



**US Army Corps  
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Engineer Research and  
Development Center

# Incorporating Vessel Effects in Simulations

## Description

The primary tool used to evaluate navigation channels and ports is the Ship/Tow Simulator (STS), housed at the Coastal and Hydraulics Laboratory. Currently, the flow fields used in STS studies do not include the vessel's effects on the flow field. In certain scenarios, such as turning maneuvers, these effects are significant and must be considered. This research will develop a modeling procedure that predicts a vessel's path using the hydrodynamic forces acting on it. These forces will be calculated using such parameters as speed, heading, engine power, and rudder angle. Once this procedure has been developed, the STS will be extended to include the new model.

## Issue

PIANC guidance states that if the underkeel clearance is small, the influence of the current can increase up to 6 times the deep-water value (PIANC 1995). This is especially obvious during turning maneuvers. To insure Corps' projects are adequately and safely designed, the hydrodynamics and ship maneuverability in the ship simulations must be modified to reflect the influence of the sailing vessel on the currents and water levels. Considering vessel-generated waves and currents will make it possible to model the bank and bottom forces using a physics-based approach, whereas simulator studies currently rely on empiricism. In addition, this will be an important step toward developing reliable predictions of underkeel clearance.

## Users

Ship pilots and hydraulic engineers responsible for the design of navigation channels and hydraulic structures such as navigation locks.

## Products

A Ship/Tow Simulator that includes the effects a vessel makes on the flow field during maneuvering. Design guidance to address specific navigation situations, such as downstream lock approaches and turning basins. The methodology to determine the forces acting on a barge tow as it sails.



## Corps Program

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## Point of Contact

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