

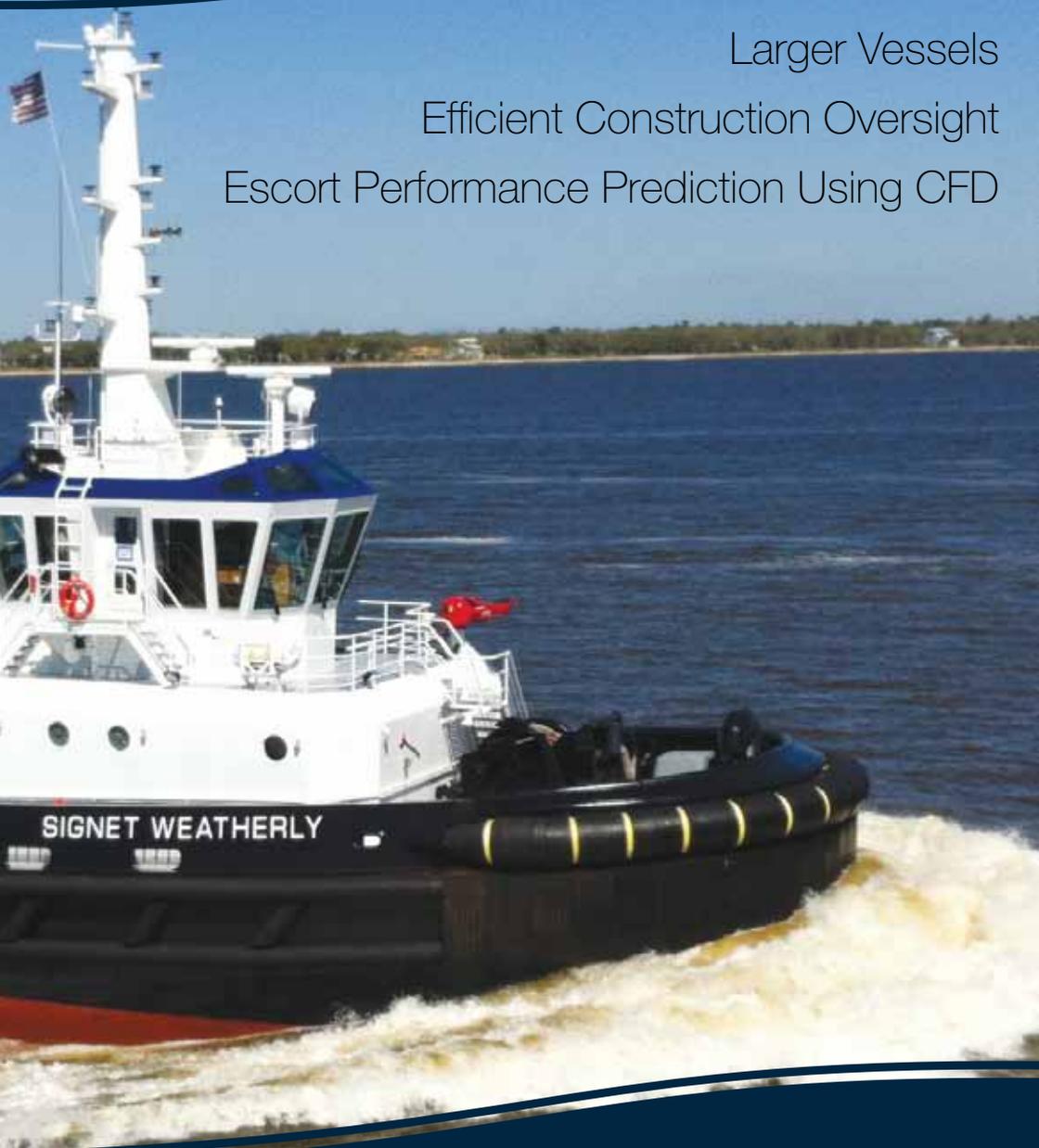
RAindrops

Robert Allan Ltd. Information & News Issue 5

Larger Vessels

Efficient Construction Oversight

Escort Performance Prediction Using CFD



ROBERT ALLAN LTD.
NAVAL ARCHITECTS AND MARINE ENGINEERS

"I welcome the challenge of other opportunities in Colombia and in Latin America"



