OCEANIC CONSULTING CORPORATION
Celebrating 15 Years of Commercial R&D

Making Waves

Newsletter of Oceanic Consulting Corporation
Fall 2008

Development of a New Vancouver SeaBus

Vancouver's SeaBus ferries *MV Burrard Beaver* and *MV Burrard Otter* were delivered by Yarrows Ltd., Victoria, BC, more than 30 years ago and have served as a vital public transit connection between downtown Vancouver and its expanding suburbs on the northern shore of the Burrard Inlet. Both vessels were in many ways considered revolutionary at the time as they were double ended catamarans, were constructed from aluminum, and had propulsion power delivered by four azimuthing right-angled drives.

The ferries offered maximized passenger capacity and are considered to be a case study in reliability, both having operated together on a regular schedule while posting a 99.95% reliability factor.

However, with an increasing population and a rise in development around the Burrard Inlet comes an increase in demand for public transportation. This increased demand often causes "lock outs" of passengers at peak times as the current ferries are forced to leave when full.

In addition, the need for increased sailing frequency was identified by the operator, and it was desirable to improve cycle times such that a ferry could leave every 10 minutes instead of the present 15 minute interval. Also, after more than three decades of service, the current ferries now require significant refit and modernization to increase their operational life span. The increased passenger demand on the route, combined with the age of the current vessels, adds up to the need for a new re-designed ferry.

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For the last 15 years, Oceanic has been specializing in physical modeling, numerical simulation, and consulting in the area of hydrodynamic and Arctic engineering research for international marine technology industries. During this time we have collaborated with hundreds of researchers, organizations and companies on industry-led research programs, joint-industry projects and hydrodynamic assessments. We believe these experiences allow us to ensure that our clients benefit from the most current advice in marine performance evaluation.

It is therefore my pleasure to announce that Oceanic has once again expanded its collaborative network through the establishment of a Joint Marketing Agreement with France's Océanide SA. To our company, this agreement is significant not only in terms of our access to additional facilities and experts, but it has also allowed us to foster linkages between Memorial University, with whom we work very closely, and the engineering school Centrale de Marseille. These links with educational institutions are not insignificant. They contribute to Oceanic's ongoing support of academic development for naval architecture students. An annual scholarship, the donation of two models to the Webb Institute, and the employment of numerous interns and work-term students each year are just a few of the ways we are supporting the industry's future professionals. Keeping in touch with the future of the industry is what keeps Oceanic and its employees on the cutting edge and able to deliver innovative solutions to its clients.

But helping to develop future professionals is not enough. Fruitful collaboration also involves identifying and accessing the experience that is already out there. Over the last three years, Oceanic has collaborated with Express Marine Inc. on several articulated tug and barge testing projects that have radically improved and perfected our tug and barge modeling capabilities. As well, our collaboration with Duncan MacLane of Express Marine, a leader in the industry whose involvement with America's Cup Challengers is known far and wide, led the Mascalzone Latino syndicate to use Oceanic's facilities and people in their quest for the 2007 America's Cup.

Speaking of people, Oceanic is pleased to announce that Dr. David Molyneux is joining the firm through a secondment arrangement with the Institute for Ocean Technology. David, no stranger to Oceanic and its partners, is an expert in hydrodynamics and ice engineering. Having David on board as a consultant will increase Oceanic's collaborative possibilities with IOT and with the local and international marine industries, and we are very pleased to have him on the team.

As Oceanic continues to grow, so too does its collaborative network. This is as it should be. Whether we are supporting the development of future industry professionals, adding facilities or capabilities, or teaming up with the right people to offer our clients the expertise they seek, we understand that we did not get to where we are alone and we won't get to where we are going alone either. Collaboration is not just an empty buzzword at Oceanic – it's what we do and it's why we're here, all in the interest of offering our clients the best hydrodynamic evaluation services that are to be had anywhere.

