OUR VISION

By combining the strengths of the academic and conference operations, MITAGS-PMI-CCMIT will be recognized as the premier learning environment for our mariners, clients, conference attendees, and stakeholders.

OUR MISSIONS

MITHAGS-PMI – East and West Coasts Campuses:
To develop and enhance professionalism through the development and presentation of internationally recognized programs in leadership, education, training and safety for the maritime industry.

CCMII – Conference Operation:
To provide the most productive education, training, and meeting venue in the Baltimore / Washington area.

CORE EMPLOYEE COMPETENCIES and VALUES

Customer Focus – Dedicated to meeting the expectations and requirements of stakeholders. Acts with the customer in mind to establish/maintain effective relationship and trust.

Integrity and Trust – Recognized as an individual who can provide the factual truth in an appropriate and helpful manner.

Functional/Technical Skills – Has the knowledge and skills to do the job at a high level of performance.

Self Development – Adapts to change and is committed to personal growth. Understands that different situations may call for different skills and approaches. Deploys strengths and works to compensate for weaknesses and limits.

Action Oriented – Strong work ethic, willing to take proactive initiative, and acts to add value to the organization.

Team Oriented – Understands that individual performance must be integrated with others in order for the organization to achieve its missions.
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MITAGS and PMI reserve the right to share any resource(s) that may be required to meet or exceed contractual obligations.
Introduction to the Maritime Institute of Technology and Graduate Studies (MITAGS) and the Pacific Maritime Institute (PMI)

The Maritime Institute of Technology and Graduate Studies (MITAGS) and the Pacific Maritime Institutes are non-profit, continuing education centers for professional mariners. The Institutes provide training for both civilian and military mariners at every level of their career. MITAGS-PMI are dedicated to the following activities:

◇ Helping mariners maintain and advance their qualifications
◇ Assisting individuals who would like to enter the maritime profession
◇ Providing operational research services for the maritime industry

MITAGS-PMI General Experience

MITAGS has been delivering a wide range of maritime training and simulation programs for well over forty years. It was an early believer in adopting Det Norske Veritas (DNV) Quality Systems for maritime training and simulation courses. MITAGS was one of the first schools to integrate simulation into maritime training programs. Many of the MITAGS innovative courses served as models for the development of Standards of Training Certification of Watchkeeping (STCW-95 and Amendments). MITAGS has also become the leading providing of continuing education and training services for state pilots and deep-draft shipmasters and deck officers.

PMI was a pioneer in the application of simulation technology for the towing industry. This led to winning the U.S. Department of Labor’s prestigious “21st Century Innovator” for its two-year, registered apprenticeship program for the workboat industry. PMI has also pioneered in the application of simulation for objective assessment of bridge watch-standing skills.

MITAGS and PMI have built on this knowledge to provide sophisticated simulation services with specialties in the areas of custom full-mission ship simulation databases and models for operational research. Today, MITAGS and PMI leverage their collective strengths by sharing curriculum, instructors/staff members, technical knowledge, and a common set of goals.

Certifications

Certain courses are approved by the U. S. Coast Guard as meeting the STCW-2010 Operational and Management level requirements. Other courses are approved by the American Pilots’ Association (APA), and Military Sealift Command (MSC). Additionally, The Maryland Higher Education Commission (MHEC) and the Washington State Vocation Training Board provide oversight.

Able Seafarer to Officer In Charge of a Navigation Watch (OICNW), Chief Mate/Master, and Workboat Mate Programs and other courses qualify for Veterans’ Administration benefits. Mariners may also qualify for college credits towards degrees in transportation from American Public Universities.
The MITAGS campus encompasses over forty (40) acres. The 300,000 square-feet facilities include an on campus hotel with 232 hotel rooms (3-STAR equivalent). Hotel and conference facilities approved by the International Association of Conference Centers (IACC).

PERSONAL AMENITIES AND CONFERENCE RESOURCES

- 500-Seat Dining Facility
- Nautilus® Fitness Room
- Indoor swimming pool
- Lobby Lounge
- Jogging / Walking Trails
- Maritime Museum
- 230-Seat Auditorium
- 55-Conference/Meeting Rooms
- Web Conference Hosting Capabilities

MITAGS LOCATION AND GENERAL FACILITY DESCRIPTION

MITAGS is located less than five (5) miles from the Baltimore-Washington International Thurgood Marshall Airport (BWI). Complimentary shuttle links the campus with the airport, BWI Amtrak Rail, Baltimore Light Rail, and regional bus services. It is also near major tourist destinations; including Baltimore, Annapolis, and Washington, DC.

TRAINING AND OPERATIONAL RESEARCH

- Full-time IT and Modeling Staff.
- Two, 360° Transas Full-Mission Shiphandling Simulator integrated with a 120° Bridge Tug and a 300° Bridge Tug Simulators.
- 8-Ship Radar, Automatic Radar Plotting Aids (ARPA), and Electronic Chart Display and Information Systems (ECDIS) Simulators.
- Vessel Traffic System (VTS) Watchstander Training Lab.
- ECDIS, Stability, and LNG Training Software.
- Emergency Medical Lab.
- 16-station networked computer Lab.
- Cryogenic Gas Control Room Simulator (LNG/LPG).
PMI LOCATION AND GENERAL FACILITY DESCRIPTION

The Pacific Maritime Institute (PMI) is a subsidiary of MITAGS in Seattle, Washington.

PMI is located approximately twenty (20) minutes from Seattle Tacoma (SEA-TAC) International Airport. Their waterfront facility is positioned directly within the Maritime Technology and Career Center. PMI offers the following onsite technology and training support facilities:

- 240° DNV Class A Full-Mission Bridge Simulator
- 300° Full-Mission Tugboat Simulator
- 300° Full-Mission Tugboat Simulator #2
- 6-Radar/Automatic Radar Plotting Aids (ARPA) Simulators
- Two Electronic Chart Display and Information Systems (ECDIS) Electronic Navigation Labs
- Global Maritime Distress and Safety Systems (GMDSS) Communications Lab
- 2-Simulation Debriefing Rooms
- 12-Conference / Class Rooms
- Student Service Center
- Complimentary Parking
MITAGS’ training center offers two (2) Full-Mission Shiphandling Simulators [SHS #1 and SHS #2], two (2) Bridge Tug Simulators [SHS #3 and SHS #4], and six (6) Part-Task Simulators.

SHS #1 and SHS #2 are Full-Mission Shiphandling Simulators that are housed within 360° curved projection screens that measure eighty (80) feet in diameter and thirty (30) feet in height. SHS #3 is a Full-Mission Bridge Tug Simulator that utilizes a 300° horizontal field of view and an unprecedented 42° vertical field of view. SHS #4 is a Bridge Tug Simulator that offers 120° of visuals and the ability to change the view to any location. The six (6) Part-Task Simulators have the same model hydrodynamic fidelity as the Full-Mission Bridge, but have reduced visual acuity (single video channel). SHS #1 SHS #2, SHS #3, SHS #4, and the Part-Task Simulators can be integrated into the same gaming area to allow up to ten (10) interactive ownships in one exercise.
The Transas Full-Mission Shiphandling Simulators (SHS #1 and SHS#2) can be fully integrated with each other and/or two (2) Bridge Tug Simulators. One of the Tug Simulators offers 120° visuals, while the other Tug Simulator offers 300° visuals.

The simulators are equipped with the next generation of visuals and advanced ship hydrodynamic modeling capabilities. Other special features include re-configurable console layouts and ship control systems. The system has been specifically designed for simultaneous training of Pilots and Tug Masters, Tug Escort, Operational Research, High-Speed Operations, Underway Replenishment and Lightering Exercises.

**SIMULATOR CONTROL AND MONITORING STATIONS**
- Selective Visual Station Views and Monitoring
- Very High Frequency (VHF) and Digital Selective Calling (DSC) Communications with Intercom
- Printer, Closed Circuit Television (CCTV) Record, and Display Equipment
- Debriefing Playback Software, Projector/Display System
- Automatic Identification System (AIS) Functions, Tug and Towing Functions
- Environmental Controls

**ENGINE CONTROLS**
- Engine Panels, Indicator Panels, Dual Throttles, Bow and Stern Thrusters, 2- Revolutions per Minute (RPM) and Pitch Analogue Indicators, Sound, Lighting, Azipod and or Z-Drive Controls.

**STEERING CONTROLS**
- Autopilot, Rudder and Non-Follow-Up Unit (NFU), Steering Gear and Wheel, Gyro Repeater, Z-Drive, Voith Schneider, Azipod.

**NAVIGATION AND COMMUNICATIONS**
- Automatic Radar Plotting Aids (ARPA), Radar, and Electronic Chart Display and Information Systems (ECDIS). Note: includes both integrated and stand-alone displays.
- NEMA GPS Data Plug and NEMA UAIS Data Plug (Portable Piloting Units)
- Differential Global Positioning System (DGPS), Long Range Aid to Navigation (LORAN), Direction Finder (DF), Universal Automatic Identification Systems (UAIS), and Ship Security Alerting System (SSAS).
- Global Maritime Distress and Safety Systems (GMDSS), Very High Frequency (VHF), and Digital Selective Calling (DSC).
- Sound System with Intercom.
The simulator provides high-fidelity graphics, with precise and accurate ship hydrodynamic behavior. The ship models handle with smooth, coupled, realistic motions. Exercise information is used for playback to facilitate lessons learned and modeling data. Visual databases and ship models are built from the official Electronic Chart Display and Information Systems (ECDIS) S-57 digitized data, vessel sea trial data, and actual photographs of the replicated port areas. MITAGS-PMI have developed over 100 original databases and models with access to over 200 more from the Transas World Library.

