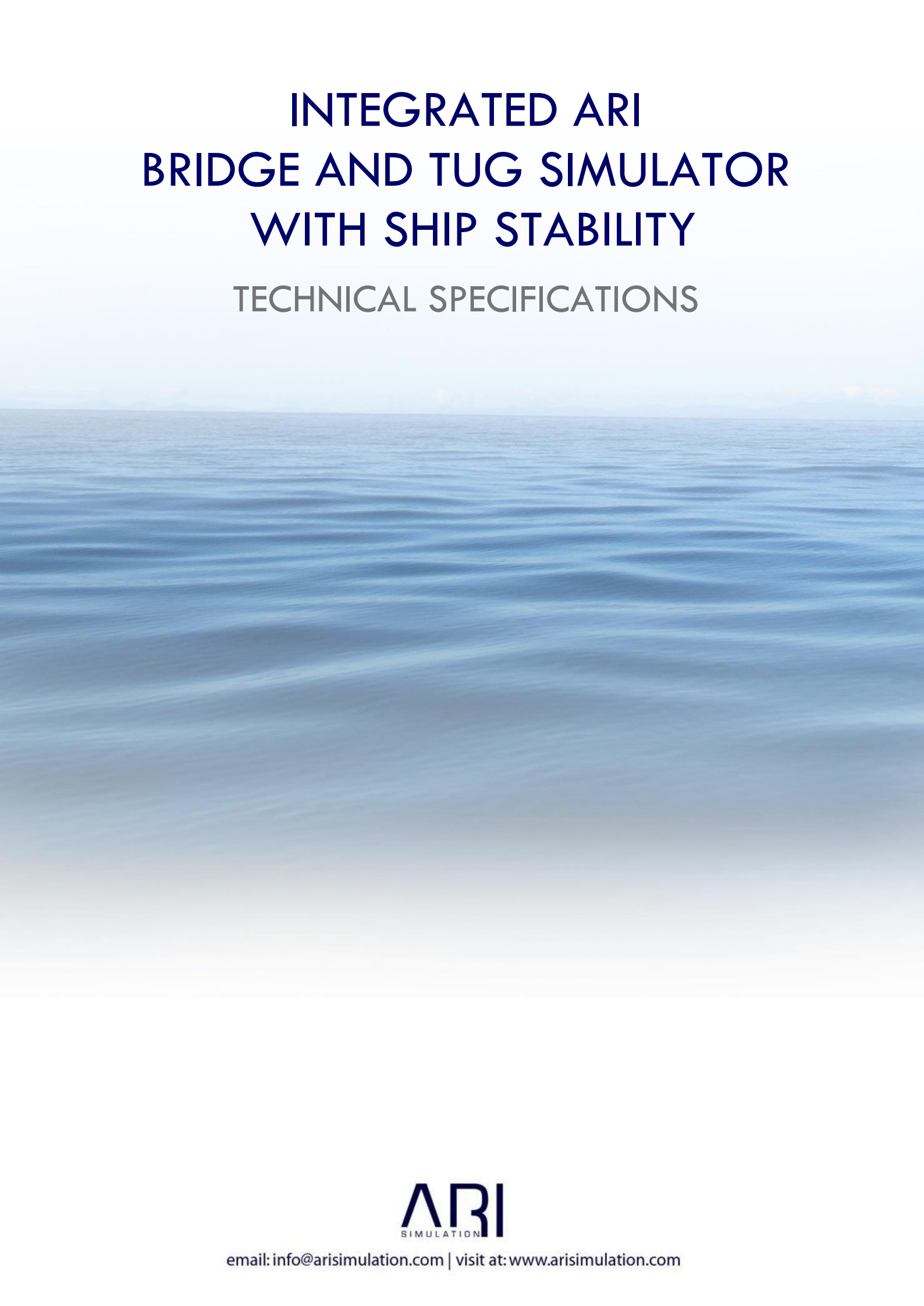




INTEGRATED ARI BRIDGE AND TUG SIMULATOR WITH SHIP STABILITY

TECHNICAL SPECIFICATIONS



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All computer generated images are indicative and for the purposes of illustration only.

ABOUT ARI

ARI Simulation is a leading global provider of simulation products and virtual reality training solutions across a broad range of industries including marine, offshore, E&P, construction and defence. Our offshore products include simulators for drilling rigs, offshore cranes, offshore vessel handling, dynamic positioning, anchor handling, subsea support, ROVs and more.

ARI's Marine and Offshore Simulation products are certified by DNV-GL to the highest Class A Standard.

ARI's range of simulators extends from desktop PC & kit based personal trainers and multipurpose trainers to full mission solutions in Ship Handling, Marine Communications, Liquid Cargo Handling, Propulsion and Power Management, Integrated Offshore Operations, Advanced Crane Handling (in both ship and shore environments) and Oil Exploration & Drilling Operations.

Besides its proven strengths in simulating processes and control systems and creating powerful real time visualizations, customization is a key strength at ARI. ARI offers customized, immersive and interactive virtual worlds to its clients, backed with a guarantee of reliable and comprehensive post installation support.

ARI Simulation has operations in US, India and Japan and representative offices across the globe.



ARI BRIDGE SIMULATOR

PHYSICAL REALISM

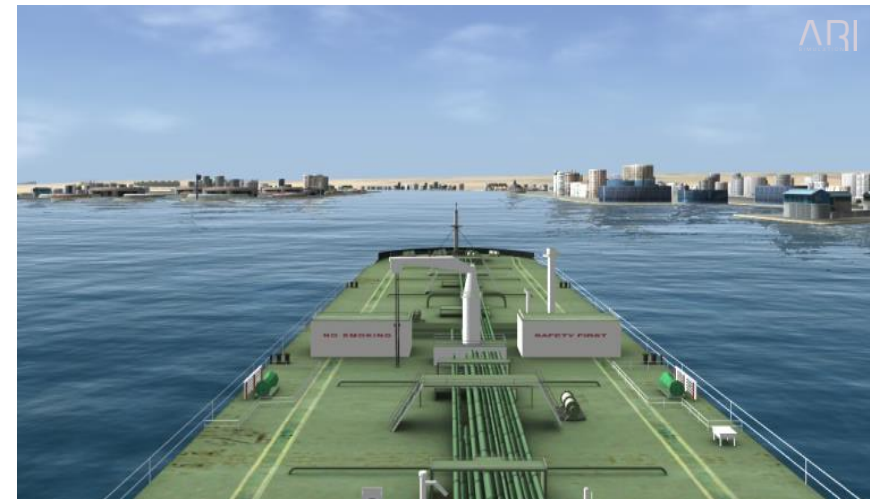
- Equipment and consoles are installed, mounted, and arranged in a ship-like manner.
- Controls for propulsion plant operations are provided. There are indicators for shaft(s) revolutions and pitch of propeller(s) along with controls for propeller(s) and thruster(s).
- Steering console, including facilities for hand steering and automatic steering with controls for switch over; indicators of rudder angle and rate of turn.
- Steering compass repeater with an accuracy of better than 1 degree.
- Simulated Radars in both 10 cm and 3 cm options.
- GPS, echo-sounder and speed log displays are available.
- Indication of relative wind direction and force is provided.
- Facility for generating “sound signal” according to the “Rules of the road” is provided.
- Facility for operation of Navigation Lights is provided.
- Control for General alarm is provided.
- Alarm Panel for machinery failure is provided.



Full mission Ship Manoeuvring Simulator – Physical realism

BEHAVIOURAL REALISM

- The model realistically simulates own ship dynamics in 6 degrees of freedom.
- The model realistically simulates own ship hydrodynamics in open water conditions.
- The radar simulation equipment is capable of demonstrating weather effects, shadow sectors, spurious echoes and other propagation effects, and generates coastlines, navigational buoys and search and rescue transponders
- The ARPA simulation equipment incorporates the facilities for:
 - Manual and automatic target acquisition
 - Past track information
 - Use of exclusion sector
 - Vector/graphic time-scale and data display
 - Trial manoeuvres
- The simulator provides own ship engine sound, reflecting the power output.
- The simulation includes the depth according to charts used.
- The simulator provides capabilities for realistically conduct anchoring and mooring operations.



Ship in Restricted waters (Suez Canal)

TYPE OF TRAINING

Training Levels

The ARI Ship Manoeuvring Simulator can be used for training at various levels including:

- Basic or familiarization training
- Operational training
- Advanced training at the management level

Navigation Training

It can be used for conducting the following kinds of navigational training that includes but is not limited to:

- Navigation in open waters/Deep Sea Navigation
- Navigation in shallow waters
- Navigation in restricted waterways and channels
- Coastal navigation
- Navigation in high traffic density situations
- Approaching harbours
- Approaching mooring positions
- Berthing
- Passage planning and execution
- Collision regulations (COLREGS)



Approaching berth



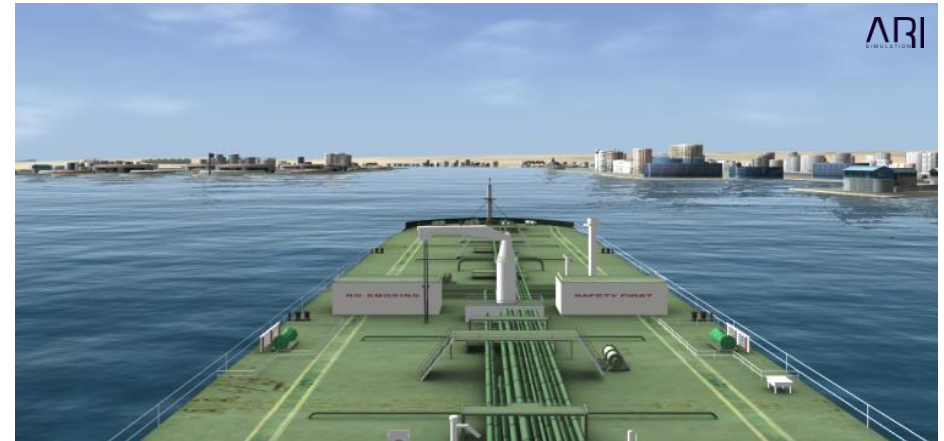
Berthing/Mooring

- Radar & ARPA operations
- Radar operations under conditions of blind navigation
- Electronic navigation systems
- Use of ECDIS in conjunction with Radar and other navigational aids
- Search & rescue
- Bridge watch keeping procedures
- Mooring
- Anchoring

Manoeuvring Training

The ARI Ship Manoeuvring Simulator is suitable for use in Manoeuvring training including but not limited to:

- Free Manoeuvring
- Berthing and un-berthing
- Manoeuvring using thruster(s)
- Mooring and unmooring
- Manoeuvring using tugs



Ship in Restricted waters (Suez Canal)



Use of Tug to assist vessel berthing

Exceptional Environment Navigation Training

The ARI Ship Manoeuvring Simulator is suitable for training use in exceptional environment including but not limited to:

- Night Navigation
- Navigation in poor visibility
- Navigation in heavy rain, strong wind, strong currents
- Navigation in areas of large tidal range



Instructor control for environment

NAVIGATION SIMULATOR COURSES

ARI Navigation simulators can be used to run several kinds of courses including but not limited to:

- Ratings forming part of navigational watch
- Helmsman training
- Ship handling
- Navigating ships in straits and traffic separation schemes with varying traffic density
- Collision avoidance for watch-keeping officers; Rules of the road – practical applications
- Bridge simulator Instructor training
- Radar observation and plotting; use of ARPA
- ECDIS training
- Bridge team training
- Bridge resource management training

INTERNATIONAL COMPLIANCES

The ARI Ship Manoeuvring Simulator can be used to demonstrate the following STCW 2010 competencies

Table A II/1.1	Plan and conduct a passage and determine position
Table A II/1.2	Maintain a safe navigational watch
Table A II/1.3	Use of radar and ARPA to maintain safety of navigation
Table A II/1.4	Use of ECDIS to maintain the safety of navigation
Table A II/1.5	Respond to emergencies
Table A-II/1.6	Respond to a distress signal at sea
Table A-II/1.8	Transmit and receive information by visual signalling
Table A-II/1.9	Manoeuvre the ship
Table A-II/2.1	Plan a voyage and conduct navigation
Table A-II/2.2	Determine position and the accuracy of resultant position fix by any means
Table A-II/2.3	Determine and allow for compass errors
Table A-II/2.4	Co-ordinate search and rescue operations
Table A-II/2.5	Establish watch keeping arrangements and procedures
Table A-II/2.6	Maintain safe navigation through the use of information from navigation equipment and systems to assist command decision-making
Table A-II/2.7	Maintain the safety of navigation through the use of ECDIS and associated navigation systems to assist command decision making
Table A-II/2.10	Manoeuvre and handle a ship in all conditions

INTERNATIONAL COMPLIANCES

Table A-II/2.11	Operate remote controls of propulsion plant and engineering systems and services
Table A-II/3.1	Plan and conduct a coastal passage and determine position
Table A-II/3.2	Maintain a safe navigational watch
Table A-II/3.3	Respond to emergencies
Table A-II/3.4	Respond to a distress signal at sea
Table A-II/3.5	Manoeuvre the ship and operate small ship power plants
Table A-II/5.2	Contribute to berthing, anchoring and other mooring operations

In addition, the following international standards have been taken into consideration while designing this full mission ship handling simulator

- International Regulations for Preventing Collisions at Sea, 1972
- International Convention on the Safety of Life at Sea, 1974
- International Convention on Standards for Training, Certification and Watch keeping, 1978, 1995 with 2010 amendments
- Automatic Radar Plotting Aids Course. REGULATIONS AND GUIDE (Department of Trade, London 1981)
- IMO Resolution A. 477(12). Performance standards for radar equipment. Adopted on 19 November 1981
- IMO Resolution A. 482(12)
- IMO Resolution A. 483(12)
- IMO Resolution A. 823(19). Performance standards for automatic radar plotting aids. Adopted on 23 November 1995
- IMO Resolution MSC 64 (67). Recommendation on performance standards for radar equipment. Adopted on 04 December 1996
- IMO Model Course 1.07
- IMO Model Course 1.08
- IMO Model Course 1.09
- IMO Model Course 1.22
- IMO Model Course 1.27

ARI SHIP LIBRARY – SAMPLE IMAGES OF OWN SHIPS AND TARGET SHIPS



Fishing Vessel



Very Large Crude Carriers (VLCC)



Offshore Supply Vessel



Harbour Tug



ULCC



VLCC



Product Carrier



LNG Tanker – Q Flex



LPG Tanker



Chemical Tanker



Container vessel



Bulk Carrier



Suez Max Bulk Carrier



Passenger Vessel



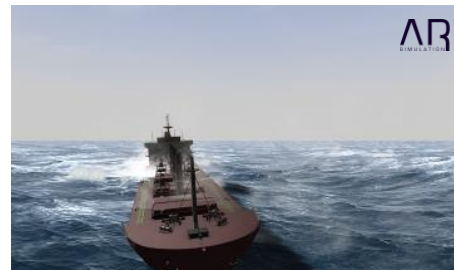
Trawler

SHIP MODELS AND BEHAVIOUR

- The simulator is provided with different types of own ships.
- The simulator is able to present multiple target ships at the same time, where the instructor is able to program voyage routes for each target ship individually.
- The target ships are equipped with navigational lights, shapes and sound signals, according to “Rules of the road”.
- The model realistically simulates own ship dynamics in 6 degrees of freedom.
- The model realistically simulates own ship hydrodynamics in open water conditions, including the effects of wind forces, wave forces, tidal stream and currents.
- The simulation includes the depth according to charts used.
- The model realistically simulates own ship hydrodynamics in restricted water-ways.

Own Ship Simulation

- Modelling in 6 degrees of freedom – yaw, roll, pitch, surge, heave, sway
- Propellers
- Rudders
- Thrusters
- Autopilot functions
- Wind effect
- Tides
- Sea wave disturbance
- Currents



Traffic Ship Simulation

- Proceed under pre-programmed instructions
- Control parameters can be altered in real time by Instructor
- Instructor can introduce and remove traffic ships from scenario
- Similar to own ships – operate in 6 DOF

Others

- SART activation
- AIS Transponder deactivation
- Man overboard
- Sailboats
- Liferaft etc.



Ship to Ship interaction

MODEL CUSTOMISATION

ARI can customize ship models according to client requirements based on client's own ship data.



