

# RAindrops

Robert Allan Ltd. Information & News Issue 1



Recent Deliveries  
Under Construction  
FEA/CFD Applications



**ROBERT ALLAN LTD.**  
NAVAL ARCHITECTS AND MARINE ENGINEERS

## Message from the President

The legacy of innovation and diversity in design established over the last 80 years has equipped Robert Allan Ltd. well for the immediate challenges of 2011 and beyond. This inaugural issue of **RAindrops** highlights some of the most recent deliveries, the growing number of Robert Allan Ltd. vessels under construction around the world, some of our exciting new projects and interesting applications of the latest structural and hydrodynamics design tools. By knowledgeable application of the latest design tools, we are continuing to innovate and provide the best available technology to our diverse clientele worldwide.

You know we design tugs, but did you also know about our growing fleet of major fireboats around the world? Did you hear that **RALion** is designing major research vessels for the Canadian Coast Guard, and for the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in Australia? **RALion**, our Joint Venture with Alion Science and Technology, has allowed both companies to share expertise and diversify their design portfolios to provide innovative solutions for such specialized vessels.

Emission reduction will demand innovation to achieve practical solutions and regulatory compliance in the next generation of vessels. Robert Allan Ltd. is actively engaged in designs for hybrid propulsion systems, vessels with alternate fuels like natural gas, and strategies to incorporate Tier IV emission treatments.

**RAindrops** will be issued periodically to diversify our communication with our stakeholders. Between issues, please refer to our website, [www.ral.ca](http://www.ral.ca) for the latest news, email [designs@ral.ca](mailto:designs@ral.ca) for additional information, or call me at 604-736-9466.

Ken Harford  
President



## Message from the Executive Chairman

Last year was a very significant year for Robert Allan Ltd., marking as it did our 80th continuous year in the business of designing high-performance, cost-effective workboats for the world. From fairly humble beginnings, and many years as a simple home office business, this company has grown through three generations of family ownership to its present status as a well-recognized and, we trust, a well-regarded name in ship design around the world. As most readers will know, we have also set a new course for the future with the recent change to employee ownership at Robert Allan Ltd., a process which is proceeding extremely smoothly. The nature of our project work continues to evolve as well, with a very diverse range of designs currently on our books for the coming year, including two major oceanographic and fisheries research vessels. Accordingly, it is appropriate that in this New Year, beginning our 9th decade in business, we start a periodic newsletter with the fittingly west coast title of **RAindrops** (Robert Allan Ltd. Information and News!) to keep our Clients and business associates abreast of the wide range of design and consulting work with which Robert Allan Ltd. is involved, and the full extent of services that we are pleased to offer.

Personally, this is a very exciting time in the Company history for me; in my new role I can relax a bit more and take the odd weekend off for some personal activities, confident that the future of the Robert Allan Ltd. heritage is firmly in the good hands of a team of dedicated professionals who are quickly learning to also be business Owners!

We hope you enjoy this glimpse inside our company, and welcome your comments and questions.

Rob Allan  
Executive Chairman



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## Recent Deliveries

In November 2010, the **RAnger 4200** Class fireboat **Firefighter II** was delivered to the Fire Department, City of New York (FDNY). This advanced fireboat, 42.7 metres long, has a total pumping capacity in excess of 11,500 Tonnes/hr @ 10 bar, placing it amongst the most powerful and capable dedicated fireboats afloat. This ship and her twin **Three Forty Three** (above) were constructed at Eastern Shipbuilding of Panama City, Florida. Both vessels are highly sophisticated fire-fighting and emergency response vessels that incorporate the very latest in fire-fighting systems technology, search and rescue systems, and also include a full CBRN hazardous environment protection capability. The design of these exciting major fireboats was the subject of a technical paper presented by Ken Harford at the recent 2010 SNAME (Society of Naval Architects and Marine Engineers) Annual Meeting (Paper available on request.)

In October 2010 the **RAmpage 5000Z-M** Class offshore support tug **SMIT Siyanda** joined her sister **SMIT Angola** (seen on the cover) to work off the coast of South Africa. Both vessels were built by Keppel Nantong Shipyard Co. Ltd. Designed for anchor handling, offshore supply, fire-fighting, ship handling and ocean towing duties, the **SMIT Siyanda** is further outfitted with a 4 point mooring system and comprehensive dive spread including decompression chamber for extended underwater dive support missions, particularly oil terminal buoy and pipeline inspections.