For Oceanic Consulting Corporation,
and with best regards,

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

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Webb Institute Students Supported by Oceanic Consulting

It was with great pleasure that Oceanic Consulting Corporation's president, Dr. Dan Walker, presented two ship models to Webb Institute's Mr. Jeffrey Reifsnyder and Ms. Kristin Jarecki in support of their senior thesis entitled "Comparison of a Wave-Piercing X-Bow with a Traditional Bulbous Bow on Offshore Supply Vessels". The two 48-inch long models, an x-bow and a bulbous bow, were designed by Mr. Reifsnyder and Ms. Jarecki in the fall of 2007 and subsequently produced by Oceanic Consulting.

The models, valued at $14,600 and fabricated in St. John's from numerically controlled (NC) milled foam plugs sheathed in fibreglass and epoxy resin, were donated by Dr. Walker during a ceremony at the Institute in March 2008.

"The donation made sense for Oceanic because their projects are an extension of what we do," says Dr. Walker. "It also helps extend the knowledge base and learning capacity at the Institute. Webb is a leading naval architecture school and Oceanic will continue to support its students in every way we can."

Prior to the presentation, Dr. Walker was hosted overnight at President Admiral Robert Olsen's home, where several students and faculty attended a special "Webb Hug" dinner. Dr. Walker also toured the campus and sat in on several classes.

Webb Institute's dean, Mr. Roger Compton, with Oceanic's president, Dr. Dan Walker.

Located in Glen Cove, NY, on Long Island Sound, Webb Institute is a unique, top-ranked undergraduate institution offering one academic option, a double major in Naval Architecture and Marine Engineering. It is also the only private full-tuition scholarship undergraduate program of its kind in the United States.

Oceanic Signs Marketing Agreement with France's Océanide

From left to right: Dr. Dan Walker, Mr. Alain Caillet, Mr. Bruno Caudrillier, Mr. Guy Facon, Mr. Sam Walters, and Mr. Lee Shinkle.

On 18 June 2008, Oceanic Consulting Corporation brought together representatives from municipal, provincial, Canadian federal, and French governments, as well as leaders in the oil and gas industry, at their signing of a Joint Marketing Agreement, formalizing a Memorandum of Understanding drafted in March 2008 with Océanide SA of Toulon, France. Both companies agree that this is a leap forward in an international partnership that aims to make Oceanic and Océanide the service providers of choice for international marine and offshore industries.

The combined capabilities offered by these two companies will generate increased business opportunities through an effective sharing of resources. "The combination of the suite of services provided by Oceanic and Océanide will generate increased business for both companies. Océanide's coastal engineering capabilities will allow Oceanic to offer a broader capability in its traditional market space. Oceanic's arctic and ship performance capabilities will allow Océanide the opportunity of seeking work in market segments such as ship and yacht performance and cold regions offshore work, areas they would like to develop," explains Dr. Dan Walker, Oceanic's president.

This agreement has also facilitated cooperation between Canadian and French universities and public sector laboratories as well as with industries. As a result of the Oceanic-Océanide agreement, linkages have been formed already between Memorial University and the engineering school Centrale de Marseille.

Océanide, in cooperation with facilities owned by the Departement du Var in the south of France, provides contract research in offshore and coastal hydrodynamics. Oceanic, with the National Research Council and Memorial University, offers complementary services in ship, offshore, and Arctic engineering. As Océanide's chairman, Mr. Bruno Caudrillier, points out, "We have identified many opportunities for cooperation on technical and economic matters. By sharing business development knowledge and cooperating to advance their technical capabilities, we will be better able to provide added services to our clients."

The partnership has been assisted by Doris Engineering, a French company with a long and successful history in Newfoundland and Labrador through its subsidiary, Doris/Conpro. With a knowledge of the capabilities of both Oceanic and Océanide, Doris has facilitated a partnership that will assist both companies in the global marketplace.

