



MITAGS

MARITIME INSTITUTE OF TECHNOLOGY
AND GRADUATE STUDIES



SIMULATION CAPABILITIES AND FACILITIES GUIDE

“What’s New at MITAGS?”

There has been an explosion of maritime simulation projects as the world’s economy puts the COVID Pandemic into the rear-view mirror. Many industry sectors are expanding operations, and / or training replacements as the “baby boomer” generation heads into retirement. MITAGS is using its substantial simulation resources to train the next generation of mariners, and to support full-mission bridge navigation studies.

Industry Sectors

The LNG Industry is using full-mission bridges (FMB) integrated with live tug bridges ensuring safe mooring practices for FLNGs and shuttle vessels. LNG bunkering vessel are developing the “best practices for the ports of Savannah, New York, PortMiami, Kingston, and others. The container industry is using simulation for ensuring the ports can safely handle largest ULCVs. Coastal Engineers are modeling bridge replacements and vessel transits during construction. The Offshore Wind Farm developers are modeling transits of the construction vessels from the load ports to the wind farms. Finally, as cruise ships continue increase in size and displacement, simulation studies are determining whether safe transits can be achieved on a routine basis, and under what conditions.

In order to keep up with the demand, MITAGS is investing in upgrading its simulation capabilities to ensure clients and students receive the highest quality levels. Upgrades include:

- Upgrade of FMB projection systems at both campuses. These upgrades enhance the visual acuity and realism of the simulation. Bridge #2 at MITAGS East upgrade included eight laser projectors (23,000 lumens, 4k) to provide one of the most realistic presentations in the business today.
- Dynamic Positioning Lab – four class B and eight class C stations for pilot and crew training.
- Virtual Reality – new hardware and visuals in the All-Weather Navigation Simulator (six units and new instructor station).
- Installation of waterjet controls and development of curriculum to support the training for the Offshore Wind Crew Transfer Vessels (CTV), and other vessel equipped with waterjet propulsion systems. .
- Programming of new vessel types (LNG Bunkering, ULCVs CTVS, and WTIV) to support training and navigation feasibility studies.
- Use of the “ROPES” program for validating interaction forces.
- GWO Basic Training Labs for the Offshore Wind Industry.

Whether training or operational research, MITAGS is committed to providing the very best in maritime ship simulation. We hope to see you soon at one of our campuses!

Warmest Regards,

Eric Friend

Executive Director, MMP-MATES, MITAGS, Inc.

Research on Passing Effects on Ships (ROPES®)

For studies where high confidence levels of the simulated forces between passing / moored vessels are critical, MITAGS uses the “ROPES” Program. This software provides an independent methodology to validate the passing forces generated by ship simulator. “ROPES®” is a software program developed by MARIN's Joint Industry Project "Research on Passing Effects on Ships." It was developed, as a tool, to determine passing vessel forces in open or in restricted waters. Results of passing vessel forces and moments are exported as surge, sway, heave, roll, pitch, and yaw.

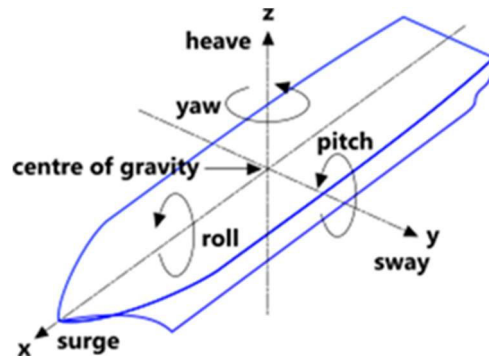
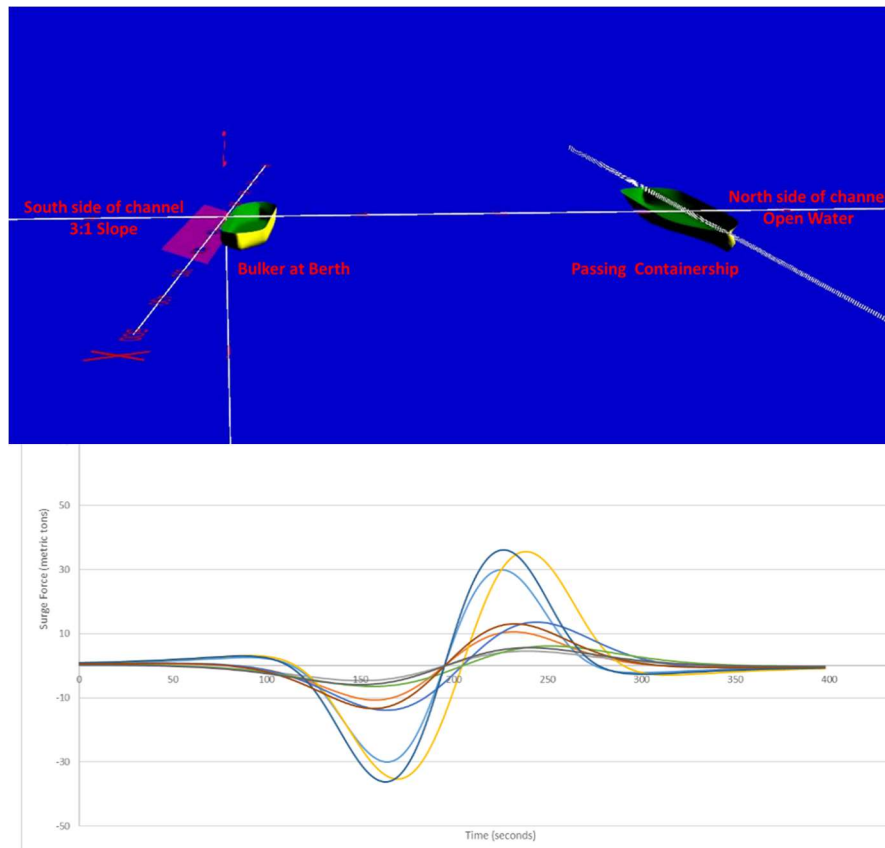


Diagram of the six degrees of freedom simulated by ROPES – surge, sway, heave, roll, pitch, and yaw



ROPES® Screen Capture and Forces Graphs



MITAGS

MARITIME INSTITUTE OF TECHNOLOGY
AND GRADUATE STUDIES

OUR VISION

We influence improvement through community relationships and chart the course of excellence in maritime education, training and simulation.

OUR MISSION

Driving excellence and safety to strengthen our communities.

VALUES *and* GUIDING PRINCIPLES

PEOPLE FIRST

Be of service.
Listen and respond with compassion.
Create a safe space for all.
Your well-being is important to our mission.

INNOVATING TO EXCEL

Take chances, be flexible and keep learning.
Embrace creativity and drive change.

CONTINUOUS IMPROVEMENT

Be smarter every day.
Add value through initiative.

INTEGRITY AND ACCOUNTABILITY

Be responsible for our impact.
Think critically and challenge respectfully.

MITAGS is the Primary Training Facility for the International Organization of Masters, Mates and Pilots (IOMM&P)



Revised 2021

ABOUT MITAGS

MITAGS, Inc. is a 501(c) 3 non-profit subsidiary of The MM&P Maritime Advancement, Training, Education, and Safety Program “MM&P MATES Program,” DBA the Maritime Institute of Technology & Graduate Studies (MITAGS).

The MM&P Mates Program is a 501(c)3 Trusteeship. The International Organizations of Masters, Mates and Pilots and the leading U.S. Flag ship operators in 1968, founded the “MATES Program”.

MITAGS serves to enhance safety and professionalism in the maritime industry through internationally-recognized leadership, education, and operational research programs.

MITAGS East and West Coast Campuses are the primary training and simulation centers for the MMP professional deck officers and pilots.

STATEMENT OF NON-DISCRIMINATION

MITAGS admits students of any race, color, national origin, and ethnic origin to all the rights, privileges, programs, and activities generally accorded or made available to students at the school. It does not discriminate on the basis of race, color national origin, and ethnic origin in the administration of its educational policies, admission policies, scholarship and loan programs and athletic and other school-administered programs. In addition, it does not discriminate against students on the basis of religion (creed), sex, sexual orientation, gender identity or expression, age, marital status, veteran/military status, genetic information, political ideology, citizenship or immigration status, disability (sensory, mental, physical or pregnancy-related) or the use of a trained dog guide or service animal by a person with a disability, or any other characteristic protected by federal, state or local law. MITAGS extends these principles of non-discrimination to all of its activities and operations and to all staff, interns, volunteers, contractors, vendors, and clients.