Real Vessel



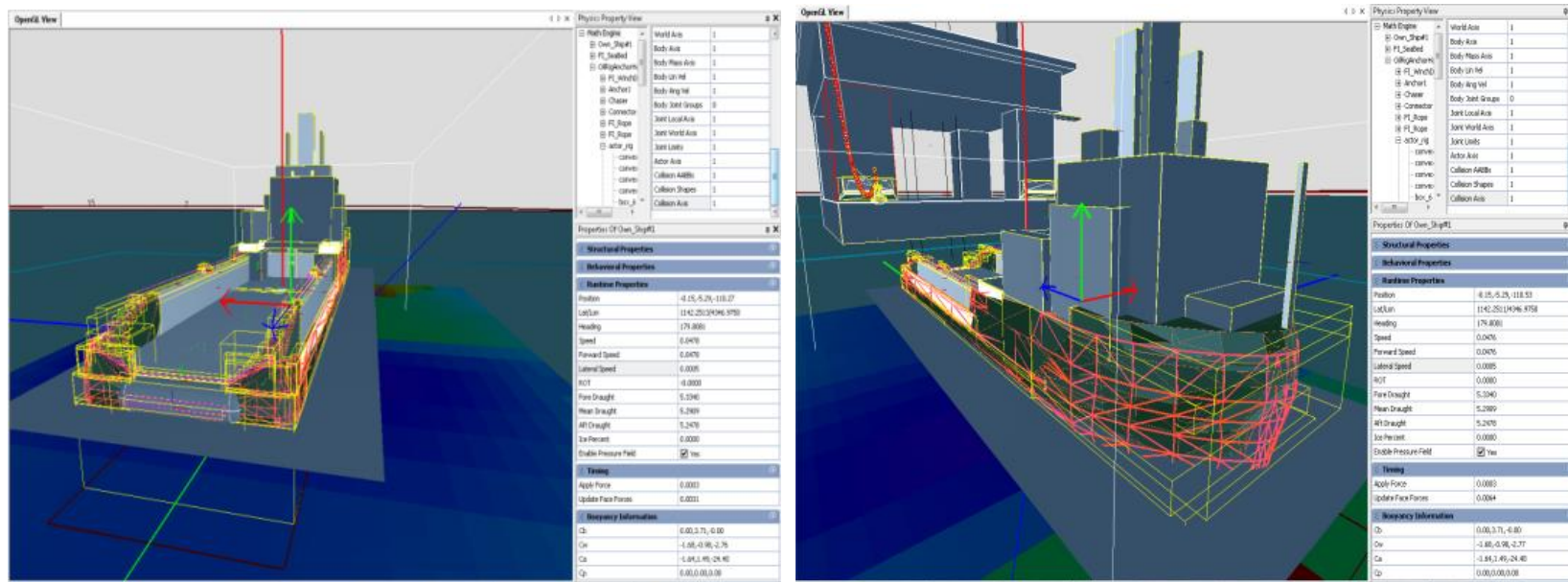
Simulated Vessel

Vessel Modelling

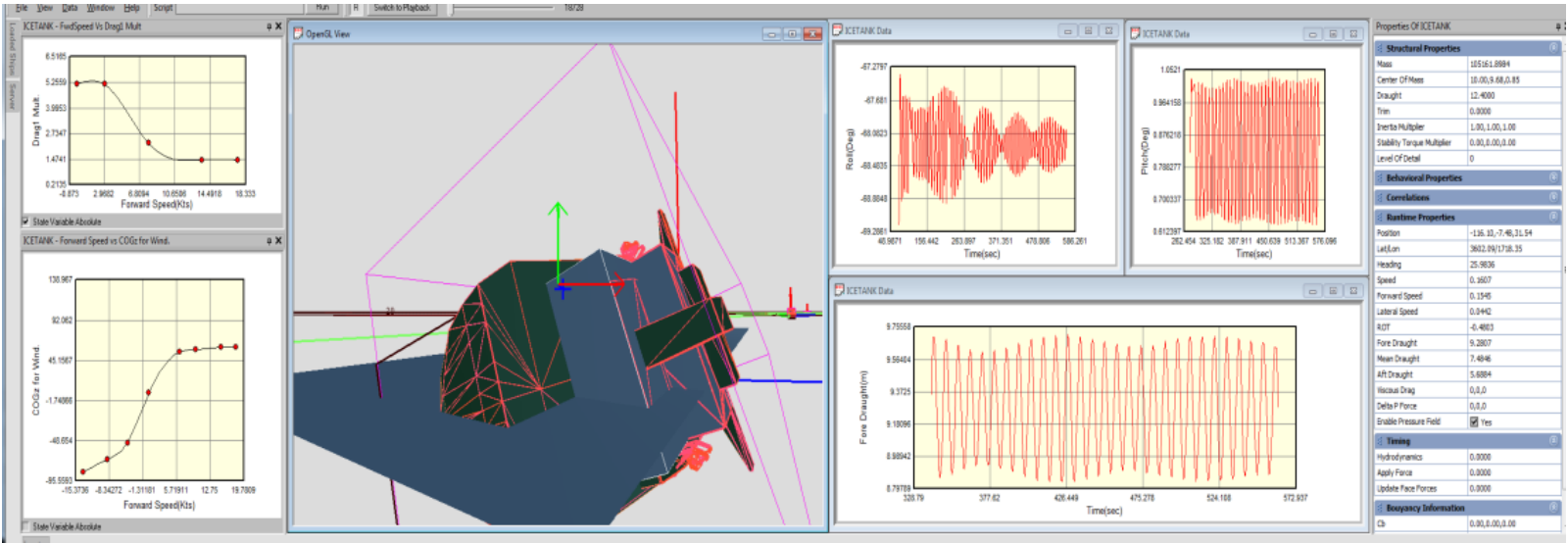
The hydrodynamic vessel model of the simulator provides a high degree of behavioural realism. The model provides results that are accurate, consistent, and predictable under a multitude of combinations of forces, conditions, objects, situations, and user actions.

At the highest level, the vessel model will account for forces and moments arising out of:

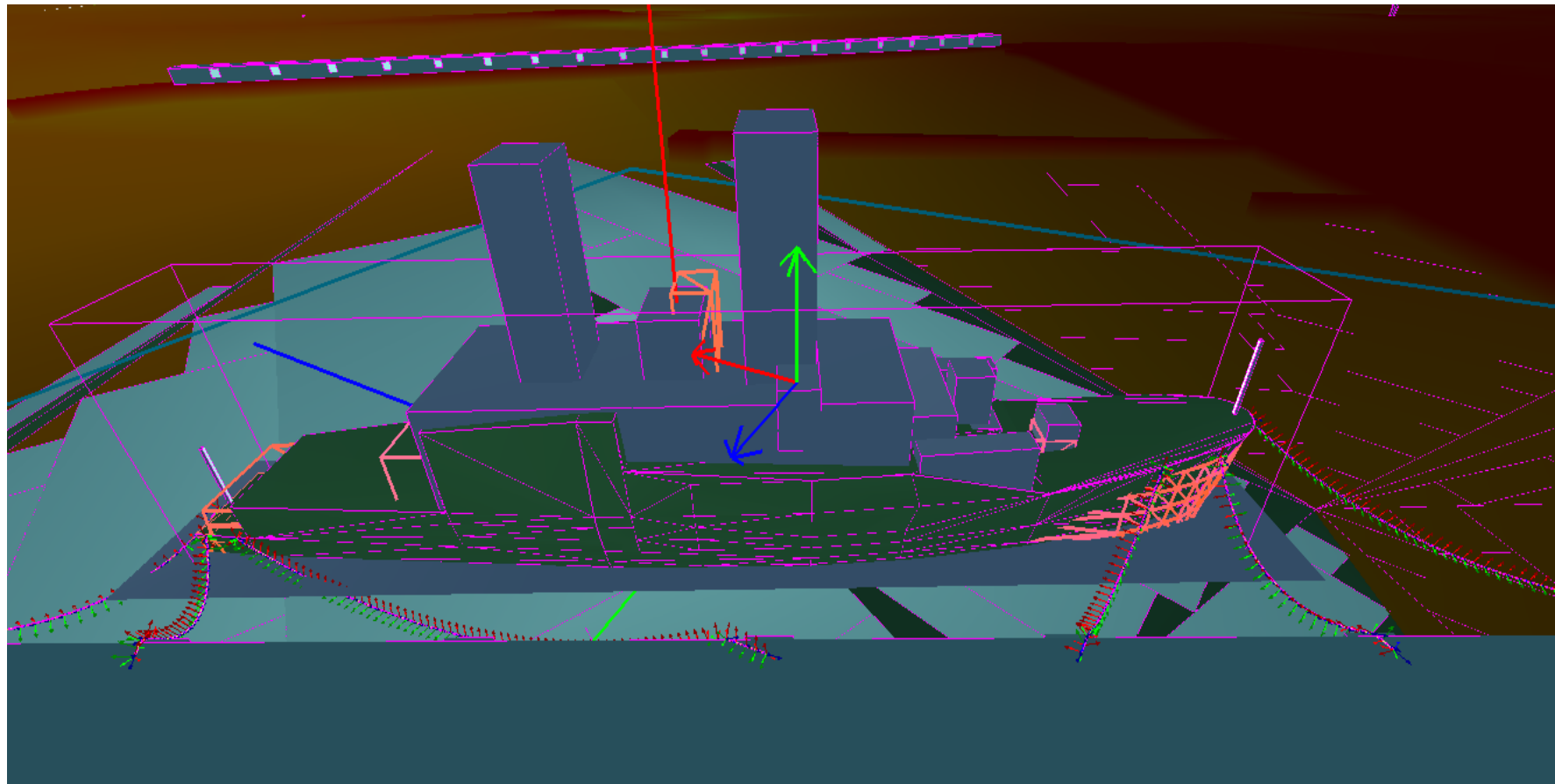
- Hydrostatics and Damaged stability conditions
- Hydrodynamics and aerodynamics
- Propulsion - propellers, pods and thrusters
- Control surfaces – rudders and fins
- External forces – environment wind, current, waves, narrow channels, low under keel clearance and conditional forces – e.g., mooring ropes, anchors, chains, wires, fenders, berths and quays, etc.



Sample images from Simulation Server



Snapshots of computational view

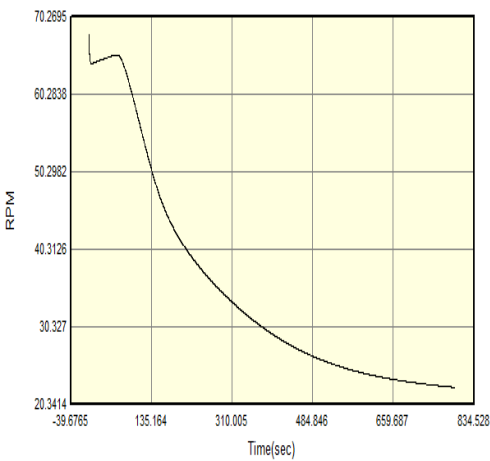


Sample computational views showing modeled entities and surfaces

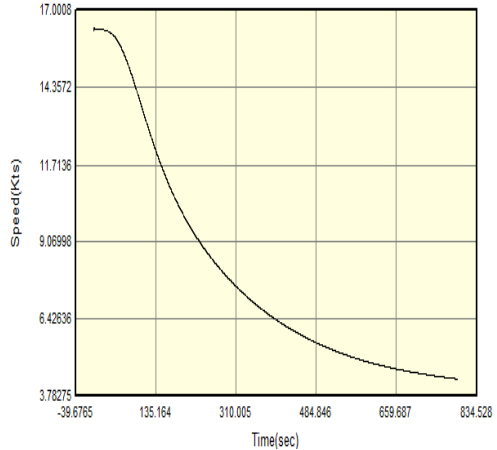
Results from Simulator for a Turn test performed on Tanker (260 K DWT)



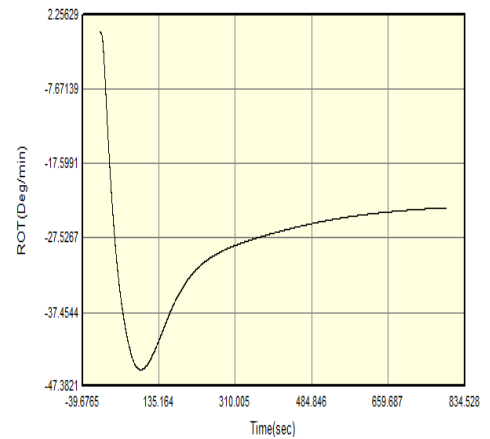
Turning Circle



Change of RPM during turn



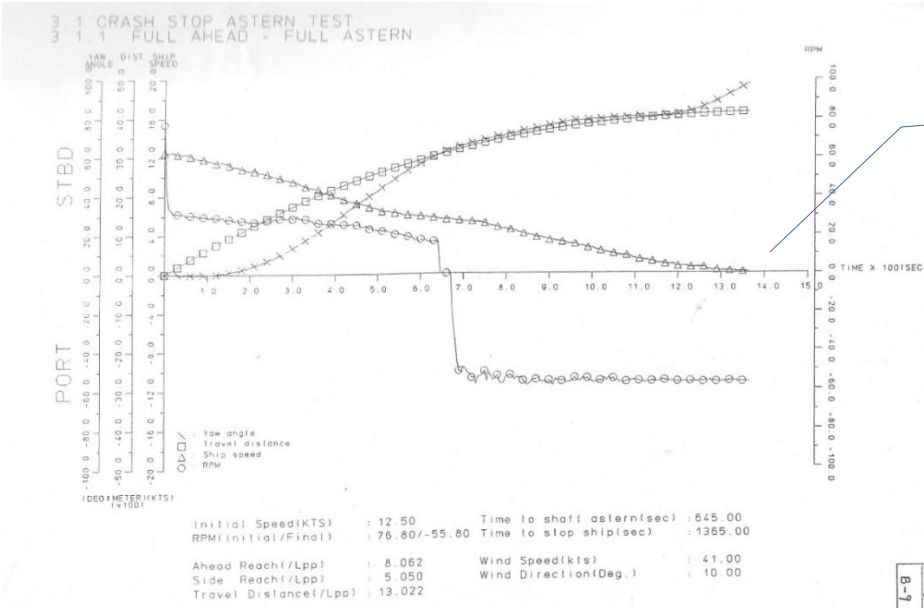
Change of speed during turn



Change of ROT during turn

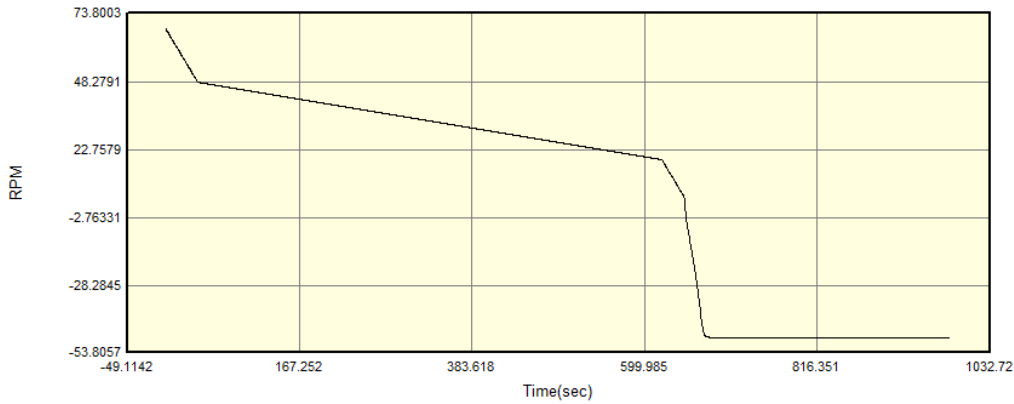
TURNING ANGLE (deg.)	PORT		STBD	
	Time	Speed	Time	Speed
90.0	159.7	9.1	167.8	8.7
180.0	346.2	5.2	368.1	5.4
270.0	592.1	3.6	613.0	4.4
360.0	870.0	2.6	885.0	4.0

Vessel turn data (from Sea Trials)



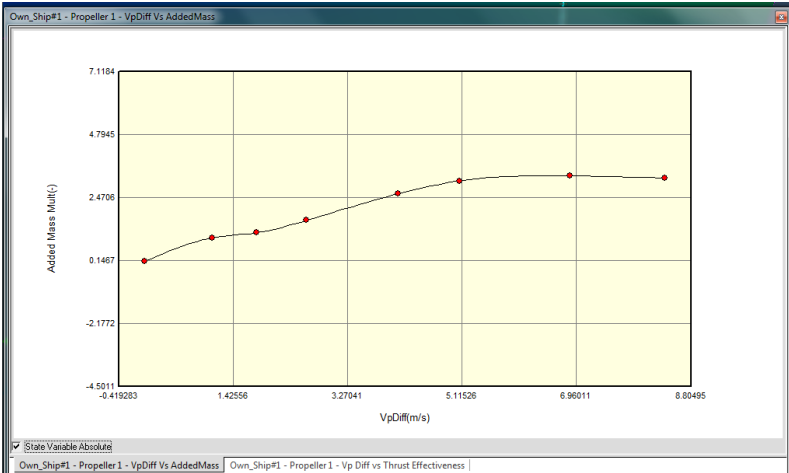
RPM change curve

Crash Stop data (from Sea Trials)

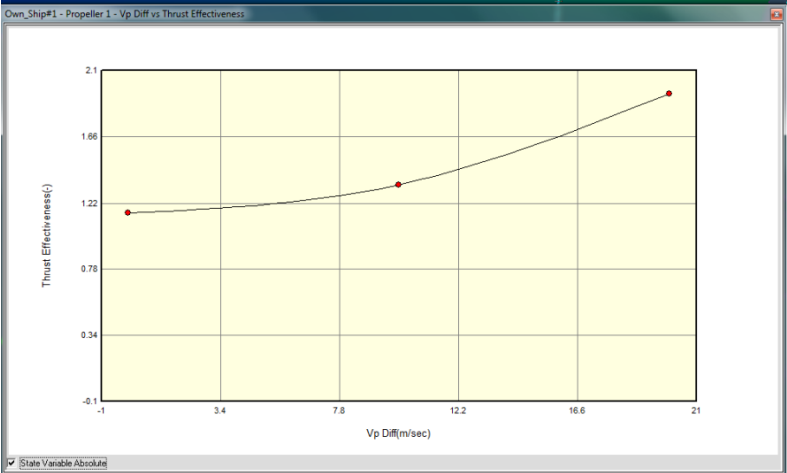


Simulator output of RPM change during Crash stop test for above vessel model

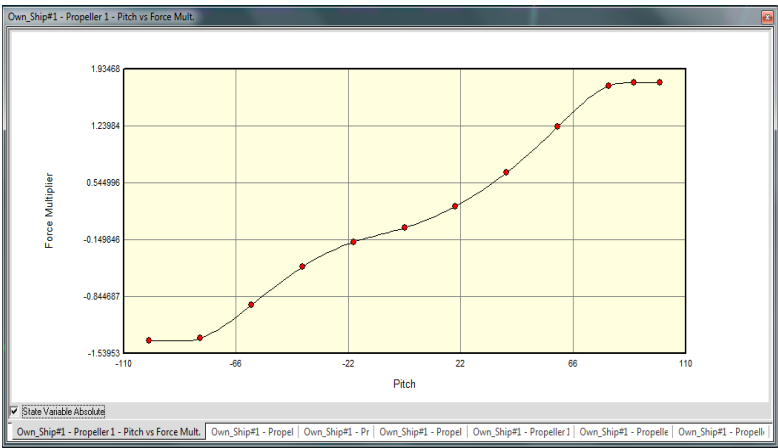
Effect of changes of model Constants



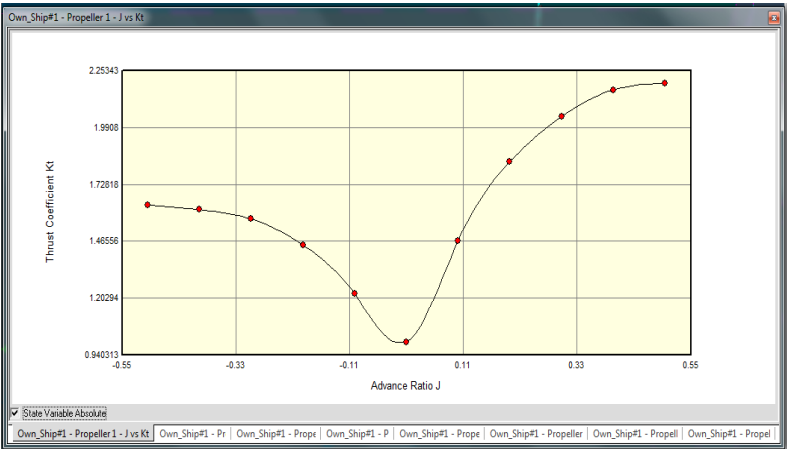
Propeller advance vs. Added mass



Propeller advance vs. Effective thrust



Pitch vs. Transverse force



Advance ratio vs. Thrust

SIMULATED EXERCISE AREAS

The ARI port and sea areas library includes a large number of ports and areas. The Exercise Areas library includes a number of navigable area types, including for example:

- Coastal navigation areas
- Approaches to Ports
- High density traffic areas
- Rivers and Canals
- Open sea areas
- Traffic separation schemes
- Narrow channels
- Harbour entrances
- Inner harbours
- Berths
- Anchorages



Singapore harbour



Europort harbour



Bosphorus strait (Turkey)



Gibraltar



Felixstowe



Southampton



Hongkong



Houston



Milford haven



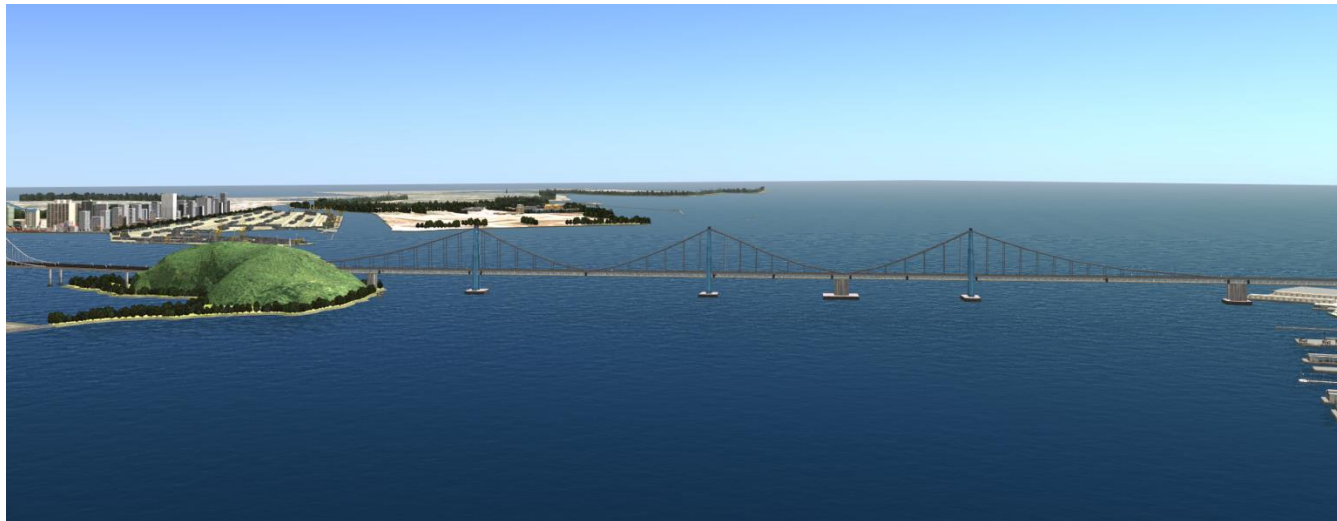
Rio de Janeiro



Map ta Phut



Texas



San Francisco

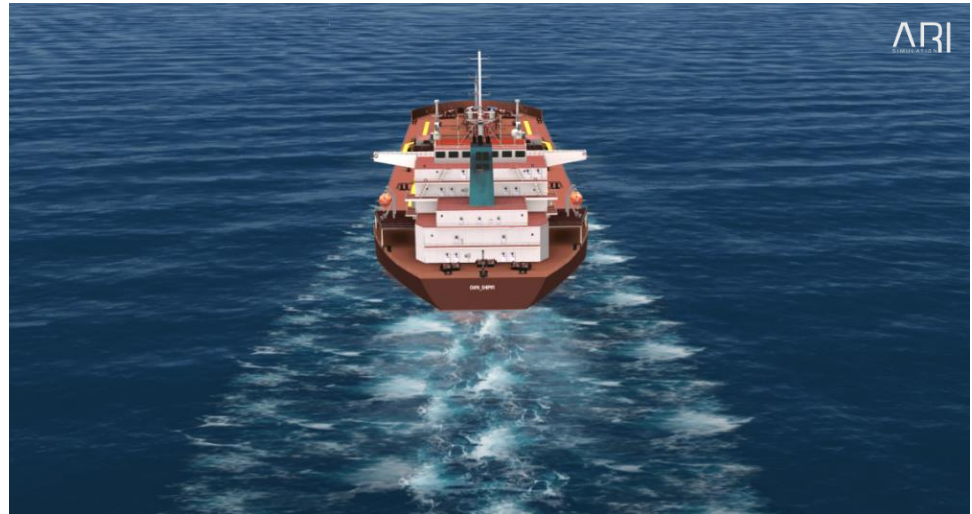
Visualization

The own ships and target vessels are provided with realistic 3 Dimensional bow wave and propeller wash. The propeller wash is directly related to the RPM of the engine selected by the user.

High resolution textured visual scenes of harbours, aids to navigation, and ships contribute to the simulation's realism. These colour visual scenes can be set for day, night, dusk, dawn or other conditions of ambient lighting and include limited visibility conditions.

The primary elements of the visualisation scenario include the following:

- Own ship deck view as seen from the 'Bridge Portholes'
- Own ship views (wings, stern etc.) as seen from the Bridge using panning function
- Water surface
 - Variable appearance with time of day, wind speed (and direction), waves
 - Reflection of sun in water
 - Variable colour
 - Wash and wake from own vessel and targets
- Sky - Variable appearance with cloud cover, time of day
- Target vessels
 - Multiple types / size
 - Underway, anchored, making way
 - Day shapes, signals, flags
 - Rotating radar scanners
- Navigation objects
 - Buoys, beacons, lighthouses



Propeller wash

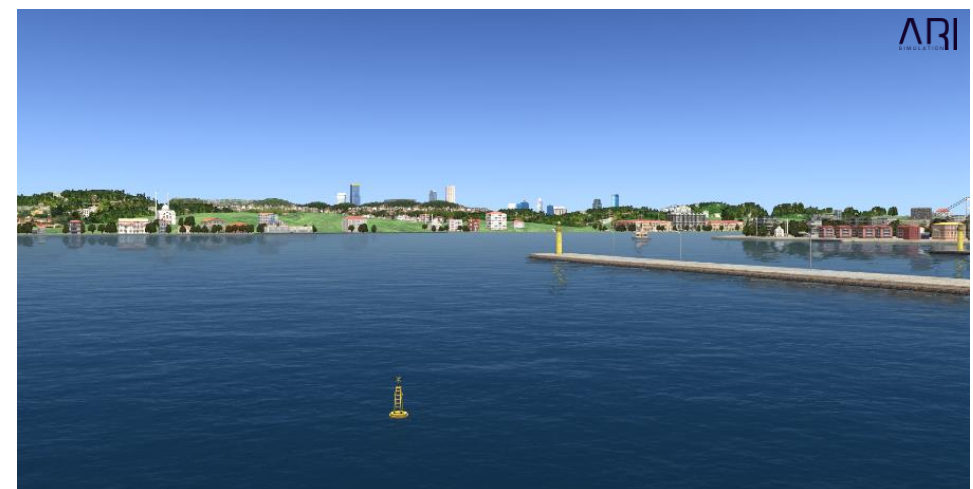


Beacon

- Land / Shore
 - Variable landmass appearance
 - Vegetation
 - Cultural objects – buildings, roads, bridges, towers, chimneys
 - Conspicuous objects (recognisable structures / buildings)
- Lights
 - Navigation lights on own vessel and target vessels
 - Buoys, beacons, lighthouses
 - Cultural lights ashore
 - Deck lights on anchored vessels
 - Signal lights (NUC, deep draft vessel etc.)
 - Steering light
 - Shapes / Day signals / Flags - Buoys, Target vessels
- Variable visibility – rain, snow, mist fog
- Wipers
- Variable ambient lighting – day, dusk, dawn, night
- Smoke, Fire, oil spill
- 3D depth perception of objects
- Varied colours and textures of objects
- Shadows



Cultural objects



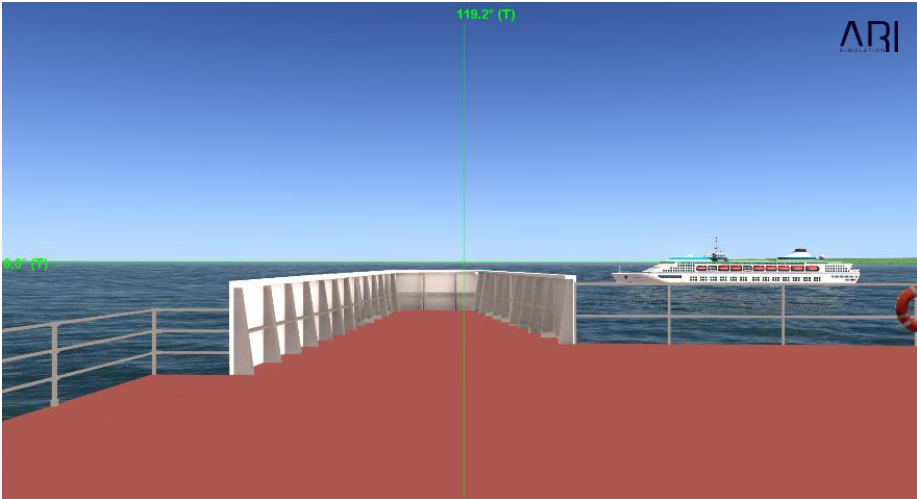
Buoys, Lighthouses



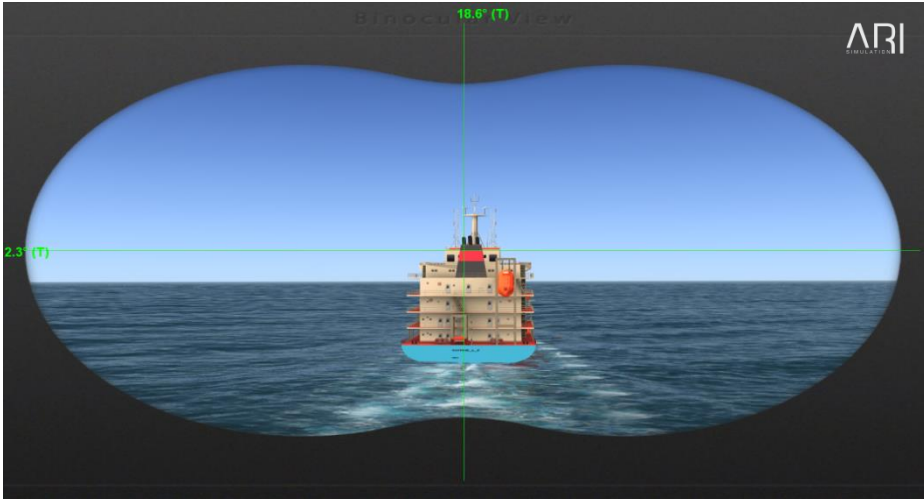
Reflection of sun in water



Restricted visibility



Bearing view



Binocular view



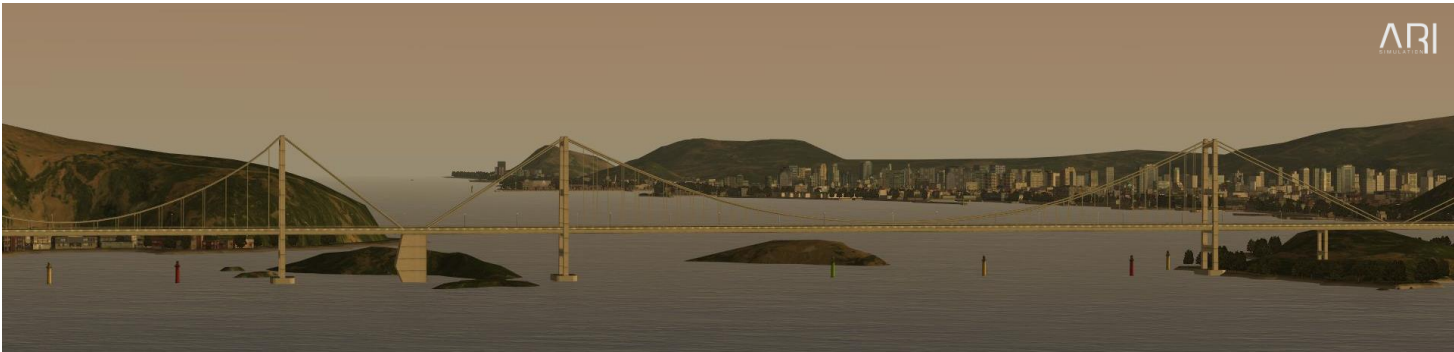
Variable colours of water surface



Day Signals



Day time visualisation



Dusk/dawn visualisation



Night time Visualisation

INSTRUCTOR CAPABILITIES

The Instructor Station is a PC based set up which allows control and monitoring of the exercise.

The Instructor station includes:

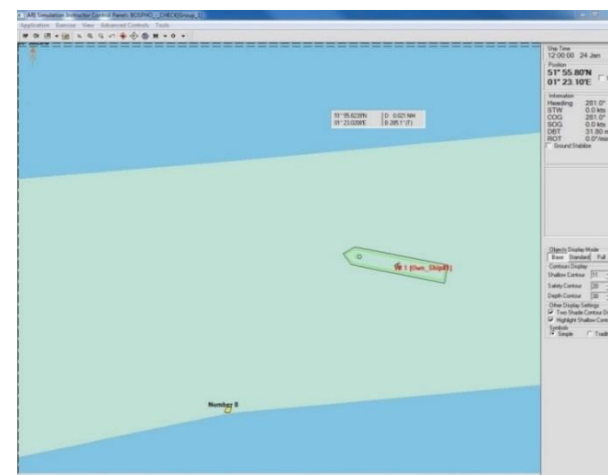
- Instructor & server applications
- Instructor Visuals
- Instructor GMDSS¹

Instructor can Launch, Pause, Resume exercises including replays. Some of the available features for control and monitoring during exercises include:

- Control and monitoring of the available environmental conditions such as current, visibility, wind, swell, precipitation, clouds etc.
- Easy monitoring of the own-ship parameters and student actions.
- Start, stop, pause, continue, and restart of exercises.
- Control of the target ship shapes, signals, lights, etc.
- Control for target ships' course, speed, etc.
- Creating of hazardous and challenging conditions for trainee by fault injection in navigational equipment and machineries.