Opportunities in Colombia

by Darren J. Hass, P.Eng.
Naval Architect / Engineer

With Colombia as an emerging market, the need to communicate with our current and prospective Spanish speaking clients is extremely important. The improvement in security in Colombia provides opportunity but it is a challenging market especially with barriers in language and differences in business protocol. This is one of the reasons I recently spent four weeks learning (...or trying to learn) Spanish in Cartagena. Cartagena is a vibrant colonial walled city on the Caribbean coast of Colombia, and is a fantastic place to visit.

During the last year Robert Allan Ltd. has had the opportunity to work with several Colombian clients including Cotecmar and Sociedad Portuaria Regional Cartagena (SPRC) along with the multitude of other Spanish speaking yards around the world. In March 2011, we also participated in ColombiaMar, the 2nd International Ship Design and Naval Engineering Congress in Cartagena. Robert Allan Ltd. is fortunate to be a company of many cultures and skills, and building on this diversity will open up new opportunities.

RAindrops Issue 5
May, 2012

On the cover: Named after the 1962 America's Cup winning yacht, the **Signet Weatherly** has the legacy of a true ocean thoroughbred.

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Not only did I have the opportunity to practice a little of what I learnt during my studies but also visit the **RAmparts 3700** Terminal / Support Tug currently under construction at Cotecmar to be delivered early in the summer. Although my Spanish still needs much improvement, I welcome the challenge of other opportunities in Colombia and in Latin America.



"Our primary objective is to continue to provide our valued clients with first class design and engineering expertise"

Taking Care of Clients at Home

by James A. McCarthy, P.Eng.
Senior Naval Architect

There has been some discussion in previous issues about the large presence Robert Allan Ltd. has in the international market and the many international designs that Robert Allan Ltd. has done over the last few years; however we still have many clients in BC, the rest of Canada and North America that keep us busy and provide us with interesting and challenging projects.

In past years we had plenty of involvement with the vessels that ply the BC waters. This includes many coastal and harbour tugs, different types of barges (from deck barges to bulk self-unloaders to newsprint and log barges), and to many other types of specialized working vessels that serve our coasts and inland waters. Some examples of the latter include the RCMP patrol catamaran fleet, the Vancouver fireboats, various crewboats and small coastal and inland ferries.

While there has been a fairly lengthy period of drought in the local market, things are again picking up and Robert Allan Ltd. continues to work with our many local clients. Some of the more interesting recent designs include five new Escort tugs for Seaspan for operations in and around the Port of Vancouver. These include the powerful **AZ 30/80** Class tug **Seaspan Resolution** and the four **RAstar 2800** Class tugs, **Seaspan Eagle**, **Raven**, **Osprey** and **Kestrel**. But it is not just all about tugs and barges. We also do work for BC Ferries - the largest passenger ferry line in North America and the second largest in the world. Another major local Client is Teekay, one of the world's largest marine energy transportation companies and

a large player in the offshore oil and gas market. We provide consulting engineering for its fleet of tankers as well as engineering support for offshore oil production companies. Recently we have provided Engineering services and support to Teekay for several large offshore projects involving FSO's, some with capacities in excess of 2 million barrels of oil.

Robert Allan Ltd. has extensive experience in the Canadian Arctic including the design of many of the NTCL vessels working on the Mackenzie River System and the Beaufort Sea. Robert Allan Ltd. has supported NTCL for more than 50 years providing design services, support for vessel upgrades, modifications and other operations such as cargo transport feasibility studies. Robert Allan Ltd. also provided the design for the a deck cargo barge with a capacity of 15,000 DWT in containers and/or deck cargo. Other Arctic and Canadian projects include the ongoing design of 34m ice Class Tugs for an East Coast Canadian client and also a recent contract with the CCG for the redesign of the shore based Search and Rescue lifeboats for the East Coast of Canada.