The simulated bridge is housed in one of two unique theaters that are easily considered the largest in the world. The simulator view offers 360° curved projection screens that measure forty feet in height and eighty feet in diameter for the display of large-scale simulation graphics. The complete system has been constructed to Det Norske Veritas (DNV) “Class A” simulator standards. It has also been configured for one-man bridge operations, as defined under the DNV Watch-1 certification rules.

300° Bridge Tug Simulator #3 (SHS #3)
The Bridge Tug Simulator #3 (SHS #3) is a Full-Mission Towing system that utilizes a 300° horizontal field of view and an unprecedented 42° vertical field of view. The simulator works in tandem with SHS # 1 for the following activities:
- Ship Assist
- Escort Training
- Research
- Navigational Skills Assessment
This includes the application of both direct and indirect towing forces.

In addition to the equipment listed under MITAGS’ Full-Mission Shiphandling Simulator # 1, this simulator also includes:
- Kobelt Telegraph and NFU Toggle Steering Control
- Lilaas Z-Drive Controls
- Voith Schneider Controls
- Towing Winch Hardware Panel
- This simulator is comparable to PMI’s Simulator # 2

120° Bridge Tug Simulator #4 (SHS #4)
The 120° Bridge Tug Simulator #4 (SHS #4) provides 120° of operating area visibility and the ability to change the view to any location. The system has been specifically designed to simulate a second assist tug during berthing exercises. This simulator contains similar equipment to that listed under MITAGS’ All-Weather Navigation (AWN) Simulator.
All-Weather Navigation (AWN) Simulator
The All-Weather Navigation (AWN) Simulator is an advanced eight ownship interactive ship simulator. The 2011 upgrade added full-mission shiphandling fidelity and visuals to all eight ships. Additionally, a Vessel Traffic Services (VTS) Watchstander Station was added to provide realistic vessel traffic monitoring and management training. The 300° Bridge Tug Simulator and the 120° Bridge Tug Simulator are both part of this system.

Equipment
All eights (8) bridges in the AWN contain Furuno VHF Radio, Sound Signals with Automatic and Manual Activation, Bow and Stern Thrusters, as well as the following equipment:

Radar/ARPA Units have the capability to display AIS information
- Furuno
- Bridge Master E
- Nucleus

Steering
- NFU Tiller
- Follow-Up with Wheel
- Autopilot

Electronic Chart Display and Information System
Navi-Sailor 3000 ECDIS-I, which is IMO certified with the capability to display/overlay integrated AIS and radar targets.

Conning and Visual Display (split screen)
- Pilot Card
- Alarm Panel
- LORAN-C
- Course Recorder
- Doppler Log
- Echo Sounder
- SAR Signals
- UAIS-MKD
- GPS
- Flags
- Navigation Signals

Portable Piloting Unit Plugs
- NEMA GPS Data Plug
- NEMA UAIS Data Plug

Full-Mission Vessel Traffic Services (VTS) Simulator
The purpose of Vessel Traffic Services (VTS) is to improve the safety and efficiency of navigation. It also protects the marine environment, shore areas, work sites, and offshore installations from the possible adverse effects of maritime traffic. In today’s society, VTS also plays an important role in maritime security.

In MITAGS’ Full-Mission Vessel Traffic Services (VTS) Simulator, the vessel traffic monitoring and management station has all of the equipment that a watchstander would find in a modern Vessel Traffic Center (VTC). The system offers a realistic environment for skills training and evaluating both VTS watchstanders and supervisors.

VTS Equipment
- Custom VTS Traffic Management Software
- AIS Targets
- Radar Image Overlay
- Furuno VHF Radio

MITAGS is the only accredited VTS Training Institute in the United States to maintain International Association of Lighthouse Authorities (IALA) V-104/1 certification for VTS operator training, and (IALA) V-103/4 VES on the job training instructor requirements.
PMI Simulation Facilities
Seattle, Washington

240° Full-Mission Shiphandling Simulator (SHS # 1)

PMI’s Full-Mission Shiphandling Simulator # 1 utilizes a 240° field of view, including 30° abaft of the beam on each side. The visual control system allows the operator to choose between the port and starboard bridge wing locations and rotates the visual image vertically, so ships, assist tugs, the sides, and the dock are all visible. This particular feature has proven to be very successful during tug assist and docking operations.

Equipment

All of the bridge equipment is fully interactive and presents real-time simulated information. Furthermore, all of the systems react realistically to operator inputs. VHF radio transmissions occur between the bridges, and between each bridge and the instructor station. In addition, the ship simulator has a fully integrated bridge system that includes the following equipment:

- 2-GPS’ (Trimble and JRC)
- SAAB AIS
- 2-VHF Radios
- 2-Radar/ARPA’s, with choice of three Radar types
- Steering Console with Controls (Autopilot with Track Control)
- NaviSailor 3000 / 4000 ECDIS
- Speed Indicators with optional Water or Ground (Doppler) Track

The simulator also has rate of turn indicators, an echo sounder, wind direction, speed indicators, and all other systems that are typically found onboard modern merchant vessels.

300° Full-Mission Tug Simulator (SHS # 2)

Simulator # 2 is a Full-Mission Towing system that utilizes a 300° horizontal field of view and an unprecedented 42° vertical field of view. This simulator works in tandem with Simulator # 1 and Full-Mission Tug Simulator (SHS #3) for the following activities:

- Ship Assist
- Navigational Skills Assessment
- Escort Training
- New Hire Assessment
- Research
- Bridge Resource Management

This includes the application of both direct and indirect towing forces.

Equipment

In addition to the equipment listed under SHS # 1, Simulator # 2 also has the following equipment:

- Kobelt Telegraph and NFU Toggle Steering Control
- Lilaas Z-Drive Controls
- Render Recovery Winch
- Voith Schneider Controls
- Towing Winch Hardware Panel
- Furuno / JRC Radar Systems

This simulator is comparable to MITAGS’ 300° Bridge Tug Simulator # 2.

300° Bridge Tug Simulator # 3 (SHS #3)

The 300° Bridge Tug Simulator #3 (SHS #3) provides 300° of operating area visibility and the ability to change the view to any location. The system has been specifically designed to simulate a second assist tug during berthing exercises.

This simulator contains equipment similar to that listed under MITAGS’ All-Weather Navigation (AWN) Simulator.

This simulator is comparable to PMI’s Full Mission Tug Simulator #2.
**Visual Controls**
The simulators provide a wide range of control from the operator’s visual perspective. The visual controls include the following:

- Transfer of position to either bridge wing
- Tilt or rotation of the visual scene
- Transfer of the view point to other locations on the vessel, such as the bow or stern
- Binocular View Mode at the press of a button

**Alarm Capabilities**
Alarms can be initiated to simulate an array of system malfunctions; including engine, steering, and navigational aid failures.

**Mooring Line Attachments**
All vessel models have multiple line attachment points and multiple line type options; including polypropylene, wire, nylon, and dyneema®. In addition, each line has its own breaking strain limits, which can be individually controlled at the instructor station.

**Anchor Response**
Vessel models respond appropriately to the use of anchors for both standard and dredging anchor maneuvers. Anchor position and forces can also be displayed and recorded in the log file for future use and reference.

**Tug Operations**
The simulators offer the conventional twin screw, Z-drive, and the Voith Schneider tug models. The tugs can be operated in an integrated simulator exercise as an “ownship” or implemented as target vessels for operation from the instructor station. Furthermore, the parameters of bollard pull can range from twenty-six (26) to eighty (80) tons. However, virtual force vectors can be applied to simulate any amount of bollard pull in any direction.

MITAGS-PMI have a fleet of validated modern Tractor Tug hydrodynamic models at their disposal. Other special features include the following:

- The Z-drive and Voith Schneider tugs can be operated in the indirect mode, which can generate up to twice the amount of bollard pull (when compared to a tug operating in direct mode).
- The Transas tug model can interact with vessels based on both speed and proximity.
- High end escort functionality, including render recovery winches.
**Introduction Standard Simulation Specifications**

MITAGS-PMI use the latest Transas operating system to drive all of their simulators. Transas is renowned for its exceptional visual graphics acuity and in-house hydrodynamic teams. In addition, Transas has proven to be very responsive regarding customer feedback. Accordingly, their simulation software offers many unique features that cannot be found in similar products offered by other simulation providers.

**Fast Time Simulation**

The portable “Fast Time” Simulator uses the same hydrodynamic models and visual databases as the Full-Mission Simulator. Fast-time simulation can be easily transferred to the Full-Mission Bridge Simulator. However, the primary difference between the Fast-Time Simulator and the Full-Mission Simulator is the emulation of the hardware controls. The autopilot on the Fast-Time Simulator replicates the Anschutz Pilot Star D, with full functionality of the actual hardware. For the purposes of research, the Anschutz has been programmed to follow track lines. It works directly with the ship’s path, which reflects the hydrodynamics of the vessel model. The simulation can be run at a twenty to one (20:1) speed ratio. It can also be replayed, if necessary, in the Full-Mission Bridge Simulator. Files can be converted to Windows Media® for playback on any computer.

**Visual Graphics**

Transas’ graphics are acknowledged as the “very best” in marine simulation. Examples of the realistic graphics that can be generated by MITAGS/PMI when using the Transas system are throughout this guide. The proprietary software uses ECDIS data for the development of the base for visual, radar, and ECDIS displays. AutoCad® drawings are overlaid into the scenes creating excellent depth perception.