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MARITIME INSTITUTE OF TECHNOLOGY
AND GRADUATE STUDIES

TABLE OF CONTENTS TO MITAGS SIMULATION CAPABILITIES AND FACILITIES GUIDE

About MITAGS	5
Introduction to the Maritime Institute of Technology & Graduate Studies CampusesAbout MITAGS	5
MITAGS EAST LOCATION AND GENERAL FACILITY DESCRIPTION	8
MITAGS WEST LOCATION AND GENERAL FACILITY DESCRIPTION	9
MITAGS WEST SIMULATION FACILITIES.....	10
MITAGS EAST SIMULATION FACILITIES	11
All-Weather Navigation (AWN) Simulator	14
Introduction Standard Simulation Specifications.....	16
Reporting Capabilities.....	17
Vessel Modeling Introduction.....	18
Database Development	19
Methodology for Database and Project Development	20
Current Modeling	22
Sea & Swell Parameters	22
Examples of Custom Simulation and Training Programs	23
Selected Operational Research Projects	25
Offshore Wind Industry	25
LNG Carriers	26
New Fortress Energy (NFE) – FLNG-FSRU	26
LNG Bunker Operations	28
Bulk Carriers	29
Tank Vessels	30
Tug Hull Design	31
Cruise Ships	32
ULCV Container Ships.....	33
ITB / Barges / Tugs	35
MITAGS TEAM AND SUBJECT MATTER EXPERTS.....	36
MITAGS Selected Client References.....	40

INTRODUCTION TO THE MARITIME INSTITUTE OF TECHNOLOGY & GRADUATE STUDIES CAMPUSES



MITAGS

MARITIME INSTITUTE
OF TECHNOLOGY AND
GRADUATE STUDIES

MITAGS-East & MITAGS-West

The Maritime Institute of Technology and Graduate Studies (MITAGS), East and West Coast Campuses 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 is 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 General Experience

MITAGS has been delivering a wide range of maritime training and simulation programs for over fifty 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 is among the leading providers of continuing education and training services for state pilots, ship Masters and deck officers.

MITAGS has been 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" award for its two-year, registered apprenticeship program for the workboat industry.

MITAGS was designated by MARAD as a 2021 – 2024 Center of Excellence for Domestic Maritime Workforce Training and Education (CoE).

MITAGS has also pioneered in the application of simulation for objective assessment of bridge watch-standing skills (NSAP®).

MITAGS has built on our over 50 years of knowledge to provide sophisticated simulation services with specialties in the areas of custom full-mission ship simulation databases and models for operational research. Today, we leverage our collective strengths by sharing curriculum, instructors/staff members, technical knowledge, and a common set of goals across campuses.

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.

Certifications

MITAGS' training is held to a high standard. Our STCW-Operational and Management level Courses are approved by the U.S. Coast Guard. 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 Workforce Training and Education Coordinating Board provide oversight.

The MITAGS East campus encompasses over forty (40) acres. The 300,000 square-foot facilities include an on campus hotel with 232 hotel rooms and conference facilities.

PERSONAL AMENITIES AND CONFERENCE RESOURCES

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



MITAGS EAST LOCATION AND GENERAL FACILITY DESCRIPTION

MITAGS East is located less than five (5) miles from the Baltimore-Washington International Thurgood Marshall Airport (BWI). 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-degree full mission bridge simulators, and four purpose built assist tug simulators that can be integrated into the same exercises. Six or more part task simulators are available for integration.
- ▶ Interactive Radar / Automatic Radar Plotting Aids, Vessel Traffic, and Electronic Chart simulators.
- ▶ Global Maritime Distress and Safety Systems (GMDSS) Communications Lab.
- ▶ Vessel Traffic System (VTS) Watchstander Training Lab. ECDIS, Stability, and LNG Training Software.
- ▶ Wärtsilä ERS 5000 Engine Room Simulator.
- ▶ Emergency Medical Lab.
- ▶ 16-station networked computer Lab.
- ▶ Cryogenic control room simulator (LNG/LPG/NH3).
- ▶ MITAGS has specially equipped classrooms that allow remote viewers to interact with in-person attendees. This allows for virtual viewing from remote locations.



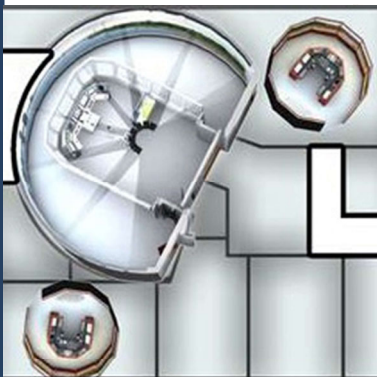
MITAGS WEST LOCATION AND GENERAL FACILITY DESCRIPTION

The west coast subsidiary of Maritime Institute of Technology and Graduate Studies, (MITAGS West) has its campus in Seattle, Washington.

MITAGS West is located approximately twenty (20) minutes from Seattle Tacoma (SEA-TAC) International Airport.

MITAGS West offers the following onsite technology and training support facilities:

- ▶ 240° DNV Class A Full-Mission Bridge Simulator
- ▶ 300° Full-Mission Tug Bridge Simulator
- ▶ 300° Full-Mission Workboat Bridge Simulator
- ▶ 12 Radar / Automatic Radar Plotting Aids (ARPA) / Electronic Chart Display and Information Systems (ECDIS) Stations in the Computer Lab.
- ▶ Regulatory and Custom Live Firefighting aboard the 125-foot ship mock-up, the M/V Fire Dragon
- ▶ Global Maritime Distress and Safety Systems (GMDSS) Communications Lab
- ▶ 2-Simulation Debriefing Rooms
- ▶ 12-Conference / Class Rooms
- ▶ Student Service Center
- ▶ Complimentary Parking





MITAGS WEST SIMULATION FACILITIES

SEATTLE, WASHINGTON

240° Full-Mission Shiphandling Simulator 1

MITAGS West's Full-Mission Shiphandling Simulator 1 (SHS 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 2

Simulator 2 (SHS 2) is a Full-Mission Towing system that utilizes a 300° horizontal field of view and a 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

300° Workboat Bridge Simulator 3

The 300° Workboat Bridge 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.

MITAGS EAST SIMULATION FACILITIES

BALTIMORE-WASHINGTON AREA, MARYLAND

MITAGS East training center offers two (2) Full-Mission Shiphandling Simulators, SHS 1 and 2, four (4) Tug Bridge Simulators, SHS 3, 4, 5, 6, and six (6) Part-Task Simulators.

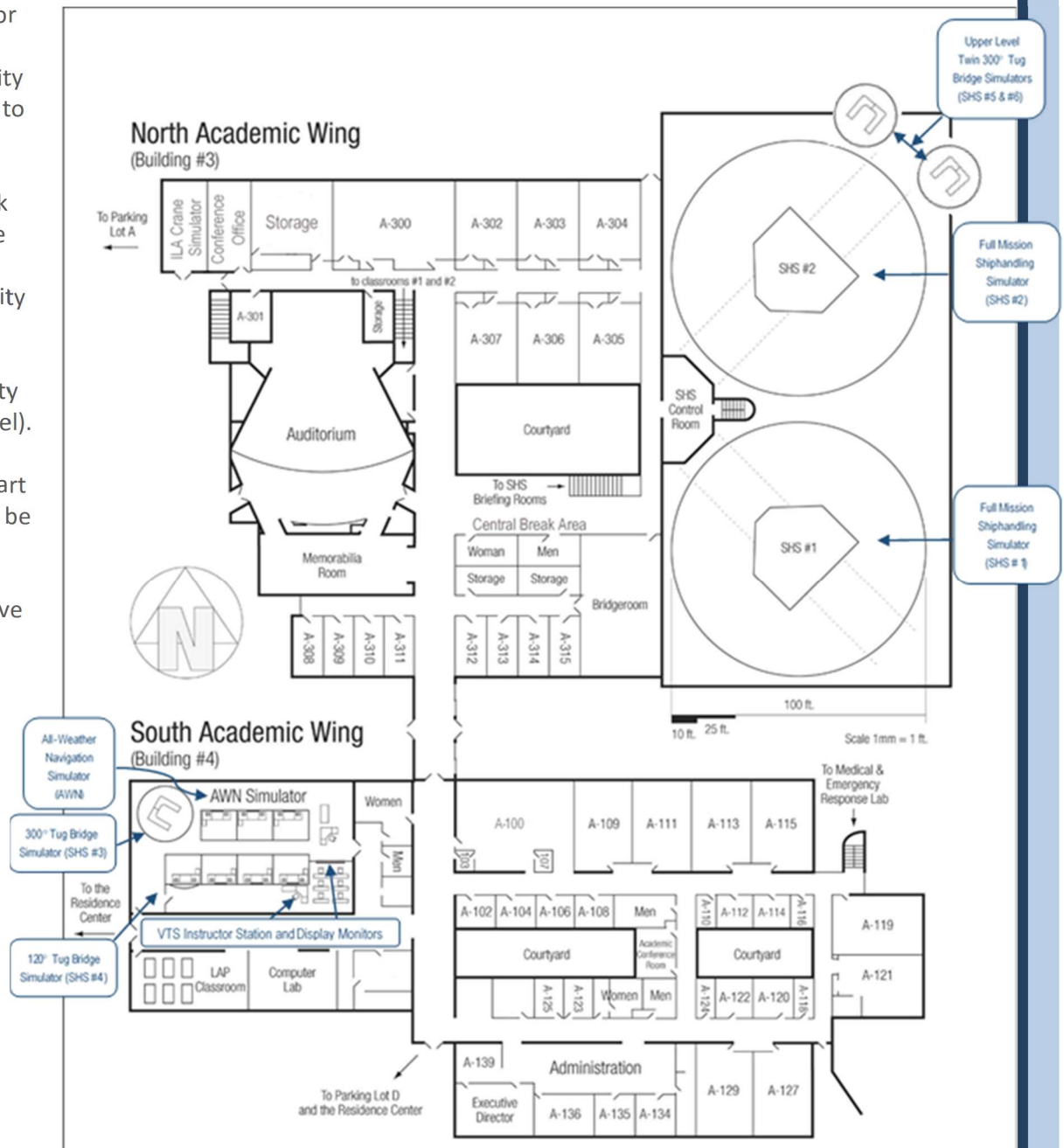
Full-Mission Shiphandling Simulators 1 and 2 are housed within 360° curved projection screens that measure eighty feet in diameter and forty feet in height.