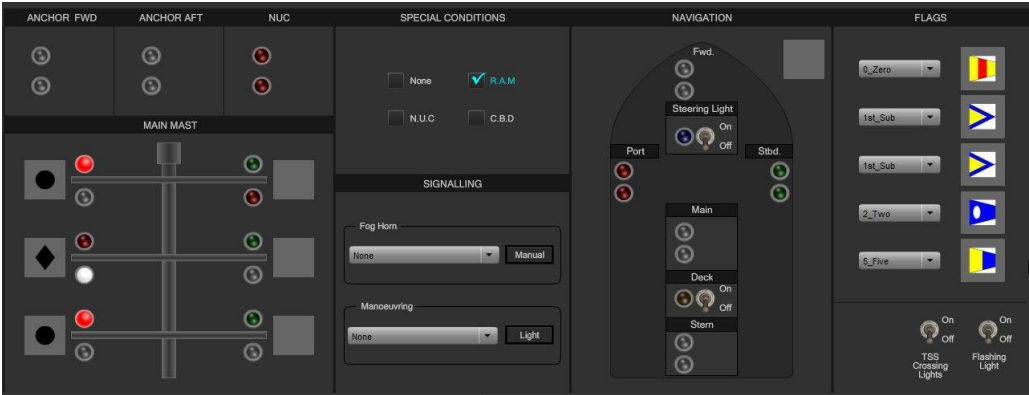
Instructor Station



Instructor chart interface

¹ Configuration dependent

LIGHTS AND SHAPES CONTROL – TARGET VESSELS



Instructor Control of Lights and Shapes for Target Vessels



Day Shapes



Flags



Navigation Lights on target vessel

ARI SIMULATION

Vessels **Environment** Nav. Equipment Failure Machinery Failure Lights Tugs AIS < >

ID / Name	Type	Dimensions(LOA,Bm,d(Mn))	Max Speed/RPM	Position	Heading(True)	SOG(k)	Steering Mode	Status	CPA/TCPA	Set Course	MMSI	IMO Number
V# 1 (Own_Ship#1)	Tanker 2	274.00m,48.00m,16.00m	14.7kts / 87	40° 59.99'N 28° 59.70'E	359.8°	0.88	Hand	Makingway		0°	636009820	9009138
V# 2 (Tanker 1)	Tanker 1	240.00m,41.00m,11.00m	13.9kts / 105	40° 58.32'N 28° 58.47'E	000.0°	0.00	Hand	Underway	0.93NM/-113.5min	0°	636011454	9225342

SELECTED SHIP ENVIRONMENT

CURRENT **WIND**

Rate Direction Rate Direction

Disable Tidal Current Tide Settings Zones Disable Sea Waves Sea Color Enable Birds Wind Gust

SWELL 1 **CURRENT** **VISIBILITY**

Height (mtrs.) Period (sec.) Current Rate (kts) Visibility

SWELL 2 **WIND - BF SCALE** **CHANGE RATE** **DAY, TIME & MOON PHASES**

Height (mtrs.) Period (sec.) CALM Min 10:42 30 APR-15

PRECIPITATION & THUNDER **CLOUD SETTINGS**

Rain Drizzle Slight Moderate Heavy Thunder Thunder Interval (min) Snow Slight Moderate Heavy Position Radius (NM) Cirrus Cumulus Cirro Stratus Cirro Cumulus Nimbo Stratus Sky Cover

ARI Instructor Graphical User Interface

ENVIRONMENTAL CONTROL

Tide

TIDE SETTINGS			
TIME (HH:MM)	TIDAL HEIGHT(m)	CURRENT SPEED (kts)	CURRENT DIRECTION
LL 3:5 - HR + - MIN +	0 0 1 2 3 4 5 6 7 8 9 10	0 0 1 2 3 4 5 6 7 8 9 10	 0°
LH 9:5 - HR + - MIN +	0.1 0 1 2 3 4 5 6 7 8 9 10	0 0 1 2 3 4 5 6 7 8 9 10	 0°
HL 15:5 - HR + - MIN +	0 0 1 2 3 4 5 6 7 8 9 10	0 0 1 2 3 4 5 6 7 8 9 10	 0°
HH 21:5 - HR + - MIN +	0.1 0 1 2 3 4 5 6 7 8 9 10	0 0 1 2 3 4 5 6 7 8 9 10	 0°
Apply			