**Environmental Controls**

The Transas system provides a realistic display of all weather conditions, various atmospheric phenomena, time of day, visibility and illumination effects, reflection, and glare on the water. Tides and currents can also be adjusted, as needed, and programmed to change during the simulation with buoys generating current feathers. In addition to the overall condition parameters, MITAGS/PMI can also set-up environmental zones to create such conditions as fog banks, local wind, current effects, and local wave effects.
**Reporting Capabilities**

The ship and tug simulators offer both video and audio recording systems that include digital screen capture and a full recording capability. The playback and recording features help provide documentation of the training and testing, as well as evaluation exercises. In addition, every action that is recorded can be re-played in real-time or fast-time and exported to assist in the reporting process.

The recording capability also offers the following features:

- Swept Path and Drift Angle
- Engine Use
- Rudder Use
- Underkeel Clearance and Squat
- Interactive Forces
- Tug Use
- Tug Positions and Forces
- Speed (Forward and Sideways)
- Vessel Position
- Distance from Navigational Hazards

**Chart View Playback**

With the chart view playback feature, information can be displayed simultaneously in one view, including the following items:

- Engine Use
- Position
- Course over Ground
- Swept Path of the Vessels
- Rudder Use
- Speed
- Heading

**Camera View Playback**

One of the most unique and powerful features on the Transas Simulator is its camera view option during playback. The operator can “fly” the camera and view the simulated scene from any angle or distance. In fact, it even offers a view from below the water surface, which helps detail bottom clearance. This feature allows unlimited screen capture and video creation options, which have proven helpful for illustration purposes.

**Vessel Modeling Introduction**

Transas Virtual Shipyard II® Software is a very versatile tool for the development of hydrodynamically accurate ship models. The MITAGS-PMI library has grown to over one hundred models. In addition, the schools have access to the Transas World-Wide Library. The current library includes:

- Cruise Ships (incl. Azipod)
- Container Ships (up to 14,000 TEU Post-Panamax)
- Ro/Ro Vessel (incl. LMSR)
- Gas Carriers (spherical, membrane; QFLEX and QMAX)
- Bulk Carriers (up to “Chinamax”)
- Tug Boats (conventional, twin-screw, Z-Drive and Voith)
- Ferries (Double and Single Ended)
- Research Vessels
- Tankers (up to VLCC)
- Naval Vessels
- OSVs
- Fishing Vessels
- NOAA Vessels
- Special Purpose
OWNSHIP MODEL

The Transas simulator uses a six degree of freedom (6 DOF) ownship mathematical model. All hydro-forces and moments are calculated in terms of coefficients. Each force component contributes differently on the 6 DOF models as explained below.

WIND

Wind forces are defined as X, Y, K, and N (4 DOF) components (constant values; plus gusting and time variable components) over the sea surface. They become 6 DOF components if the ownship has heave and pitch in a seaway. The wind heave and pitch components are usually negligible, as compared to the hydrostatic forces heave/pitch equations of motion.

WAVES

Wave and swell forces are computed accurately for all 6 DOF. Accurate wave force computation is critical for the modeling of dynamic positioning, along with wind and current forces.

CURRENT

Current effects are modeled using the underwater profile and empirical coefficients for each force component. The empirical coefficients are model test derived. Specially programmed two or three dimensional current models are available for specialized projects.

BOTTOM

Bottom effect forces are modeled using empirical coefficients as a fraction of the depth/draft ratio that is multiplied by the deep water value. Type of bottom can also be adjusted.

MISCELLANEOUS

Anchor and chain forces, mooring and fender forces, pushing/towing effects, and ship collisions are all modeled as 6 DOF units with its force/moment components defined by their location and 6 DOF motion parameters. Multiple ownships for lightering and tug assist are available.

MITAGS-PMI MODEL TESTING

Prior to the introduction of a newly programmed ship model, MITAGS-PMI shiphandling consultant staff thoroughly tests the model behaviors in a variety of conditions including:

- Propeller RPM ahead and astern settings
- Propeller RPM running-up time (example: stop to full ahead)
- Propeller RPM running down time (example: full ahead to stop and full astern)
- Acceleration and deceleration
- Wind effects
- Turning circle (shallow and deep water)
- General maneuvering
- Swept path and drift angle
- Model visuals
- Squat and bank interaction
- Current effects
Database Development

Introduction

The Modeling Department at MITAGS/PMI utilizes a powerful visual modeling tool that was specifically created for the production and updating of integrated databases (visual, radar, and ECDIS) on the Navi-Trainer simulators (version 5000 family and higher). Additionally, it can be used for activities:

- Planning of Construction Work at Ports
- Comparison of channel and terminal designs

The campuses have onsite modelers that can adjust / program the databases and ship models. This provides for minimum down-time during training or operational research projects.

Model Wizard

Various databases can be generated using the Model Wizard. The Model Wizard offers the following features:

- Magnetic Deviations
- Recons
- Lighthouses
- Buoys with Top Marks
- Templates to Create Models and Objects

The Model Wizard also incorporates an editor for the creation and modification of 3-D models for all coastal objects, including visual and motion models of the ships.

In the first stage, the user selects a specific area on the chart and sets the coastline configuration (such as mooring walls and embankments). The polygonal terrain model is then created from the chart data.

The generated scene can be supplemented with 3-D models (prototypes) from the Object Library or they can be created through AutoCAD and the use of textured photographs. In addition, illumination effects can be set, such as time of day and weather conditions.
Methodology for Database and Project Development

**Planning the Database**

The Project Manager defines the scope and objective of each project, including the following items:

◊ Define the objectives of the development.
◊ Determine the geographical area(s) to be modeled.
◊ Identify all areas of high, medium, and low Levels of Detail (LOD).
◊ Identify natural and cultural (man-made) features that are to be included.

**Data Acquisition Process**

During the Data Acquisition Process, the following data is obtained:

◊ Electronic Chart Data
◊ Navigational Publications (Corrected)
◊ Site Surveys
◊ Climatological Reports
◊ Digital Elevation Model (DEM) Data
◊ Terrestrial Photography and/or Video
◊ Topographic and Contour Maps
◊ AutoCad® Drawings

A data collection team can be provided to perform a detailed site survey and onsite data collection trip, as required.

*Autocad® illustration of proposed channel and harbors. This electronic data is used to program dimensions of channel, breakwaters, turning basin, and harbor.*

*DEPTH CONTOURS*

Depth contours are then programmed to represent the underwater contours of the proposed channel and surrounding area.
LOCAL KNOWLEDGE

Local subject matter experts are brought in to provide critical data. This invaluable input is utilized to ensure accuracy and realism.

INITIAL AREA CREATION AND REVIEW

A test area is typically generated to ensure data integrity. The area is then reviewed by the Development Team.

AREA REVISIONS AND REGENERATION

The area is re-generated, as needed, to meet necessary specifications.

DETAILED EDITING

High Detail Areas include the following:
- Define geographic boundaries of high LOD areas.
- Identify any specific cultural (man-made) or natural features that may require additional attention.

NATURAL FEATURES

- Depths: Ensure depths <40 meters are accurately represented.
- Currents
- Navigational hazards.
- Coastline: Ensure accuracy of the coastlines.
- Terrain: Check for accurate representation of the elevations.

CULTURAL (MAN-MADE) FEATURES

- Area(s) adjacent to the terminal facilities.
- Specific cultural features, as defined by the customer.
- Navigation aids (standard and custom).

TESTING

Areas are tested constantly throughout the development process.
Certain training and operational research projects required very accurate current modeling. For this purpose, MITAGS-PMI partners with Waterway Simulation Technology (WST) to develop a two-dimensional weighted average model for specific time periods (spring flood, spring ebb, etc.). This programming feature allows the simulator to replicated complex current patterns in channels, entrances, turning basins, and terminals.

**Model Flow Boundary Integration:** Field measurements, at different depths, are used to construct a sophisticated two-dimensional computer model that creates a weighted-average current velocities and directions.

**RMA Grid Details:** WST proprietary modeling software develops a grid pattern for calculating the depth-average current directions and velocities across the project area.

The current models take into account the change in velocities and directions due to obstructions such as breakwaters and / or channel configurations.

Note the changes in current flow due to the breakwater entrance. This data greatly enhances the accuracy of the predicted motion of large, deep-draft vessels.
The simulators can be programmed to account for sea and swell actions. The level of accuracy depends on the availability of field measurements. (WST is experienced in making these measurements.) The example above demonstrates the use of data from physical wave models. The results are used to manually adjust the simulator’s wave heights to recreate the “dampening effects” of waves refracting around a breakwater. Additionally, multiple swell periods can be entered along with a selection of wave models.
Navigation Skills Assessment Program (NSAP)

The program is used to provide an object assessment of deck officer watch standing skills. The assessment objectives can be tailored to specific company or pilot requirements. The program is highly recommended for new hire, promotion, and refresher assessments. Since its inception in 2006, over 1,000 mariners have gone through the program. The assessments focus on the following skill sets:
- Shiphandling
- Bridge Resource Management
- Application of COLREGS
- Communication
- Use of Navigation Tools (Radar, ARPA, ECDIS, GPS / DGPS)

Shell LNG Navigation Skills Assessment Program

A variation of the original NSAP focused on masters / chief officers operating LNGC in world trade. The 2-day assessment program is also licensed to a school in the UK and the Philippines.

Crowley Maritime New Hire Assessment Program

A shortened ½ to 1-day assessment used by Crowley as part of new hire and promotion process.

Pilot Applicant Evaluation for the Washington State Pilotage Commission

The primary purpose of this custom program was to develop a marine simulation scenario that consisted of geographic database areas and a ship model that emulated a vessel transiting Puget Sound waters. The scenario was part of a detailed simulation process that evaluated the fundamental shiphandling and pilotage skills of trainee applicants.

