

Collision course: ONR testing high-speed planing hulls to better understand wave slam

May 28 2015, by Katherine H. Crawford



Earlier this month, scientists sponsored by the Office of Naval Research (ONR) performed experiments to better understand the motions, forces and pressures generated by waves on boats with high-speed planing hulls.

Planing hulls are like those used on a speedboat—they're designed to produce lift and allow the watercraft to glide on top of the water, skimming more quickly over its surface. At higher speeds, waves become a problem. The higher the crests of the waves, the more the boat will rise to the top of the wave and then fall back down to the wave's trough with great force. This is known as "wave slam."

"When a hull is going at speed and it hits a wave, it's like hitting a wall—it's a violent collision, and the forces are very large," said Dr. Bob Brizzolara, a program officer with ONR's Sea Warfare and Weapons

Department. "This causes injuries to Sailors—commonly back and leg injuries—and also can degrade the structure of the vessel."

This research was motivated by a series of workshops ONR program officers held with personnel from the Navy small combatant craft commands about high-priority challenges that ONR could help with. One identified challenge was the need to carry greater loads while maintaining their speed capabilities. To do this, some structural weight would need to be shed. Since the hull is the heaviest part of a vessel, Brizzolara and his team began there, investigating ways to save weight.

"To deal with the effects of wave slams, the Navy must have strong boats that are forced to reduce speed in higher seas," said Dr. Carolyn Judge, an associate professor in the U.S. Naval Academy (USNA)'s Naval Architecture and Ocean Engineering department, as well as a current Young Investigator Program recipient working with Brizzolara on this research. "Mitigating the problem of wave slams will allow Navy boats to travel faster in higher seas states as well as allow for lighter boat structural designs."

Working with Naval Surface Warfare Center (NSWC) Carderock Division, USNA and the University of Iowa, ONR is considering ways to reduce hull weight while maintaining structural adequacy. For unmanned craft, it might be possible to reduce weight even further, allowing additional payload to be carried.

"We're working to understand the pressures on the hull that are due to the wave slamming, since right now, they are not well understood," Brizzolara said. "We'd like to be able to save weight in the structure so we can carry more fuel and payload, but we don't understand those pressures well enough to be able to start taking weight out of the structures."

The team is executing the research in two parts: experimentally with scale models and using computer simulations. The scale models are tested in the large tow tank at NSWC Carderock.

Computer simulations for planing hulls are being developed by the University of Iowa, a challenging problem due to the complexity of planing hull physics. The model results will be used to develop computer simulations that are more realistic and accurate. This will vastly increase the numbers of tests that can be run since the [computer simulations](#) are much less expensive than experimental testing.

Provided by Office of Naval Research

Citation: Collision course: ONR testing high-speed planing hulls to better understand wave slam (2015, May 28) retrieved 1 July 2024 from <https://phys.org/news/2015-05-collision-onr-high-speed-planing-hulls.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.