To mark this occasion, a reception was held after the press conference and signing of the agreement for which Mr. Caudrillier and Mr. Guy Facon of Océanide, Mr. Alain Caillet of the Conseil General du Var, and Mr. Olivier Nicolas of the Consul général de France traveled to St. John's.

DEVELOPMENT OF A NEW VANCOUVER SEABUS

Vancouver SeaBus in the 90-meter Towing Tank.

continued from cover...

BMT Fleet Technology – Pacific Division accepted owner and operator Coast Mountain Bus Company's challenge to design a new, better SeaBus. Oceanic Consulting Corporation was then engaged by BMT Fleet Technology to collaborate on the development of the new hull form, to undertake Computational Fluid Dynamics (CFD) assessments of candidate hull options, and to conduct a physical test program to validate the CFD results and further investigate select hull variants. From a hydrodynamic perspective, the vessel is constrained in length and overall beam, therefore improvements were sought through optimization of the hull shape by variation of hull volume distribution and the addition of bulbous bows. However, the use of bulbous bows on a double-ended ferry can present issues as the upstream bulb acts in a conventional manner whilst underway, but the bulb at the "stern" can cause increased drag and wave propagation. It should be noted that Coast Mountain required the new vessel to have a wave train that did not contain any more wave energy than the current ferries.

Oceanic conducted the numerical CFD investigations to predict the wave resistance of the current SeaBus ferries, as well as for a number of subsequent hull variations, using a Dawson method panel solver at the University of British Columbia (UBC). The purpose of the work was to validate the code's applicability for this problem, based on experimental data from the original SeaBus hull development, and to quantify wave elevation and wave resistance for a number of candidate hull configurations. The numerical investigations gave significant insights into the effects of parametric hull form variation on both the drag of the hulls as well as the wave generation and resulting wave energy. The results indicated that the new design potentially could realize performance benefits if the demi-hulls were asymmetrical, had increased prismatic coefficients, and were fitted with bulbous bows. Two hull variants and two bulb options were eventually selected for a further detailed assessment in a physical experimental program.

The two hull variants, at a scale of 1:7, were fabricated by Oceanic from structural foam and fiberglass reinforced plastic using numerically controlled (NC) milling and manual processes. Two removable bulbs for each hull variant were similarly fabricated with each bulb set including a bow and stern bulb for each hull.

The physical experiments were conducted in the 90-meter Towing Tank at the Institute for Ocean Technology (IOT) in St. John's, Newfoundland. The Oceanic multi-hull towing dynamometer was employed for the program to measure the model's tow force, sinkage, and trim. In addition, an array of wave probes was placed in the tow tank to measure the wave train during the experiments.

The overall experimental program was very successful from the perspective of both Oceanic and BMT Fleet Technology. For Oceanic, the results demonstrated the direct applicability of the CFD tool in understanding the performance of this type of hull form, with good agreement being reached between the physical and numerical results based on both resistance and wave generation. Most importantly, the design was a success as BMT Fleet Technology was able to demonstrate that the new generation of SeaBus' will be a significant addition to the service and will exceed the owners requirements once constructed.

ASSESSING THE RISK OF FALL AT SEA

In December 2006, the Canadian Coast Guard (CCG) approved the final revision of its Canadian Fall Protection Program. Based on feedback from the CCG's five regions and combined with headquarters' aim to further solidify a truly national program that stresses safety when working at heights, the revised initiative was launched in 2007 and aimed to enhance and complement the CCG's earlier version of the Canadian Fall Protection Program. The revisions specifically outlined the CCG's need to expand its ship-based fall protection program while addressing the unique conditions that prevail in a maritime environment. Under sub-contract from NOTRA, Inc. for the CCG, Oceanic Consulting Corporation developed a Risk Assessment Matrix (RAM) that considered the dynamic conditions found on ships at sea.

The RAM selected three specific ships that were considered to be typical examples of a small, a medium, and a large vessel found in the current CCG fleet. Specifically, the three candidate vessels were the *CCGC W. Jackman*, the *CCGS Cygnus*, and the *CCGC Henry Larsen*. To focus the investigation, tasks and activities relating to eight work areas of concern were considered for the three candidate vessles.