Full-Mission Tug Bridge Simulators 3, 5, and 6 utilize a 300° horizontal field of view and a 42° vertical field of view.

Tug Bridge Simulator 4 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).

All of the full and part task simulators can be integrated into the same gaming area allowing up to twelve (12) interactive ownships in one exercise.



360° Full-Mission Shiphandling Simulators 1 and 2

The Wärtsilä® Full-Mission 360° Shiphandling Simulators (SHS 1 and 2) can be fully integrated with each other and / or four (4) Bridge Tug Simulators.

Three of the Tug Simulators offer 300° visuals, while one of the Tug Simulators offers 120° visuals.



The simulators are equipped with the next generation of visuals and advanced ship hydrodynamic modeling capabilities. 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)
- ▶ 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 Full Mission Shiphandling Simulators provide 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.

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.

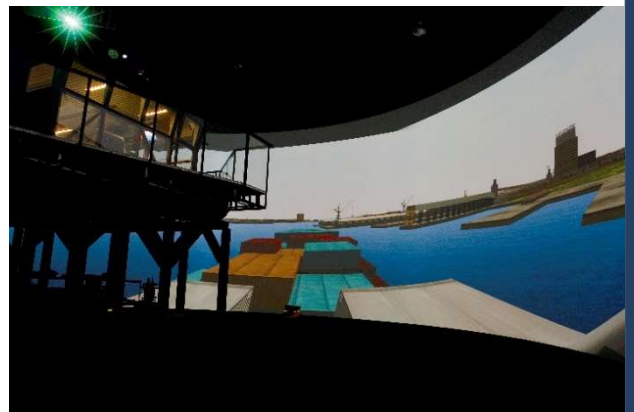
300° Tug Bridge Simulators 3, 5, and 6

The Bridge Tug Simulators 3, 5, and 6 are Full-Mission Towing systems that utilize a 300° horizontal field of view and a 42° vertical field of view. These simulators work in tandem with each other and/or Full-Mission Shiphandling Simulators 1 and 2 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 Simulators, the tug bridge simulators also include:

- ▶ Kobelt Telegraph and NFU Toggle Steering Control
- ▶ Lilaas Z-Drive Controls
- ▶ Voith Schneider Controls
- ▶ Towing Winch Hardware Panel



120° Tug Bridge Simulator 4

The 120° Bridge Tug Simulator 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 East’s All-Weather Navigation (AWN) Simulator.

ALL-WEATHER NAVIGATION (AWN) SIMULATOR

The All-Weather Navigation (AWN) Simulator is an advanced eight-ship interactive simulator. The bridges can be run independently or integrated. Additionally, they can be integrated with four other ship simulators for a total of 12 own ships in one exercise area. A vessel traffic services (VTS) watch station was also added to provide realistic vessel traffic monitoring and management training. Visuals on one of the bridges has a 300° field-of-view, and another to 120°.

Bridge 3 is specially designed for navigation skills assessment (NSAP®). The data from this bridge is fed to a remote assessors' station for accurately monitoring all aspects of the simulated transit.

Equipment

All eight (8) bridges in the AWN contain Furuno VHF Radio, Sound Signals with Automatic and Manual Activation, Bow and Stern Thrusters. Radar/ARPA Units have the capability to display AIS information as well as the following equipment:

- ▶ Furuno
- ▶ Bridge Master E
- ▶ Nucleus

STEERING

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

ELECTRONIC CHART DISPLAY AND INFORMATION SYSTEM

ECDIS with the capability to display/overlay integrated AIS and radar targets.

CONNING AND VISUAL DISPLAY (SPLIT SCREEN)

- ▶ Pilot Card
- ▶ SAR Signals
- ▶ Course Recorder
- ▶ GPS
- ▶ Alarm Panel
- ▶ UAIS-MKD
- ▶ Doppler Log
- ▶ Flags
- ▶ Echo Sounder
- ▶ 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



VTS ACCREDITED

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.

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 viewpoint 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®. 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 single / twin screw, Z-drive, Rotor, 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. 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 has 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 Wärtsilä® 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 uses the latest Wärtsilä® operating system to drive all of their simulators. Wärtsilä® is renowned for its exceptional visual graphics acuity and in-house hydrodynamic teams. In addition, Wärtsilä® 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 up to 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.

Remote Viewing Capabilities

MITAGS can provide a private live remote viewing link for stakeholders that cannot attend in person. No special software needed (only a high-speed internet connection). Viewers have multiple viewing options on a 4-part screen. For an example of our client “remote viewing capabilities, please visit <https://www.youtube.com/watch?v=1I7pdmaNd4U>.

Visual Graphics

Wärtsilä® graphics are acknowledged as the “among the best” in marine simulation. Examples of the realistic graphics that can be generated by MITAGS when using the Wärtsilä® 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 Wärtsilä® 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 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
- ▶ Underkeel Clearance and Squat
- ▶ Tug Use, Positions, and Forces
- ▶ Engine Use
- ▶ Interactive Forces
- ▶ Speed, Forward and Sideways
- ▶ Rudder Use
- ▶ Vessel Position
- ▶ Distance from Navigational Hazards

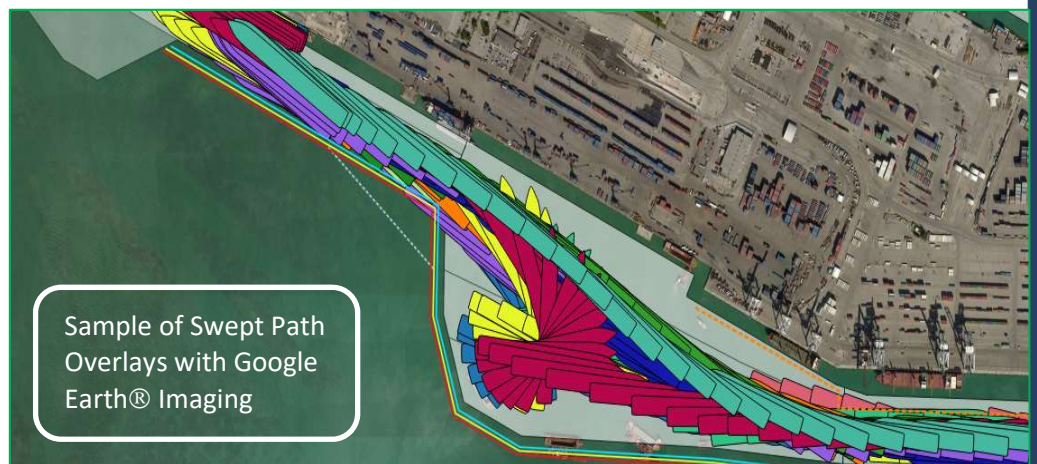
Chart View Playback

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

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

Camera View and Playback

One of the most unique and powerful features on the Wärtsilä® 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. MITAGS's premier simulation systems, allow our in-house engineering team to create cost effective video productions to explain technical projects, such as the WCC LNG Project and Annova, which you can view at <https://www.youtube.com/user/MaritimeInstitute>, select [Simulation Examples](#).



VESSEL MODELING INTRODUCTION

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

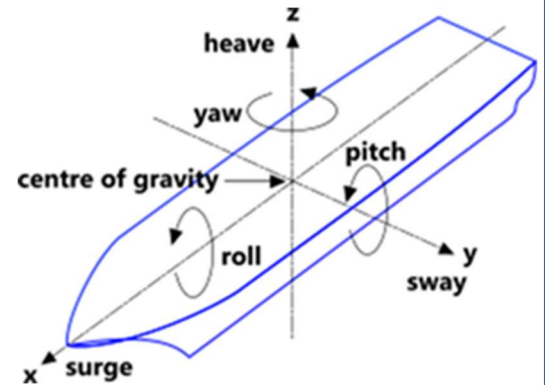
- ▶ Cruise Ships including Azipod
- ▶ Research Vessels
- ▶ ULCV Container Ships up to 24,000 TEUs
- ▶ Ro/Ro Vessel including LMSR
- ▶ Naval Vessels
- ▶ Gas Carriers: spherical, membrane, QFLEX & QMAX
- ▶ Bulk Carriers up to "Chinamax"
- ▶ Fishing Vessels
- ▶ Tug Boats: conventional, twin-screw, Z-Drive & Voith
- ▶ Shuttle tankers to VLCCs
- ▶ OSVs
- ▶ Offshore Wind Crew Transfer Vessel (in Dev.)
- ▶ Ferries Double & Single Ended
- ▶ LNG Bunker VsIs

Ownship Model

The Wärtsilä® 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.

BANK AND SHIP-TO-SHIP INTERACTION

Interaction effects are modeled using twelve (12) or more points of force (pressure velocity vectors) that are distributed along the hull. The vectors change value as the channel or bank configuration changes along the ships path. This is one of the most advanced methodologies used in simulation today. Channel toe lines and slopes can be added.