The above mentioned projects (most of which I was very fortunate to be involved with) represent only a small portion of the many projects that Robert Allan Ltd. has ongoing in the local markets extending from BC across Canada and the USA; there's not enough space to cover them all here. Regardless of the project large or small, Robert Allan Ltd. values all these projects and more importantly values both its long term and new clients (local and abroad). As we continue to grow and encounter new challenges in the marine and offshore fields, Robert Allan Ltd.'s primary objective is to continue to provide our valued clients with the first class design and engineering expertise they have become accustomed to receiving.

“Problems were identified and solutions determined before anything was ever constructed”



Riverwijs Rowan, fresh from the shipyard

Efficient Construction Oversight

by Todd L. Barber, P.Eng.
Senior Naval Architect

In early 2011, Robert Allan Ltd., designed a 30 metre, 60 tonne bollard pull Voith tractor harbour tug for a large Colombian coal mining company. The construction contract for the vessels, designated as the **AVT 30-60** Class, was awarded to Uzmar Shipyard in Izmit, Turkey.

The Owners were also seeking assistance managing and overseeing the construction of the vessels. Given the quality tug production that Uzmar is well known for, and given Robert Allan Ltd.'s excellent working relationship with Uzmar, it was decided that full time Owner's representation in the shipyard was not necessary for the project. The Owner thus contracted Robert Allan Ltd. for a less time demanding oversight of the construction which included "paper tasks" being conducted at Robert Allan Ltd.'s office coupled with regular site visits to the yard to inspect production at key stages of the build process. Purchase order review, drawing review and approvals, change order processing, regular conference calls, as well as other



AVT 30-60 Class Tug

administrative tasks are all being conducted by Robert Allan Ltd. staff working remotely. A representative from Robert Allan Ltd. flies to Turkey every couple of months to inspect the vessels and discuss progress with shipyard personnel. The Owner also sends their own personnel for certain key inspections.

Of particular benefit to the project for both the Owner and the shipyard was Uzmar's willingness to provide their 3D model of the hull to Robert Allan Ltd. Uzmar's process is to "construct" the entire tug in minute detail on the computer before production begins (See below image of the engine room deckhead taken from Uzmar's model). 3D modeling is completed for all structure, every pipe down to 1" diameter, every railing, even outfitting is detailed down to the level of the coffee maker! This detailed virtual tug was provided to Robert Allan Ltd. so that compliance with design drawings, structural details, pipe routing, manhole and hatch arrangement, ladder positions, fender details, and outfitting arrangement could be easily reviewed in 3D. Problems were identified and solutions determined before anything was ever constructed. This process has helped minimize costly changes and rework occurring during construction and thus minimize schedule and budget impacts. Good for both the Owner and the Shipyard!

So far the process is working very well and the first of the **AVT 30-60**'s is scheduled for delivery in September 2012.

Recent Deliveries

The following is a brief description of some of the most recent international deliveries from the design team at Robert Allan Ltd.:

In December, 2011, the tug **AOS Power** was delivered to her owners Atlantic Maritime Group, Sharjah, UAE Built by GMG Shipbuilding & Heavy Industry Co. Ltd., China, **AOS Power** is the first of the new **RAmpage 4500** class design. This vessel is fully equipped for anchor handling, ship-assist, long distance towing operations, fire-fighting, deck cargo transfers, personnel transfer and other offshore support duties.

Menominee – The 6th of 6 **Z-Tech 4500** Class tugs delivered by JM Martinac Shipyard, of Tacoma, USA, to the US Navy and currently stationed in Yuko, Japan. Sister ship **Seminole** shown below.

RiverWijs has recently taken delivery of two sister vessels, the **Riverwijs Emma** and **Riverwijs Rowan** (shown above). The christening was performed by the vessel's sponsors and namesakes; Ms. Emma Lok and Mrs. Rowan Campbell. The vessels were constructed at ASL Shipyard, Singapore for operation at the LNG terminal in Dampier, Australia.

They represent the 49th and 50th vessels delivered to the Svitzer group of companies by ASL. Based on the now venerable **RAmparts 3200** design, these tugs are unique in their shallow draft requirement of 5 meters, specifically for mooring in the tug pen during cyclone season.