Instructor control of Tidal times and heights with tidal current



Low tide



High Tide

Visual effects of tidal height variation

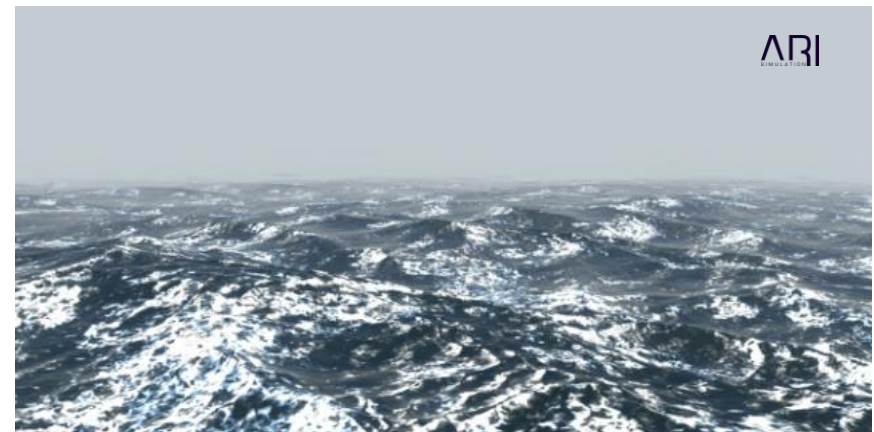
Wind speed and Direction



Instructor control of Wind direction and speed, with Swell



Wind force "0" – Calm



Wind force "9" – Strong Gale

Visibility



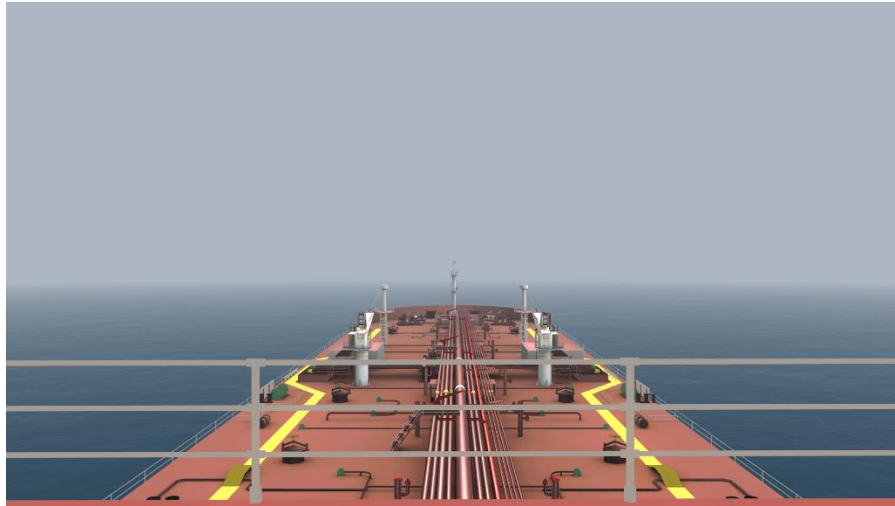
Instructor control of visibility



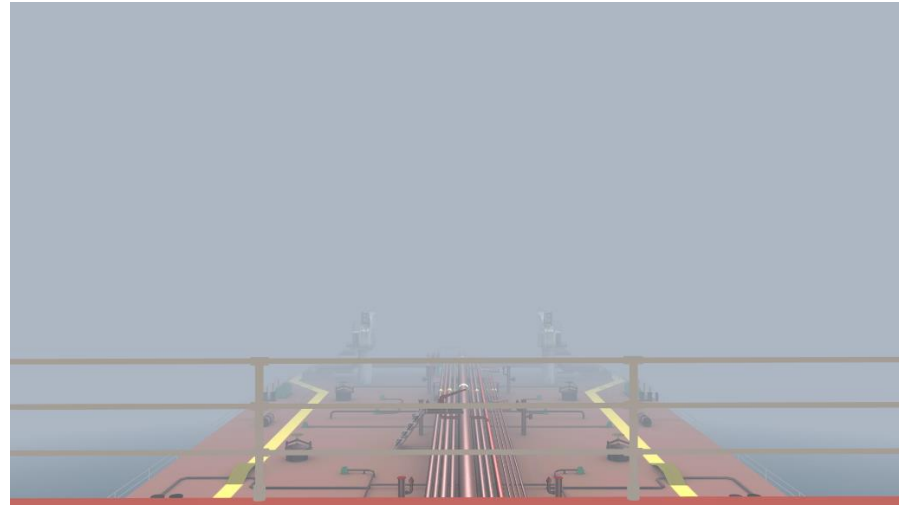
Clear Visibility



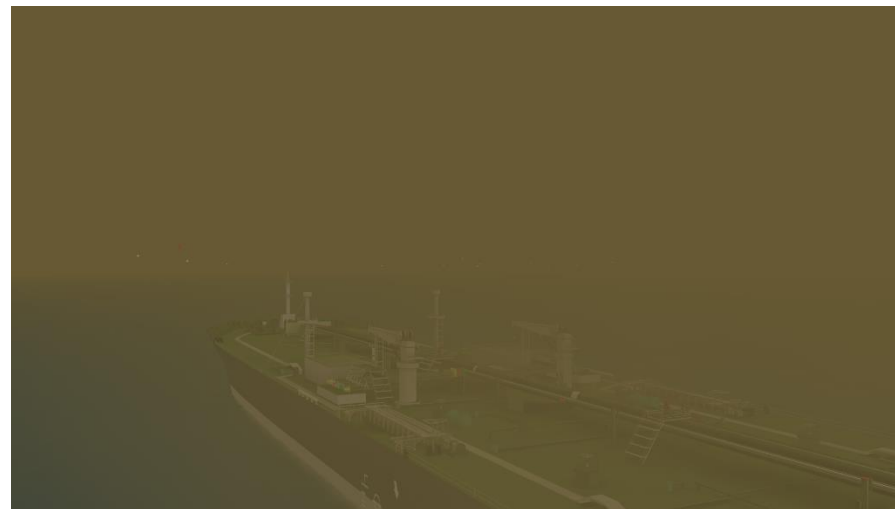
Reduced visibility condition – 3 NM



Reduced visibility condition – 0.5 NM

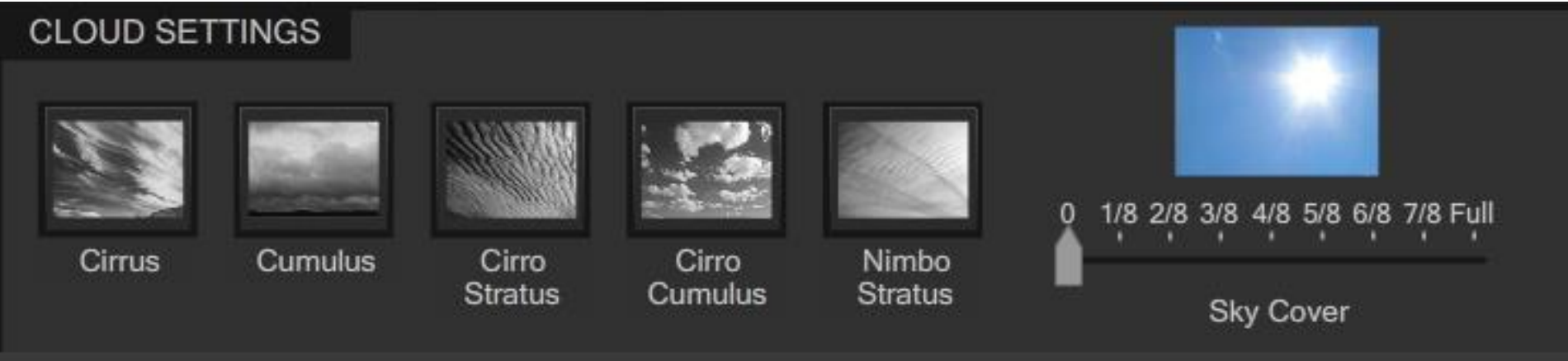


Reduced visibility condition – 100 Metres

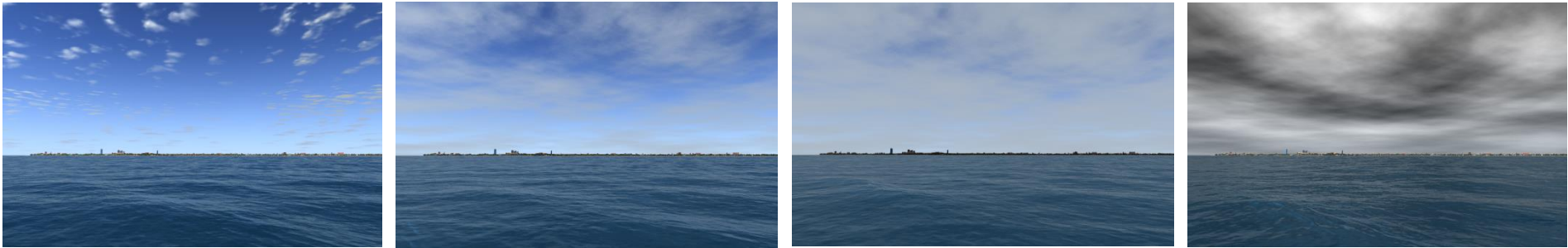


Reduced visibility condition – Dust Storm

Clouds



Instructor control of cloud types and cover



Various Cloud types and Variable sky cover

Precipitation and Thunder



Instructor Control for Precipitation (Rain and Snow) and Thunder



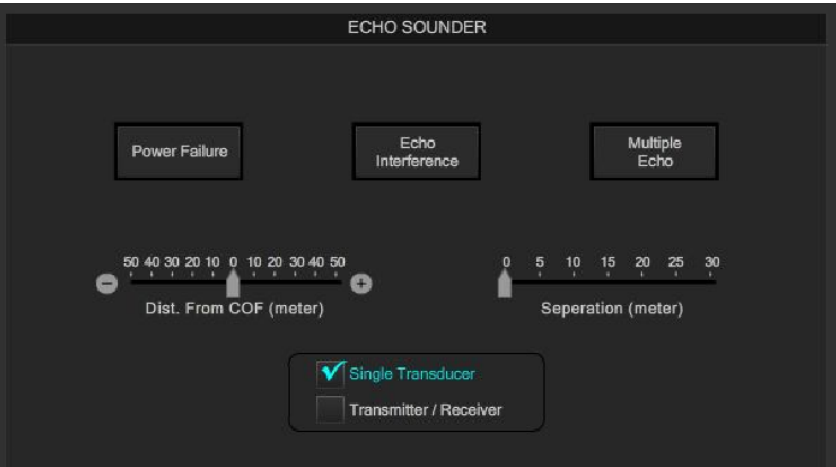
Lightning and rain

Vessel Movement

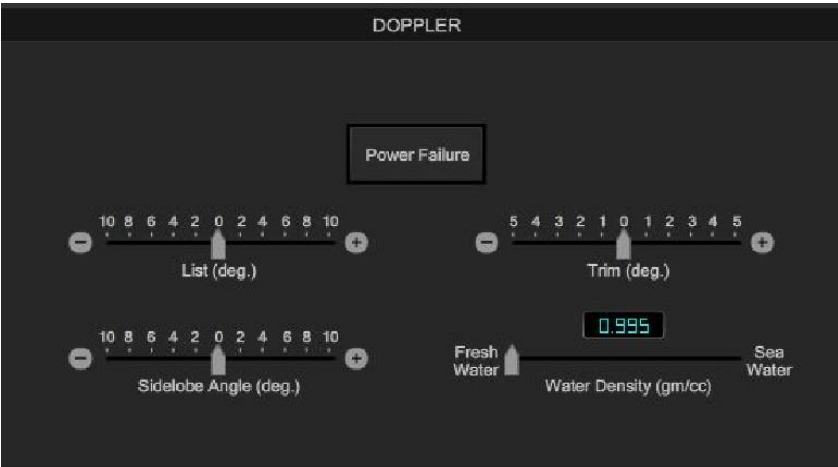


Sample images from simulator showing vessel movement in heavy seas

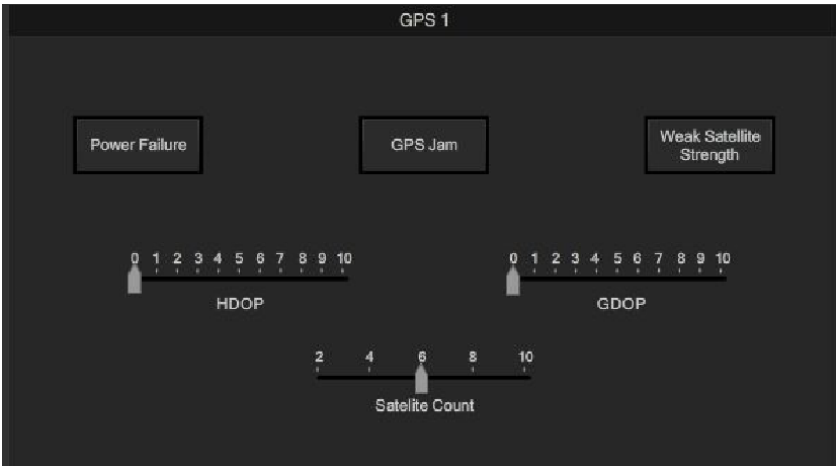
FAULTS AND MALFUNCTIONS



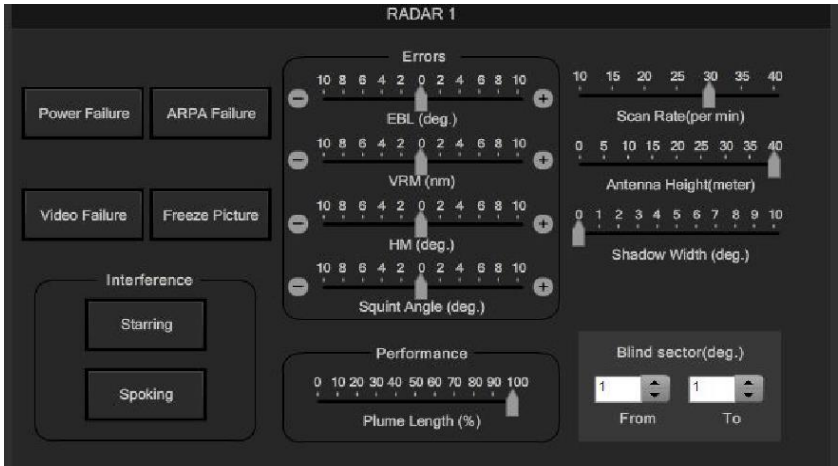
Errors of echo Sounder



Errors and Malfunctions of Doppler speed log

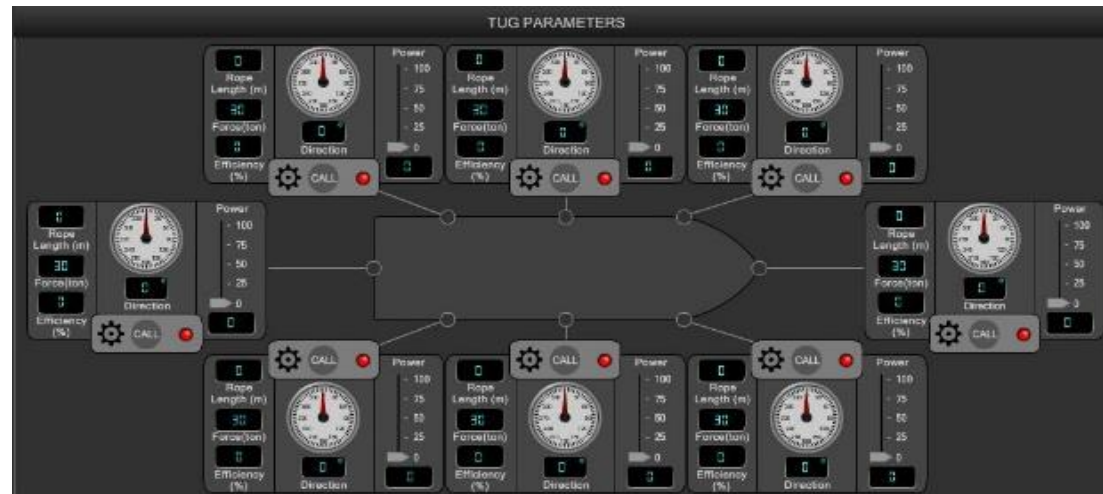


Errors of GPS / DGPS

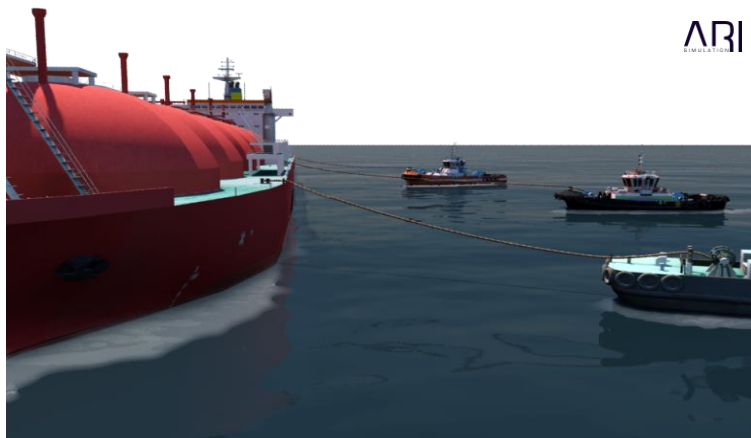


Various errors of Radar and ARPA

TUG CONTROL AND TOWING



Instructor control of tug deployment and operation

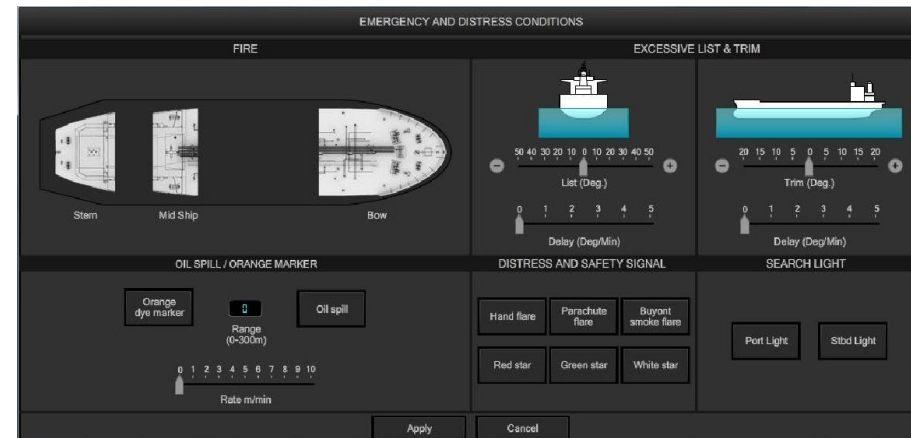


Sample images of Tug(s) in use for vessel manoeuvring assist

DISTRESS AND EMERGENCY CONDITIONS

These include, for example:

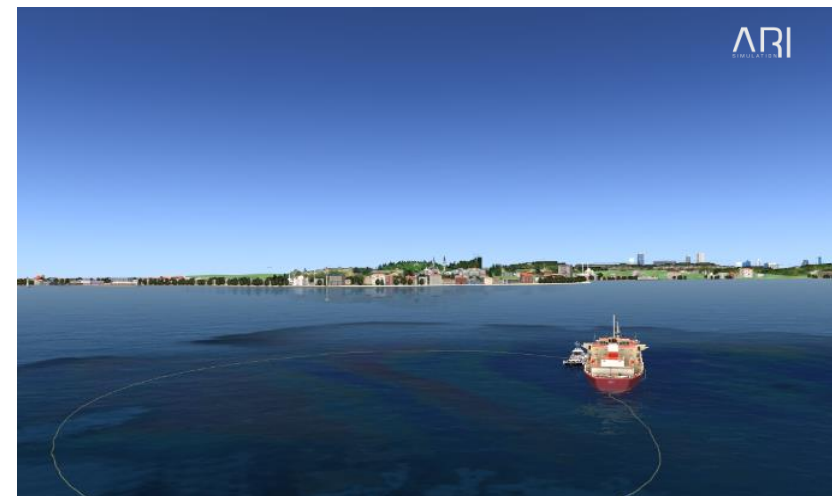
- Fire on selected target vessel (different locations on vessel)
- Excessive List / Trim condition on target vessel (to simulate a possible capsizing vessel)
- Oil spill from selected target vessel
- Orange dye marker from selected target vessel
- Distress / Safety signals from selected target vessel – these include: Parachute flare, Buoyant smoke flare, Red Star, White Star, and others.



Instructor interface for creating several distress and emergency conditions.



Fire on board Target vessel



Oil Spill



Excessive list on target vessel



Excessive Trim on target vessel



Man Over-board



Target ship reflection



Distress Signals from target vessel – Green star

TUG HANDLING SIMULATOR FEATURES

SPECIFIC FEATURES

Own Ship (Tug)

- ASD Tug
Azimuth thruster controls will be provided with ARI Tug Handling Simulator²
(Other Tug models are available in the ARI own tug library).



Azimuth thruster controller – Lilas or similar

² If customized tug handling controls (Aquamaster or similar) are required, these can be procured by buyer.

Target Ship

3 target ships of different sizes / types from the ARI Target vessels library will be provided in the simulator.



Ship Models

Exercise Areas

One exercise area will be provided.



Sample Exercise Area

FUNCTIONAL FEATURES

- Ship Assisting work
- Escort work
- High fidelity hydrodynamic modeling of tug behavior
- Using custom tug controllers (Aquamaster or similar as provided by buyer) to perform Tug handling maneuvers
- Making fast and adjusting line length
- Making towage transit
- Basic Rope behaviour under tension
- Visualisation with facility to pan 360 degree around the horizon
- Effect of wind and weather conditions
- Push/Pull action by tug
- Procedural training in tug operations

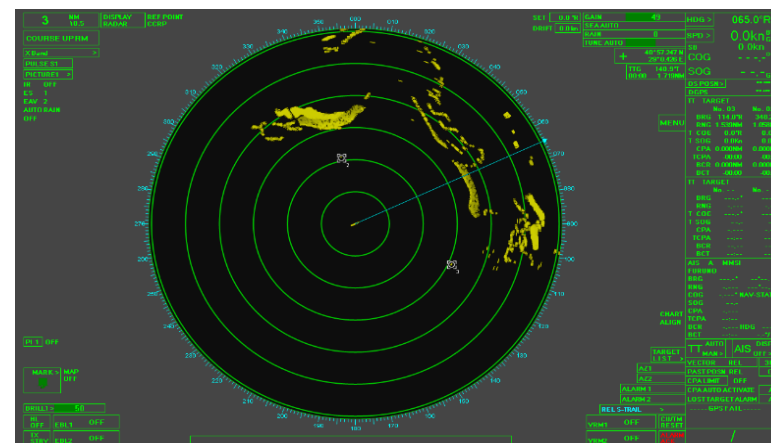
BRIDGE EQUIPMENT

RADAR/ ARPA

The ARI Radar/ARPA simulator meets the requirements of simulators as per IMO Regulations I/12 regarding the use of simulations in training and exercise. Additionally, it incorporates the features that are demanded from radar equipment installed on board after 1st January 1999 as per MSC Resolution 64 (67) and ARPA equipment installed after 1st January 1997 as per MSC Resolution A.823 (19). It also meets the STCW recommendations for Radar simulators.

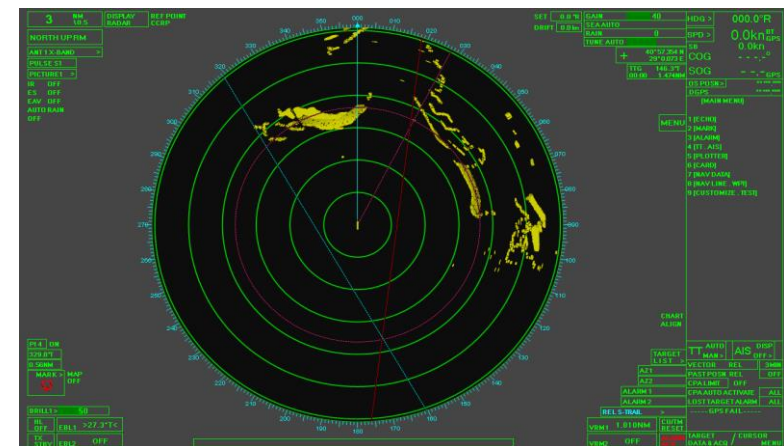
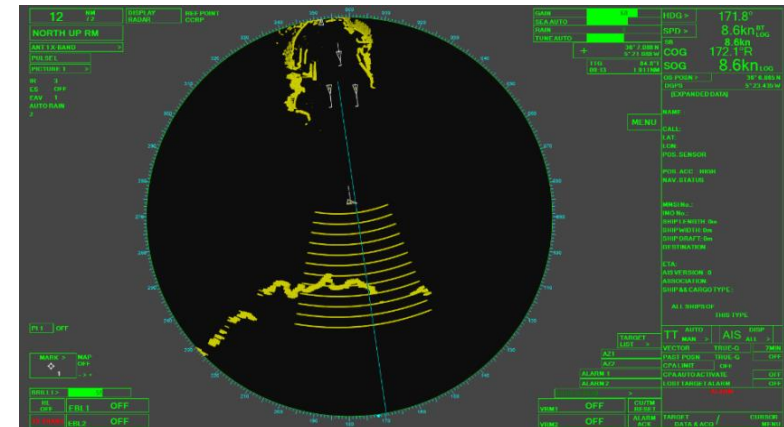
Primary features of the Radar/ARPA Simulator:

- Understanding Characteristics of radar sets and factors affecting performance
- Set up and maintain radar display
 - Switch Standby – On
 - Alter pulse length
 - Adjust controls to give an optimal picture (tuning, gain etc.)
 - Adjust display controls (brilliance, range selector, range ring, VRM, EBL, heading marker, anti-clutter etc.)
 - Adjust display modes (true motion, relative motion – unstabilised, relative motion – stabilized, north up, course up, head up)
 - Verify compass input for relative stabilized display, and compass and log input for true motion display
 - Use centre offset, centre reset functions
 - Set and alter range scale
 - Measure ranges and bearings
- Perform manual radar plotting:
 - Determine course, speed and aspect of other ships
 - Determine CPA and TCPA
- Fix vessels position by radar
- Identify aids to radar navigation and safety
- Use parallel indexing in radar navigation
- Use Radar to Avoid Collisions or Close Encounters



Radar Display

- Observe the effect of precipitation on radar detection
- Identify blind areas and shadow areas
- Observe how clutter may mask targets (sea clutter, rain clutter)
- Set up and maintain an ARPA display
- Acquire targets using ARPA function
 - o Use auto-acquisition zone(s)
 - o Delete acquired targets
- Observe processing delays in obtaining target information
- Obtain target information
 - o Course, speed, CPA, TCPA, BCR etc.
- Use ARPA to assist in applying COLREGS
- Observe and interpret True vectors and Relative vectors
- Use target history display
- Observe and interpret warnings and alarms related to Radar and ARPA functions
- Use performance monitor
- Set up and use a PI line
 - o Use more than one PI line
- Use Nav Marks function
- Interpret real motion of vessel from a tracked echo
- Observe errors to RADAR/ARPA display, including for example:
 - o Heading marker error, variable range marker, gyro error etc.
- Observe factors which might cause faulty interpretation of the radar picture, for example, interference, side echoes, multiple echoes, second trace echoes, etc.



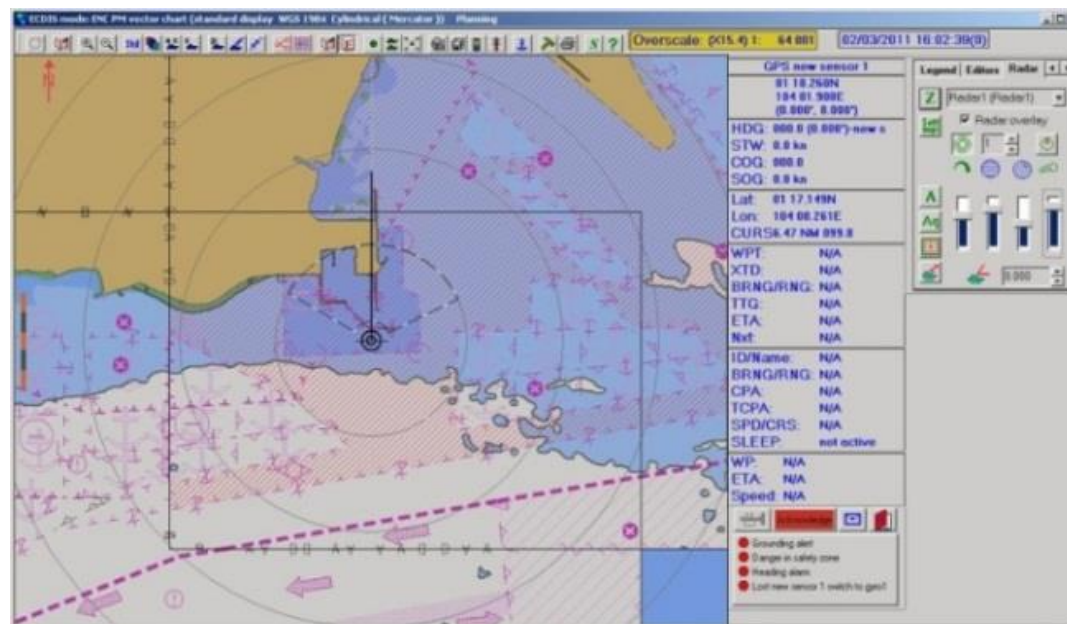
ECDIS

The ARI ECDIS Simulator is a comprehensive training solution designed to comply with the relevant requirements of STCW 2010 under section(s) A-I/12, A-II/1 and A-II/2 and it meets the objectives and training requirements as specified in the IMO modular course 1.27. In addition to being used as a training tool for familiarization and operational training, it can also be used to demonstrate competence in accordance with the STCW 2010 requirements.

The simulator includes ECDIS software providing the functionality of a ship-board ECDIS system.

Some of the available features are as follows:

- Basic navigational functions and settings
- Operation of Electronic Charts, ARCS, C-Maps etc. & Chart updating
- Route planning check functions
- Route monitoring functions
- Required indications and alarms
- Display of navigational sensor information
- Overlay of ARPA target information
- RADAR overlay function
- Overlay of AIS information
- Typical Sensor Faults & Failures
- Data recording & playback
- Presentation of ECDIS data in accordance with the requirements
- Route Planning and Monitoring functions



ECDIS Display

CONNING AND MANOEUVRING STATION

Own Ship controls and displays include:

- Rudder controls and indicators
- Rate of Turn indicator
- Magnetic compass and Gyro compass repeaters
- Engine controls including RPM and thruster control
- Doppler Log
- Time, wind, distance sailed, depth indicators
- Own ship navigational lights display control
- Own Ship Fog Horn (Auto/Manual) controls
- Pilot card and Manoeuvring characteristics for own vessel
- Engine Alarm Panel
- Engine Control Panel
- Telegraph control display (for engine speed/direction control)



On-screen conning controller station



Gyro Compass display



Magnetic Compass display

GMDSS

GMDSS Module includes the following simulated equipment:

- VHF DSC
- MF-HF DSC
- NBDP
- INMARSAT C, B
- Fleet 77
- Navtex
- EPIRB
- AIS SART
- Portable VHF
- Battery Panel
- Remote Distress Alarm Panel
- Intercom & PA



ELECTRONIC NAVIGATION EQUIPMENT (NAV-AIDS)



ECHO Sounder



DGPS



Automatic Identification System (AIS)

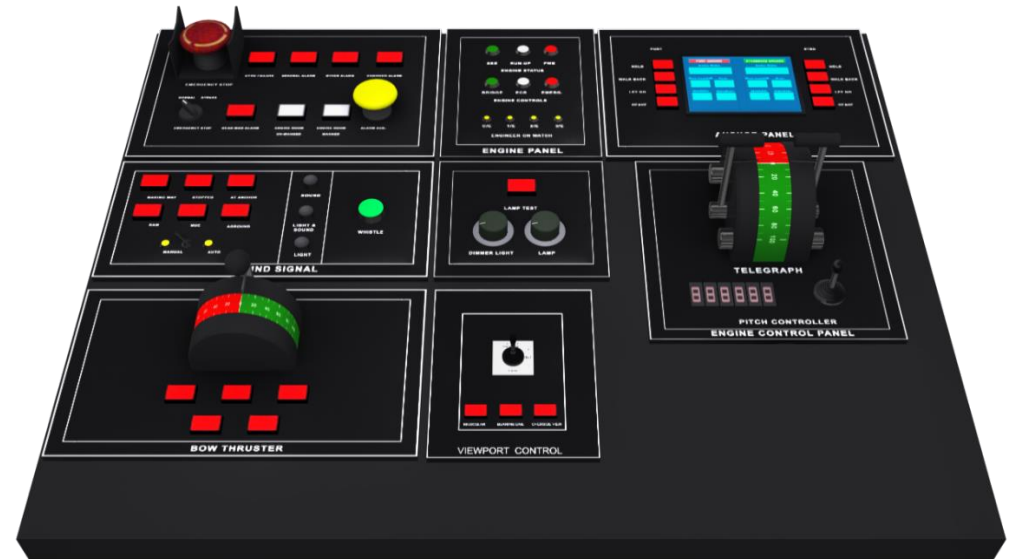


Doppler Log

CONNING AND MANOEUVRING HARDWARE HMI

The Conning and Manoeuvring hardware control includes:

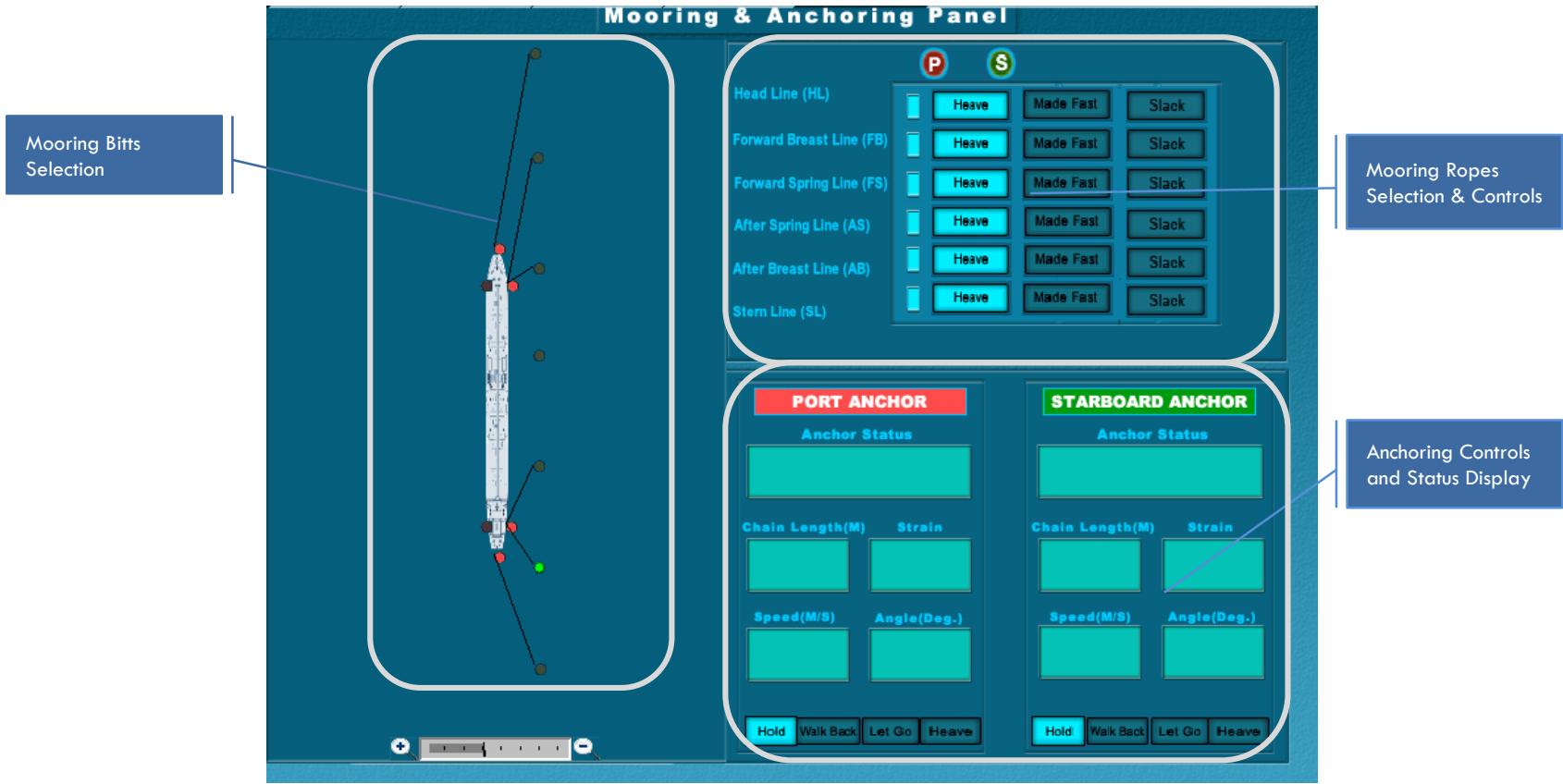
- Engine Telegraph
- Bow Thruster Control Panel
- General Alarm Panel
- Engine control
- Engine Status
- Sound Panel
- NFU Lever
- Lamp Test and Dimmer Panel
- Auto pilot control



Conning and Manoeuvring Hardware HMI



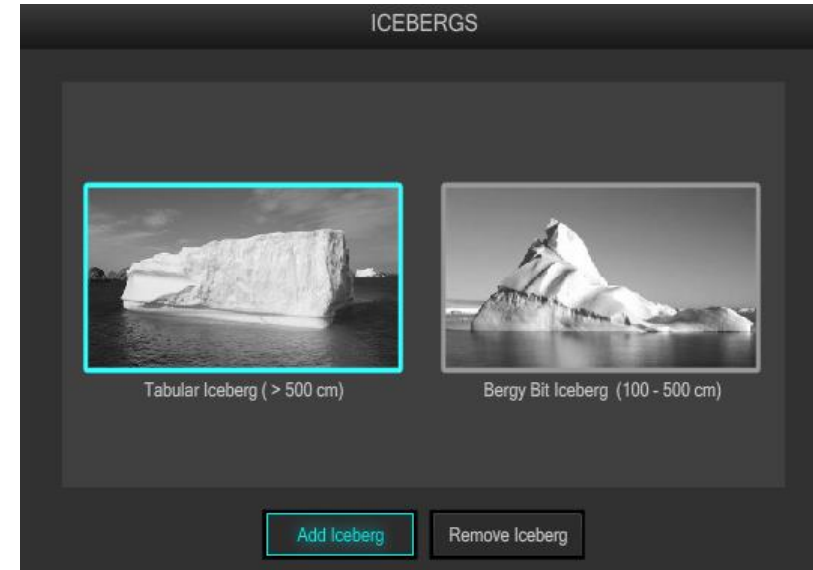
MOORING AND ANCHORING



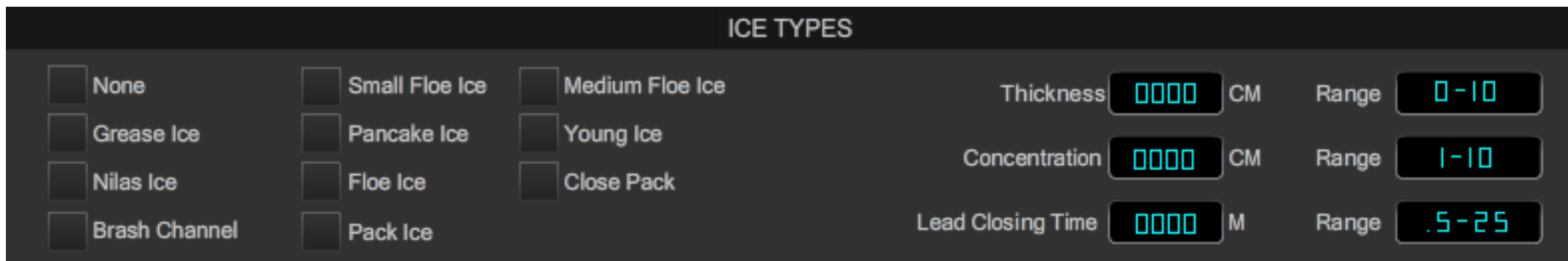
Mooring and Anchoring User Interface

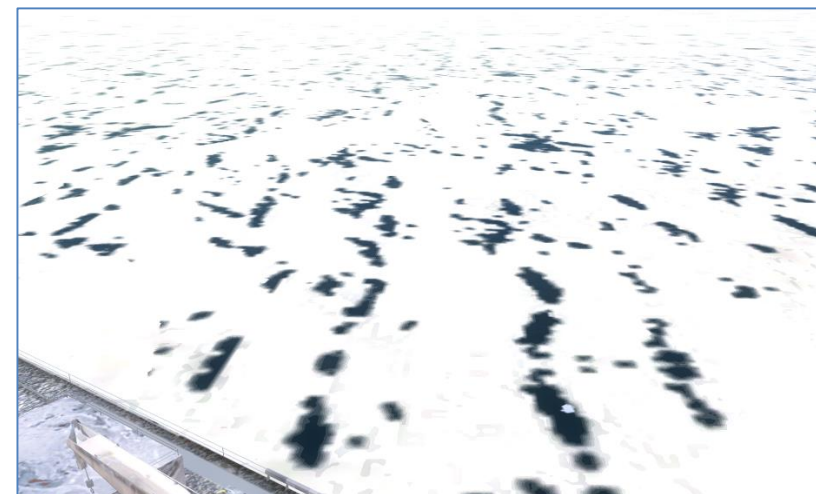
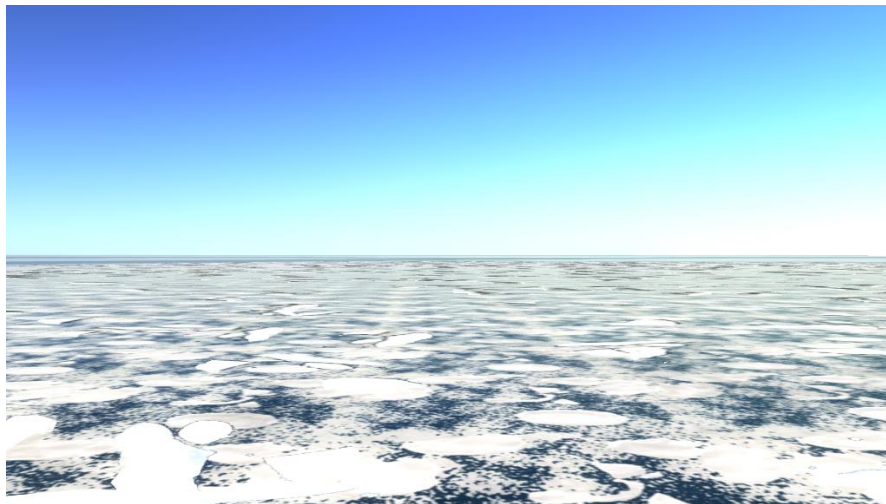
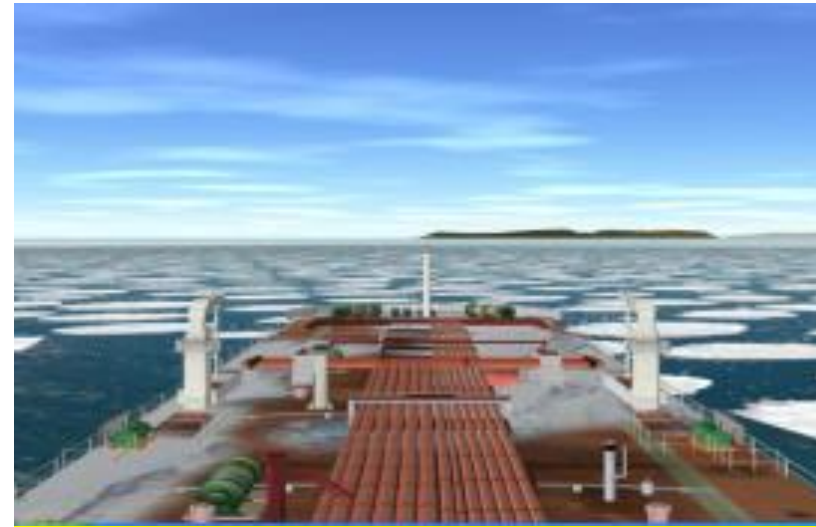
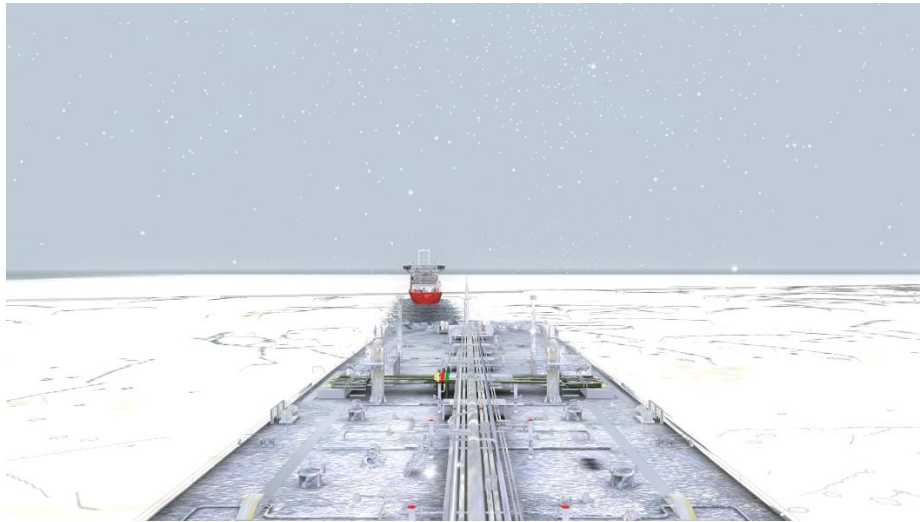
ICE NAVIGATION MODULE (OPTIONAL)

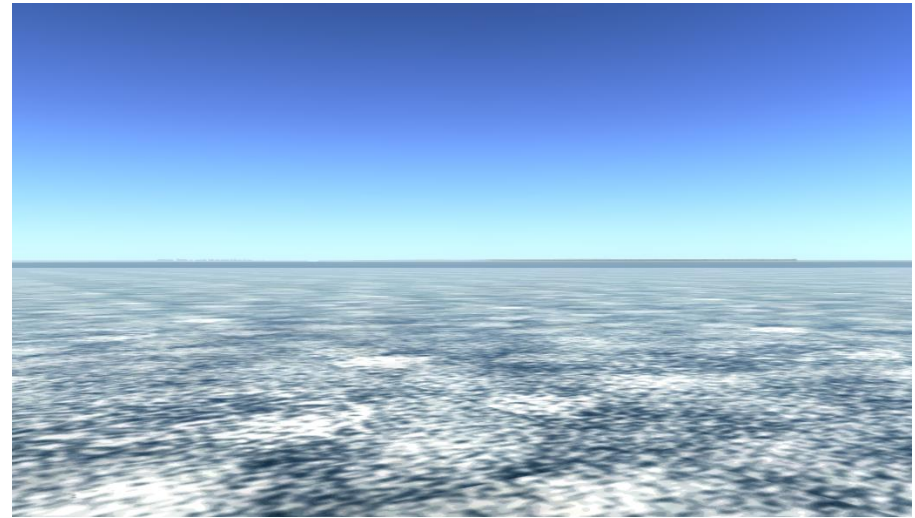
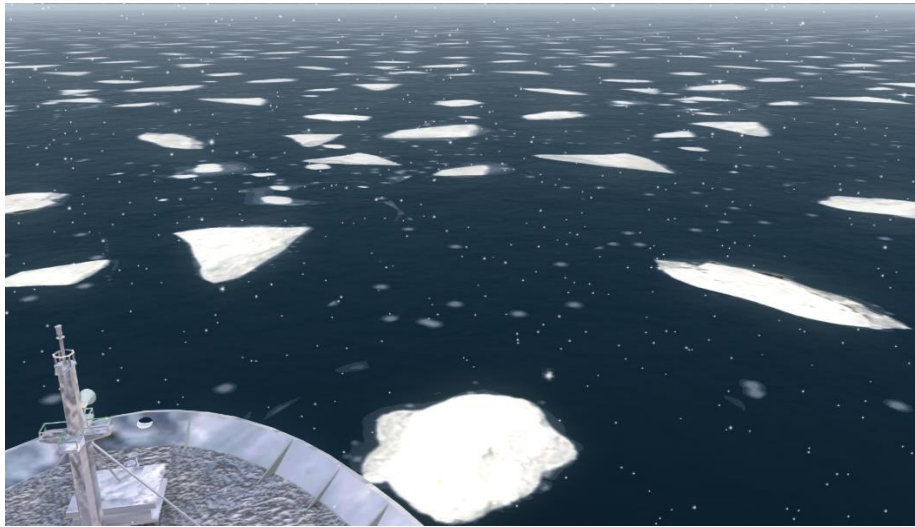
The Ice module provides full out of the window view of real world ice environment selectable by the user. The world created on Ice module is based on real world ice conditions and accurately reflects actual conditions to be encountered by a vessel transiting in the ice region. Complete set of ice and weather data is included for better understanding of the navigation passage.