British Columbia Pilots’ Integrated Bridge Navigation Systems

This comprehensive five (5) day course curriculum covered the limitations, cautions, and considerations of electronic systems, including the following:
- Electronic Chart Display and Information Systems (ECDIS)
- Integrated Bridge Systems (IBS)
- Integrated Navigation Systems (INS)
- Integrated Control Systems (ICS)
- Automatic Identification Systems (AIS)
- Radio Detection and Ranging (RADAR)

In addition, the curriculum also required an advanced demonstration of knowledge and skill when recognizing, assessing, and responding to standard shiphandling situations on vessels of various lengths, tonnages, and propulsions (both with and without the use of conventional tugs).

Ship to Ship Lightering Operations

The multiple integrated bridges allow for accurate training for lightering masters as well as underway replenishment exercises. These custom courses run from three to five days. Depending on customer requirements, the training may use multiple integrated bridges.
Examples of Custom Simulation Training Programs

Pilot Refresher Training
This seven (7) day custom Emergency Shiphandling, Bridge Resource Management, and Azipod Program covers the following specific subject areas:
- Emergency Shiphandling in close quarters, combined with the principles of Bridge Resource Management for Pilots (BRMP).
- Advances in Electronic Navigation; including Electronic Charting (ECS/ECDIS), IBS, AIS, VHF, and DSC.
- Emergency Medical Response; including Elementary First Aid, Cardiopulmonary Resuscitation (CPR), and Automated External Defibrillators (AED).
- Azipod Control Systems training
- Fatigue, Sleep, and Medications per National Transportation Safety Board (NTSB) Recommendation # M-97-44 and M-97-45.
- Regulatory Review for Pilots.

Puget Sound Pilots – ATC-Crowley – Tug Escort Training
This custom three (3) day Team Escort Training and Bridge Resource Management course was delivered to the following organizations:
- Alaska Tanker Company
- Puget Sound Pilots
- Crowley Marine Services

United States Coast Guard Vessel Traffic Services (VTS) Program
This training program provided U.S. Coast Guard Vessel Traffic Services (VTS) Operators with knowledge and experience relating to government Vessel Traffic Centers (VTS) and commercial Vessel Traffic Information Systems (VTIS). The course also provided attendees with the opportunity to exchange and relate their operational work environments with licensed state pilots who act as Pilot Advisors.

STCW As Amended Deck Officer Competencies (Operational and Management Levels)
MITAGS-PMI make extensive use of simulation to conduct the electronic, ship handling, and BRM assessments required by the Standards of Training, Certification and Watchkeeping Code (STCW) as amended. This helps ship operators ensure that deck officers have demonstrated sufficient knowledge, understanding and proficiencies (KUPs) in the competencies outlined by the Code and company safety management systems.

Workboat Mate Academy – Apprenticeship Program
A structured apprenticeship that takes a holistic view of training over a 24 month period. Upon graduation, mariners sit for 500 / 1600 GRT Near Coastal / Ocean License and 500 GT Officer In Charge of a Navigation Watch (OICNW). Approved by the United States Coast, and eligible for VA benefits. This is an ideal program for retiring veterans seeking a fast-track to a second career.

ATB Escort Team Training
Crowley Petroleum Services selected MITAGS-PMI to conduct a comprehensive team training seminar focused on the Master/Pilot exchange by ATB Masters and regional Pilots, in order to maximize the effectiveness of the bridge team and better define the roles of the Master and Pilot during critical evolutions. The focal point of the seminar was use of the combined simulator suite (full mission bridge and two full mission tug bridge simulators) by members of Crowley’s ATB fleet, along with ship escort tug operators from the different regions as well as pilots from LA/LB, San Francisco, Columbia Bar and Columbia River, and Puget Sound.
Selected Operational Research Projects

The Institute has developed numerous area databases and vessel models for a diverse customer base. The projects are listed by category.

**LNG CARRIERS**

**Golden Pass LNG Terminal - Sabine River LNG Terminal**

This project included the programming of seven (7) hydrodynamic LNG models and one tractor tug model. The Institute programmed the Sabine River into the simulators from the Sea Buoy (R/W “SB”) to the terminal. The area included all navigationally significant features displayed on a NOAA electronic chart. MITAGS-PMI also overlaid additional visual graphics; including the following:

- West Shore near the Terminal
- East Shore near the Terminal
- West-North Shore near the Terminal
- Terminal Piers
- Island near the Terminal
- Pilot Station

One of the most advanced operational research projects included over nineteen (19) different terminal and ship operators. Advanced bottom and current models were developed and programmed into the databases. Exxon Mobil was the project leader.

**Sociedad GNL Mejillones S.A. Chile (GDF-Suez)**

GDF-Suez LNG contracted with MITAGS to program the new LNG terminal in Port Mejillones, Chile. Existing LNGC hydrodynamic models were adjusted to handle similar to the LNCG Shuttle and FSRU. BW Captains, Chilean Pilots and Svitzer Tug Masters trained together in interactive simulation to develop standard and emergency procedures for vessels berthing/un-berthing at this new terminal.

**Exelrate - Rio de Janeiro, Pecem, and Bahia de Todo os Santos, Brazil**

Exelrate Energy tapped MITAGS-PMI to program three LNG terminals in Brazil. The project included programming 173,000 cubic-meter FSRU. The tests assess the upper operational environmental limits and assist tug requirements. The terminals are located in Rio de Janeiro, Pecem, and Bahia de Todo os Santos, Brazil.

**Ridley Island LNG Terminal Simulation (BG Group)**

BG Group selected MITAGS-PMI in validation of a proposed LNG export terminal located on Ridgely Island, British Columbia, Canada. The study included identification of the conditions for the safe berthing of heavy lift vessels and barges at the marine off loading facility (MOF). Participants included BG Group Marine Advisors, BC Pilots, the Port Authority of Prince Rupert, Towing Solutions, and Crowley Marine Services.

**Annova LNG, Brownsville, TX (Waterway Simulation Technology)**

WST selected MITAGS to program the Brownville, TX ship channel from sea to a proposed new LNG export terminal. Multiple versions of the channel and terminal basins were evaluated.
LELU ISLAND LNG TERMINAL (PNW LNG)
PNW selected MITAGS-PMI for the feasibility study of a new LNG export terminal proposed for Prince Rupert, British Columbia, Canada. Phase I included validation vessels bringing construction materials to the remote site. Phase II focused on the feasibility of the approach channel, basin and terminal designs for the classes of LNGC expected to call on this terminal. The study included validation of assist tug requirements.

SABINE RIVER AND CORPUS CHRISTI LNG TERMINALS (CHENIERE LNG)
Cheniere LNG selected MITAGS-PMI on numerous feasibility studies related to the export and import of LNG. Projects included validation of terminal on the Sabine River, and feasibility of proposed terminal located in Corpus Christi, Texas. These projects were conducted in partnership with WST.

KITIMAT WATERWAY LNG TRANSIT SIMULATION (CHEVRON CANADA AND LNG CANADA)
Chevron Canada Ltd and LNG Canada selected MITAGS-PMI to investigate the feasibility of operating LNG facilities in the Kitimat area of BC. The Chevron facility will be located at Bish Cove and the Shell facility in the inner harbour of Kitimat at the old Eurocan dock. LNG Carriers will need to traverse the Douglas Channel which is BC’s largest coastal fjord (approximately 98 nautical miles in length). This project focused on the extended transit and possible risk areas within that transit, along with the ability to safely escort the vessels during the entire journey.

TUCK INLET SHIP MANEUVERING ANALYSIS (EXXONMOBIL)
ExxonMobil selected MITAGS-PMI’s to review the engineering, environmental and navigational objectives of the Tuck Inlet LNG Terminal proposal. Specifically, the project identified recommendations for vessel maneuvering operations between the Triple Island Pilot Station and the Port of Prince Rupert, and the LNG export berths at the Tuck Inlet proposed facilities. The research also helped to develop and confirm berthing strategies that balance safety and efficiency, and included a detailed tug capacity analysis integral to the LNG ship maneuvers.

TUG HULL DESIGN

TUG HULL DESIGN SELECTION
Shaver Transportation creatively chose MITAGS-PMI to help test-drive various tug hull configurations in anticipation of their new build construction. Shaver operates in the unique waters of the Columbia River between Washington and Oregon, and was faced with unique operational requirements and limitations. Through the use of the full mission tug simulator, the Shaver team was able to operationally test-drive numerous hull and propulsion combinations to determine the best configuration to meet their needs. This effort allowed for the very specific selection and design for river escort and assist operations, and saved millions in the possible risk of selecting the wrong combination of technologies.
**Selected Operational Research Projects**

**Bulk Carriers**

**Sudeste Port Project, Brazil (MMX)**

MMX, LLC, Brazil selected MITAGS-PMI to program a new iron export terminal called Project Sudeste Port. When fully operational, this terminal is designed to handle some of the largest bulk carriers in operation today. The project included detailed programming of the underwater contours and current modeling. MITAGS-PMI, WST and Brazilian pilots participated in the tests.

**Acu, TX1, Brazil (CH2M Hill)**

CH2 selected MITAGS-PMI to conduct confirmation tests for owners of the LLX-MR iron export terminal located in TX1, Brazil. In addition to modeling the port, the project included programing Zhong Xing Hai cape class bulk carrier.

**Port of Callao, Peru**

The study involved the placement of a new iron ore terminal and extensive changes to the channel and breakwater entrance. Detailed modeling of currents was also included.

**Puerto Nuevo, Columbia (Moffatt & Nichol)**

M&N selected MITAGS-PMI to simulate a new coal exporting terminal located in Puerto Nuevo, Columbia. The project included channel, berthing and turning basin analysis.

**Sudeste Port Project, Brazil**

This study is part of a continuum of two earlier studies conducted at MITAGS-PMI. The study objectives were to familiarize pilots with night transits in order to implement vessels transits during night hours for 24-hour operation, determine the feasibility of reducing the number of assist tugs to three tugs, and still provide an adequate safety margin under routine operational conditions, determine if additional / changes to the existing aids to navigation, and recommend upper operational environmental limits for wind and current with the reduced number of assist tugs.