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.

- ▶ Swept path and drift angle model visuals
- ▶ General maneuvering
- ▶ Acceleration and deceleration
- ▶ Squat and bank interaction
- ▶ Turning circle (shallow and deep water)
- ▶ Propeller:
 - ▶ RPM ahead and astern settings
 - ▶ RPM running-up time, e.g., stop to full ahead
 - ▶ RPM running down time, e.g., full ahead to stop and full astern



DATABASE DEVELOPMENT

IN HOUSE MODELING TEAM

The Modeling Department 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.

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 downtime 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

Visual database examples:

Top: City of Victoria, B.C. modeled bridge

Right: Bermuda modeled day and night scenes

Introduction

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.

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.



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:

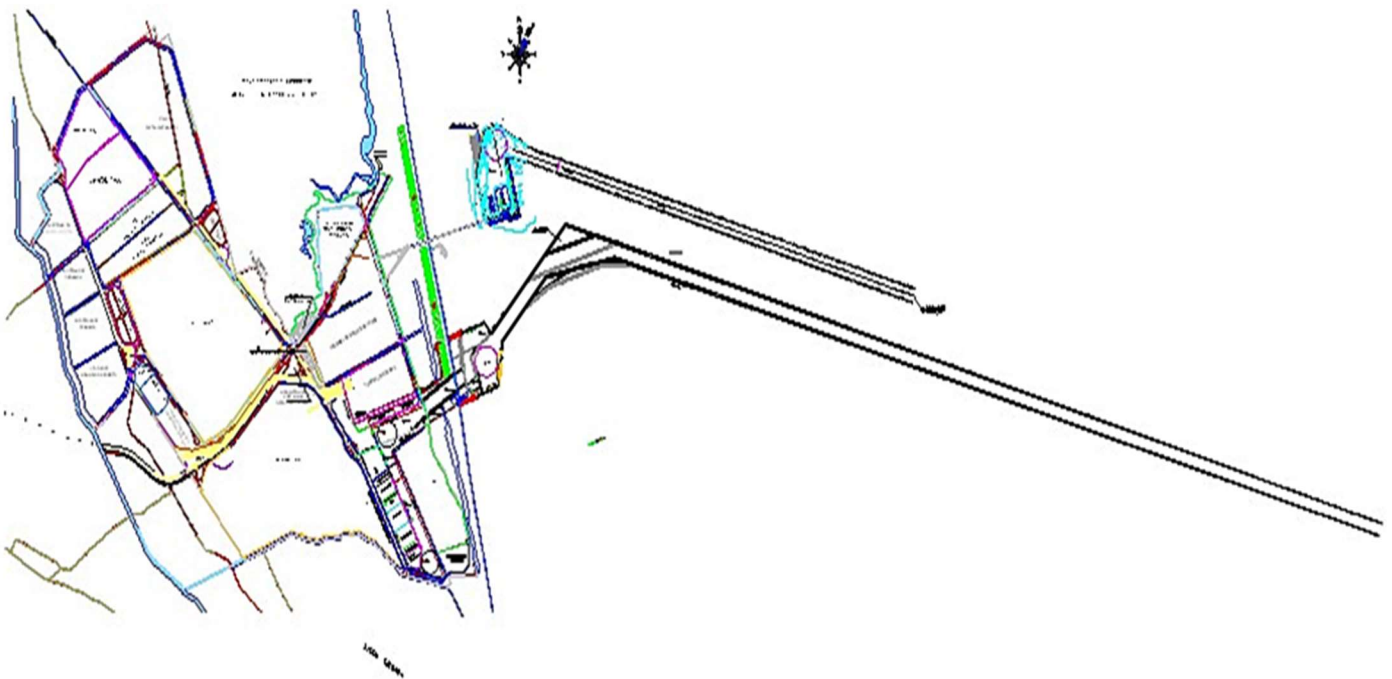
- ▶ Electronic Chart Data
- ▶ Digital Elevation Model (DEM)
- ▶ Data Navigational Publications (Corrected)
- ▶ Terrestrial Photography and/or Video
- ▶ Site Surveys
- ▶ Topographic and Contour Maps)
- ▶ Climatological Reports
- ▶ AutoCad® Drawings

AUTOCAD® DRAWINGS

This electronic data is used to program dimensions of channel, breakwaters, turning basin, and harbor.

Below:

AutoCAD® illustration of a proposed channel and



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 Development Team then reviews the area.

Area Revisions and Regeneration

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

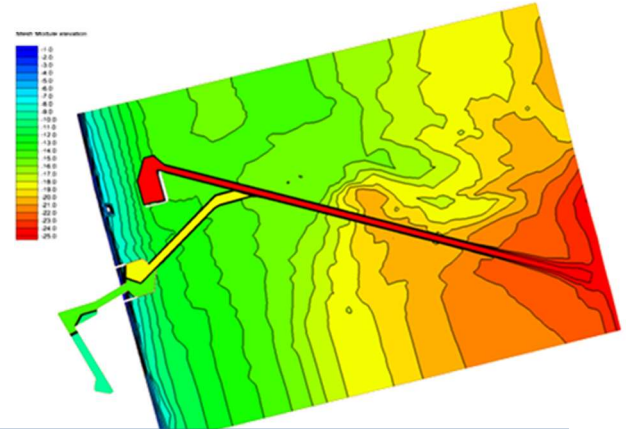
Detailed Editing

High Detail Areas include the following:

- ▶ Define geographic boundaries of high LOD areas.
- ▶ Identify any specific man-made or natural features that may require additional attention.

Depth Contours

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



Actual Photograph



Simulated 3D Rendering

The visual programming can create very detailed images that can be used for promotional purposes.

Natural Features

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

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

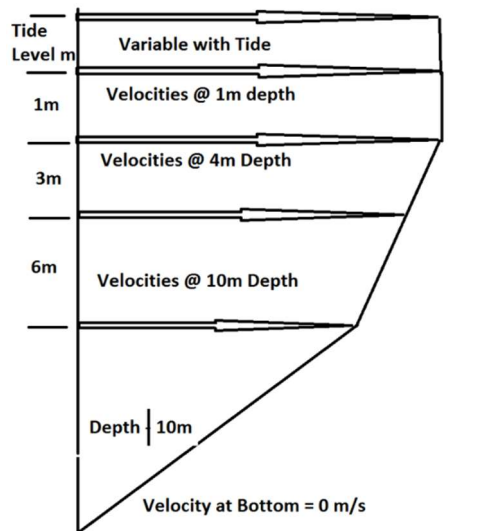
Areas are tested constantly throughout the development process.

CURRENT MODELING

Certain training and navigation studies required high fidelity water current modeling. MITAGS can provide two-dimensional depth averaged models for specific time periods (spring ebb, spring flood, etc.). Three-dimensional models can also be programmed for projects where the changes in tide levels and currents over time are critical.

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.

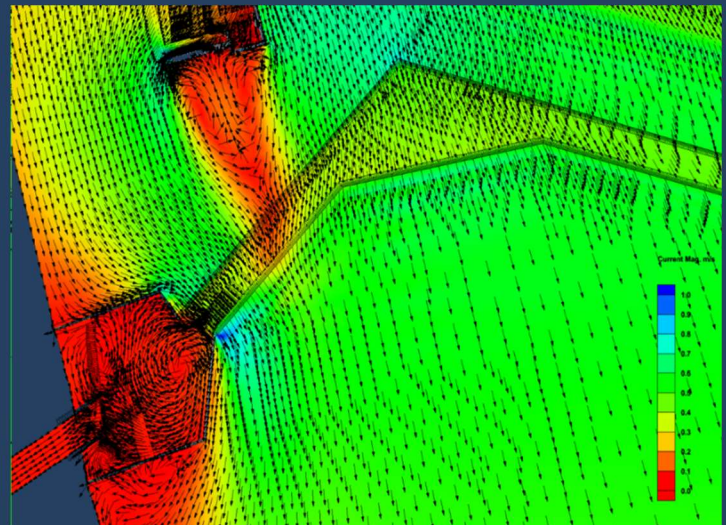


SEA & SWELL PARAMETERS

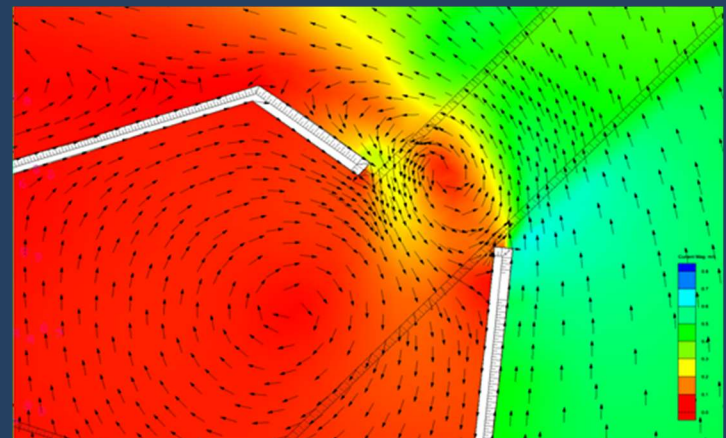
Multiple wind and swell generate waves can be programmed. Wind waves can be programmed manually by entering wave heights, periods, and direction. They may also be generated using the simulator's built in wave spectrum models:

- ▶ JONSWAP, Pierson-Moskowitz, Shallow Water, or Custom.
- ▶ Beaufort Scale (height dependent on Beaufort Scale selected).