Presently undergoing trials and nearing delivery are two new classes of Pollution Response Vessels (PRV) for the Canadian Coast Guard. Both designs are road transportable and are configured with hinged bow door/ramps. The **PRVII** (bottom left) Class is a 9.4m vessel with a deck loading capacity of 1,360 kg. The larger **PRVIII** (bottom center) Class are 14.32m long with a 2720 kg load capacity. The **PRVIII** recently achieved 25 knots during testing and the **PRVII** is expected to achieve at least 30 knots.

Several major tug deliveries have also occurred in recent months: The **RAstar 3600 Svitzer Pembroke** (above; BP of 105 tonnes) is now in operation at Milford Haven, UK, joining the five **RAstar 3400** and one **RAstar 3900** Class tugs currently in service there. The **Calovebora**, **Changuinola I** (bottom right) and **Sixaola**; three of a total order of thirteen new **Z-Tech 6500** Class tugs built by Cheoy Lee Shipyards for the Panama Canal Authority have now successfully completed the 9,700 mile journey across the Pacific Ocean. Tugs 4 and 5 are currently in transit from Hong Kong to Balboa. The **RAstar 2800** Class escort tug **Seaspan Raven** (right) arrived in Vancouver Harbour in early January after a delivery voyage of approximately 10,000 miles from the Sanmar shipyard in Turkey. Five Uzmar-built **RAMparts 3000** Class tugs are on the 14,400 mile delivery voyage from Izmir, Turkey to Gladstone, Australia for SMIT. Finally, the **Seminole**, fourth in a series of **Z-Tech 4500** Class ship-handling tugs built by J.M. Martinac Shipbuilding Corp. of Tacoma, Washington for the US Navy was delivered in early February 2011.





## Showcasing the *BRAtt*

In December, the ultra-compact, fully operational training tug *BRAtt* (below) sailed on an international voyage to Seattle to be on hand for both the SNAME Annual Meeting and the Pacific Marine Expo trade show. The *BRAtt* then spent several weeks in the Puget Sound area being demonstrated to a wide range of prospective users, including the US Navy. The *BRAtt* has generated considerable interest worldwide for the obvious training applications, but also as a versatile small tug/workboat for harbour applications such as yacht and small craft handling, boom deployment, hose handling, spill response etc.

## *Z-Tech* goes Diamond!

In January 2011, a major milestone in the life of the highly successful *Z-Tech* series was achieved with the order of the 60th of these very innovative ship-handling tugs. In this month alone we received design commissions, or construction contracts were awarded for two 24 metre *Z-Tech 5000*'s, one 27 metre *Z-Tech 6500* and two more 27 metre *Z-Tech 4500* Class tugs, the latter being the 5th and 6th in a series for the US Navy. The *Z-Tech* concept was introduced to the world only in 2004, and since then has become widely accepted for its versatility and ability in ship-handling operations. These tugs are found primarily in the Port of Singapore, the Panama Canal, the Middle East, Australia, and the US Gulf Coast.

## Teaming Agreements

*RALion* is a Joint Venture collaboration between Robert Allan Ltd., Alion Science and Technology Corporation of McLean, Virginia, and Alion Science and Technology (Canada) Corporation, of Kanata, Ontario. Robert Allan Ltd. and the Alion companies agreed in 2009 to develop a relationship that highlighted the strengths of each company and by capitalizing on the synergy of their collective talents would enable the team to support major maritime projects throughout the global market.

Alion Science and Technology is an employee-owned technology solutions company deliver-

ing scientific, research and development and technical expertise as well as operational support to customers around the globe, including the U.S. Department of Defense, other U.S. federal agencies, governments worldwide and commercial customers. Alion's wholly-owned subsidiary, Alion Canada, supports Canada's ship programs, from its offices located in Kanata, Ontario.