**T1, Ferroport, SA, Brazil**

Ferroport, SA, conducted tug emergencies simulation tests to determine whether the pilots could maintain control of the vessel, after one of the four assist tugs became disabled, and take the vessel back to the anchorage or complete the maneuver, allowing the Port to reduce the total number of tugs from five to four.
Selected Operational Research Projects

TANK VESSELS

**The Port of Texas City, Texas (LJA Engineering)**

LJA Engineering selected MITAGS-PMI to conduct a feasibility study of a new terminal pier in the Port of Texas City. The terminal is being designed to handle Aframax and Suezmax Class Tankers. Issues in included berthing/unberthing into multiple piers and clearances needed to reach other terminals. The project was overseen by Waterway Simulation Technology (WST). Project used two assist tug bridges integrated with FMSS. Tug modeling included Robert Allan’s Z-Tech® Designs.

**Canaport East (Moffatt & Nichol)**

M&N selected MITAGS-PMI to program and conduct simulation studies on proposed new oil terminal berth in Saint John’s Harbor, Canada. Project included assessment of assist tug, terminal/channel requirements, and environmental wind/wave limitations. This information is being used to refine the final design. Participants included representations from M&N, TransCanada, Port Authority of Saint Johns, Atlantic Pilotage Authority, Irving Oil, and Transport Canada.

**South Riding Point, Sea Island Oil Terminal, Grand Bahama Island (StatOil)**

Statoil, LLC operates the South Riding Point Crude Oil Storage and Transshipment Terminal. The facilities include an onshore tank farm connected to the offshore Sea Island Terminal via underground pipeline. The purpose of the tests was to assess the minimum bollard pull and number of tugs to safety berth and unberth when impacted by varying speeds of wind and current conditions on the VLCC and Suezmax size tankers in loaded and ballast condition.

**LLX Logistica, S.A. – Simulation of Terminal Sul (TX2) and Terminal Norte (TX1) (Now Prumo Logistica and Ferroport, SA)**

To validate the design of a new harbor off the Coast of Brazil, North of Rio de Janeiro associated with the proposed Acu Superport. LLX contracted with MITAGS, from a ship operations perspective, to program the new port and approach channels into the full-mission ship-handling simulator (FMSS). The TX2 port consists of a new approach channel that intersects with an existing channel (Canal de Acesso), an outer harbor design to handle Cape Size and Panamax coal carriers, and an inner harbor designed for general cargo, container, and roll on/roll off (RO/RO) carriers.

The TX1 project consists of an approach channel (Canal de Acesso), a turning and maneuvering basin and seven ship berths protected by an “L”-shaped breakwater connected to land by an elevated causeway. The harbor was designed to handle ships up to the size of Very Large Crude Carriers (VLCC), and Suezmax and Aframax petroleum tankers. In addition, the inner harbor will have a shipyard for building floating Production Storage and Offloading Platforms (FPSO) and other structures needed to support the offshore oil industry. This simulation allowed local shiphandling experts (pilots from the Port of Rio de Janeiro, Brazil) to pilot vessel models similar in size/displacement expected to call on the new port. The full-mission simulated environment provided an excellent tool to gather comments on the design’s impact on vessel movements, and to develop preliminary operational procedures for berthing and un-berthing vessels in the new port. MITAGS also provided an in-house shiphandling expert to assist, and provide comments. The new owners, Prumo Logistica, and Ferroport, SA, continue to use MITAGS-PMI for ongoing updates to the ports.

**Single Point Mooring Simulation (Dilhan Consultants, Chile)**

Dilhan Consultants select MITAGS-PMI to recreate a single point mooring casualty in Quintero Bay, Chile. The simulation included programming of the database, tankship and assist tugs. The Simulation was used to recreate the accident and to develop alternative procedures to reduce the chance of future events and to mitigate the consequences. Towing Solutions, Inc. partnered with MITAGS-PMI on this project.
Moffatt and Nichol, LLC – Simulation of Ports of Hamilton and Saint George, Bermuda

MITAGS-PMI completed a simulation of the Ports of Bermuda. The simulation is part of a larger project for the Government of Bermuda conducted by Moffatt and Nichol, LLC. MITAGS-PMI was selected as a sub-consultant for these tests to evaluate potential physical and operational improvements of the shipping channels to the designs of the Ports of Bermuda and to develop recommendations on future changes to accommodate the next generation of cruise ships.

Other Projects for the Ports of Bermuda

Over the last 15 years, The Department of Marine and Ports Services of Bermuda selected MITAGS-PMI to assist in the feasibility of new classes of cruise ships to call on the ports of Bermuda.

Other Projects for the Ports of Bermuda

Over the last 15 years, The Department of Marine and Ports Services of Bermuda selected MITAGS-PMI to assist in the feasibility of new classes of cruise ships to call on the ports of Bermuda. Cruise Ships programmed for these tests included:

- Quantum of the Seas (RCI Cruises)
- Divina (MSC Cruises)
- Millennium (Celebrity Cruises)
- Breakaway (NCL Cruises)
- Dream (Disney Cruises)
- Queen Mary II (Princess Cruises)

Port of Vancouver, British Columbia – Centerm Project

The purpose of this project was to determine safety margins (if any) necessary to accommodate a dolphin extension located on the DP World Centerm Berth 6 in the Vancouver, Canada harbor complex. The simulation runs reflected the British Columbia Pilots’ maximum operating and normal operating metrological and hydrographical conditions. Several large cruise ships and the Port of Vancouver were programmed into the FMSS for these tests.

PortMiami, Florida

PortMiami (Florida) desired a full-mission ship simulation study to determine if the larger cruise ships can safely transit past the ULCV container berths on a routine basis. PortMiami designated CH2M Hill, a coastal engineering firm, to contract for a full mission simulation study, which was provided by MITAGS. MITAGS-PMI cruise ship models were used to determine if these vessels can turn in the “Lummus turning basin,” and safely back into terminal J on a routine basis. Identification whether the presence of ULCVs at the container berths with the crane booms down would impede the transit of the cruise ships or interfere with the containerships. Recommendations for safe environmental limits (wind speeds / directions, and water currents) for berthing evolutions with and without assist tugs, were among the objectives obtained from the study.

The tests used the Waterway Simulation Technology (WST) water current models programmed for ULCV simulation studies. These models contained a various combinations of tidal and offshore conditions (20 different models).
**Bayport Container Terminal - Post-Panamax Container Ships Houston Ship Channel (Maersk Lines)**

The purpose of this study was to determine through ship maneuvering simulations whether these channel dimensions would be safe and efficient for each of the ships of Post-Panamax Containerships ranging in size from 8,000 to 15,000 TEU and if there would be operational limitations and special tug requirements for movements of these ships through these alternative plans.

**Seagirt Marine Terminal, Baltimore Maryland (GBA)**

GBA, an Engineering Firm, in partnership with the Maryland Port Authority and Ports America, selected MITAGS-PMI to program the approach channels and berthing areas of the Seagirt Marine Terminal. The terminal was upgraded to handle post-panamax containerships. The purpose of the project was to better define assist tug requirement in the expected upper environmental conditions and to make recommendations on dredging and navigational aid placements. The included programming of three classes of post-panamax containerships.

**New Container Terminal in the United States (Moffatt & Nichol)**

M&N selected MITAGS-PMI to conduct a study of a proposed new containership terminal. The terminal is being designed to handle post panama containerships. The study includes programming the area, water current models, and multiple post-panamax containerships. The location withheld at customer request.

**PortMiami, Florida**

PortMiami desired to conduct a full-mission ship simulation study to revise the “best practices” for handing the “A Class Maersk” ULCV Class (that is currently calling on PortMiami), and to develop tentative requirements for handling 14,000 TEU (MSC Kalina Class) and larger. The MITAGS-PMI, and Towing Solutions, Inc. (TSI), with support from Waterway Simulation Technology (WST) for the channel depth soundings and water current models, provided this simulation using one full-mission ship simulator (FMSS) conned by Biscayne Bay pilots, and up to two assist tug bridges, conned by Moran tug masters, integrated with the FMSS. The simulation study provided “revised” transit handling requirements for the “A Class Maersk” ULCV class that is currently calling on the PortMiami, guidance on the tentative requirements for handling 14,000 TEU ULCV (Kalina class) and larger, assessed the port’s existing tug capabilities for supporting ULCV transits and recommended assist tugs needed (number, type, power, and configuration) for routine transits. It also identified environmental operational limits for wind directions / speeds, and water currents velocities / directions for ULCV transits.
**Selected Operational Research Projects**

**ULCV CONTAINER SHIPS**

**The Port of Charleston, South Carolina**
The South Carolina Ports Authority in cooperation with the Charleston Branch, and the Docking Pilots, conducted a full mission simulation study at MITAGS-PMI to determine whether the next generation of ULCV “MSC Kalina” Class size containerships can safely transit to/from the Wando Welch terminal on a regular basis. Transits between Buoy “28”, and the terminal included meeting situations; berthing and un-berthing evolutions using multiple tugs as directed by the Port’s docking masters. The tests were used to assess the safety of the ULCV transit and the environmental operational limits for winds, currents, tides, and visibility. An additional objective was an assessment of the minimum tug requirements, using one assist tug simulator along with multiple auto tugs integrated with a full mission ship simulator.

**Port of Savannah, Georgia**
The Georgia Port Authority requested that the Savannah River Pilots and Docking Masters assess the feasibility of safe navigational transit of the ultra large container vessels (ULCV) in the existing channel configurations and depths of the Port of Savannah. The Pilots contracted with Towing Solutions, Inc. to conduct the Study and the MITAGS-PMI to support the project by providing one, 360-degree of view, full-mission ship simulator (FMSS) integrated with two assist tug bridges.