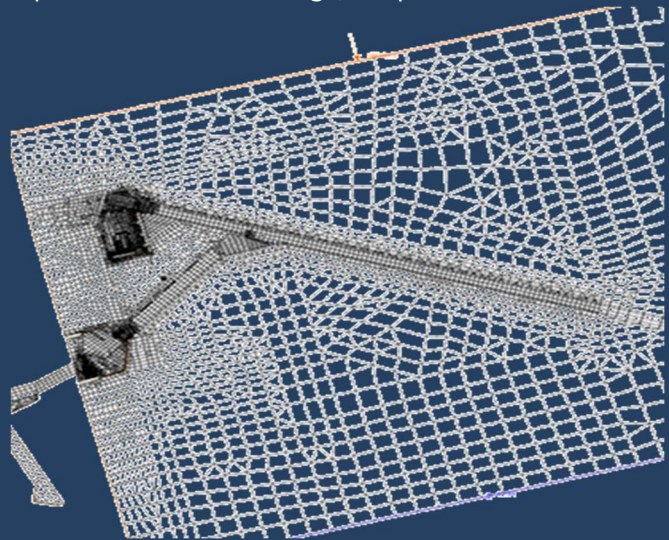
Swell may also be over laid and entered as regular waves in heights, periods, and direction.



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.



Example of a grid pattern for calculating the depth-average current directions and velocities across the project area.

MITAGS offers over 100 standard courses and provides more custom training programs for ship operators and pilot organizations than any other school in the United States. Our network of simulator systems is also used for mariner training exercises and in the evaluation of their skills. The following list is representative of the custom programs that have been offered in the past few years.

EXAMPLES OF CUSTOM SIMULATION AND TRAINING PROGRAMS

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, thousands of mariners from varied vessel types 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)



MITAGS was the recipient of the 2017 Professional Mariner Plimsoll Award for this innovative program.

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.

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:

- ▶ Differential Global Positioning Systems/Global Positioning Systems (DGPS/GPS)
- ▶ 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 AND TRAINING PROGRAMS, CONTINUED

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.

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 DECK OFFICER COMPETENCIES (OPERATIONAL AND MANAGEMENT LEVELS)

MITAGS 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.

MARITIME APPRENTICESHIP PROGRAM (MAP)

A structured apprenticeship that takes a holistic view of training over a 24 month period. Upon graduation, mariners sit for an unlimited oceans, unlimited near coastal, or unlimited inland license. There is also a program (Workboat Academy) for 500 / 1600 GRT Near Coastal or Ocean License and 500 GT Officer In Charge of a Navigation Watch (OICNW), which won the Lloyd's List North American Maritime Award in 2015. 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 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.

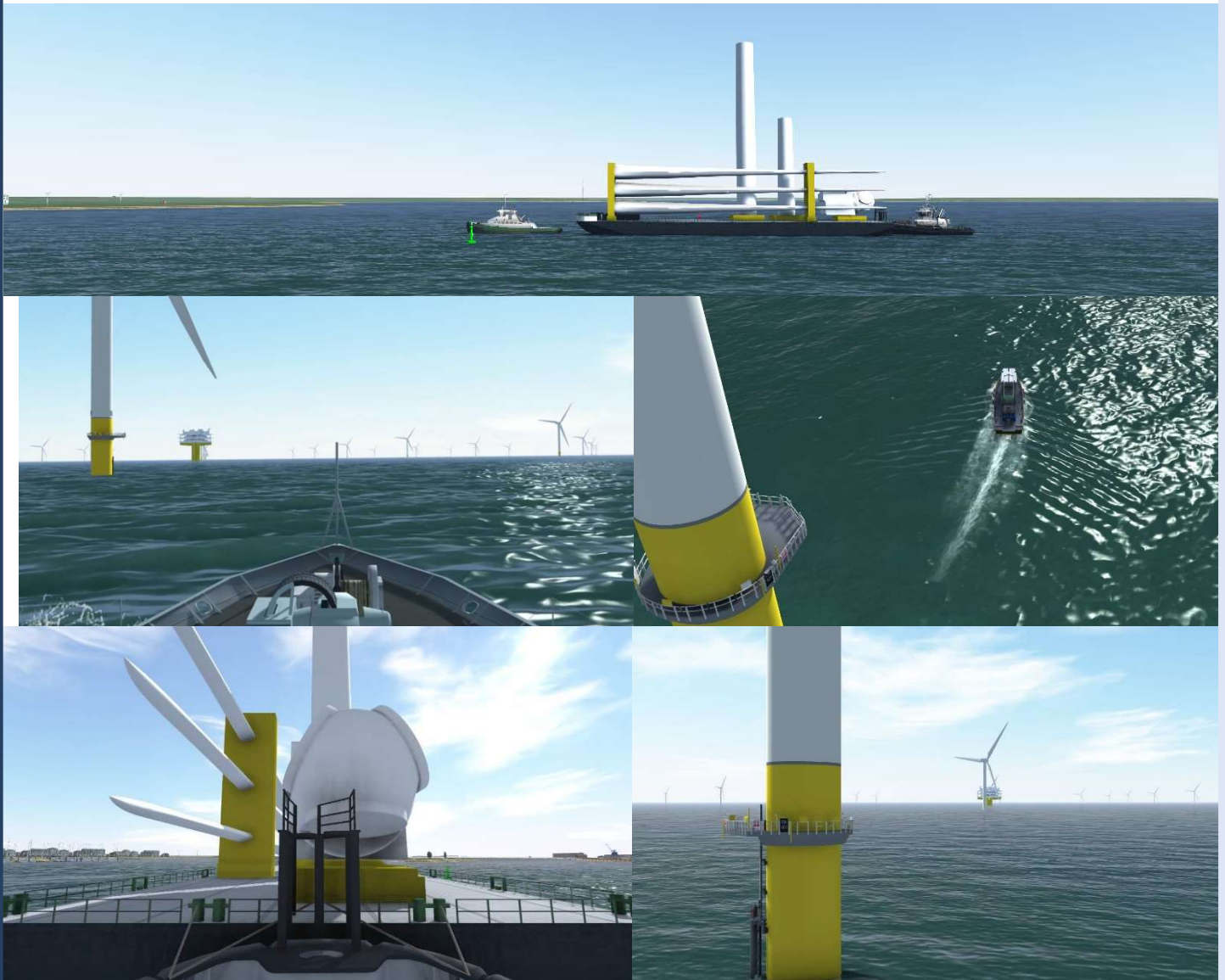
Maritime Professionals From Around The Globe Use Our Simulators To Help Solve Challenging Maritime Operational Research Problems. The Dramatic Increase In Vessel Size Parallels The Complexity Of Their Operations. Prior To Investing In A Project, Our Clients Can Safely Navigate Transits By Simulating Vessel Type, Local Environmental Conditions, Channel Dimensions, And Tug Procedures.

SELECTED OPERATIONAL RESEARCH PROJECTS

OFFSHORE WIND INDUSTRY

MITAGS provides advanced training and simulation support to the emerging Offshore Wind Industry. Recent clients include Ørsted Wind®, Vineyard Wind®, Crowley Wind®, and others. Services include:

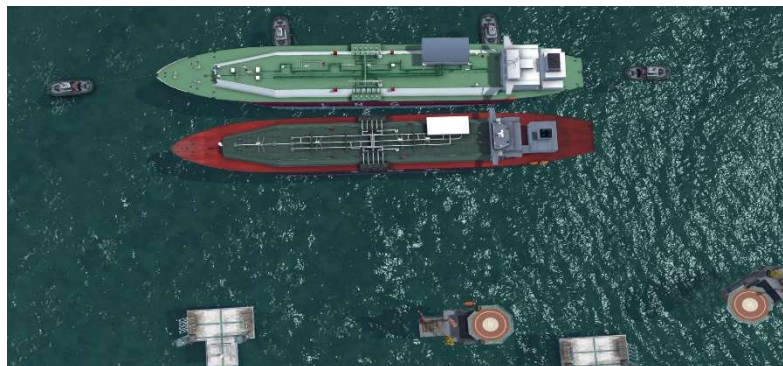
- ▶ Virtual offshore wind navigation simulation that allows mariners and stakeholders to experience piloting through a commercial scale wind farm.
- ▶ Validation simulation to assist in the selection of designs during the feasibility stages.
- ▶ Vessel transit planning from construction staging area to wind farm.
- ▶ Berthing evolutions alongside rigs.
- ▶ Mariner familiarization training (waterjet controls).
- ▶ Construction crew safety training (GWO-BST).



LNG CARRIERS

NEW FORTRESS ENERGY (NFE) – FLNG-FSRU

NFE is among the leaders in the industry in the use of floating natural gas storage and regasification units. The approach dramatically reduces the time it takes to go from construction to full operation. NFE uses full-mission bridge (FMB), integrated with live tug bridges, to develop “best practices.” This includes the mooring / unmooring of the FLNG / FSRU, and the LNGC shuttle vessels. The video recordings of the exercises also assist in the refinement of “best practices,” and for new crew training.