The **Signet Constellation** and **Signet Stars & Stripes** are the latest development in Robert Allan Ltd.'s **RAstar** series of tugs. These two powerful new escort tugs have been delivered to Signet Maritime Corporation of Houston, Texas. They will provide marine support services to Angola LNG Supply Services (ALSS) in the Port of Pascagoula, Mississippi. Designated as **RAstar 3100s** they were constructed by Trinity Yachts LLC, at their Gulfport, MS shipyard. The names of these vessels pay tribute to past America's Cup winners, the 12 meter yachts **Constellation** (winner in 1964) and **Stars & Stripes** (winner in 1987).

The vessels is built in accordance with Lloyd's Register of Shipping requirements for the notation: LR 100 A1, TUG, LMC, UMS, IWS, Fi-Fi 1 with waterspray, Unrestricted Voyages

Tonosi – the 13th and final **Z-Tech 6500** delivered to the Panama Canal Authority by Cheoy Lee Shipyards. All 13 tugs were delivered in a 16 month time span – a very impressive feat!

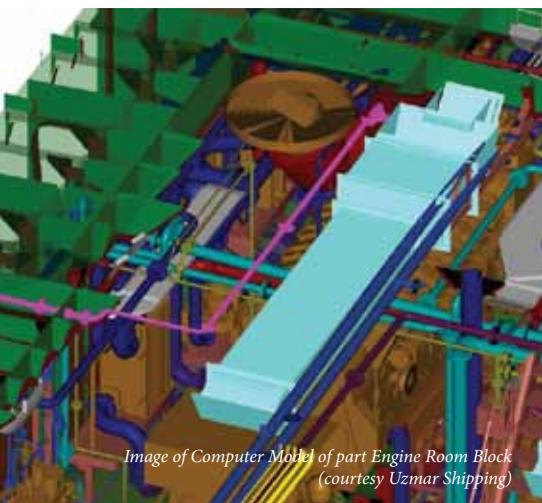


Image of Computer Model of part Engine Room Block (courtesy Uzmar Shipping)



Seminole on task with the US Navy

Signet Weatherly (on the cover) is the latest **RAmparts 3200** Class ASD tug. Recently delivered to her proud owner, Signet Maritime Corporation, the tug will be based in Corpus Christi, Texas. Named after the 1962 America's Cup winning 12 metre yacht **Weatherly**, the new vessel will enhance Signet's Gulf Coast operations, providing ship-assist and long range towing capability.

Tai O – The third of 4 **RAmparts 3000** class tugs for Hong Kong Salvage and Towage, built by Cheoy Lee Shipyards, Hong Kong.

Ras Emshaireb – the 4th of 4 **RAstar 3600** Terminal Support/Escort tugs delivered by Astilleros Balenciaga of Spain to IRSHAD in the UAE.

Seaspan Kestrel – The 4th of 4 **RAstar 2800** terminal/Escort tugs built by Sanmar, Turkey and delivered to Seaspan Marine Corp. in Vancouver, Canada. The Kestrel (shown below) joins her sisters; **Seaspan Raven**, **Seaspan Eagle** and **Seaspan Osprey** in bolstering the Port of Vancouver's advanced fleet of ASD tugs designed by Robert Allan Ltd. All of the tugs made the entire 10,000 n.m. journey comfortably under their own power– a tribute to all those involved in their design, construction and delivery.

Robert Allan Ltd. is very proud of all of these new deliveries and we congratulate all of our clients, owners and shipyards for this accomplishment as we look forward to what will be hopefully an equally prosperous balance of 2012!



Robert Allan Ltd. tugs to the rescue!

Vale Beijing

The **Vale Beijing** (above) is one of the world's largest bulk carriers with a deadweight of almost 400,000 DWT. When the vessel developed cracks in its ballast tanks during loading, and posed a risk of sinking, the port of Sao Luis (Which ships approximately 10% of the world's iron ore production) knew the ship had to be moved or operations could be in jeopardy. In order to move the behemoth, the Robert Allan Ltd. tugs in the SMIT Brazil fleet were put into action, safely moving the ship to a place where temporary repairs could be carried out. Serious tugs for a serious job!

