures in Ice, Wind, Tide, Current and Precipitation
~ Ship Model/Bottom Interaction

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 • MOTSIM

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

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