## Under Construction

Robert Allan Ltd. presently has four fireboats at various stages of construction around the world, with another major fireboat contract announcement due in the very near future. Currently building are:

- A *RAnger 2400* fireboat for the Massachusetts Port Authority (Massport) in Boston, building at A.F. Theriault & Son Ltd. in Nova Scotia [24.1 m. long, 1,360 m<sup>3</sup>/h pump output]
- A *RAnger 2700* Class fireboat for the Chicago Fire Department, nearing completion at Hike Metal Products Ltd. in Wheatley Ontario. This very unique boat, at 27.4 m length, and with a 3,400 m<sup>3</sup>/hr Fi-Fi capacity was constrained in every conceivable dimension by the confines of the Chicago waterways. It will surely win our lifetime "Ugly Duckling" award!
- A *RAnger 4600* Class fireboat for Dongguan, China building at Wang Tak Engineering and Shipbuilding Co. Ltd. of Hong Kong. [46.42m long, 10,800 m<sup>3</sup>/hr total pump output]
- A *RAnger 3900* Class major fire-fighting tug for the Kuwait Fire Services Directorate, building at Simulation Tech. Inc. (STI), in Seoul, South Korea [39.1 m long, 8,400 m<sup>3</sup>/hr total pump output]

In the last few months of 2010 there was a continuation of orders for the versatile *RAmpage* Class offshore tug designs. Two of these high-performance offshore support tugs are currently under construction:

- *RAmpage 5500* - 55metres length, with 100 tonnes BP, at Keppel Singmarine



- *RAmpage 4500* - 45metres length, with 67 tonnes BP, at GMG shipyard in China

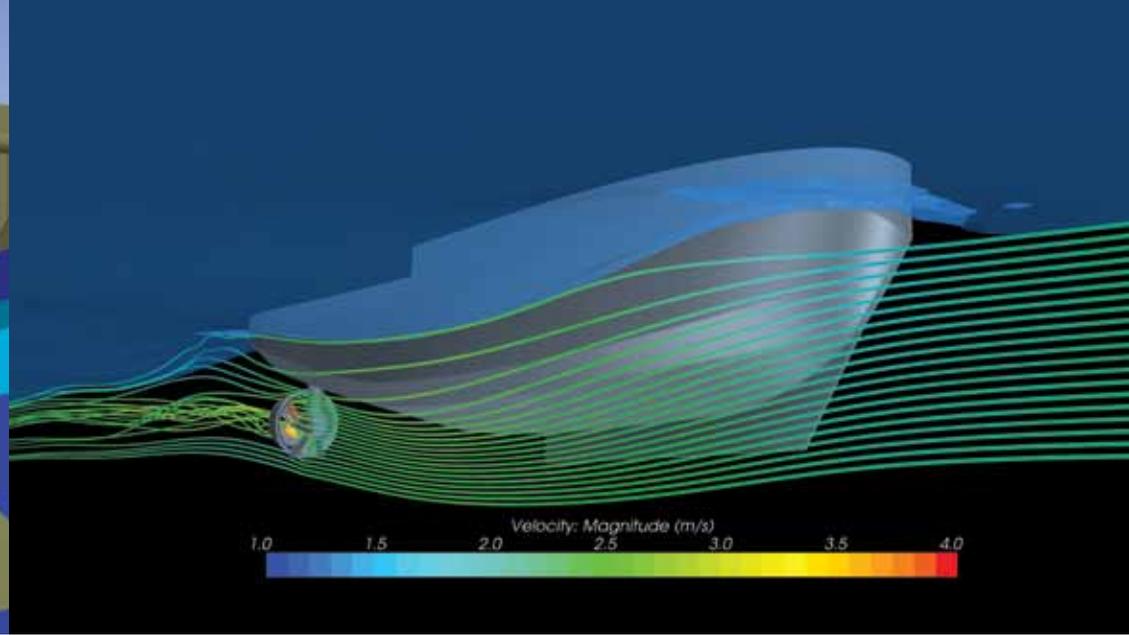
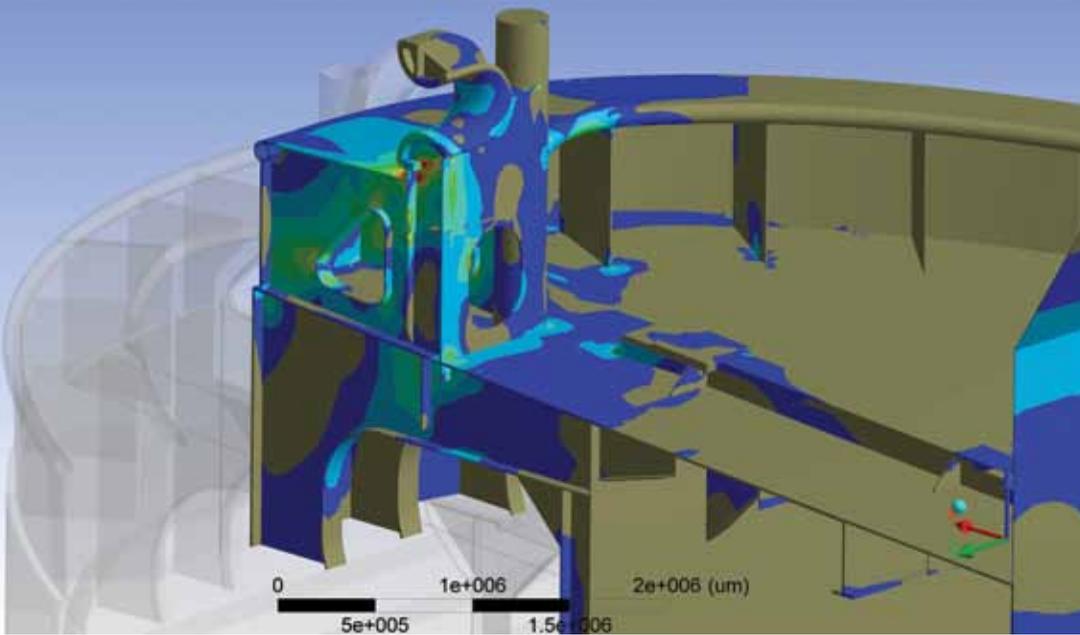
Presently under construction at Meridien Maritime Inc. in Quebec are three new *Inshore Science Vessels (ISVs)* for the Canadian Coast Guard. The two 22m class and one 25m class *ISV*'s (rendering shown above) reflect a current and significant shift in the demand for our design services. These vessels will perform valuable fisheries research duties in the east coast waters of Canada. For some of the Robert Allan Ltd. design team participating in this project was a return to their own family roots in the fishing industry.

