A smoother ride over troubled waters

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Researchers at USU's Splash Lab are developing the science that will improve soft-hull watercraft design. Their findings could make a ride over choppy watersa lot smoother. Credit: Splash Lab

Boating through choppy waters can be an exciting but physically exhausting experience. Now researchers at Utah State University's Splash Lab are taking steps toward the design of an inflatable speedboat that absorbs wave energy and provides a smoother ride for passengers.

Their findings were recently published in the *Journal of Fluid Mechanics*, and for the first time demonstrate the unique differences in water impact behavior of rigid and elastic bodies.

"Rigid and elastic materials interact with the water surface quite differently," said Randy Hurd, a PhD candidate at USU and lead author on the study. "When an elastic body impacts the surface, the material deforms and oscillates significantly which changes the water-impact physics compared to a rigid body."

Hurd's team used high-speed cameras to record elastomeric spheres dropping into a tank of water. At 2,000 frames per second, the footage revealed the unique splash curtains and air-filled cavities that form after impact. The group used the images to track the position and deformation of the elastic spheres to understand how energy transfers from the water to the material. By analyzing the results, Hurd says his team can accurately predict the water interaction behavior based on the type of soft material and its speed.

"Being able to predict water interaction from a materials perspective is

an important first step in understanding which material types would be best for developing an inflatable watercraft capable of providing a smoother ride over a choppy surface," said Hurd.

The findings are particularly useful to the U.S. Navy and other agencies that deploy watercraft in rough seas. The Splash Lab team worked alongside the United States Office of Naval Research in Newport, R.I., and with noted materials scientist Dr. Allan Bower at Brown University.

More information: Randy C. Hurd et al, Water entry of deformable spheres, *Journal of Fluid Mechanics* (2017). DOI: 10.1017/jfm.2017.365

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