The dynamics of the three vessels in various sea conditions were numerically simulated to develop sufficient motion and acceleration data upon which to assess the risk. In addition, the severity and likelihood of a fall at the various areas was categorized. This combination of inputs was used to develop an overall fall-risk classification that was then separated into three risk zones; acceptable, alarm, and unacceptable. The results for the three select ships were then presented in a series of colour coded tables to allow for easy identification and interpretation by operators.

The risk assessment method that has been developed by Oceanic clearly indicates the variability in risk associated with sea and weather conditions for each vessel. However, other parameters such as warm versus cold and wet weather conditions were seen to have a significant influence on the level of fall risk. The semi-quantitative approach that has been developed to assess the risk of fall is based on the specific loading, environmental, and sea conditions modeled for each vessel and can be modified to suit any particular vessel and sea condition combinations. It is clear that further development and resolution of the fall severity and fall likelihood classification scales, along with an assessment based on a large number of specific vessel locations, may provide further insights into the overall risk of fall at sea for a particular vessel.

Confirmation of Resistance and Seakeeping Characteristics for a New Build from Trinity Yachts

Rendering of the MY New Horizon.

Located on the Gulf Coast of the United States, Trinity Yachts has earned a solid reputation as one of the world's elite builders of custom superyachts. With the ability to construct steel or aluminum vessels up to 123 meters in length, Trinity Yachts places an emphasis on European quality and has worked with world-renowned naval architects and interior designers. One of its current projects involves a quad-deck 74-meter motor yacht that was designed by Trinity Yachts and the United Kingdom firm BMT Nigel Gee Limited, one of the world's leading independent design consultancies. They have developed the hull design used for model testing.

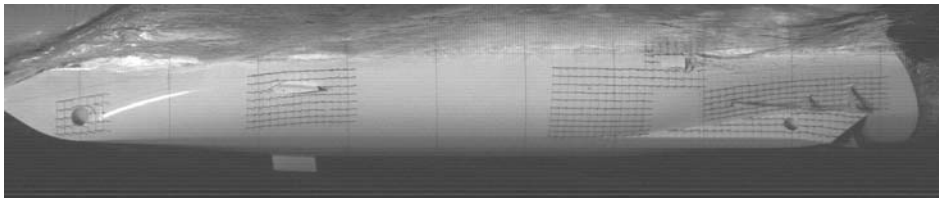
In 2007, Oceanic Consulting Corporation was contracted by Trinity Yachts to undertake a series of model experiments to evaluate the performance of the design for this new luxury motor yacht. This test program included flow visualization testing and calm water resistance evaluations of both the bare hull and the appended hull. Also, added resistance and head seas seakeeping tests were completed. Appendages on the 6.7-meter model included bow and stern thruster tunnels, roll stabilization fins, engine exhaust cowlings, and twin propeller shafts with two shaft brackets per shaft. The model experiments were performed in the 200-meter Towing Tank at the Institute for Ocean Technology during the summer of 2007. Both qualitative and quantitative observations of the yacht were made during testing.

Flow visualization tests were completed at 13 and 15 knots to assess water flow past the thruster tunnels, roll stabilization fins, skeg, exhaust cowlings, and in way of the propeller and rudder locations. This testing was also used to verify the alignment of the roll stabilization fins that would achieve minimum drag at the design speed. The results indicated that flow over the locations of interest was predominantly steady, with no indication of any significant regions of non-uniform flow along the hull.

During the calm water resistance experiments, the hull was examined in both bare and appended conditions. Various load conditions were tested up to a maximum ship speed of 16 knots. The pressure drop at the engine's exhaust cowling was also measured as part of the appended tests and this verified the speed at which the maximum pressure drop would occur. Such testing is a useful tool for designers as verification of critical performance factors ensures proper selection of propulsion machinery.