MSC Fabiola

The **MSC Fabiola** (opposite page) is the largest container ship (12,600 TEU) ever to dock in North America! When she visited the West coast ports of Long Beach and Oakland, California in March of this year, Robert Allan Ltd. tugs were helped get her safely in and out of the berths. Tough jobs need tough tugs!

Beyond the "Toy Tugs"

by Dave Christopher, IEng IMarEng, MIMarEST, MNI
Senior Marine Engineer / Chief Engineer

Robert Allan Ltd. is world renowned for the design and development of innovative tugs. They can be seen on all continents berthing and un-berthing containers ships and bulk carriers, escorting tankers and LNG carriers, towing barges and assisting at many "on water" construction sites. Although small, they perform a vital function in the many harbours. Just recently I commented to a fellow engineer, that the design of a new Offshore Support Vessel (OSV) was not quite as breathtaking as he thought it was; His response was to suggest I *stay with the toy tugs*.

Prior to joining Robert Allan Ltd. I spent a considerable number of years working in the offshore oil patch. I started as a 2nd Engineer in the early 80's, but for the most part sailed as a Chief Engineer right up until a few years ago. Over that time I saw many changes in the design and use of offshore support vessels; in a multitude of applications... although I am at heart an anchor handler.

In a day when deep water was 250m, a boat with more than 5,000 bhp was huge, and the typical bollard pull was less than 50 tonnes, the average AHTS was a simple boat and the level of complexity in its design was nothing compared to what it is today. Now 250 tonne BP and 2500m water depths are not uncommon. The capability to lift and deploy heavy anchors of increased

holding power has changed the way in which anchors are worked. Buoys and pennants attached to their anchors were replaced with chains, swivels and remotely operated "typhoon" connections. Probably the most radical change was the use of the chaser system, which negated the use of buoys. To effectively lay a system requires increased skill and a certain amount of finesse. This was something that one could only acquire with practise, and as the systems changed faster than the design of the vessels; it became necessary to learn how to adapt "on the run". These skills have now been realised in the development of tools to enable the deployment of bigger and heavier systems; however without that practical knowledge the most appropriate design would never have come about.

The "old" methods for delivery of cargo to an offshore drilling unit are now considered unacceptable; the boat would drop an anchor and back up to the rig. Mooring lines were lowered down by the rig's crane and made fast to the boats mooring bitts. Hoses went up, and fuel and water, and occasionally dry bulk (cement, and drilling compounds) were pumped up to the rig. Deck cargo was by pallets of sacks all wrapped up in *cling film*.

Tying up to a rig is now a thing of the past. Dynamic Positioning, in its various levels (DPI, II, III) allows boats to maintain a position within reach of the crane, and to adjust their position for heavy lifts and weather. Tanks and the equipment installed within them allow the carriage of drilling fluids, fuel, water, and drilling mud additives that