Instructor interface screen for Ice navigation control







Sample images from Ice Navigation module

RESCUE OPERATIONS

Search and Rescue Patterns

Using the ECDIS based SAR Module, the navigator can create SAR routes using selected options to plan for SAR operation. Different route patterns can be created, for example:

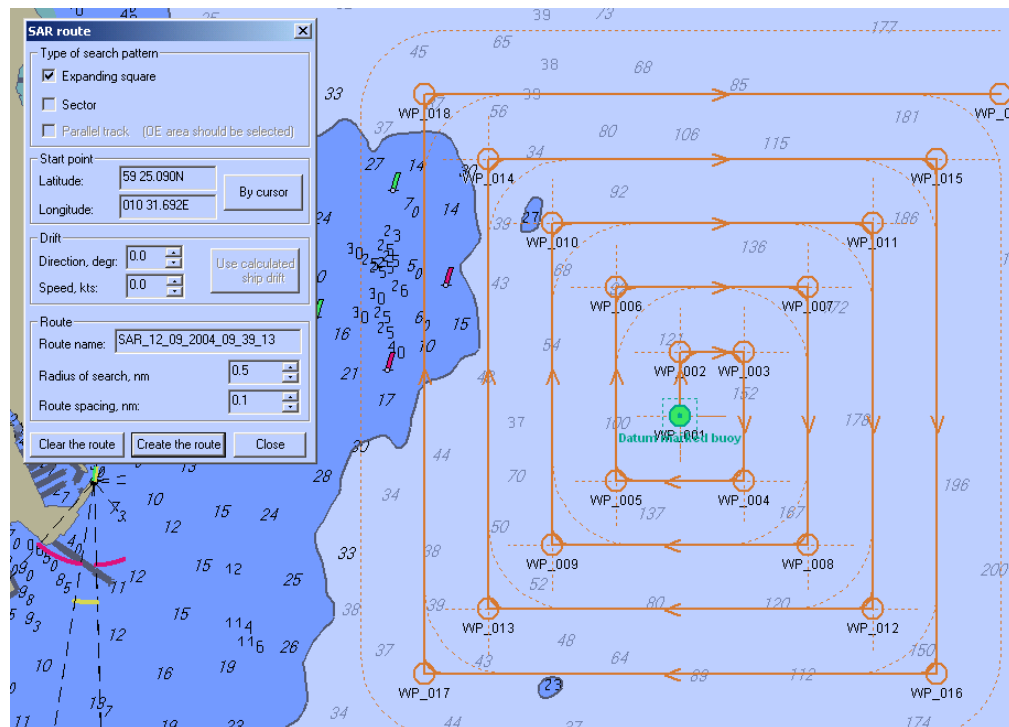
- Expanding square
- Sector
- Parallel line

To create the Expanding Square search pattern on the ECDIS for example, the Trainee will follow these steps:

The start point of the route is either the position of the ship.

- Select the direction of search
- Select the speed to proceed the route
- Select the search area with the parameter Radius of search
- Select the space between leg with the parameter Route spacing

The system will create the pattern automatically using these parameters. The trainee can monitor the position on the route by observing the position of the vessel as it is automatically updated on the Chart (ENC).



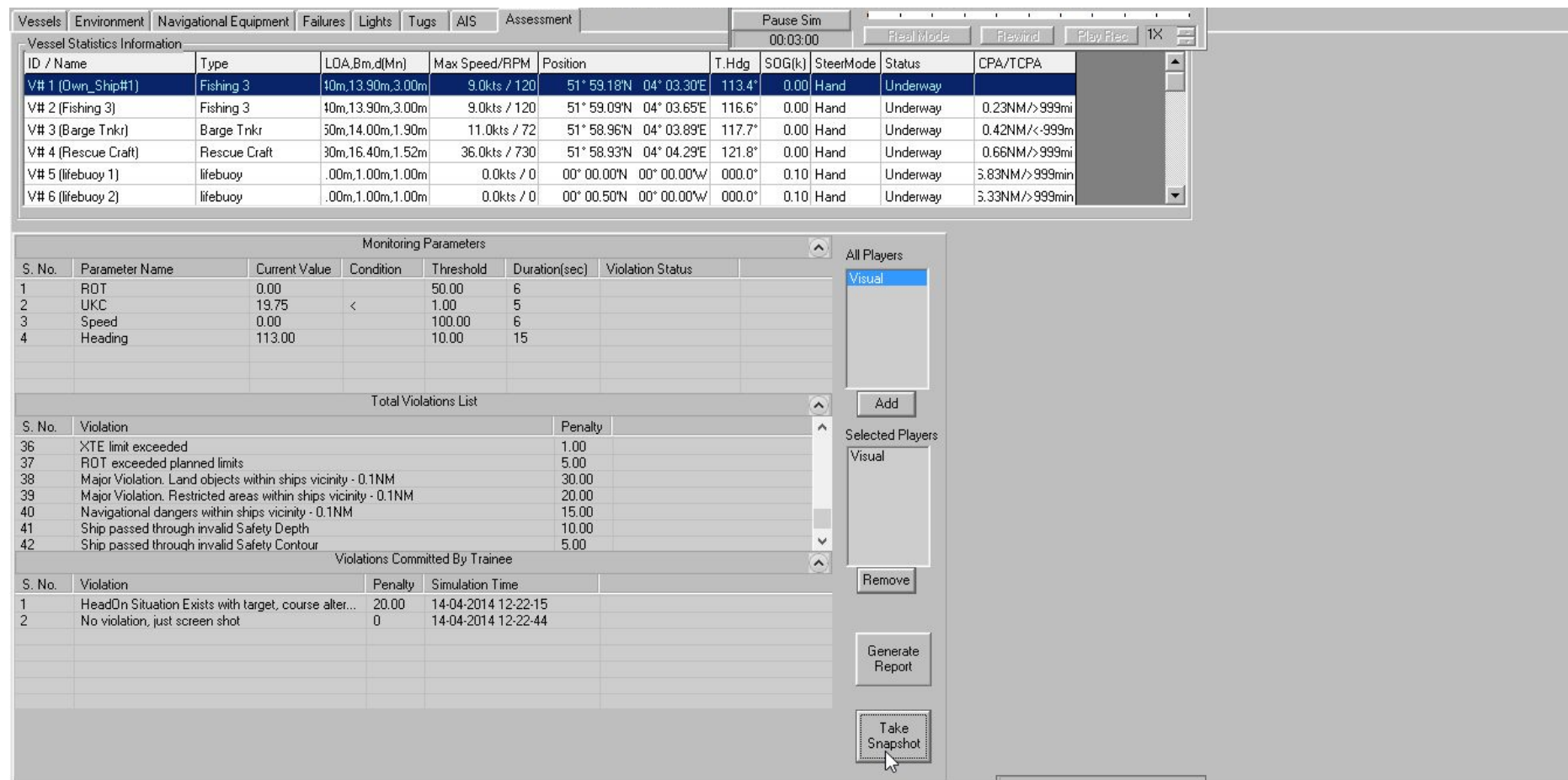
Example of an Expanding Square Search Pattern



EVALUATION / ASSESSMENT MODE

Assessment tool has been designed keeping in mind competent based assessment of the trainee i.e. a carefully considered judgement of the workplace performance to demonstrate that the individuals can perform or behave in accordance with the real time and operational requirements.

The facility includes possibilities to Set up a scoring method to assess performance of the learner.



Vessel Statistics Information

ID / Name	Type	LOA,B,m,d(Mn)	Max Speed/RPM	Position	T.Hdg	SOG(k)	SteerMode	Status	CPA/TCPA
V# 1 (Own_Ship#1)	Fishing 3	40m,13.90m,3.00m	9.0kts / 120	51° 59.18'N 04° 03.30'E	113.4°	0.00	Hand	Underway	
V# 2 (Fishing 3)	Fishing 3	40m,13.90m,3.00m	9.0kts / 120	51° 59.09'N 04° 03.65'E	116.6°	0.00	Hand	Underway	0.23NM/>999mi
V# 3 (Barge Tnkr)	Barge Tnkr	50m,14.00m,1.90m	11.0kts / 72	51° 58.96'N 04° 03.89'E	117.7°	0.00	Hand	Underway	0.42NM/<999m
V# 4 (Rescue Craft)	Rescue Craft	30m,16.40m,1.52m	36.0kts / 730	51° 58.93'N 04° 04.29'E	121.8°	0.00	Hand	Underway	0.66NM/>999mi
V# 5 (lifebuoy 1)	lifebuoy	.00m,1.00m,1.00m	0.0kts / 0	00° 00.00'N 00° 00.00'W	000.0°	0.10	Hand	Underway	3.83NM/>999min
V# 6 (lifebuoy 2)	lifebuoy	.00m,1.00m,1.00m	0.0kts / 0	00° 00.50'N 00° 00.00'W	000.0°	0.10	Hand	Underway	3.33NM/>999min

Monitoring Parameters

S. No.	Parameter Name	Current Value	Condition	Threshold	Duration(sec)	Violation Status
1	ROT	0.00		50.00	6	
2	UKC	19.75	<	1.00	5	
3	Speed	0.00		100.00	6	
4	Heading	113.00		10.00	15	

Total Violations List

S. No.	Violation	Penalty
36	XTE limit exceeded	1.00
37	ROT exceeded planned limits	5.00
38	Major Violation. Land objects within ships vicinity - 0.1NM	30.00
39	Major Violation. Restricted areas within ships vicinity - 0.1NM	20.00
40	Navigational dangers within ships vicinity - 0.1NM	15.00
41	Ship passed through invalid Safety Depth	10.00
42	Ship passed through invalid Safety Contour	5.00

Violations Committed By Trainee

S. No.	Violation	Penalty	Simulation Time
1	HeadOn Situation Exists with target, course alter...	20.00	14-04-2014 12:22:15
2	No violation, just screen shot	0	14-04-2014 12:22:44

Buttons: All Players, Visual, Add, Selected Players, Visual, Remove, Generate Report, Take Snapshot

Sample image of Evaluation control screen at Instructor

On-task performance parameters are detected and recorded automatically by the system, and compared to pre-set thresholds to determine if a violation has occurred. In the event of a violation (which is a combination of the threshold value and the duration for which the threshold has been crossed continuously), the occurrence will be recorded along with the pre-set numerical penalty.

All violations can be triggered by the Instructor from a pre-defined list.

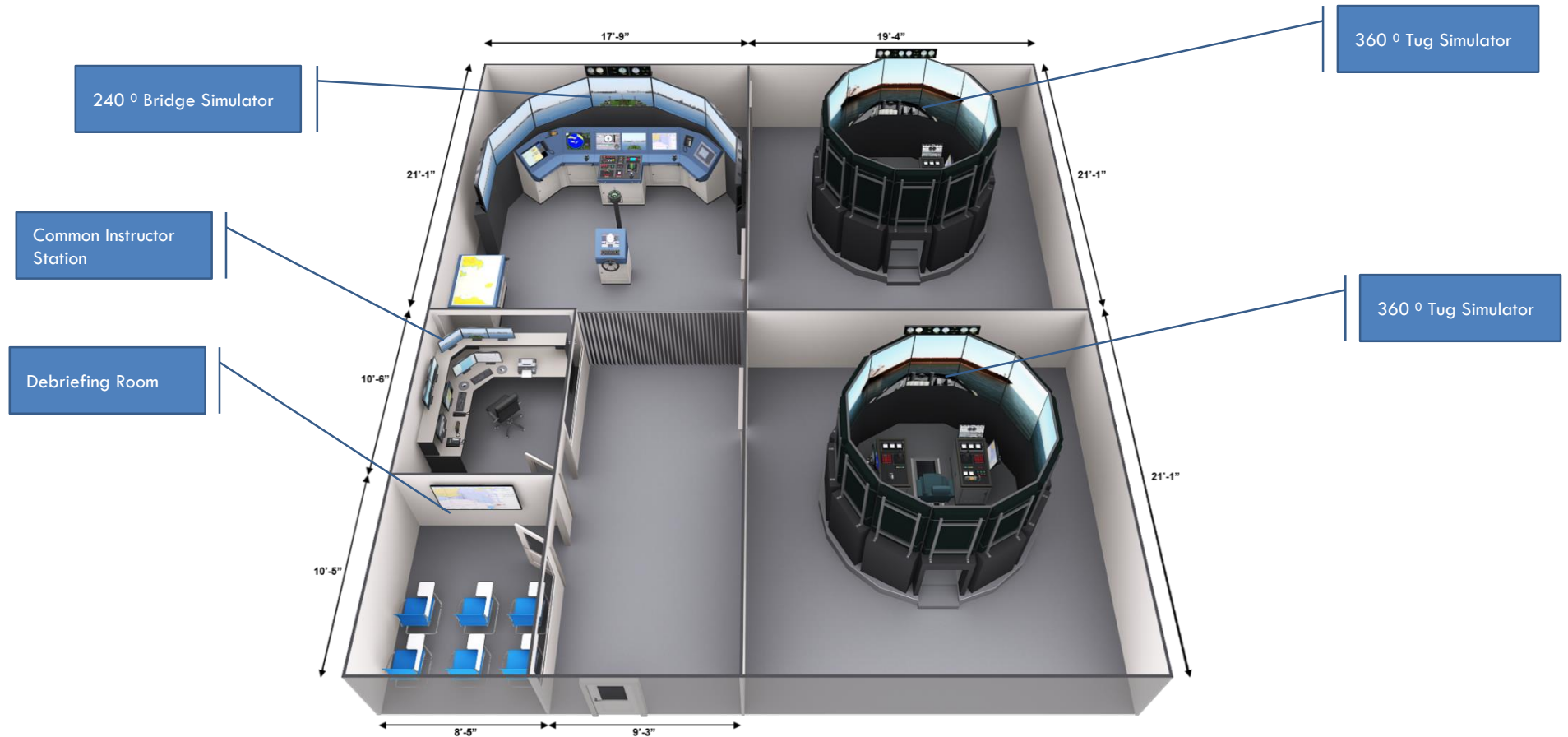
Instructor can take a 'Snapshot' of the situation to store an instant image of the scenario which the instructor thinks is noteworthy, or as supporting information for any violation as recorded.

A Report of the assessment can be generated and printed.

AUDIO GENERATOR

The bridge simulator consists of a sound generator capable of providing environmental and operational sound according to conditions simulated.

PROPOSED SOLUTION



Indicative Layout



240° Bridge Trainee Station Components

CONNING & MANEUVERING



Bridge Conning and Manoeuvring Panel

360 Deg. Full Mission Tug Simulator



WWW.ARISIMULATION.COM



RHS & LHS Controls with interfacing circuit for integration of Tug Controls

INSTRUCTOR STATION



Instructor Station

ADDITIONAL BRIDGE FEATURES

ADDITIONAL FEATURES:

- Anchoring and Mooring Module
- Ship to Ship
- Maneuvering using tugs
- Maneuvering with mooring lines fixed to jetty
- Maneuvering with mooring lines fixed to buoy
- Anti-Piracy Module
- Fire Control Detection Panel
- Bow/ Stern Monitoring System
- Hull Stress Monitoring
- Ballast Water Control Panel
- Torque Indicator
- Fire door/water tight door monitoring panel

TUG FEATURES

- Ship Assisting work
- Escort work
- High fidelity hydrodynamic modeling of tug behaviour
- Using custom tug controllers to perform Tug Handling Maneuvering
- Making fast and adjusting line length
- Making towage transit
- Basic rope behaviour under tension
- Visualisation with facility to 360° around the horizon
- Effect of wind and weather conditions
- Push/ Pull action by tug
- Procedural training in tug operations
- Conning and Maneuvering Station

DATABASE

- 5 Indonesia Sailing Area (Tj. Priok, Tj Perak, Selat Sunda, Selat Makasar, Sorong)
- 5 International Sailing Area (Singapore, Selat Malaka, Felixstowe, Gibraltar, Bosphorus)
- 20 Kapal Ownship
- 25 Kapal Target

SHIP STABILITY SIMULATOR

A ship stability simulator facility with the Bulk Carrier type, which is capable of simulating physical phenomena ship stability. A ship stability simulator is a simulation software that functions to simulate phenomena the stability of a ship in 3 vector axes (roll, pitch and heave).

With the loading given, there will be a change in the orientation of the ship at any time. Ship direction orientation in the 3 axis vectors at any time it will be calculated by the simulation software, then the calculation of the parameters is also carried out the stability of the ship, which is displayed in both 2D and 3D modes. Where is the 3D representation view

The animation referred to can be shown changes in the magnitude of the force and the position of the mechanical central points (center of gravity, center of buoyancy, metacentric, etc.) at any time as a result of changes in the weight and location of the load, shown the position point and the magnitude of each vector. In addition, the computer will also display curves ship stability parameters of the ship model.