The last component of the test program involved a series of experiments to assess the yacht's added resistance and seakeeping response in head seas. The vessel was examined at speeds of 10 and 12 knots, in the full load condition, for nominal Beaufort 5 and Beaufort 6 wave conditions. During these tests, the roll stabilization fins were in the extended position. Measured results included added resistance, heave and pitch response, and vertical accelerations at the bow, center of gravity, and the stern.

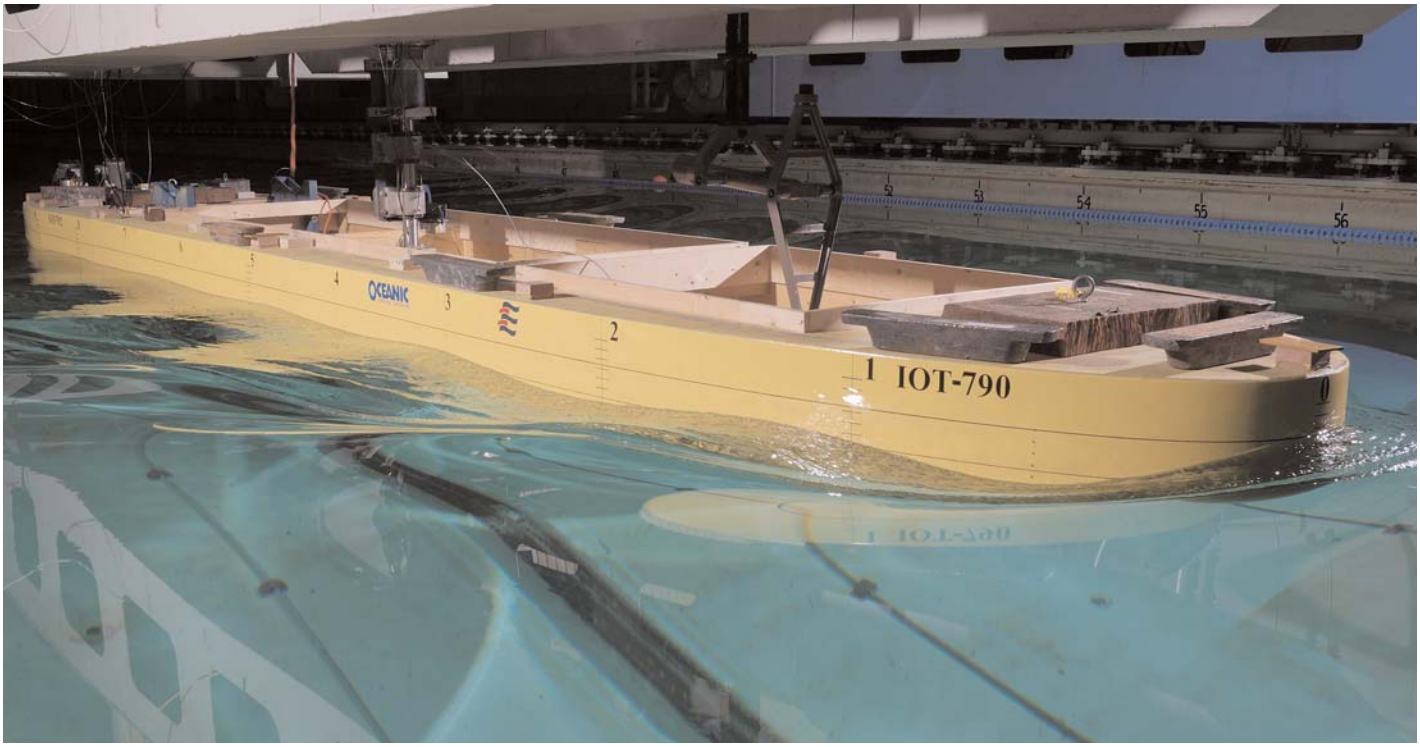
Trinity Yachts subsequently reported that the model experiments verified the excellent resistance and head seas seakeeping performance of the design. The vessel is to be classed as ABS Maltese Cross A1 Commercial Yachting Service, Maltese Cross AMS, MCA, and delivery is planned for 2010. Oceanic is pleased to have worked on another successful project with Trinity Yachts as they continue their tradition of building some of the finest yachts in the world. Oceanic also welcomes its initial involvement with BMT Nigel Gee Limited. We wish success to both firms as vessel construction progresses, and we anticipate a continuation of our working relationship with them on future projects.



