



US Army Corps of Engineers®

Engineer Research and
Development Center

ERDC Ship/Tow Simulator

Description

The U.S. Army Corps of Engineers' only marine ship/tow simulator, located at the U.S. Army Engineer Research and Development Center, provides engineers, licensed pilots, and others studying navigability in Federal channels with the ability to design and evaluate proposed modifications for improvements to commercial navigation. This computerized simulator of navigational conditions uses real-time piloted evaluations, meaning that the events require the same amount of time on the simulator as they do in real life. Realistic sights, sounds, and conditions for maneuvering ships and tows help make the pilots more at ease and comfortable as if they are in their actual surroundings. The simulator features two ship-bridge mockups specifically developed for evaluating navigation channel designs, modifications, and safety issues. It can simulate ports, harbors, inland waterways, and any other maritime environment. The simulations on the two ship-bridge mockups can be conducted independently or can be integrated. In an integrated simulation, the pilots controlling the two simulators interact with each other via radio and through the visual scene. Models accurately portray currents, wind and wave conditions, shallow-water effects, bank forces, ship handling, ship-to-ship interaction (in a meeting and passing or overtaking and passing situation), fender forces, anchor forces, and tug assistance.



Capabilities

The ERDC Ship/Tow Simulator is an important tool in the analysis or design of harbors or channels or for the study of safety issues in these surroundings. It allows for the ERDC Engineer, the District personnel, and the licensed pilots from the study area to bring their collective knowledge together to design, evaluate, propose, and/or solve questions about navigability in Federal channels. As tests are completed, the results from each one are processed with "off the shelf" programs and tools created in-house. These processed results are analyzed and put in a final report. This report might contain design comparisons, new design evaluations, channel realignment recommendations, modification recommendations to existing or proposed channel configurations, or any other type of information that the customer might need.

Supporting Technology

The ERDC Ship/Tow Simulator uses five projectors on a cylindrical screen to provide a 220-degree field of view for the visual scene. The viewing angle is pilot-controlled and can be rotated 360 degrees horizontally and 180 degrees vertically. Changing the viewing

angle accomplishes the same effect as turning one's head and/or tilting it in real life. High-performance graphic workstations are used to generate the visual scene.

Radar and Electronic Chart Display and Information System (ECDIS) displays are also on the simulator. The radar is comparable to what is found onboard a typical ship. The simulator also furnishes pilots with a precision navigation display showing rudder command and position, engine command and speed, absolute ship speed, lateral ship velocity for bow and stern, wind magnitude and direction, and elapsed time for the test exercise.

The heart of the marine simulator is the Virtual Ship model, a hydrodynamic model made by Computer Sciences Corporation Advanced Marine Training Technologies, and used to calculate ship response to the variety of forces that can be exerted upon a vessel. The hydrodynamic model uses a repetitive process that modifies flows in response to changed topography caused by the channel and the passage of a vessel through that channel. Thus, channel depth and width effects on the vessel can be examined. Forces causing ship motion are both environmental and mariner-controlled. Environmental forces include: current, bank effects, wind, and waves. Mariner-controlled forces include: rudder angle, propeller revolution, tugs, and bow and stern thrusters.

Benefits

Results from the simulator studies of channel alignment can provide substantial savings through design, evaluation, maintenance, or construction costs, or through avoidance of unforeseen expenses. The ship/tow simulator gives pilots the opportunity to test a channel before it is built, thus the customers get their channels evaluated for safety in advance. Also the channel is optimized for size, which will conserve construction costs and will provide the safest affordable channel to construct and maintain. Navigational changes can also be adjusted to avoid real estate problems or conflict with environmentally sensitive areas or to avoid high relocation costs such as water supply lines that could present a problem.

Success Stories

The Brownsville Ship Channel in Brownsville, Texas, was completed in 1995. Results from the simulator study reduced the original \$38.8 million estimate by approximately \$4 million. The primary savings were from study results, which reduced the recommended width of the 24-km (15-mile) Laguna Madre Reach from 90 m (300 ft) to 75 m (250 ft).

Point of Contact

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