CHENIERE LNG – CORPUS CHRISTA, TEXAS

A series of advanced navigation studies over five years that assisted in determining the feasibility of issues related to the safety of LNCG transits into Corpus Christi, TX. Studies started with validation of preliminary designs through the development of standard and emergency transit plans. Programming included visual databases from the sea buoy to berths, terminal berths, various navigation channel designs, depth average water current models, and hydrodynamic ship / tug models with six degrees of movement. Specific objectives included:



1. Validation of preliminary and final designs for approach channels, turning basin, and multiple terminal berths.
2. Development of tug package including numbers, types, and configurations under for LNGCs up to QMax (266,000m³) classes of LNGs.
3. Feasibility of night transits on a routine basis.
4. Feasibility of LNGCs meeting in the navigation channels. Studies included various classes of LNGCs, and tankers.
5. Validation of proposed channel improvements to facilitate vessels passing in the channel.
6. Development of preliminary transit plans and pilot / tug captain familiarization training.

SABINE RIVER LNG TERMINAL

Multiple-year projects for Cheniere LNG with the most recent including validation the feasibility of adding a third berth to the facilities.

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 also overlaid additional visual graphics; including the following:

- ▶ West Shore near the Terminal
- ▶ Terminal Piers
- ▶ East Shore near the Terminal
- ▶ Island near the Terminal West-North Shore 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.



EXCELERATE – FSRU TO LNGC TRANSFER AND TUG STUDY

MITAGS' simulation assisted in the determination of the feasibility of the site for transfer operations, the development of safe environmental operating limits, and best practices for berthing shuttle LNGCS alongside a moored Floating Storage Regasification Unit (FSRU). Secondary objectives included the evaluation of tug designs for holdback and general assist work. Simulation used one full-mission simulator integrated with two live tug bridges.



EXCELERATE – RIO DE JANEIRO, PECÉM, AND BAHIA DE TODO OS SANTOS, BRAZIL

Excelerate Energy tapped MITAGS 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 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.

RIO GRAND LNG, BROWNSVILLE, TX (MOFFATT & NICHOL FOR NEXT DECADE, LLC)

MITAGS conducted the study which was designed to assist Moffatt & Nichol in the validation of the proposed navigational improvements (channel widening, deepening, and bend easing), and the Front End Engineering Design (FEED) for the turning basin, dredged berth basin, and LNGC berth configurations.

A second goal of the simulation was to assist in the establishment of the initial LNGC transit operations, assist tug requirements, and environmental operational limits (wind, sea, and current). This included preliminary berthing / un-berthing operations, select emergency responses to loss of rudder, propulsion, and / or tugs, and channel design improvements, and the placement of navigational aids.

LELU ISLAND LNG TERMINAL (PNW LNG)

PNW selected MITAGS 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.



KITIMAT WATERWAY LNG TRANSIT SIMULATION (CHEVRON CANADA AND LNG CANADA)

Chevron Canada Ltd and LNG Canada selected MITAGS 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 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.

ENERGIA DEL PACIFICO (EDP) LNG TERMINAL PORT OF ACAJUTLA, EL SALVADOR (MOFFATT & NICHOL FOR INVENERGY)

Moffatt & Nichol (M&N) was contracted by Invenergy to provide Front End Engineering Design (FEED) services for the Energia del Pacifico (EDP) liquefied natural gas (LNG) import terminal in the Port of Acajutla in El Salvador. M&N selected MITAGS to perform a navigation study to evaluate the navigation safety of the FSU and LNGC berthing and departing the Invenergy terminal, without interfering with the El Paso multi-buoy mooring (MBM) to the northwest or the local traffic transiting to Piers A, B, and C in the Port of Acajutla.

LNG BUNKER OPERATIONS

MITAGS is also involved in the emerging LNG bunkering industry. Simulation involves programming of these specialized vessels, and the expected area of operations. MITAGS also uses the simulation to develop stakeholder awareness videos. MITAGS LNG bunkering model inventory includes Jones Act, and international vessels with CPP and Azi-drive propulsion systems.



BULK CARRIERS

SUDESTE PORT PROJECT, BRAZIL (MMX)

MMX, LLC, Brazil selected MITAGS 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, WST, and Brazilian pilots participated in the tests.



ACU, TX1, BRAZIL (CH2M HILL)

Ch2 selected MITAGS 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 programming *Zhong Xing Hai* cape class bulk carrier.

SUDESTE PORT PROJECT, BRAZIL

This study is part of a continuum of two earlier studies conducted at MITAGS. 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.

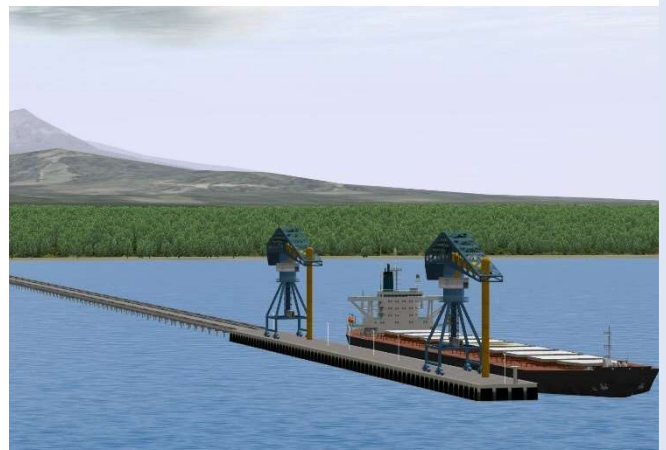


PORT OF CALLAO, PERU

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 to simulate a new coal exporting terminal located in Puerto Nuevo, Columbia. The project included channel, berthing, and turning basin analysis.



TANK VESSELS

HARBOR ISLAND VLCC FACILITIES, CORPUS CHRISTI, TEXAS (AECON ENGINEERING AND WST)

Multi-year projects assisting in determining the feasibility of approach channels from sea, turning basins and berthing facilities. Programming included visual databases from sea to the terminals, navigation channels, depth averaged water current, and hydrodynamic VLCC / tug modeling. AECON® and Waterway Simulation Technologies (WST) were the lead engineering firms on this project on behalf of the Port of Corpus Christi. Other project objectives included:

1. Tug package (number, type, and configurations).
2. Comparison of rotor versus ASD tug designs.
3. Development of preliminary VLCC transit environmental operating limits.



THE PORT OF TEXAS CITY, TEXAS (LJA ENGINEERING)

LJA Engineering selected MITAGS 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 included berthing / un-berthing 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 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 safely 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.



TANK VESSELS CONTINUED

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 unberthing 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 for ongoing updates to the ports.



SINGLE POINT MOORING SIMULATION (DILHAN CONSULTANTS, CHILE)

Dilhan Consultants select MITAGS 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. collaborated with MITAGS on this project.

TUG HULL DESIGN

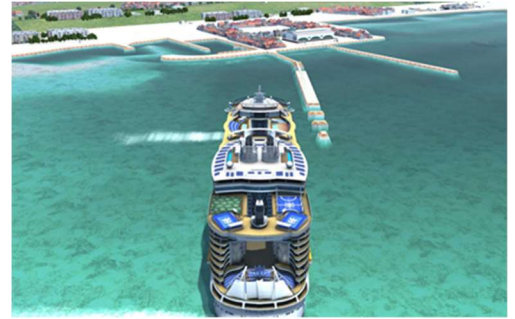
TUG HULL DESIGN SELECTION

Shaver Transportation creatively chose MITAGS 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 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.

CRUISE SHIPS

PORT ZANTE NAVIGATION STUDY FOR OASIS CLASS

MITAGS simulated Oasis Class Cruise Ship transits into Saint Christopher Air & Seaport Authority (SCASPA) new pier (Port Zante). The Study provided recommendations on the maximum environmental operating limits for routine cruise ship transits.



PORT JERSEY SIMULATION STUDY

Port Jersey provides berth services for cruise, container, and RoRos. The Study determine the feasibility of simultaneously handling ULCVs up to 22,000 TEUs and large cruise ships (Oasis Class). The test included the integration of full-mission with multiple tug bridges. The Study included recommendations on channel and berth improvements to facilitate vessel transits.

BERMUDA STUDIES

Over the last 20 years, The Department of Marine and Ports Services of Bermuda has selected MITAGS to assist in the feasibility studies of new cruise ships transits to call on the ports of Bermuda. Cruise Ships programmed for these tests included:



- ▶ Oasis of the Seas
- ▶ 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.

PORT MIAMI, 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 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).



ULCV CONTAINER SHIPS

PORT OF NYNJ – HOWLAND HOOK AND PORT ELIZABETH TERMINALS

Multi-year projects. The most recent project assisted in determining the feasibility of super ultra large container vessels (16,000 to 18,000 TEUS) transiting to Howland Hook and Port Elizabeth terminals. Study included the use of five, integrated simulators (one SULCV, and three live 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 study evaluated 14,000 TEU ULCV MSC Kalina Class to assist in the development of “best practices” for handling ULCV, and to 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.



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 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 do better define assist tug requirement in the expected upper environmental conditions and to make recommends on dredging and navigational aid placements. Three classes of post-panamax containerships were included in the programming.