In the still very active tugboat department, currently there are 33 *RAmparts*, 23 *RAstars*, 11 *Z-Techs*, 4 *AZT* and 2 *AVT* Class designs (73 tugs in total!) being constructed worldwide... a delivery every 5 days on average!

## Major Contract Awards

Following the Canadian Government's recent announcement of plans to reinvigorate the Canadian Shipbuilding Industry, Robert Allan Ltd. has successfully secured a number of significant design contracts, highlighting the diversity of our design services that have been recently overshadowed by the very active demand for our services in the international tug market. The new projects include the aforementioned *Inshore Science Vessels* and *PRV*'s, but the major award, in a joint venture with Alion Science and Technology Corporation (see *RALion* alliance article) is for the design for three 65m Offshore Fisheries Science Vessels (OFSV) for the Canadian Coast Guard. Further information on this unique vessel design will follow in future *RAindrops*.





## Workboat Applications for Finite Element Analysis

By Norbert Schumacher, EIT

Finite Element Analysis (FEA) has been a powerful tool in the Naval Architect's arsenal for many years, but it has generally been the preserve of those working with very high-speed craft, multi-hulls or more complex large ships. The rugged and relatively structurally-simple tug hardly seemed like a candidate for such a powerful analytical tool. However in the world of high-performance tugs, especially for escort service, the strength of major towing fittings and other highly loaded parts of the boat need a level of analysis well beyond the standard Class scantling calculations or even simple direct "manual" calculations. Indeed, it is apparent that Class is now demanding that highly loaded structures be analyzed using FEA methods and that this be submitted for approval. This is not a trivial exercise and has a significant impact on both the design schedule and budget. Robert Allan Ltd. has therefore been using FEA extensively for several years to design the most efficient load-rated structures possible for our many tug designs. Failure to take this professional approach can result in failures such as seen in the following photo. Certainly not one of our designs!