Seaspan Kestrel is the 4th RAstar 2800 for Seaspan



Foss America and AmNav Revolution

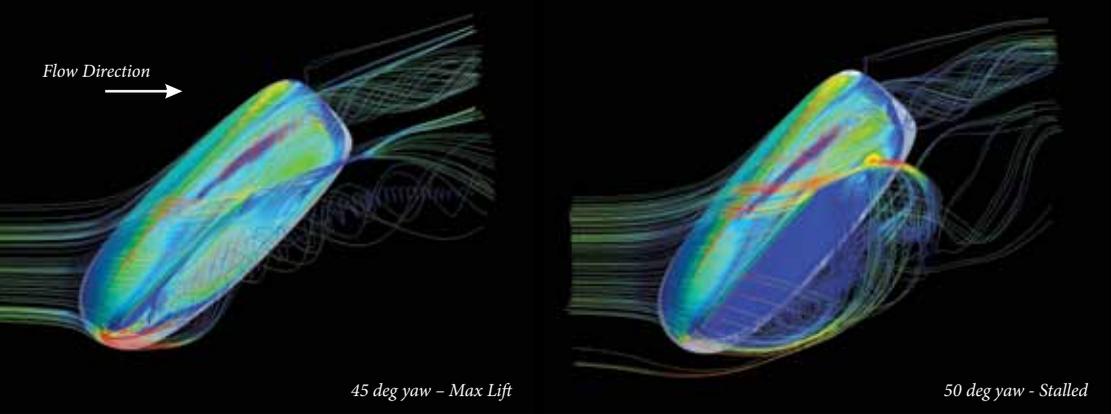


Figure 1: View Up of Flow around an Escort Tug Hull at Various Yaw Angles

require no hands-on intervention. Deck cargo is placed in baskets or containers, and hook up procedures require minimal participation of the deck crew. Even hooking up a hose can now be done by machine. Pumps and valves are all controlled by a “mouse”, and the days of lugging shackles down the deck have been replaced by manipulator arms on top of the bulwarks, controlled from the Bridge.

When the carriage of liquid mud first came about, vessels were not designed with specific tanks, and the product was an unknown entity to the crew on the boat. Putting mud into regular tanks created huge problems when it separated out. It was not uncommon to spend days digging out the solids with shovels. Now the tanks have evolved into exo-skeleton construction, with mixers (agitators) to keep the product in suspension. Water-based mud has been replaced with oil-based, and in some cases have very nasty liquid fractions.

How best to handle these products was a huge learning curve for those onboard, and the impact on the industry led to many changes both for personal safety and the environment. Tank cleaning machines and detergents means you don't even have to go into the tanks, never mind do anything in them.

Today all these factors are taken into account in the initial design, making vessels safer for the crews and more efficient for the owners. None of these innovative designs and changes could have been developed without the knowledge gained by years of hands-on work by the dedicated crew and officers of the early AHTS... and those people continue to pass on that knowledge to enable offshore vessels to further evolve. I am able to pass on my practical knowledge to others here at Robert Allan Ltd. - Together providing designs to the offshore industry, and going well *beyond the “Toy Tugs”*.

Escort Performance Prediction Using CFD

by: *Brendan Smoker E.I.T.*
Mechanical Engineer

&

Bart Stockdill M.A.Sc., P.Eng.
Mechanical Engineer

Escort tugs work in the essential role of assisting large oil tankers and LNG carriers to navigate safely through confined waterways where the consequences of a loss of vessel control cannot be tolerated. In the event of loss of propulsion or steering, escort tugs must have sufficient force-generating capability to brake and steer the tanker to ensure safe passage.

There are two types of forces that an escort tug exerts on a tanker: steering forces, used to control the heading of the tanker; and braking forces, used to control its speed and advance. Escort tugs are designed to provide steering and braking forces at transit speeds up to 10 knots using a towline tethered to the stern of the tanker. By orienting themselves at yaw angles up to 45 degrees in a side slipping motion, an escort tug hull acts as a giant rudder and is therefore able to leverage itself and generate towline forces well in excess of bollard pull. Steering forces upwards of 150 tonnes have thus been achieved on Robert Allan Ltd. designed escort tugs with a bollard pull of <80 tonnes.

Such high towline forces can create significant hazards for the escort tug. At worst, the towline forces could be high enough to cause the tug to roll over. To mitigate such a risk, the naval architect must be able to accurately assess the escort tug performance during the design phase, and ensure that the vessel stability is well-matched to this force-generating capability. Currently this is done by carrying out escort model tests in a towing tank or by interpolating test data from existing vessels.

Towing tanks are very expensive; an escort model test program can easily exceed the usual design fee for the vessel itself. The use of data from existing vessels is only appropriate where the new design is very similar. This approach cannot be used to assess the performance of novel hull designs.

Robert Allan Ltd. has developed a method using Computational Fluid Dynamics (CFD) to predict escort tug performance. This offers significant advantages over previous methods including:

1. Elimination of scaling errors associated with model tests since CFD analysis is carried out with full size ships, not models;
2. Reduced cost and time compared to model tests;
3. Ability to test innovative hull designs.

Figure 3 (right) shows an escort tug side slipping through the water. Its hull acts like a wing, albeit in water, generating lift and drag forces. These forces translate into towline force and thus steering and braking forces on the tanker. The yaw angle of the escort tug is like the angle of attack of a wing, as it increases, the lift force increases up to maximum just before stall occurs. In figure 1, (opposite page) the maximum lift is generated at 45 degrees yaw on the left. On the right, the hull has stalled at 50 degrees yaw as shown by the large dark blue area of separated flowlines behind the skeg.