By using this ship stability simulator it can be introduced to students about:

- 1) The concept of displacement
- 2) Calculating the actual position of the ship G when shifting or Light-Ship
- 3) Calculating the position of G in the longitudinal direction: LCG
- 4) Determine the position of G in the vertical direction: KG
- 5) Determine the position of G in the transverse (transverse, lateral) direction: TCG
- 6) Calculating the ship's G position as a result of carrying the cargo
- 7) Calculating the ship's G position due to unloading
- 8) Calculating the ship's G position as a result of shifting cargo
- 9) Shifting the load in longitudinal direction to change the trim
- 10) Shifting the charge in the transverse direction to change the zincet
- 11) Adjusting the ballast tank to obtain certain draft conditions
- 12) Assessing the ship is in tender or stiff condition
- 13) Effect of slack water

The ship model will refer to the bulk carrier vessel model with the following configurations:

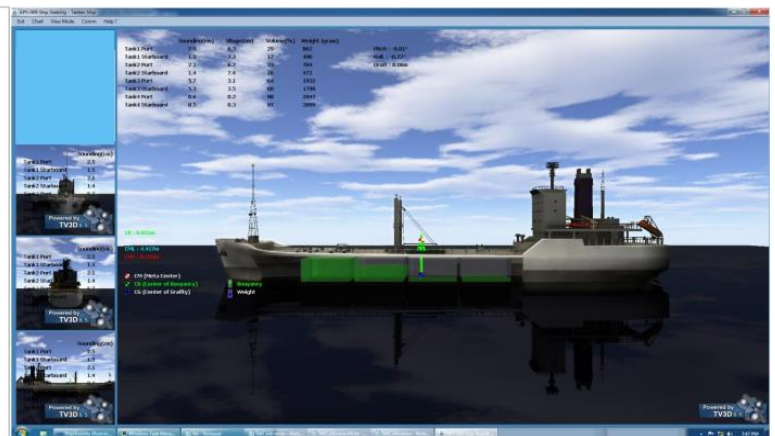
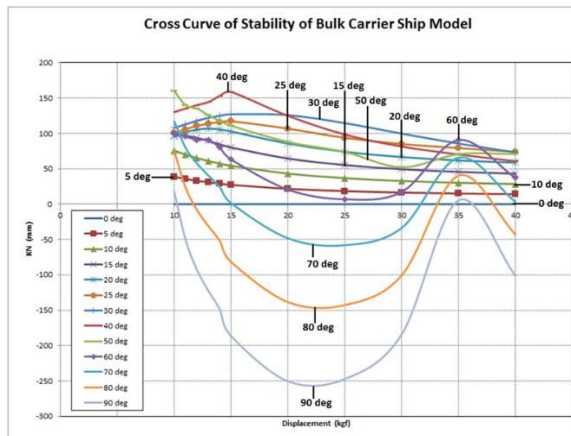
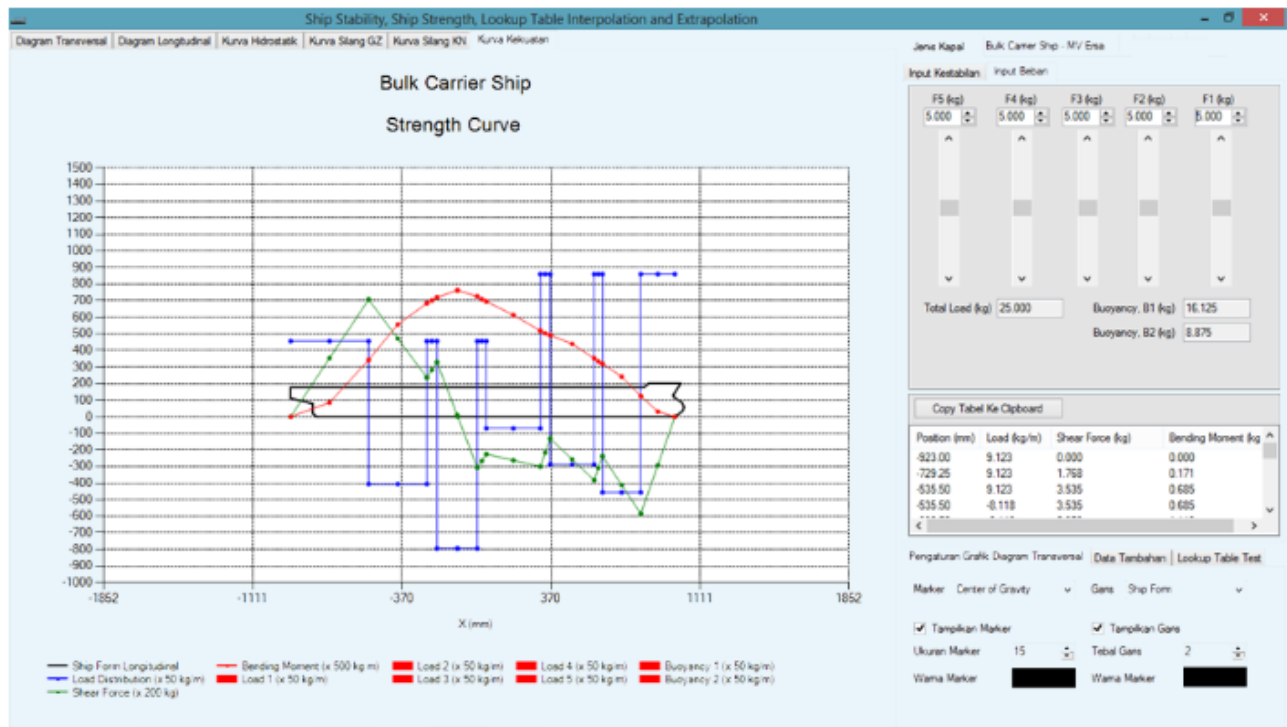
- Has a hold space
- Has a ballast tank
- Have a freshwater tank
- Has a fuel tank

This ship model is also used to model the ship on the bridge simulator, so that the stability effect can be obtained The difference is felt when the ship moves and is disturbed by the waves.

IMO Model Course 7.04, function 4: Controlling the Operation of the Ship and Care for Person on Board at the Operational Level, competence : maintain seaworthiness of the ship, subject : ship stability

With topics :

- Displacement
- Buoyancy
- Static Stability
- Angle of Loll
- Curves of Static Stability
- Movement of center of gravity
- List and its correction
- Trim
- Ship Stresses



Indicative Picture of Ship Stability Simulator

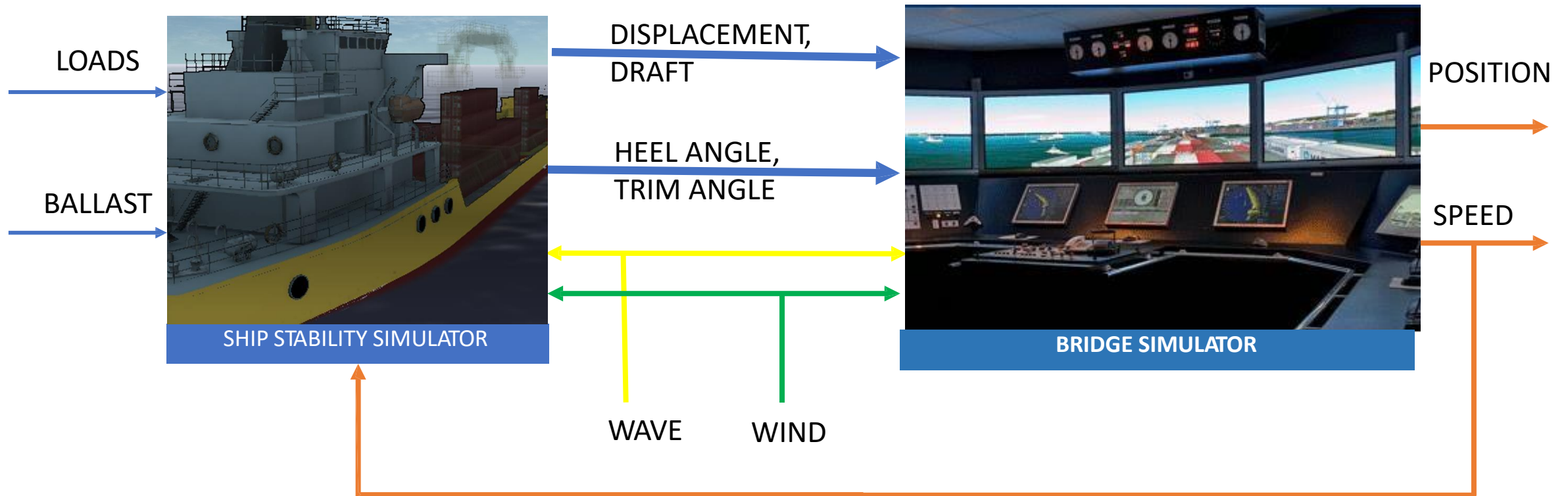
THE INTEGRATION BETWEEN SHIP STABILITY WITH BRIDGE SIMULATOR

Trainees will input the size of the container load in the ship stability simulator and adjust the position of the container placement on the ship. Positioning and the magnitude of the load will result in changes to the data on the bridge. Trainees can view the changes on:

1. The draft of the ship (both aft and forward positions), this can be proven by changes in the echosounder
2. Visuals on the horizon line
3. Draft Displacement is also seen in Conning which affects the maneuverability and speed of ownship vessels.

The next influencing external factors are:

- Weather Condition (Wind Force)
- Wave
- Current



STATEMENT OF COMPLIANCE

Statement No:
023/180511
 DNV GL Id No:
142684

Particulars of Product

Function Area:	Bridge Operation Simulator
Class Notation	INTEGRATED SIMULATOR SYSTEM, NAUT AW (SIM), DYNPOS - AUT (SIM), HSC, TUG, ICE, AHTS,IN
Name and type designation:	ARI-NAVSIM10000λn Dry Cargo Ships, Container Ships, RO/RO Ships, Passenger Ships, Oil Tankers, Chemical Tankers, Liquefied Gas Tankers, Compressed Gas Tankers Naval, Naval Support, Naval Landing Craft Offshore Service Vessel - Anchor Handling, Towing, Supply, AHTS, Windfarm Maintenance, Standby Vessel, + Vessel of Special Operations – Crane Vessel, Cable Laying Vessel, Pipe Laying Vessel, Diving Support Vessel, Fire Fighter, Semi-Submersible Heavy Transport Vehicle, Icebreaker, Tug, Dredger, Pusher, Inland Water Craft, Fishing Vessel, Stern Trawler

Particulars of Manufacturer

Manufacturer:	ARI Simulation
Manufacturer address:	Applied Research International

This is to confirm:

That the above product is found to comply with Class A- Standard for Certification of Maritime Simulators No. DNVGL-ST-0033 April 2018.

Application

The above Standard is based on requirements in the STCW Convention, Regulation I/12 and corresponding industry standard and guidelines.

This Statement is valid until **2023-05-11**, provided the requirements for the retention of the Statement will be complied with.

Issued at **Sandefjord** on **2018-05-11**

Nordholm, Aksel
 David

Digitally signed by Nordholm,
 Aksel David
 Date: 2018.05.11 08:12:25 +02'00'

for **DNV GL**



Capt. Aksel David Nordholm
Manager Simulator Certification

Partha Basu
Auditor

This Statement is subject to terms and conditions overleaf. Any significant change in simulation performance may render this Statement invalid.



Form code: MSS 301

Revision: 2018-03

www.dnvgl.com

Page 1 of 3

Application/Limitation

The simulator is capable of simulating a realistic environment for all of the applicable STCW competence requirements referred to in the column for Class A, B, C and S in Table 3-2.

Table 3-2 Competencies addressed by bridge operation simulator class					
<i>STCW reference</i>	<i>Competence</i>	<i>Class A (NAV)</i>	<i>Class B (NAV)</i>	<i>Class C (NAV)</i>	<i>Class S (NAV)</i>
Table A-II/1.1	Plan and conduct a passage and determine position	A	B		(S)
Table A-II/1.2	Maintain a safe navigational watch	A	B		(S)
Table A-II/1.3	Use of radar and ARPA to maintain safety of navigation	A	B	C	(S)
Table A-II/1.4	Use of ECDIS to maintain the safety of navigation	A	B	C	(S)
Table A-II/1.5	Respond to emergencies	A	B	C	(S)
Table A-II/1.6	Respond to a distress signal at sea	A	B	C	(S)
Table A-II/1.8	Transmit and receive information by visual signalling	A	B	C	(S)
Table A-II/1.9	Manoeuvre the ship	A	B	C	(S)
Table A-II/2.1	Plan a voyage and conduct navigation	A	B		(S)
Table A-II/2.2	Determine position and the accuracy of resultant position fix by any means	A	B		(S)
Table A-II/2.3	Determine and allow for compass errors	A	B		(S)
Table A-II/2.4	Co-ordinate search and rescue operations	A	B		(S)
Table A-II/2.5	Establish watchkeeping arrangements and procedures	A	B		(S)
Table A-II/2.6	Maintain safe navigation through the use of information from navigation equipment and systems to assist command decision-making	A	B	C	(S)
Table A-II/2.7	Maintain the safety of navigation through the use of ECDIS and associated navigation systems to assist command decision making	A	B	C	(S)
Table A-II/2.10	Manoeuvre and handle a ship in all conditions	A			(S)
Table A-II/2.11	Operate remote controls of propulsion plant and engineering systems and services	A			(S)
Table A-II/3.1	Plan and conduct a coastal passage and determine position	A	B		(S)
Table A-II/3.2	Maintain a safe navigational watch	A	B		(S)
Table A-II/3.3	Respond to emergencies	A	B	C	(S)
Table A-II/3.4	Respond to a distress signal at sea	A	B	C	(S)
Table A-II/3.5	Manoeuvre the ship and operate small ship power plants	A			
Table A-II/5.2	Contribute to berthing, anchoring and other mooring operations	A	B	C	(S)



Statement No: **023/180511**
DNV GL Id No.: **142684**

This Statement of Compliance is for the manufacturer offering the simulator for examination or mandatory simulator training and complies with the requirements of DNVGL-ST-0033 Maritime Simulator Systems.

Based on this statement of compliance, maritime training providers in possession of simulators that comply with the requirements of the standard can apply for a product certificate for "Maritime simulator". The simulator's function area and the simulator class according to the standard will be stated on the certificate.

STATEMENT OF COMPLIANCE

Statement No:
003/180511
DNV GL Id No:
142684

Particulars of Product

Function Area:	Bridge Operation Simulator
Name and type designation:	ARI-NAVSIM10000λn ECDIS, Radar/ARPA & Navigational Aids

Particulars of Manufacturer

Manufacturer:	ARI Simulation
Manufacturer address:	Applied Research International

This is to confirm:

That the above product is found to comply with Class A- Standard for Certification of Maritime Simulators No. DNVGL-ST-0033 April 2018.

Application

The above Standard is based on requirements in the STCW Convention, Regulation I/12 and corresponding industry standard and guidelines.

This Statement is valid until **2023-05-11**, provided the requirements for the retention of the Statement will be complied with.

Issued at **Sandefjord** on **2018-05-11**

Nordholm, Aksel
David

Digitally signed by Nordholm,
Aksel David
Date: 2018.05.11 07:53:08 +02'00'

for **DNV GL**



Capt. Aksel David Nordholm
Manager Simulator Certification

Partha Basu
Auditor



Application/Limitation

The simulator is capable of simulating a realistic environment for all of the applicable STCW competence requirements referred to in the column for Class A, B, C and S in Table 3-2.

Table 3-2 Competencies addressed by bridge operation simulator class					
<i>STCW reference</i>	<i>Competence</i>	<i>Class A (NAV)</i>	<i>Class B (NAV)</i>	<i>Class C (NAV)</i>	<i>Class S (NAV)</i>
Table A-II/1.3	Use of radar and ARPA to maintain safety of navigation	A	B	C	(S)
Table A-II/1.4	Use of ECDIS to maintain the safety of navigation	A	B	C	(S)
Table A-II/1.5	Respond to emergencies	A	B	C	(S)
Table A-II/1.6	Respond to a distress signal at sea	A	B	C	(S)
Table A-II/2.6	Maintain safe navigation through the use of information from navigation equipment and systems to assist command decision-making	A	B	C	(S)
Table A-II/2.7	Maintain the safety of navigation through the use of ECDIS and associated navigation systems to assist command decision making	A	B	C	(S)

This Statement of Compliance is for the manufacturer offering the simulator for examination or mandatory simulator training and complies with the requirements of DNVGL-ST-0033 Maritime Simulator Systems.

Based on this statement of compliance, maritime training providers in possession of simulators that comply with the requirements of the standard can apply for a product certificate for "Maritime simulator". The simulator's function area and the simulator class according to the standard will be stated on the certificate.

STATEMENT OF COMPLIANCE

Statement No:
005/180511
DNV GL Id No:
142684

Particulars of Product

Function Area: **Radio Communication Simulator**

Name and type designation: **ARI-COMMSIM10000λn**

Particulars of Manufacturer

Manufacturer: **ARI Simulation**

Manufacturer address: **Applied Research International**

This is to confirm:

That the above product is found to comply with Class A- Standard for Certification of Maritime Simulators No. DNVGL-ST-0033 April 2018.

Application

The above Standard is based on requirements in the STCW Convention, Regulation I/12 and corresponding industry standard and guidelines.

This Statement is valid until **2023-05-11**, provided the requirements for the retention of the Statement will be complied with.

Issued at **Sandefjord** on **2018-05-11**

Nordholm, Aksel
David

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Aksel David
Date: 2018.05.11 07:55:46 +02'00'

for **DNV GL**



Capt. Aksel David Nordholm
Manager Simulator Certification

Partha Basu
Auditor



Application/Limitation

The simulator is capable of simulating a realistic environment for all of the applicable STCW competence requirements referred to in the column for Class A, B, C and S in Table 5-2.

Table 5-2 Competencies addressed by radio communication simulator class

<i>STCW reference</i>	<i>Competence</i>	<i>Class A (COM)</i>	<i>Class B (COM)</i>	<i>Class C (COM)</i>	<i>Class S (COM)</i>
Table A-IV/2.1	Transmit and receive information using GMDSS subsystems and equipment and fulfilling the functional requirements of GMDSS	A	B	C	
Table A-IV/2.2	Provide radio services in emergencies	A	B	C	

This Statement of Compliance is for the manufacturer offering the simulator for examination or mandatory simulator training and complies with the requirements of DNVGL-ST-0033 Maritime Simulator Systems.

Based on this statement of compliance, maritime training providers in possession of simulators that comply with the requirements of the standard can apply for a product certificate for "Maritime simulator". The simulator's function area and the simulator class according to the standard will be stated on the certificate.

Certificate of Approval

This is to certify that the Management System of:

Applied Research International Pvt. Ltd.

46/13, E-Block, Okhla Industrial Area, Phase-II, New Delhi, 110020, India

has been approved by Lloyd's Register to the following standards:

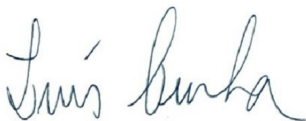
ISO 9001:2015

Approval number(s): ISO 9001 – 0048141

This certificate is valid only in association with the certificate schedule bearing the same number on which the locations applicable to this approval are listed.

The scope of this approval is applicable to:

The design and development of software, simulators, computer and model based training aids.



Luis Cunha

Area Operations Manager - SAMEA

Issued by: Lloyd's Register Quality Assurance Limited



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Certificate Schedule

Location	Activities
46/13, E-Block, Okhla Industrial Area, Phase-II, New Delhi, 110020, India	ISO 9001:2015 Top Management
46/12, E-Block, Okhla Industrial Area, Phase II, New Delhi, India	ISO 9001:2015 The design and development of software, simulators, computer and model based training aids.
150/S, D Block, Chattarpur Extension, New Delhi, 110074, India	ISO 9001:2015 The design and development of software, simulators, computer and model based training aids.



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