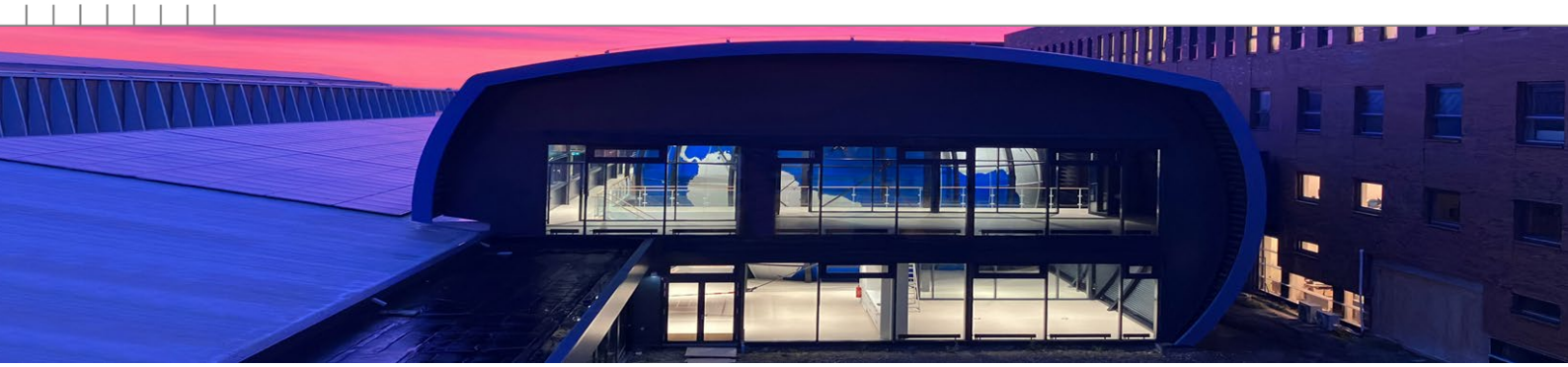


Seven Oceans Simulator centre (SOSc)

Most realistic simulator centre in the world for crew centred ship design and offshore operations

MARIN's SOSc bridges the gap between design and operation. The involvement of the future crew in the design of the ship and its operation is a prerequisite for safe, effective and smart ships, offshore structures and their operations. We call this 'crew-centred ship design and operation'. With the SOSc we offer a digital and virtual workspace to stimulate this development in the maritime sector. Advanced digital twinning on simulators allow the engineers and crew to experience and improve ships in operational conditions together before they are built. The SOSc simulators can also play a major role in the mission rehearsal and training of complex operations and the design of complex infrastructure.

Key capabilities

- All simulators can be linked to realistically simulate multi-ship and multi-tool operations.
- Research platform for new control techniques and human-machine interfaces to improve situational awareness during an operation.
- Close observation of the behaviour and interaction between operators.
- Measurement and feedback on the performance and workload of operators.
- The latest visualisation, virtualisation and motion cueing techniques.
- Prediction of hydrodynamics, including all interactions between ships, offshore constructions and environment.
- Optimises nautical operations with excellent modelling of hydrodynamics.

Facing complex maritime operations in a safe environment

Our objective is to make maritime operations safer and more efficient through the most realistic simulation of the behaviour of and the interactions between maritime structures, the environment and people. For maritime operations are becoming increasingly complex. Containerships are getting bigger, traffic and the number of new infrastructures at sea are increasing and weather patterns are becoming more unpredictable. The safe performance of these operations requires a capable and well-prepared crew. The spherical simulators of the SOSc in combination with a motion-based bridge to simulate realistic ship motions will safely immerse crews in unprecedented ways to maximize research results.

The new facility will also be used for research studies and testing innovative developments in human-machine interfacing. Examples are the application of virtual reality, operational advice tools and the testing and monitoring of autonomous ships.

A research facility focused on people, with unique opportunities for simulating real-life situations at sea as realistic as possible to make the seas safer.

The 16 m wide Full Mission Bridge (FMB) with cylindrical projection forward/backward and domes of 6 m wide at both bridge wings to allow forward, backward, downward and upward views during port and other complex operations.

The Large Motion Simulator (LMS) with moving bridge of 4,5 x 5,5 m on a hexapod.

Maritime eXperience Lab (MX Lab) with cable robot and Fast Small Ship Simulator (FSSS).

Multi-Purpose Simulator (MPS) with 360 degrees projection for coupled tug or crane simulations.

Accurate hydrodynamic behaviour

For the accurate prediction of the hydrodynamic behaviour, the link with MARIN's test facilities, prediction methods (such as Computational Fluid Dynamics, CFD) and full-scale measurements is essential. MARIN has developed a universal calculation platform for this link: XMF, the eXtensible Modeling Framework. The strength of this modular platform is that all specialist calculation models that are developed and validated within this platform can be used for both design evaluations and simulator studies. This gives a very strong hydrodynamic basis to the MARIN simulators.