By using CFD, the hull lift and drag forces, and thus the towline force, can be predicted at various speeds and yaw angles. This provides valuable information on the expected performance of the escort tug, particularly with respect to towline forces and expected heeling angles. Furthermore, fine tuning of the escort tug design, such as optimizing the position of thrusters and skeg shape, can be carried out cost effectively. This results in a highly efficient design capable of substantial steering and braking performance with less engine power.

Robert Allan Ltd. has been a pioneer in the design of high-performance escort tugs with a wide range of hull sizes, and of varying propulsion configurations, ASD's, Rotor tugs and Voith Tractors. This refinement of this powerful new predictive capability will help move us further ahead in this most challenging area of tug design.

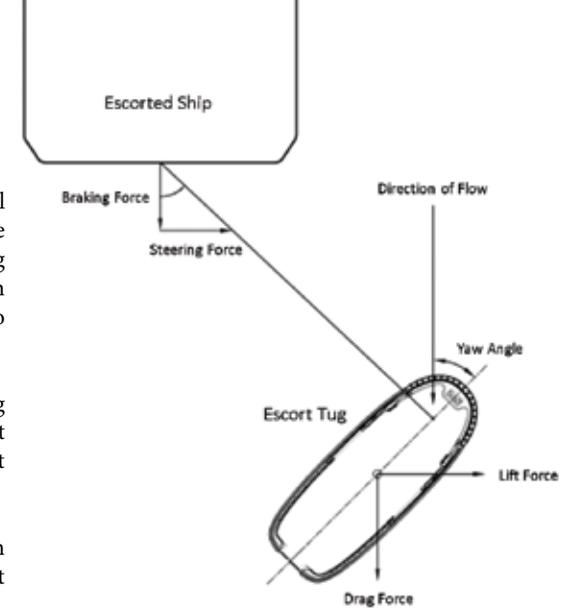


Figure 2: Escort Tug Forces



Figure 3: Tug Escorting in Indirect Mode



Canadian Coast Guard type 1050 nav-aids tender *Samuel Risley*



Ice-breaker/offshore supply vessel *Miscaroo*



Russian shallow draft, ice-class supply vessel *Vzmoreye*



Australian research vessel



Canadian Department of Fisheries and Oceans research vessel



Ice-class supply vessel *Canmar Supplier*

Larger Vessels

by *Jim Hyslop*
Manager, Project Development

Over the years, Robert Allan Ltd. has developed an international reputation as a world leader in the design of all manner of workboats, and especially harbour, ship-docking and escort tugs. There are several hundred of these types of tugs in operation all over the world; from Australia to Russia to the UAE and Mexico. Our designs truly are internationally represented!

What readers may not know is that Robert Allan Ltd. also has a distinguished history in the design of large offshore vessels. Starting in the mid 1970's and fuelled by oil exploration in Canada's Arctic, several large tug/supply vessels were built for this harsh environment. At the time these were some of the most powerful AHTS/OSVs in the world and are still in operation today.

More recently in Russia, a series of shallow draft, ice-class supply vessels were developed for operation in the Caspian Sea.

In addition, Robert Allan Ltd. has extensive experience designing large Nav-Aids tenders and Search & Rescue vessels, primarily for the Canadian Government, and more recently for other international agencies.

In short; Robert Allan Ltd. has the knowledge and experience to design all types of working vessels, from large to small.



Concept rendering of salvage/ocean rescue *RASalvor* Class tugs



Canadian Coast Guard search and rescue vessel *Gordon Reid*

www.ral.ca

230-1639 West 2nd Avenue
Vancouver, BC V6J 1H3
Canada

604-736-9466

Design Enquiries

Mr. Robert G. Allan, P.Eng. - Executive Chairman of the Board
Mr. Mike Fitzpatrick, B.Eng. (Naval Arch.) - Vice President, Projects
Mr. Jim Hyslop - Manager, Project Development
design@ral.ca

Employment Opportunities
careers@ral.ca

Media Relations
Mr. Ernst Schneider - Graphic Designer
media@ral.ca