TRADEPOINT ATLANTIC COKE POINT CONTAINER (MOFFATT & NICHOL)

MN selected MITAGS to conduct a study of the new Tradepoint Atlantic® Coke Point Container terminal. Studies including modeling ULCVs up to 20,000 TEUs, and use of multiple integrated bridges. .

ULCV CONTAINER SHIPS CONTINUED

PORT MIAMI, FLORIDA

PortMiami desired to conduct a full-mission ship simulation study to revise the “best practices” for handling 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 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.



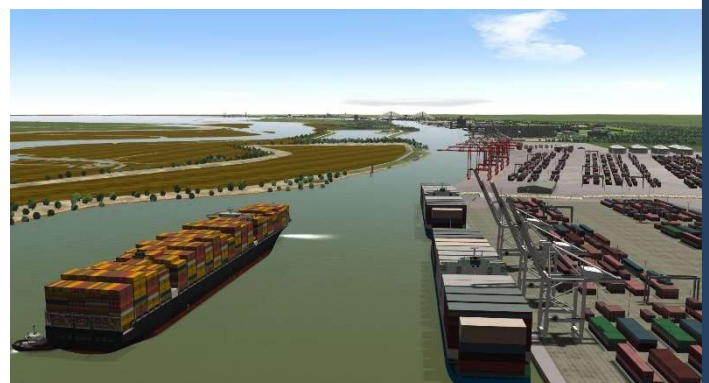
The simulation study provided “revised” transit-handling requirements for the “A Class Maersk” ULCV class that is currently calling on the PortMiami, guidance on the tentative requirements for handling 14,000 TEU ULCV (Kalina class) and larger, assessed the port’s existing tug capabilities for supporting 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.

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 to determining whether the next generation of ULCV “MSC Kalina” Class size containerships can safety 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 to support the project by providing one, 360-degree of view, full-mission ship simulator (FMSS) integrated with two assist tug bridges.



ITB / BARGES / TUGS

THE HOUSTON SHIP CHANNEL, TEXAS

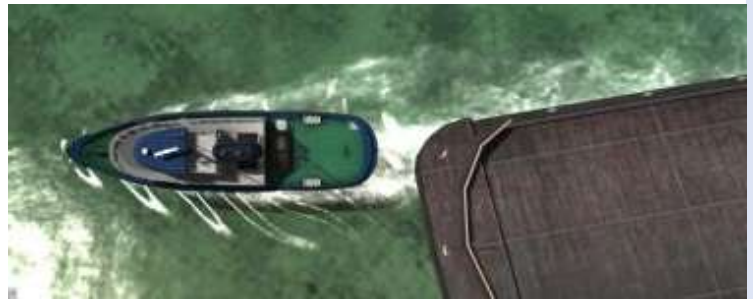
Vopak, North America contracted with MITAGS to simulate a new terminal in the confined waters of the Houston Ship Channel. This complex project included the integration of full ship bridges in order to assess the interactive effects of the ships meeting and passing in the channel with vessels moored 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 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

Four 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 developed a simulator model of the tugs, and was able to validate accuracy of performance between the simulation model and the actual vessel.



Following is an alphabetical list of key staff members, instructors, and consultants:

MITAGS TEAM AND SUBJECT MATTER EXPERTS

MR. PASHA AMIGUD, SIMULATION ENGINEER

Pavel has over twenty years of experience with maritime simulation projects. His specialties include hydrodynamic and visual development of Harbor tugs with indirect assist capabilities, as well as other vessels such as heavy lift ships and various barge configurations. Other areas of expertise include design and installation of hardware control systems and visual development of databases.

CAPTAIN HENRY F. ANDERSSON – SHS CONSULTANT

In May of 1982, Captain Andersson began serving as Master of 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 ROBERT BECKER – BUSINESS DEVELOPMENT CONSULTANT, MITAGS.

Captain Becker held the position of Director of Business Development at MITAGS from July of 2004 until July 2021, when he retired and became a consultant. 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 licensed capacities onboard MM&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 at Kings Point.

CAPTAIN JOHN LAWRENCE (LARRY) BERGIN – SHS CONSULTANT

Captain Bergin’s sailing experience includes 31 years as Master of large vessels. He has been a consultant and instructor at MITAGS, instructing mates, masters, and pilots in Ship Handling and Bridge Resource Management. In 2012, Captain Bergin was appointed as Harbor Pilot consultant for the state of Florida and is under contract with the state to provide expert advice on any Harbor Pilot related incidents that occur in Florida. He has a B.S. Marine Transportation from the U.S. Merchant Marine Academy. He is a member of the IOMM&P, and the Council of American Master Mariners.

CAPTAIN M. “SCOTT” CONWAY – SHIPHANDLING – DEPARTMENT CHAIR

Captain Conway is an USCG approved instructor for over dozen courses in addition to heading up the Shiphandling Department. He has 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. He began his seagoing career after obtaining a B.S. 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 Calhoun MEBA School for five years; after which, he was a sales manager for Wärtsilä (formerly Transas) USA, Inc., Marine Technologies, serving as a consultant to maritime training schools.

MR. ERIC P. FRIEND – EXECUTIVE DIRECTOR OF MMP MATES AND MITAGS, INC.

Mr. Friend is the Executive Director of the MMP MATES Program, and MITAGS, Inc., Eric oversees the overall operation of the schools and conference center. 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. Eric holds a Master 1,600 Ton license, a Second Mate Unlimited license, and a B.S. in Marine Transportation from the U.S. Merchant Marine Academy. He was honorably discharged after serving 12 years in the U.S. Naval Reserves. Mr. Friend’s Master’s degree is in Management with a concentration in organizational leadership.

CATHERINE “CATIE” A. GIANELLONI – MITAGS EAST ACADEMIC DIRECTOR

Ms. Gianelloni oversees the academic activities at the MITAGS East Campus. She reports directly to the Executive Director. Previous positions include Campus Coordinator, Department Head, and in charge of the internationally recognized Navigation Skills Assessment Program. “NSAP” makes extensive use of simulation to assess mariner navigation skills at the entry, management, and pilot levels. She is approved by the USCG National Maritime Center as an instructor in over two dozen courses and a qualified assessor. Ms. Gianelloni is a proven simulator operator, adept at presenting any simulation situation from the Wärtsilä® database. Ms. Gianelloni holds a USCG Second Mate, unlimited tonnage license, and a commission in the U.S. Naval Reserves. During her sea service, she sailed as mate on numerous vessel classes including Great Lakes Bulk Carriers, RoRo, and containerships. She has been on the MITAG staff since 2009. She graduated from the United States Merchant Marine Academy with a Bachelor of Science in Marine Transportation. Catie is extensively involved in the Shipboard Operations Cooperative Program. “SOCP” is a non-profit organization dedicated to resolving maritime operational issues.

CAPTAIN (WALTER) “BUTCH” GRAF – SHIPHANDLING CONSULTANT

Captain Graf began his seagoing career after graduating from the U.S. Merchant Marine Academy. He quickly progressed through the ratings to Master where he remained for the duration of his time at sea. In the year subsequent to his ocean going retirement, he joined MITAGS as a USCG approved instructor and qualified assessor, where Captain Graf’s shiphandling skills were utilized in teaching advanced and emergency shiphandling, bridge resource management, as well as many other USCG approved courses. “Butch” earned a Bachelor of Sciences, with a minor in management from the United States Merchant Marine Academy, and was honorably discharged from the Naval Reserve as a lieutenant.

CAPTAIN JOE HARNETT –SHIPHANDLING CONSULTANT

Captain Harnett is a senior pilot for the Association of Maryland Pilots, and has been actively piloting for thirty years. He holds USCG 1st Class Pilot, and unlimited tonnage master, oceans licenses. He is also credential to teach multiple navigation and shiphandling relates courses. Capt. Harnett graduated from the State University of New York Maritime College in 1980. Industry Associations includes the Council of American Master Mariners (Camm) and others.

MR. MARK HOKENSON, SIMULATION ENGINEER AND LEAD SIMULATION OPERATOR

Mark’s primary responsibility is the simulation facility of the MITAGS-West is overseeing maintenance, repair, and operation of a busy simulator schedule. Trained as a Project Manager, Mark also has extensive experience with managing simulation research projects with a focus on finding creative solutions and ensuring a tight delivery date.

EMILY HOPKINS – MITAGS WEST DIRECTOR

Emily Hopkins is MITAGS West Director, based at our west coast campus in Seattle, Washington. She lends her business savvy to oversight of the daily operations, staff, and simulation projects. Emily has been with MITAGS since 2008, prior to which she worked with various cruise line companies as an operations manager. She holds a bachelor’s, and Master’s degree, and is a Senior Certified Professional with the Society of Human Resource Management.

MR. VERNE JUSTICE – SHS CONSULTANT

Mr. Justice’s career at sea began on Alaskan fishing boats, graduating to small freighters running between Seattle and cannery towns in Alaska. After earning his 1600-ton Master’s license, Verne worked for 26 years as a Puget Sound Pilot, piloting tankers, cruise ships, car ships, bulkers, yachts, etc. He has taught several different classes at MITAGS West, primarily related to emergency ship handling. He has also helped applicants prepare for the Pilot Simulator exams for SE Alaska, Puget Sound, San Francisco, Los Angeles, and Long Beach.