Key features

Large Motion Simulator (LMS): a six degrees of freedom motion-based bridge of 4,5 x 5,5 m on a hexapod with a payload of 14,000 kg and 360 degrees projection in a large spherical dome with a diameter of 16 m.

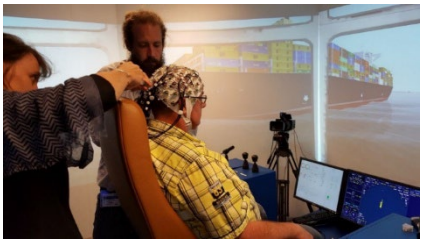
Full Mission Bridge (FMB): a 16 m wide bridge with a forward or backward view on a cylindrical screen (240 degrees horizontally and 42 degrees vertically). Both bridge wings have 6 m diameter domes to allow forward, backward, downward and upward views during port and other complex operations.

Four **Multi-Purpose Simulators (MPS)** of 4.2 x 4.2 m with 360 degrees projection for coupled tug or crane simulations.

The **Maritime eXperience Lab (MX Lab)** for advanced virtual, augmented and mixed reality applications, including the Fast Small Ship Simulator (FSSS), smaller motion platforms, treadmills, motion capturing and a cable robot. With the 8 cables of the cable robot moving objects (such as a crane hook) can be simulated above a moving platform or the FSSS for advanced interactive Mixed Reality simulations, both above and below water.

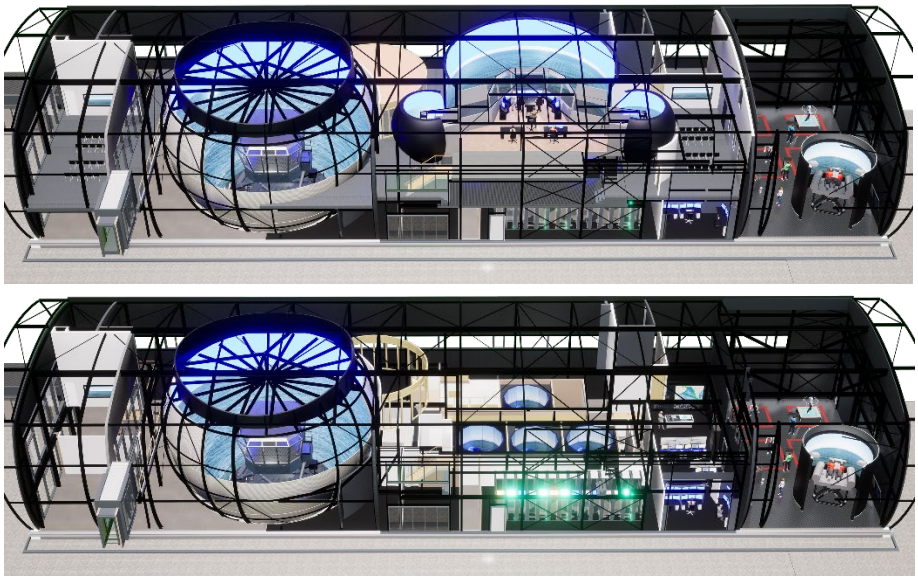
Traffic & Mission Control (TMC): multi-purpose and flexible room with projection on three walls to simulate control or command centres on board or ashore, coupled to the other simulators and the MX Lab.

High Performance Computers (HPC): extra calculation power consisting of a combination of central processing units and graphics processing units for optimum real-time hydrodynamic modelling. These make it possible to include highly complex hydrodynamic features such as interactive wave fields.



Human Factor equipment: a sensor set consisting of eye trackers, heart rate sensors, galvanic skin response sensors, wearables and multiple cameras. Measurements of physiological parameters, such as heart rate variability and eye scanning, combined with observation techniques with multiple cameras and annotation capabilities, will give the instructor a clear picture of what is going on with the participants. Individual performance, team interaction and communication during the operation can be observed and optimised.

Instructor rooms and debriefing rooms: each of the large facilities has its own instructor operation station/shore control centre from which all aspects of the simulation are controlled. Modern debriefing facilities with live datalinks and extensive replay functionalities are available to follow and evaluate the simulations. Additionally, there is a laboratory for vessel traffic management.



MARIN SOSc from left to right: meeting rooms, Large Motion Simulator (LMS) in projection dome, Full Mission Bridge (FMB) with below that the High Performance Computer (HPC), 4 Multi-Purpose Simulators (MPS), Traffic & Mission Control (TMC) and at the far right the Maritime eXperience Lab (MX Lab)

Our mission 'Better Ships, Blue Oceans'

Research institute MARIN is a provider of advanced expertise and independent research to the maritime industry. Using the newest test facilities and simulators and working together with an extensive innovation and research network we achieve our goal: the development of cleaner, safer and smarter ships and sustainable use of the sea.

For more information and to discuss how to use these facilities for your projects, research or training, contact:

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