**Port of New York and New Jersey**
The Port of New York and New Jersey has completed a major navigational channel deepening and improvement project. The Port, through the Deep Draft Working Group of the Harbor Operations Committee, conducted a full-mission ship simulation study to develop the “best practices” for ULCV transits, to the major container terminals within the area including APM / Maher Terminals in Port Elizabeth, Port Newark Container Terminal, and GCT Bayonne LP Terminal (Global Marine). Waterway Simulation Technology (WST) programmed 48 different water current models that covered two different Hudson River flow conditions, and multiple times. The MITAGS–PMI study evaluated 14,000 TEU ULCV MSC Kalina Class to assist in the development of “best practices” for handling ULCV, and determine the feasibility and challenges to address for the 18,000 TEU Maersk Triple E ULCV Class. Towing Solutions, Inc. was contracted to observe tests and make recommendations related to the use of assist tugs.
Selected Operational Research Projects

ITB / BARGES / TUGS

THE HOUSTON SHIP CHANNEL, TEXAS

Vopak, North America contracted with MITAGS or simulated a new terminal in the confined waters of the Houston Ship Channel. This complex project included the integration of full ship bridges in order to assess the interactive effects of the ships meeting and passing in the channel with vessels moored on the berths on either side of the channel. The berthing arrangement also required simulating ITB, tugs and barges using berths between the terminal and the shoreline. The Houston Pilots, Kirby Corporation, and Waterway Simulation Technology participated in the simulation.

ATB NEW BUILD / TRAINING

With the impending delivery of a fleet of completely new series of ATB, Harley Marine selected MITAGS-PMI to both familiarize and train future operators on their new class of vessel. By accurately modeling the new ATB in the full mission tug simulator, with the inclusion of CFD data provided by naval architects to fine tune model of new ATB operators were able to successfully orient themselves to the new equipment and to reduce the overall risk inherent in operating a new class of vessel.

CITY OF VICTORIA, BRITISH COLUMBIA

Bridge Fendering and Transit Study. The Johnson Street Bridge project is studying the severity of forces on the bridge and its associated structures resulting from impacts during tug and barge transit through the waterway between the Upper and Lower Harbors passing through the new Johnson Street Bridge when open. The City of Victoria is also studying the best practices of conducting such tug and barge transits in order to reduce the probability of such impacts.

SAKHALIN REGION, RUSSIA

Maneuvering Study – Barge and Swell, and Bar Crossing, Tug Capacity Analysis. This Study was undertaken to dynamically evaluate the tug capacity required to safely transit and maneuver custom barge cargo to a proposed Temporary Offload Facility (TOF) in the Sakhalin region of Russia for a given set of limiting environmental conditions. This testing was undertaken at the request of Foss Teras Marine LLC to satisfy the contractual requirements of the Piltun Bay/Odoptu Stage II project, which includes the delivery of large processing modules transported on deck barges and maneuvered with working tugs.

Navy Region Northwest Submarine Base Bangor, Washington

Tug and Submarine Base Modeling, Maneuvering Study and Training. Model of entire region and piers surrounding Submarine Base Bangor, including security fence line and Hood Canal Bridge, along with Trident Submarine and tugs currently used by the assist team, for use in new tug/pilot training and submarine crew familiarization

ROBERT ALLAN LTD.

Tug Model Design using CFD Data Direct to Simulator Model. Using CFD data provided by RAL for existing tugs designed and built by RAL, MITAGS-PMI developed a simulator model of the tugs, and was able to validate accuracy of performance between the simulation model and the actual vessel.
**MR. WILLIAM ANDERSON – DIRECTOR MITAGS-PMI WEST**

“Bill” Andersen is the Director of PMI, as well as an APA approved Shiphandling/Bridge Resource Management (BRM) instructor. Mr. Anderson has more than twenty five years of strategic planning, operations, training, engineering, safety and emergency management, and managerial experience. Examples include: process engineering, project management, quality programs (TQM and Six Sigma), strategic planning, total quality management and education, training and instruction, nuclear plant operation, reactor safety, maintenance management, vehicle maintenance support, leadership training, counseling, security system assessment, training and implementation, extensive maritime operations, print publication sales, research, LAN administration and security, naval architecture and marine engineering. Mr. Anderson provides strategic and tactical leadership in managing the delivery of safety, quality and security systems for MITAGS-PMI.

**CAPTAIN HENRY F. ANDERSSON – CONSULTANT**

Captain Andersson began his career serving on ro-ro ships, container ships, and dry cargo vessels. In May of 1982, Henry advanced to the level of Master and began working with a variety of cruise line vessels, including Commodore Cruise Lines, Crown Cruise Lines (Effjohn International), and Cunard Crown Cruise Lines. In 1996, Henry was appointed to the position of Manager of Marine Operations with Disney Cruise Lines. Captain Andersson attended the Merchant Marine Academy in Gothenburg, Sweden. He also completed studies at the Nova University School of Business. Henry has a Swedish Unlimited Master Mariner License, as well as an Unlimited Master Mariner License for the Bahamas. He is fluent in multiple languages; including English, Swedish, Finnish, and Spanish. Captain Andersson is also a “proficient” communicator in Norwegian and Danish.

**CAPTAIN WAYNE BAILEY – CONSULTANT**

Captain Bailey has over thirty years of experience in the maritime industry with twenty years in piloting. Wayne is working as a Senior Pilot for the Bay and River Delaware. Wayne is considered to be one of the foremost experts on the development and implementation of Portable Piloting Navigation Systems (PPNS). Captain Bailey is also an active member of the American Pilots’ Association (APA) Navigation and Technology Committee and regular speaks on the subject. Captain Bailey holds both a State and Federal Pilotage License for the entire Delaware River. He also achieved a Degree in Marine Transportation from the U.S. Merchant Marine Academy (USMMA) in Kings Point, New York.

**CAPTAIN RICHARD BEADON – CONSULTANT**

Captain Beadon is one of today’s leading experts in Bridge Resource Management (BRM). He specializes in the development of custom simulation training programs including the development of Senior Officer BRM Assessment Programs for ConocoPhillips and Carnival Cruise Lines. Captain Beadon’s previous employment includes the following:

- Director of Seamen’s Church Institute/Center for Maritime Education.
- Associate Director of Continuing Education for the U.S. Merchant Marine Academy (USMMA).
- Maritime Operations and Safety Department Head for the College of Maritime Studies.
- Head of the Fiji College for Maritime Studies/United Kingdom Ministry of Overseas Development.

Captain Beadon holds an Unlimited Masters License, as well as a 1st Class Pilotage License. He has received Certificates in Management and Administration from the United Kingdom’s Department of Education and Science and a Technical Teaching Certificate in Maritime Education from the University of London.
Captain Robert Becker – Director of Business Development, MITAGS-PMI

Captain Becker has held the position of Business Development Manager at MITAGS since July of 2004. Prior to his employment with the Institute, Bob sailed as Master with Sea-Land Services and U.S. Ship Management and for decades served in other capacities onboard IOMM&P contracted vessels. Bob has extensive experience on chemical tankers, roll-on/roll-off vessels, break bulk ships, containers, and bulk ships. Bob holds a U.S. Coast Guard (USCG) Master’s License, Oceans, Any Gross Tons and a Degree in Marine Transportation from the U.S. Merchant Marine Academy (USMMA) in Kings Point, New York.

William “Allen” Birch – Consultant

Allen Birch came to MITAGS-PMI after a 20 year career in the United States Coast Guard. While in service, he was an officer on US Coast Guard Cutters, an instructor at Quartermaster “A” school, Nautical Science instructor to USCG officer candidates, Senior Watch Officer in Vessel Traffic Service New York, and Deputy of Cutter Forces, Atlantic Area. Allen has a Master of Education, Education Administration and is in the process of achieving a Master of Business Administration from Strayer University. He is IALA certified to teach the USCG-VTS course, and also instructs Electronic Navigation and ECDIS to pilots. At MITAGS-PMI, he is instrumental in simulation projects as a simulator operator, responsible for setting up, modifying, and running simulation scenarios from the Transas database. He is the OZ behind the curtain of our simulators during operational research studies. Captain Birch holds a USCG Master of 100 ton, near coastal license.

Colleen Black – Visual Modeling

Ms. Black is responsible for programming hydro-dynamically accurate geographic area database that include detailed visual scenes, underwater bathymetry, RADAR and ECDIS images. Colleen works in the MITAGS-PMI Simulation Engineering Department, and provides technical support for the simulation systems and project management services. She has a Master’s of Science Degree in civil, coastal, and ocean engineering.

Captain Gregory Brooks – Consultant

Captain Brooks is the principal of Towing Solutions® Inc., whose mission is dedicated to the improvement of the overall safety and operational effectiveness of tug escort systems and general towing operations. He strives to work to improve the knowledge base among tug operators on the physics behind towing operations and openly shares the expertise gained over a lifetime in this industry. Captain Brooks is considered to be one of the leading experts on escorting and escort tug technology in the world today.
Mr. Hao Cheong – Director of Simulation Engineering

Mr. Cheong is MITAGS’ Director of Simulation Engineering and has direct oversight of both the Information Technology (IT) and Simulation Engineering Departments. He is truly an integral part of MITAGS’ in-house simulation team.

Hao has extensive software experience and is proficient in computer programming and systems. Mr. Cheong’s detailed knowledge allows him to provide engineering design and technical support for MITAGS’ computer network systems. His other responsibilities include system design, model development, and engineering support for all maritime-related simulation systems at the Institute.