CAPTAIN JONATHAN KJAERULFF, DIRECTOR OF BUSINESS DEVELOPMENT

Capt. Kjaerulff is responsible for the development and execution of the Academic marketing and business development plans. He is involved with the fiscal and strategic planning for the institution. Jon is a graduate of the

U.S. Merchant Marine Academy and has sailed in positions from deckhand to Master aboard ships and workboats all over the world. In 1989, after running a support ship during the Exxon Valdez cleanup effort, Jon came ashore and founded Fremont Maritime Services in Seattle. Over the next 27 years, Jon established a reputation as a pioneer in the field of maritime safety, survival, and firefighting training. His company was one of the very first organizations in the U.S. to obtain Coast Guard approval for an STCW Basic Safety Training program, and from 2003 to 2015 Fremont Maritime was the only private company utilized by the U.S. Navy to provide marine firefighting training to its military sailors. In 2017, Fremont Maritime was purchased by MITAGS, and Jon came aboard as a marine safety training and business development specialist. His focus has been on the tug and barge and cruise industries, as well as helping to create new programs required by the industry and regulations such as Subchapter M.

MR. GLEN PAINE – BUSINESS DEVELOPMENT CONSULTANT

Mr. Paine was the Executive Director of MMP-MATES / MITAGS, Inc., for 23 years until his retirement in 2021. He now assists the Simulation Engineering Department with research projects. During his tenure as Executive Director, MITAGS became one of the leading maritime training and simulation centers in the United States.

CAPTAIN DOUGLAS PINE – INSTRUCTOR, SIM. OPERATOR AND NSAP CONSULTANT

Captain Pine is a USCG approved instructor in over thirty courses. He also is a qualified assessor and simulator operator for the MITAGS Navigation Skills Assessment Program (NSAP). He has over thirty years of maritime experience, and a MITAGS Consultant for over twenty. During his career, he has sailed as master or mate on ocean-going tugs, harbor assist, OSVs, ferries and passenger vessels. He holds USCG 1600 Ton Mate and 500 Ton Master Oceans, 500 Ton Master of Towing N/C Western Rivers, 100 ton Aux Sail Master Oceans, and AB Unlimited / Sail.

MS. COLLEEN SCHAFFER, P.E. – DIRECTOR OF SIMULATION ENGINEERING

As director, Ms. Schaffer has direct oversight of the Simulation Engineering Department. She is responsible for the accuracy of the hydrodynamic geographic area database that includes detailed visual scenes, underwater bathymetry, RADAR and ECDIS images. Colleen provides technical support for the simulation systems, project management, and report writing. She has a Master's of Science Degree in civil, coastal / ocean engineering, and a licensed professional engineer.

MR. JEREMIAH SHEAHEN, SIMULATION ENGINEER

Simulator engineer at MITAGS East and West. Mr. Sheahen has 20 years of experience in maritime simulation. Specializing in projection, theatre design, display technologies, 3rd party hardware, and software integration. President of FTL Concepts 2012 to 2014. Owner Inventor of "Cutting Edge" optical masking system for multi-image projection. Hobbies and areas of study include electrical and mechanical engineering, programming C++ basic, high energy physics, molecular physics, theoretical chemistry, and quantum mechanics.

CAPTAIN WILLIAM J. SKAHAN – CONSULTANT

Capt. Skahan has consulted in many 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. Captain Skahan sailed on clean and chemical tankers for over thirty years. He sailed exclusively as Master from 1986 to 2010. He also 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 – TUG 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 JAMES STAPLES - CONSULTANT

Twenty-three years of Captain Staples thirty-nine years at sea were in command, with experience operating worldwide. He has assisted in the delivery of newly built vessels, and oversaw the final construction of a Ro/Ro vessel in Japanese shipyard. His expertise in piracy and counterterrorism is palpable when teaching Vessel Security (ISPS) courses at MITAGS, where he is as an USCG qualified assessor and approved instructor in many STCW and Safety classes. Captain Staples holds an unlimited Master's license and a Bachelor of Science in Maritime Transportation from the Massachusetts Maritime Academy.

CAPTAIN JONATHAN A. STEINBERG – TUG CONSULTANT

Captain Steinberg became a relief Master for Moran Baltimore in 2008. 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, 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 – TUG CONSULTANT

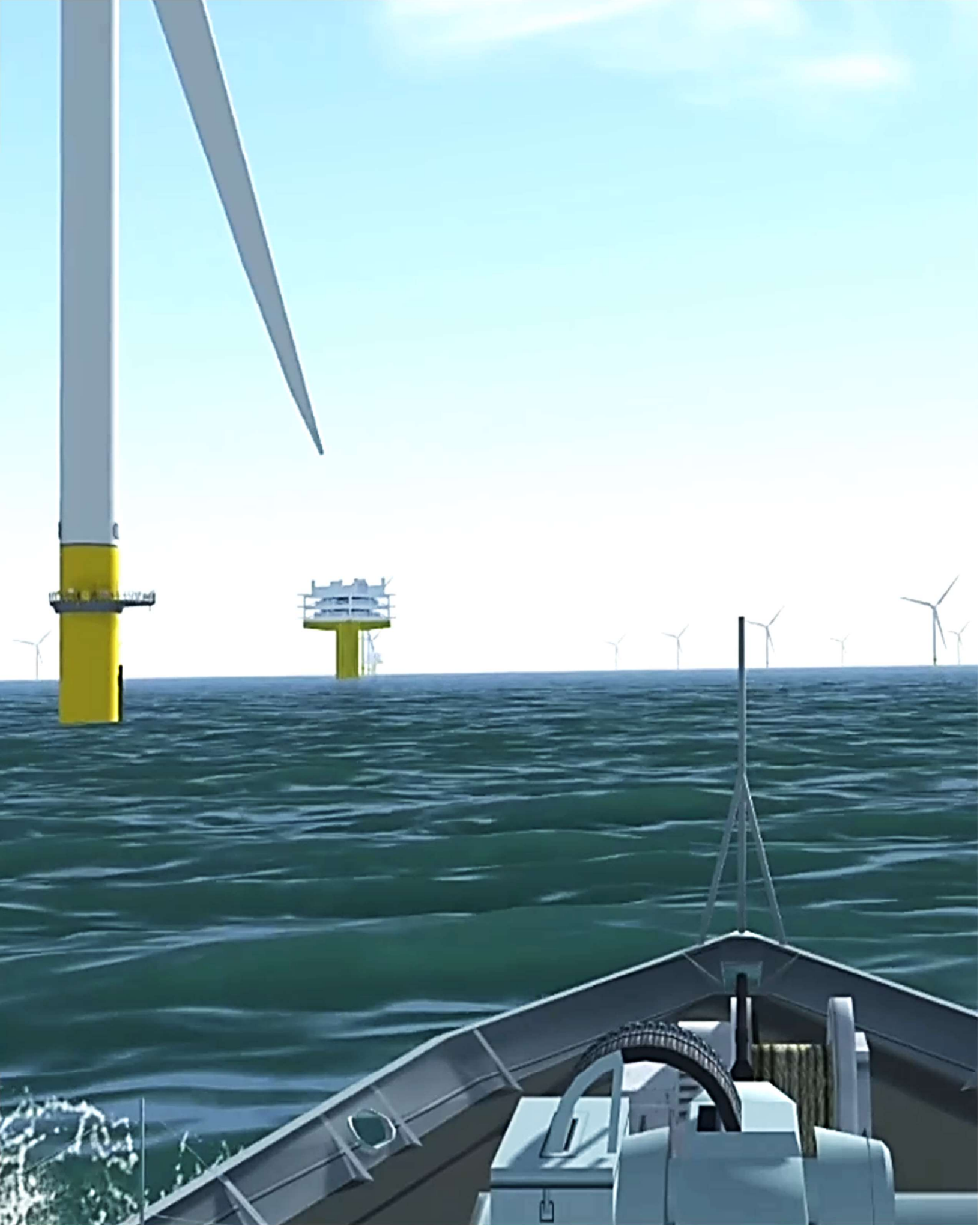
Captain Thalheimer's seagoing career began in the United States Coast Guard. He pursued the career graduating from Maine Maritime Academy (1990) with a B.S. in Marine Transportation. Since 1992, Steve has served as Tug Master for Moran Towing. Now on terra firma, MITAGS makes use of his operating skills 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. DENNIS WEBB, P.E. – SIMULATION PROJECT MANAGER

Mr. Webb is a licensed Professional Engineer, and a certified Diplomat Navigation Engineering, American Society of Civil Engineers. He served with the U.S. Army Corps of Engineers at the Engineer Research and Development Center – Navigation Branch (Vicksburg, MS) for nearly 30 years. His duties included principal investigator on over 60 simulation studies, and completed numerous technical reports, data reports, and letter reports. During his tenure, he served as Chief, Navigation Branch for approximately five years.

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Sheri Tonn, Chair, Washington State Board of Pilotage Commissioners	2901 Third Avenue Seattle, Washington 98121	(253) 952-2339 Tonn@wsdot.wa.gov
Captain Kevin Obermeier Pacific Pilotage Authority	1100-1130 West Pender Street Vancouver, British Columbia V6E 4A4 Canada	(604) 666-6771
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FOR QUOTES ON SIMULATION STUDIES

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MITAGS is Internationally Certified
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