



CORPORATION OF  
LOWER ST. LAWRENCE PILOTS

Maritime Simulation and Resource Centre

WORLD-CLASS  
TUG  
SIMULATORS

## Tug Simulators

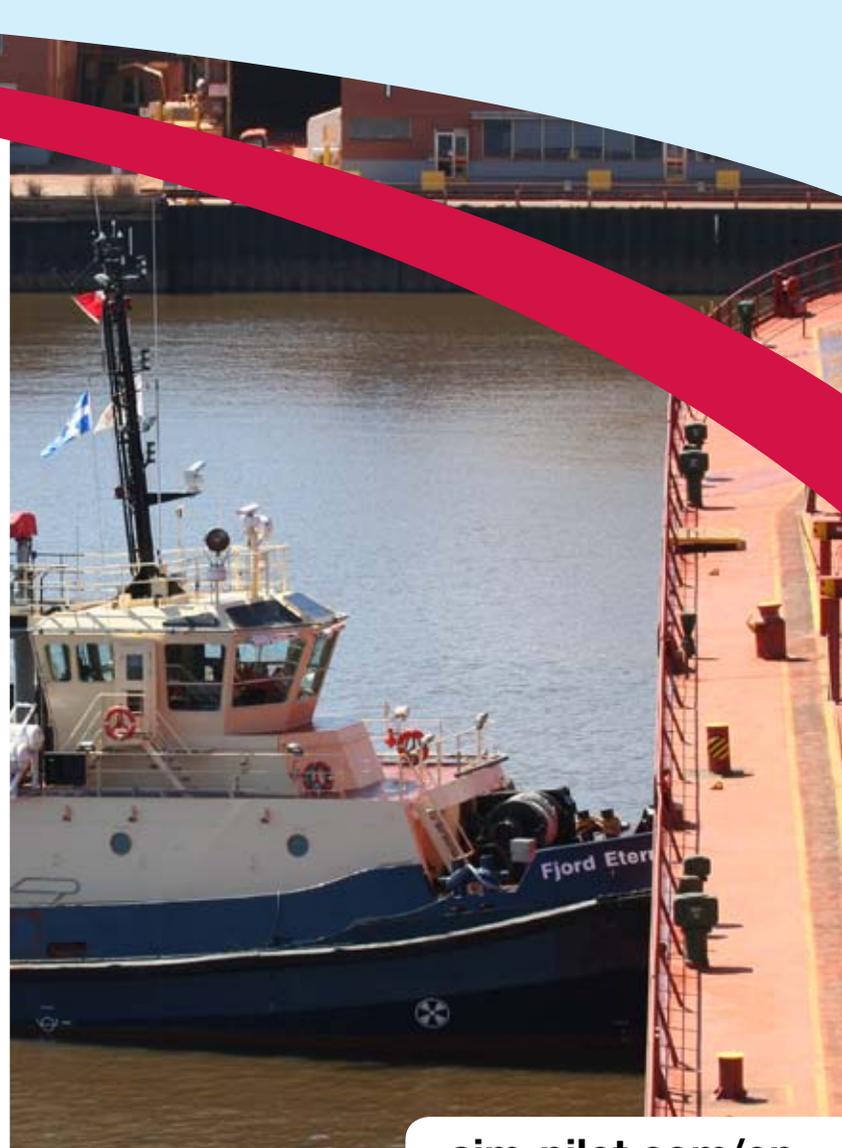
The Maritime Simulation and Resource Centre (MSRC), owned and operated by the Corporation of Lower St. Lawrence Pilots (CLSLP) and located in Quebec City, Canada, has expanded its simulation capacities by adding three own ship bridges to its DNV Class A, 330° horizontal field of vision bridge, manufactured by Kongsberg Maritime.

The three bridges have a 240° horizontal field of vision and are fully instrumented. Each bridge can be configured as a standard or azimuth propulsion tug, as well as any other vessel in the MSRC ship's library.

The MSRC has the capacity to run four individual fully functional virtual ships in the same exercise or in separate exercises, and a wide range of targets and vector tugs can be added, pre-programmed or handled at will during any exercise. For example, the MSRC's instructors can simultaneously train ship and tug masters in manoeuvres related to port or escort operations.

The MSRC tug simulators are specifically designed to support high-fidelity training and detailed procedural rehearsal for the full range of tugging operations. This capability is achieved by combining two critical operational components:

- Purpose-built tug wheelhouses, which replicate the controls, layout and tools used by a tugboat captain; and
- High-fidelity mathematical models of the tugboat, the vessel being worked or towed, the hydrodynamic phenomena and interaction between the tug and the vessel, and the resultant towline/frictional forces being produced.