Underwater flow visualization test.

Model during calm water resistance test.

Express Marine Inc. Advances ATB Technology



Express Marine ATB undergoing testing in the 90-meter Towing Tank.

Express Marine, Inc. is a family owned and operated company headquartered on the Delaware River in Camden, NJ. Founded over 100 years ago, Express Marine has continuously developed the technologies used in their fleet. Starting a century ago with wooden barges, Express Marine has constantly improved its fleet and is now adding state-of-the-art tugs and barges, as well as retrofitting its existing fleet with new technology. Oceanic Consulting Corporation has recently completed two experimental programs for Express Marine and is pleased to be a part of Express Marine's dedication to developing the best solutions for their shipping applications.

Oceanic conducted an experimental model test program for Express Marine prior to the retrofit of the tug *Baltimore* and the barge *1850* with a JAK (Beacon Finland) pin connection system. The experimental program was designed to determine if proposed modifications to the stern, to be made while the pin-connections were installed, would provide resistance benefits while maintaining the current controllability of the ship. Existing models of the *Baltimore* and the *1850* were used during the model tests, and the experiments were conducted using a large amplitude Planar Motion Mechanism (PMM) in the 90-meter Towing Tank at the Institute for Ocean Technology in St. John's.

Subsequently, Express Marine started the process of building a new Articulated Tug and Barge (ATB) unit for service on the Gulf Coast. Express Marine's naval architect/designer Duncan MacLane, and project manager Ken James, contracted Oceanic to conduct an extensive experimental program to optimize the ATB for this service. The ATB was modeled by Oceanic at a large scale of 1:18, with a combined unit length of over 9 meters (30 ft.) and a displacement of over 5 tonnes.

The twin Z-drive tug for the unit was designed by Guido Perla and Associates of Seattle, WA, and the tug model was outfitted with instrumented Z-drive propulsion units. A focal point of the efficiency of any ATB design is the flow interaction between the tug and the barge, particularly how cleanly the flow transitions from the barge to the tug. With this in mind, Bay Engineering of Sturgeon Bay, WI, designed the barge and provided three stern options for evaluation.

The three initial designs were all tested through a range of loading conditions and speeds. In addition to the quantitative tests of resistance and propulsion performance, flow visualization tests were completed for all candidate designs. The results were ranked, and modifications were made to the best alternative to further improve the ATB powering requirements and carrying capacity. Modifications were guided by an analysis of the flow observed in the proceeding tests, with the object to improve the lines of flow from the barge to the tug. Resistance and propulsion tests were conducted in the towing tank, and controllability experiments were conducted on the large amplitude PMM. As a result of this experimental program, a barge stern configuration was found that is projected to provide a 10% increase in speed (compared to the lowest ranked configuration tested) and will still allow the ATB unit to conform to IMO controllability criteria.

Further experiments were conducted to evaluate the loading on the connection pins in a seaway. Model experiments were conducted in modeled 8 meter significant waves (Sea State 7) in following and stern quartering seas. Maximum pin load and tug angles were measured.

As well, experiments were conducted to assess the ability of the barge to be towed when not operating as an ATB. These experiments were completed in the 22-meter Flume Tank at the Marine Institute in St. John's, NL. The flume tank provides a unique opportunity to investigate long period oscillatory events such as the towed stability of a barge. As the flume is essentially a facility with an infinite length, it was possible to conduct the towed stability tests over the equivalent of several miles. By contrast, in even in the longest of towing tanks, the testing time at speed is limited to a few minutes. The flume tank's underwater viewing gallery also provides an excellent opportunity for flow visualization work.