*For want of good design the staple was lost... for want of the staple the tug was lost...for want of the tug the ship was lost!*

FEA is being used to develop a series of standardized fittings for towing applications, including staples, tow-bitts, mooring bitts and gob-eyes which can be Class-approved as standard fittings and thereby bring efficiencies to the design process and expedite the Class approvals. For example, the screenshot (top left) from ANSYS (FEA software) shows stress distribution for a recent multiple bow staple design. Representative ship's structure in the adjacent deck and bulwarks has been modeled to provide more accurate boundary constraints as well as evaluate the impact on the ship's structure. Standardization and Class pre-approval of these structures greatly expedites the design process.

## Computational Fluid Dynamics (CFD)

By Bart Stockdill, P.Eng.

Ten years ago CFD was an expensive and specialized engineering tool used mostly by the aerospace industry with its large engineering budgets. Rapid advances in computer power, dropping hardware costs and new commercially oriented software now make CFD a viable and effective design tool for naval architects working in the commercial industry.

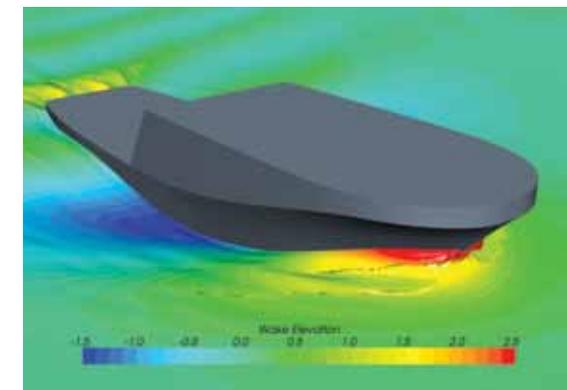
Indeed, design optimization of hull shape and thruster configuration can be carried out at much lower cost than traditional model testing. Powerful 3-D visualizations allow examination of every aspect of the flow field and identification of problem areas such as thruster and appendage misalignment, transom immersion and wake wash generation. This gives designers a detailed insight into the flow field and allows them to quickly create and test alternate configurations. The resulting improvements in performance ultimately lead to reduced fuel consumption which is under ever increasing scrutiny.

One of several ongoing CFD research projects at Robert Allan Ltd. is the investigation of various z-drive inclination angles on the **RAMparts 3200W** Class tugs. By inclining the z-drives, the nozzle can be better aligned with the flow field around

the hull. This improves nozzle performance and reduces drag, particularly at speeds above 10 knots. For example, a 5% increase in thrust was recently obtained by inclination angle optimization.

An extensive CFD program was used to develop the new **RASalvor** Class salvage tug hull design following a shortened model test program. More than 10 variations in hull shape, several thruster inclination angles and inboard versus outboard propellers were simulated. A 10% reduction in total engine power was achieved without affecting vessel speed and bollard pull. This project was also an excellent opportunity to benchmark CFD accuracy. Several simulations were run with conditions matching the model tests. The results are very good; the hull resistance predicted by CFD is within 2% of the model test values.

CFD has quickly become a very popular design tool; our CFD computers are running 24 hours a day, 7 days a week to keep up with the demand.



# Want Gas?

By Fuzz Alexander, P.Eng.