[sim-pilot.com/en](http://sim-pilot.com/en)

### MSRC offers a Wide Range of Services and Expertise

- A team of specialized instructors with exceptional knowledge, backed up by the members of the Corporation of Lower St. Lawrence Pilots, who all hold command certificates and a wealth of navigation experience as ship handling experts.
- One DNV Class A, 330° Full Mission Bridge Simulator that exceeds STCW 95 requirements.
- One fully instrumented tug bridge with a control console providing identical physical dimensions and ergonomics.
- Two fully instrumented tug bridges, with a horizontal field of 240°.
- In-house capability for developing geographic database compilations and realistic mathematical ship models.

### MSRC has quickly earned a Worldwide Reputation

Among its many activities, the MSRC has carried out engineering work to validate port expansion projects, including natural gas terminals: Rabaska and St-John, NB (Canaport LNG), etc. More recently, simulations were conducted for the Canadian Coast Guard and also for a planned new bulk terminal in Colombia.

From its creation, the MSRC has been consulted by tug companies, engineering firms, pilot groups and shipping firms from across North America, and from such countries as France, Brazil, Morocco and Chile.

# Purpose-Built Tug Wheelhouse

MSRC uses custom wheelhouse layouts to ensure that tugboat captains walk directly from their tugboat into the simulator and feel immediately at home in their surroundings. The purpose-built tug wheelhouse provides a layout with access to vessel controls and bridge tools that is nearly identical to the actual vessel being modelled. Additionally, the use of a dual row of display screens provides a vertical and horizontal field of view consistent with that of a real modern tug. The integrity of this functional layout allows tugboat captains to perform mechanical tasks and to monitor operations in a fashion identical to that of their own tug.

## Key Features:

- Control console providing identical physical dimensions and ergonomics;
- Identical steering controls providing precise mechanical feel and response;
- Simulator console arrangement equipped with emulated electronic displays and instruments replicating the information used and monitored by the captain when performing operational tasks;
- Hydraulic winch controls supporting the full range of functions, including constant tension winches and line tension meters.

*“A team with exceptional knowledge of ship handling and advanced navigational skills.”*

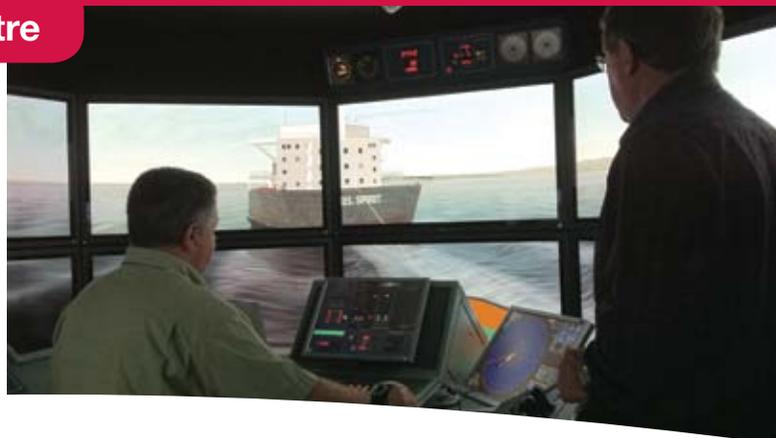
Capt. Greg Brooks  
Towing Solutions Inc.

## Training Applications

By combining a high-fidelity ship handling bridge with one or more high-fidelity tug handling bridges, the Maritime Simulation and Resource Centre can support the full range of towing and assist tug operations, including the combination of pilot and tug master training and port procedural and emergency response rehearsal. The use of these fully interactive facilities is rapidly becoming a common part of the methodology used by ports to develop procedures for employing new generation tugs or for determining how to safely handle new classes of ships that wish to visit the port.

## Supported Training Scenarios:

- Towing alongside/on the hip;
- Ship assist operations to include berthing and high-speed escort operations;
- Emergency procedures training;
- Port operations and procedural practices; and
- Port development and research work.



## High-Fidelity Mathematical Modelling

Kongsberg has taken painstaking efforts to ensure that its tugboat models perform in a fashion consistent with real tugs. This includes not just manoeuvring and mechanical performance, but most importantly performance of the tug when connected on a line and pulling or pushing a vessel. The careful modelling of the cause and effect relationship between the tug and the vessel being worked ensures that the results achieved in the simulator when working a vessel, whether in a ship assist role or a towing operation, are representative of what can be achieved with a real tug and a ship of similar characteristics.