The tug, to be named *Freedom*, is currently under construction at Patti Shipyards in Pensacola, FL. Construction of the barge is slated to begin soon at the Greenbrier – Gunderson yard in Portland, OR.

PROFILE: DAVID MOLYNEUX, PH.D.

Dr. David Molyneux

Oceanic Consulting Corporation is pleased to introduce Dr. David Molyneux, currently on secondment from the National Research Council of Canada (NRC). Dr. Molyneux has joined Oceanic as a Senior Naval Architect and Hydrodynamics Specialist within the Consulting Department; he will provide technical expertise in the research and development of ships and offshore structures as well as advance the firm's numerical modeling capabilities.

During his career at NRC's Institute for Ocean Technology (IOT), Dr. Molyneux was a scientific authority for research projects related to ship performance in calm water, waves, and ice. His most recent work includes the prediction of forces and flow patterns using Computational Fluid Dynamics (CFD) and Particle Image Velocimetry, as well as the performance evaluation of ice-class tankers and ice-class bulk carriers in the waters off Northern Labrador.

Prior to his work at IOT, Dr. Molyneux was a Project Manager and scientific authority with the Institute for Marine Dynamics (IMD) where he researched hull performance in waves, carried out simulations of fishing vessel voyage economics, and played a crucial role in the Polar 8 model experiments. During his time at IMD, Dr. Molyneux also led the laboratory's Ship Performance Group.

Dr. Molyneux has collaborated extensively with Oceanic over the last 15 years and has been a technical advisor on many of the firm's projects, including the evaluation of an Arctic drill ship, wave piercing hulls, integrated tugs and barges, and shallow-draft icebreakers.

Dr. Molyneux holds a doctorate in Ocean and Naval Architectural Engineering from Memorial University. He also holds a Masters in Applied Science in Mechanical Engineering from the University of British Columbia and a Bachelor of Science in Naval Architecture and Shipbuilding from the University of Newcastle upon Tyne. His work has been disseminated through publication and presentation in various forums, including ICETECH, the Journal of Offshore Mechanics and Arctic Engineering, the World Maritime Technology Conference, and the Transactions of the Society of Naval Architects and Marine Engineers. Dr. Molyneux is also a Fellow of the Royal Institution of Naval Architects and a member of the Society of Naval Architects and Marine Engineers.

OCEANIC CONSULTING/RINA SCHOLARSHIP WINNER ANNOUNCED

Mr. Nathan Higgins is presented with his award by Mr. Michael Doucet and Dr. Dan Walker of Oceanic. Also present are Ms. Catherine Dutton and Mr. Bruce Whitelaw of the Marine Institute.

Oceanic Consulting Corporation recently presented its annual scholarship award to Mr. Nathan Higgins, a Naval Architecture student from Memorial University's Marine Institute. Mr. Higgins was awarded the $800 grant for his "Bell Island Ferry" project which aligned with Newfoundland and Labrador's vessel replacement strategy. For his project, Mr. Higgins studied the province's ferry fleet and designed a vessel that would improve vessel turnaround time, speed, and capacity. His final design, *The Somme*, named for one of the largest battles of the First World War, was a 59.5-meter vessel with a cruising speed of 13 knots by way of four 400 HP azimuthing thrusters and with a capacity for 40 vehicles and 224 passengers.

Organized by The Royal Institution of Naval Architects (RINA) and sponsored by Oceanic Consulting Corporation, this award is made annually to a student who is studying naval architecture or a related subject and is adjudged to have given the best presentation of the final year project. Oceanic's Mr. Lee Hedd, VP Business Development, who judged this year's competition, notes that "clarity of communication, both written and verbal, is key in an engineering environment where the dissemination of complex information is a continuous requirement. It is clear from the work that Nathan has completed as part of his design development that he has also achieved the strong communication skills which are a key requirement for the OCC/RINA award."