Hao holds a Master of Engineering Degree in Computer Science from Loyola College in Baltimore, Maryland, a Bachelor of Science Degree in Information Management Systems from the University of Maryland, an Associate’s Degree in Data Processing from Essex Community College in Baltimore, Maryland, as well as certification as a Microsoft Professional for the NT Operating System.

Captain M. “Scott” Conway - Navigation Systems, License Advancement – Department Chair

Captain Conway began his seagoing career after obtaining a Bachelor of Science Marine Transportation, Texas A&M University in 1984. He continued up the ranks to sailing Master.

“Scott” managed the Department of Deck Officer Training at the Calhoon MEBA School for five years; after which, he was a sales manager for Transas USA, Inc., Marine Technologies, serving as a consultant to maritime training schools. He conducted maritime instructor training at the operational and management level including onboard manufacturer training of vessel bridge teams and pilot associations in the operation of electronic charting systems. His clients included MSC, NOAA and the U.S. Coast Guard. Now at MITAGS, he is USCG approved to teach dozens of courses and Chairs the Navigation Systems and License Advancement Programs. Captain Conway has provided his subject matter expertise to a number of professional maritime organizations.

Captain Gerold “Gerry” Cooper – Consultant

Captain Cooper holds a U.S. Coast Guard (USCG) Master’s License, Oceans, any Gross Tons. He serves as a Shiphandling Consultant at the Institute. Captain Cooper has been actively instructing for well over ten years. During this time, he also served as a Pilot and Mooring Master for American Eagle Tankers in Houston, Texas. Additionally, Captain Cooper was a Panama Canal Pilot for well over twenty-five years gaining extensive knowledge, skills and experience with the Container Ships, Barges, Warships, Ice Breakers, Passenger Ships, Dead Ships under Tow, Research Vessels, Drill Ships, Submarines, Tankers, Supply Vessels, Bulk Carriers and Tugs.

Captain Cooper earned a degree from New York State Maritime College in Fort Schuyler, New York and Texas Maritime Academy in Galveston, Texas.

Captain Michael Cosenza – Consultant

Captain Cosenza commanded numerous U.S. Coast Guard Cutters, taught Seamanship and Navigation at the U.S. Naval Academy, was the Chief of Surface Operations and Waterways Management, and the Chief of Office of Military Personnel during his service in the United States Coast Guard. He holds an Unlimited Oceans Master’s License, a Bachelor of Marine Science from the U.S. Coast Guard Academy, a Master’s Degree in Marine Affairs from the University of Rhode Island, and a Master’s Degree in Homeland Security from the Naval Postgraduate School in Monterey, California. MITAGS-PMI utilizes his array of skills as an instructor and as a simulator operator.
MITAGS-PMI TEAM AND SUBJECT MATTER EXPERTS

FOLLOWING IS AN ALPHABETICAL LIST OF KEY STAFF MEMBERS, INSTRUCTORS, AND CONSULTANTS:

MR. ERIC P. FRIEND – DIRECTOR OF MITAGS-PMI EAST

Mr. Friend serves as MITAGS’ Director of Training. He oversees the day-to-day operation of the school. He is recognized as a leading expert in the operation of advanced simulation systems for training. Eric serves on the U.S. Delegation for the International Association of Lighthouse Authorities (IALA). Mr. Friend has been extensively involved in the development of many state pilot training programs, including Vessel Traffic Management and Electronic Piloting Programs for the Crescent River Port Pilots Association. He is also responsible for the successful development and implementation of custom courses for the following groups: British Columbia, Virginia, Tampa, Houston, Sandy Hook, Great Lakes, and Delaware. Eric holds a Master 1,600 Ton license and a Second Mate Unlimited license. He also possesses a Bachelor of Science Degree in Marine Transportation from the U.S. Merchant Marine Academy. In addition, Mr. Friend’s Master’s degree is in Management with a concentration in organizational leadership. He had a commission in the U.S. Naval Reserves for approximately 12 years before receiving an honorable discharge.

CAPTAIN GERALD “JERRY” HASSELBACH – CONSULTANT

Captain Hasselbach’s shipboard career began in 1969. He advanced through the ranks to the level of Master. Throughout his time at sea, Captain Hasselbach gained valuable experience with many types of vessels; including tankers, military vessels, break-bulk ships, container ships, and passenger vessels. After sailing as Captain with American President Lines, the organization advanced him to Assistant Marine Superintendent. In addition, Captain Hasselbach worked as a private Security Consultant where he conducted extensive Vessel Security Assessments and assisted other organizations with the execution of Vessel Security Plans. Prior to employment with MITAGS, Jerry also briefly served as Program Director for the Sailor’s Union of the Pacific in Piney Point, Maryland. Captain Hasselbach received a Bachelor of Science Degree in Marine Transportation from the State University of New York Maritime College. In addition, he also possesses a Doctor of Jurisprudence Degree from the University of California - Hastings College of Law and is a retired Captain with the U.S. Naval Reserve.

CATHERINE “CATIE” A. HORN – SIMULATOR OPERATOR

Catie came to MITAGS-PMI in 2009, shortly after graduating from the United States Merchant Marine Academy with a Bachelor of Science in Marine Transportation, and an Unlimited Third Mate’s license. Since her deck cadet days, she has gained shipboard experience on the Great Lakes and Oceans. She is approved by the USCG National Maritime Center as an instructor in over two dozen courses at MITAGS-PMI. Ms. Horn has been proven as skilled simulator operator, adept at presenting and any simulation situation from the Transas database. As Ms. Horn continues to acquire seatime toward her license upgrade, MITAGS-PMI is fortunate to utilize her talents while she is ashore.

MR. RICHARD JEWART – RESEARCH AND MODELING DEPARTMENT HEAD

Mr. Jewart oversees and develops the Transas visual graphics and programming for PMI. He has been involved in the development of many databases. Richard has broad-based skills in all major engineering disciplines; including civil, mechanical, architectural, structural, and electrical. He also has extensive experience with 3-D drafting and modeling. Richard has well over twenty-five years of work experience in the areas of engineering and related fields. Mr. Jewart has also attended a number of colleges and is a veteran of the United States Air Force.
MITAGS-PMI TEAM AND SUBJECT MATTER EXPERTS

FOLLOWING IS AN ALPHABETICAL LIST OF KEY STAFF MEMBERS, INSTRUCTORS, AND CONSULTANTS:

CAPTAIN EMYLN JONES – CONSULTANT

Captain Jones’ knowledge encompasses all aspects of tankship operations, principally Very Large Crude Carriers (VLCC). His mooring master experience includes Lightering vessels of up to 550,000 deadweight tons into vessels of 100,000 deadweight tons, piloting vessels for lightering operation, maintaining lightering equipment and documenting lightering operations. He has been a Pilot Loading Master, Marine Superintendent/Surveyor, and Salvage Master. Captain Jones has a B.S. in Marine Transportation and advanced to Commander in the British Royal Navy Reserve.

CAPTAIN KENNETH D. KUJALA – CONSULTANT

Captain Kujala has more than thirty years of maritime experience including as new vessel Trials Master for Austal USA, Director of Marine Operations for Hawaii Super Ferry, Master of High Speed Vessels with Hornblower Marine Services, Ships Captain/Master with Sabine Transportation and Deputy Director of U.S. Navy Fleet Support. Ken’s seagoing experience also includes Cruise Ships, Tankships, and Research Vessels. He has developed and executed shipboard training programs and served as an Analyst with Naval Intelligence. Captain Kujala earned a Bachelor of Science in Meteorology and Oceanography from the State University of New York Maritime College and served in the United States Navy and Naval Reserves.

CAPTAIN RICHARD MICHAEL – CONSULTANT

Captain Michael’s maritime experience spans nearly fifty years. Throughout his career, he has been involved in the training of mariners. Captain Michael has served as a marine harbor pilot, tug master and owner/operator of fishing trawlers. He is NMC approved as an instructor in Basic and Advanced Shiphandling, and as an assessor for Officer in Charge of a Navigation Watch candidates. He is licensed by the USCG as a pilot any gross tons, Master of Steam and Motor Vessels 1600 tons, and Master of Towing Vessels, East Coast and Western Rivers.

MR. GLEN PAINE – EXECUTIVE DIRECTOR OF MITAGS/PMI/CCMIT

Mr. Paine has been the Executive Director of the Maritime Institute of Technology and Graduate Studies (MITAGS), the Pacific Maritime Institute (PMI), and the Conference Center at the Maritime Institute (CCMIT) since 1999. During his tenure, MITAGS and PMI have become the leading maritime training and simulation centers in the United States. To date, MITAGS and PMI provide training to eighty percent (80%) of the State Pilot associations. Glen has received an “Outstanding Professional Achievement Award” and a Meritorious Service Award from the U.S. Merchant Marine Academy (USMMA). He is the recipient of a Public Service Commendation awarded on October 7, 2011, by the Department of Homeland Security, United States Coast Guard, for his contributions in improving maritime safety and merchant mariner training. Mr. Paine received the award for his service on the U.S. Delegation for Standards of Training, Certification and Watchkeeping for Seafarers (STCW) Sub-Committee to the International Maritime Organization and for his technical expertise provided during the Comprehensive Review of the International Convention on STCW. He has also been featured in both the 2002 and 2007 editions of the Maritime Executive. Mr. Paine serves as a member of the U.S. Coast Guard Merchant Marine Personnel Advisory Committee (MERPAC) and as the 2011 President of the Ship’s Operations Cooperative Program (SOCP). Glen previously worked as the Operations Manager for the Pilots’ Association for the Bay and River Delaware. He was also a Division Director at MITAGS. Prior to that, Glen was a Department Head at MITAGS. He taught a wide range of subjects, including Radar, Electronic Navigation, Automatic Radar Plotting Aids and Weather. Glen holds a Master’s Degree in General Administration from the University of Maryland. He also possesses an undergraduate degree from the U.S. Merchant Marine Academy and an Unlimited Oceans Chief Mate’s license.
MITAGS-PMI TEAM AND SUBJECT MATTER EXPERTS

FOLLOWING IS AN ALPHABETICAL LIST OF KEY STAFF MEMBERS, INSTRUCTORS, AND CONSULTANTS:

CAPTAIN WILLIAM J. SKAHAN – CONSULTANT

Captain Skahan has been sailing on the deck of Clean and Chemical Tankers since 1975, and exclusively as Master from 1986 to 2010. During that period he also consulted in different aspects of the maritime industry, especially in the simulation areas of Emergency Shiphandling, Bridge Resource Management and Piloting. Captain Skahan’s skill and ability to impart the knowledge of handling and operating tankships proves invaluable during shiphandling simulation scenarios. He holds an Unlimited USCG Master’s License and earned B.S. in Meteorology and Oceanography from the State University of New York Maritime College.