Kongsberg has combined proven numeric modelling methods with live trial data to ensure that both static bollard pull and dynamic line tension forces are consistent with the real-world performance capabilities of the modelled vessel:

- Realistic towline catenary;
- Realistic frictional forces and “stick” while pushing alongside a moving ship;
- Precise light boat handling characteristics, including sideways walk for tractor tugs or tugs with flanking rudders;
- Precise modelling of tug’s underwater profile, including skegs and their related effects on directional stability, speed induced lift and drag;
- Realistic heel angle as a function of vessel speed and towline forces;
- Precise modelling of high-speed escort manoeuvres, including indirect towing, powered indirect and transverse arrest;
- Realistic tug and ship interaction (pressure zones and venturi effect) when working the bow, midship and stern; and
- Highly detailed and contrasted visual ship models to ensure depth perception and situational awareness when working close to a ship.



Complete Interaction Between the 4 Bridges

# Recent MSRC Operational Research Projects



*“One of the most comprehensive combinations of equipment, technology and pilotage expertise available in the world.”*

Garland Hardy  
Lantec Marine Inc.

## Feasibility Study for LNG Terminal (LNG with ASD Tugs)

CANAPORT LNG used the services of the Maritime Simulation and Resource Centre to determine safe and appropriate procedures for approaching, berthing and unberthing manoeuvres at the LNG terminal pier with tugboat assistance.

Pilots from the Atlantic Pilotage Authority and tugboat captains from Atlantic Towing Ltd. used four bridges of the MSRC navigation simulator to conduct a series of simulations on various types of LNG vessels assisted by 5,000 HP tugboats fitted with azimuthing podded propulsion (Z-drive).

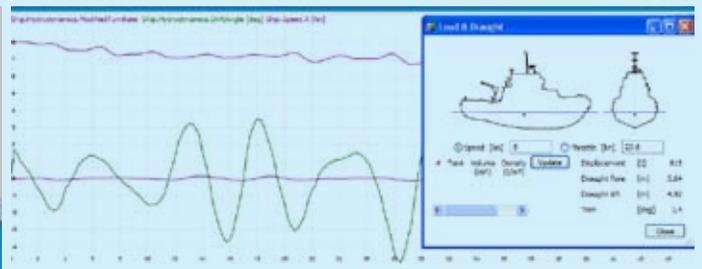
The MSRC developed a geographic database for the site and integrated the currents used for the simulations.

## Tugboat Evaluation Project, Rio Tinto Alcan

The MSRC was mandated by Rio Tinto Alcan to conduct simulations designed to determine realistic bollard pull for a replacement tugboat at the Port Alfred facilities.

The Centre developed a geographic database for the site, integrating the currents used for the simulations. A series of manoeuvres was carried out using the navigation simulator.

Then the full mission bridge simulator was used to represent the ship, while the tug was represented by one of the other three bridges.



## Feasibility Study for New Port Infrastructure in Colombia

This study was designed to evaluate the concept of a new port infrastructure in Colombia, determine its operating limits and eventually serve as a training tool for ship and tug captains, pilots and terminal operators.

The MSRC developed a geographic database for the site and conducted simulations in order to:

- Evaluate and determine operating limits, while factoring in any activities taking place nearby, so as to ensure the safe use of infrastructures; and
- Determine the number and minimal capacity of tugboats needed to ensure safe and appropriate assistance during escort operations, berthing and unberthing manoeuvres.





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## Experience Quebec City and its Unique Attractions

A visit to the Maritime Simulation and Resource Centre is already a unique experience in itself. Why not take advantage of the opportunity to discover all the beauty and wealth of one of the oldest port cities in America... the majestic City of Quebec!

You are sure to be delighted by its heritage sites, its picturesque neighbourhoods, its artistic and cultural activities, and its gastronomic treats!

In operation since December 2004, the **Maritime Simulation and Resource Centre** has been purposely built to function as a total turnkey port procedural development centre. It is one of the few facilities in the world offering a full selection of simulation options, ranging from stand-alone desktop simulation to fully interactive manned tug and large vessel simulations. For projects requiring the knowledge of ship manoeuvres, the MSRC can draw on the vast experience of members of the Corporation of Lower St. Lawrence Pilots. The synergy derived from this combination of new technology and pilot/tugboat captain experience generates exceptional added value for the MSRC and allows the Centre to offer unique expertise for port development projects.

**The MSRC also features an in-house database compilation capability, which enables it to build, modify or customize simulated geographic areas and ship models to suit client-specific requirements.**

This extremely unique combination of human and physical resources enables the MSRC to provide flexible and total solutions through all

stages of port development, including appraisal and conceptual design, manoeuvring procedure training for new facilities, data capture and reporting.



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