Oceanic is proud to jointly sponsor the award as this program provides an excellent synthesis of essential factors in vessel design. The award and a cheque were presented to Mr. Higgins in July by Oceanic's president, Dr. Dan Walker, and Mr. Michael Doucet, and on behalf of the Marine Institute, Ms. Catherine Dutton and Mr. Bruce Whitelaw.

SML - Ship Maneuvering Laboratory:

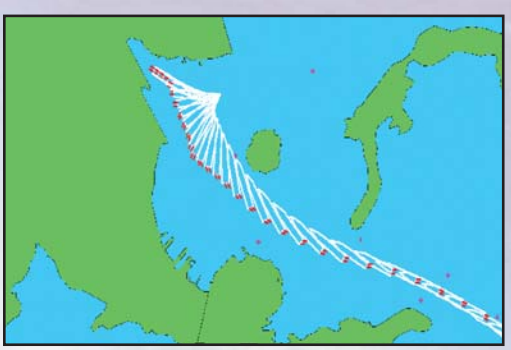
SML (Ship Maneuvering Laboratory) is a PC-based computer code used to simulate the maneuvering of a ship or any floating body. It solves rigid body motion in three (surge, sway, and yaw) or four (including roll) degrees of freedom using a time step solver. The program has three basic modules: SML-Engine, 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.

Maneuvering Assessments	Turning circle, initial turning ability, 10/10 and 20/20 zig-zag maneuver, crash stop, Dieudonne spiral maneuver, and maneuvering in restricted waterways with wind and current.
Machinery Configuration	Conventional shafts with fixed or controlable pitch propellers, standard rudders, high lift rudders, podded propulsion units, bow and stern tunnel thrusters, and drop-down thruster units.
Data Required	Hydrodynamic maneuvering coefficients, resistance data, principal vessel particulars and load conditions, machinery configurations and characteristics, control surface data, windage for hull and superstructure, and topographic and navigational charts for port maneuvering studies.
Data Outputs	Plots of vessel track, engine and helm commands, environmental conditions imposed during the maneuvers, and vessel condition data.

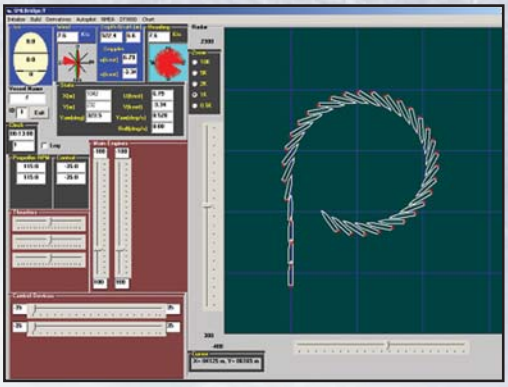
SML-ENGINE - Solves for the motion of the vessel based upon external forces and Newtonian mechanics.

SML-ENVIRONMENT - Controls the vessel's environment, which may include wind speed and direction, current speed and direction, ice characteristics, and seabed bathymetry.

SML-BRIDGE - Provides a graphical user interface (GUI) representing the controls on the bridge and display of the current ship position and its environment.



Track plot of a vessel maneuvering through a channel and then moving astern into a berth.



Screen capture of SML-Bridge showing the configurable user interface.

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 • MOTSIM
• Centre for Marine Simulation • Ice Engineering • VIV Test Apparatus

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

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Meet us at:

SNAME 2008 Annual Meeting & Expo	Arctic Shipping North America	Fort Lauderdale International Boat Show	Marine Log Ferries 2008	The International WorkBoat Show
October 15-17	October 20-22	Oct 30 - Nov 3	November 3-5	December 3-5
Houston, TX	Montreal, Quebec	Fort Lauderdale, FL	Delray Beach, FL	New Orleans, LA