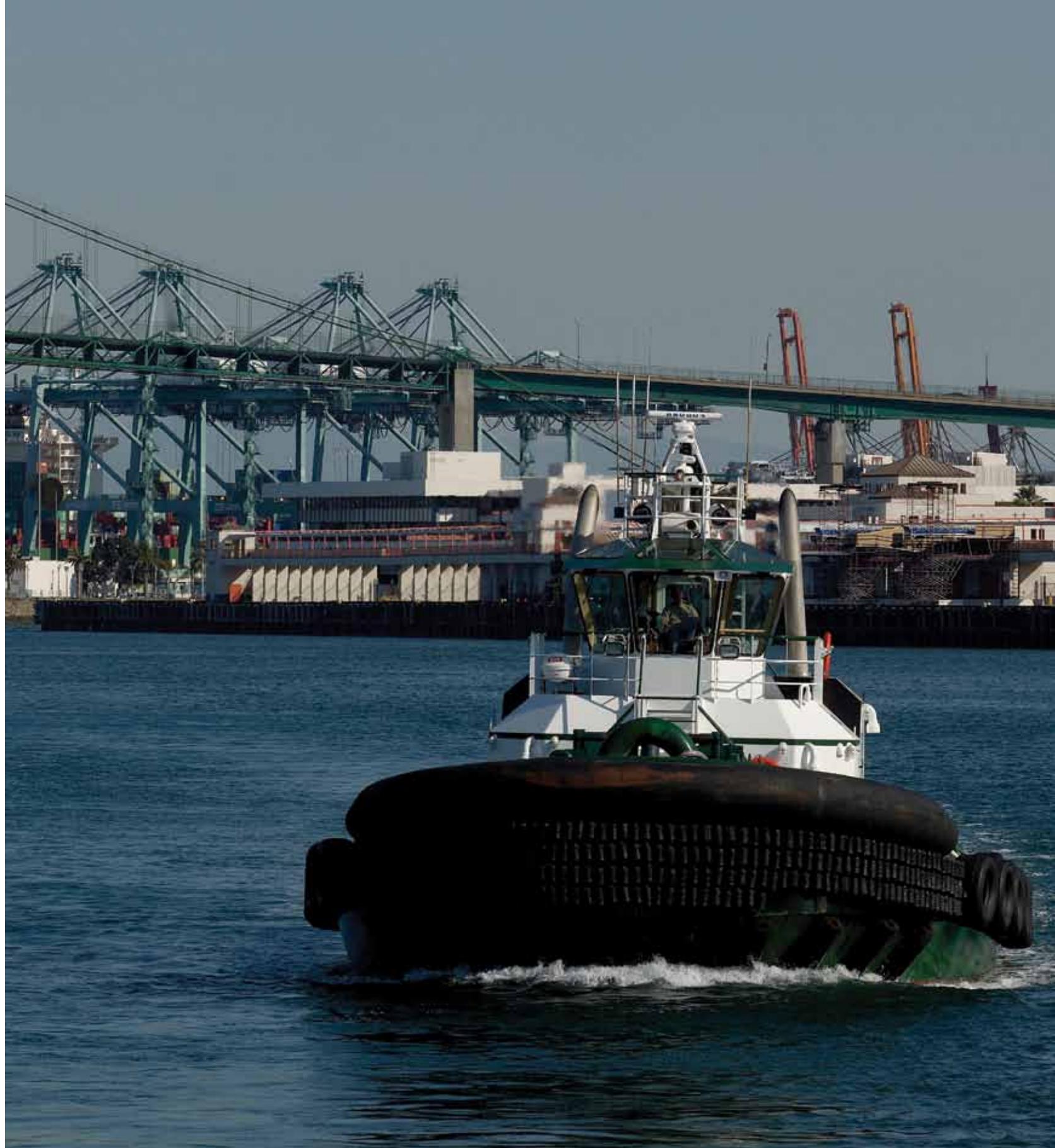
Natural gas is both environmentally attractive and despite the increased capital cost the current low price for natural gas may result in life-cycle cost savings for high-use applications. Fuel use can be either gas only or dual fuel and may consider either Compressed Natural Gas (CNG) or Liquefied Natural Gas (LNG). According to Dr. Hermann J. Klein, Member of the Executive Board Germanischer Lloyd, "With new emission control regulations taking effect, gas as a ship fuel, once banned, is now re-emerging as an environmentally and economically attractive option". We have been involved with a number of studies and USCG/ABS sponsored workshops exploring the use of gas fuels and are ready to assist on any gas fuel requirements.

## Hybrid Alternatives

The world's first hybrid tug *Carolyn Dorothy* (opposite page) has been in operation for several years now and a recent report released by California Air Resource Board (CARB) indicates that the tug has demonstrated significant emissions reductions. A copy of the report is available at <http://www.marinelog.com/PDF/hybridreport1010.pdf>. The Owners, Foss Maritime, are planning on retrofitting another of their Robert Allan Ltd. designed *Dolphin* Class tugs with the same technology.

The feasibility of Hybrid-powered systems is dependent on a specific operating profile. Robert Allan Ltd. has developed a powering system evaluation tool called *RAptures* that can be customized to suit a variety of application configurations and provide comparisons of runtimes, fuel use, emissions, maintenance, and the net present cost of capital and operating costs for power related equipment.

Details of the *RAptures* analytical approach were originally described in detail in a presentation to Tugology 2009. A copy of the paper describing this tool is available on request. Please contact [design@ral.ca](mailto:design@ral.ca).





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