CAPTAIN JEFF SLESINGER – CONSULTANT

Captain Slesinger’s expertise stems from his extensive experience as Maritime Training Consultant, Director-Safety & Training, Port Captain and Vessel Master. Captain Slesinger formed Delphi Maritime, LLC® to develop and implement marine safety management systems, crew development and vessel training programs, both onboard and simulator based, and to conduct vessel and management audits and surveys. He has developed tug-handling, bridge resource management, and seamanship training programs, and authored two books—Shiphandling with Tugs and ASD, Tugs-Learning to drive a Z-drive. As a master of towing vessels his expertise encompasses all aspects of harbor, coastal and ocean towing throughout Pacific Coast and Alaskan waters. Captain Slesinger has made contributions to numerous professional towing committees, as both chairperson and participating member.

CHIEF ENGINEER CHARLES G. SNYDER – CONSULTANT

Charles Snyder, a chief engineer, specializes in marine propulsion plants, and the carriage of Liquefied Natural Gas. From his education and personal shipboard experience, he takes the lead in the MITAGS-PMI LNG training for the USCG approved Tankship Liquefied Gases Person-In-Charge course, as well as LNG safety and training for Terminal Personnel, Pilots, Marine Chemists, and USCG Inspectors. He has participated in the Gastech conference in 2001, 2005, 2007 and served as a consultant for Singer Link on the development of a LNG Cargo Handling Console for an Energy Transportation Corporation simulator. Charlie also teaches courses for the ILA Carriers Container Council, Inc., including Container Refrigeration and Diesel Electrical Generators. In additional to his USCG Chief Engineer, Unlimited Horsepower License, he holds certifications from the state of Maryland as a First Grade Engineer, a Refrigerant Transition and Recovery Universal Endorsement from the Environmental Protection Agency, and Certified Control Systems Technician from the Instrument Society of America. Charlie is a veteran of the United States Marine Corp.

CAPTAIN JONATHAN A. STEINBERG – CONSULTANT

Captain Steinberg has been on the deck and in the engine room on tugs since 2008, ultimately becoming a relief Master for Moran Baltimore. He operates tractor tugs in the Baltimore Harbor, docking and undocking, escorting and assisting ships, tugs, and barges in and around the Baltimore Harbor, the Delaware River, and the Chesapeake Bay. At MITAGS-PMI, he performs those functions from the Tug Bridge of a simulator. Captain Steinberg holds a U.S. Coast Guard licenses as Master of 1600 Ton Inland and a Master of Towing Inland. His career path at sea was a true change in course for him. He earned a Bachelor of Arts in Political Science and Public Policy from Saint Mary’s College of Maryland in 1994 and a Juris Doctor Degree from Emory University School of Law in Georgia in 1998, becoming a member of the Maryland Bar Association in 1999, prior to progressing to Tug Master.

CAPTAIN STEPHEN P. THALHEIMER – CONSULTANT

Captain Thalheimer’s seagoing career began in the United States Coast Guard. He pursued the career graduating from Maine Maritime Academy (1990) with a B.S. in Marine Transportation. Since 1992, Steve has served as Tug Master for Moran Towing. When on terra firma, MITAGS-PMI makes use of his operating skills in the Tug Bridge Simulator, which works in tandem with the Full Mission Simulator, by presenting him with a gamut of ship escort and assist scenarios, including emergency situations, and heavy weather. He is approved as an instructor in able seaman, radar, and basic training by the USCG’s National Maritime Center. Captain Thalheimer holds a USCG 1600 ton Master of Oceans license endorsed as First Class Pilot of Steam or Motor Vessels of any gross tons upon the Patapsco River.
MR. GREGG TRUNNELL – DIRECTOR OF BUSINESS DEVELOPMENT, MITAGS-PMI

Mr. Trunnell is the Director of Business Development for MITAGS-PMI. Gregg opened the Pacific Maritime Institute after an eight year shipping career working primarily on tankers for West Coast Shipping. Today, Gregg develops and executes strategies for lead generation, sales, pricing, and all other matters relating to revenue generation. Gregg is one of the driving forces in the development of the work ethic, culture and values of the sales and business development group. Through personal example, he helps establish the style and approach which will characterize the Company’s dealings with the marketplace. In addition, to Business Development, Gregg is the founder of the Workboat Academy. The Workboat Academy, recruits trains and delivers qualified and competent mariners to the Workboat Industry. http://www.workboatacademy.com. Gregg is a graduate of the California Maritime Academy (CMA), where he earned his degree in Business Administration and Marine Transportation. He also holds a Chief Mate, Unlimited Oceans, license and a 3,000 Gross Tons Master’s license.

WATERWAY SIMULATION TECHNOLOGY, INC.

Waterway Simulation Technology, Inc. (WST) was formed as a Mississippi S-corporation in 1997. The Principal Investigators (PIs), Mr. Chris Hewlett and Dr. Larry Daggett, have nearly 80 years of combined experience in all aspects of navigation design studies including systems analysis simulation modeling, development and implementation of numerical models of ship maneuvering behavior physics and hydrodynamics, study design and management, database development, analysis of results, and reporting and presentation of study results. Also, the PIs have extensive experience consulting with various private and governmental organizations involved in the marine transportation industry including pilot organizations, state and municipal port authorities, major engineering consultants, the Panama Canal Commission, U.S. Army Engineer districts, U.S. Coast Guard offices, St. Lawrence Seaway Management Corporation, Canadian Transportation Development Center, and commercial shipping and towing companies. Dr. Daggett was responsible for writing or overseeing updating the Corps of Engineers’ (COE) Engineering Manuals and Regulations concerning navigation project hydraulic design. Because of this long experience, WST has detailed knowledge and ability in the management and technical application of state-of-the-art navigation study processes and methods. Since both PIs are former employees of the USAE Waterways Experiment Station (WES) in Vicksburg, Mississippi, WST possesses unsurpassed direct experience with numerous navigation projects across the country. Dr. Daggett also serves as expert witness in marine cases, was recently elected as Diplomate, Navigation Engineering, and worked with the Operations Department of the Panama Canal Authority to organize and has chaired the Maritime Navigation Advisory Board for the ACP for the past six meetings of the MNAB. Dr. Daggett is serving on an Incident Review Committee by invitation of the Jefferson & Orange County Board of Pilot Commissioners and has contributed to the preparation of a report to the Board on the Eagle Otome Incident at Port Arthur, TX.

ROB WEINER – NAVAL ARCHITECT AND MARINE ENGINEERING

Mr. Weiner is responsible for programming high fidelity hydrodynamic ship models. Rob works in the MITAGS-PMI Simulation Engineering Department, and provides technical support for the simulation systems and project management services. Rob has a B.S.E. in Naval Architect and Marine Engineering from the University of Michigan College of Engineering.
WST CORPORATE EXPERIENCE AND CAPABILITIES

WST is a consulting engineering firm dedicated to improving navigation safety and efficiency through the improvement of navigation channel design and operation. WST performs field measurements of ship maneuvering using highly accurate DGPS equipment, including measurement of vertical ship motions, e.g. ship squat. WST applies numerical models of current flow in harbors for independent navigation analysis or for the development of input to simulator systems. Also, the company performs expert witness services and marine accident reconstruction, investigation, analysis, which can be supported by field measurements and/or simulation modeling. WST performs engineering design studies for harbors and waterways, including the analysis of navigation conditions for channel design and improvements, port development, accident investigation, and operational policy and decisions. WST has developed a model to analyze the impacts of passing traffic on moored ships and tows using the same simulation models used for channel design purposes. Navigation environments include inland waterways and harbors, rivers, and coastal ports and harbors.

WST has signed a Cooperative Research Development Agreement (CRDA) with WES to use their facilities during channel design studies or hydraulic research. This includes both physical and simulation modeling facilities. WST also has a working relation with the Maritime Institute for Technology and Graduate Studies (MITAGS) for joint maritime studies, including engineering project studies and training. WST also is the North American agent for O’Brien Maritime Consultants, International for their Dynamic Under Keel Clearance (DUKC) system. This system is designed to increase port efficiency and safety by more accurately predicting under keel clearances for ships entering and leaving the port and optimizing ship loads and sailing times by using real-time information on tides, waves, etc. WST also has developed its own simplified method for computing real-time ship squat prior to and during channel transits.
### MITAGS-PMI SELECTED CLIENT REFERENCES

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Maritime professionals from around the globe use our simulators to help solve challenging maritime operational research problems. The dramatic increase in vessel size parallels the complexity of their operations. Prior to investing in a project, our clients can safely navigate transits by simulating vessel type, local environmental conditions, channel dimensions, and tug procedures. Our network of simulator systems is equally used for mariner training exercises and in the evaluation of their skills.

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