Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

The Fluid-Structure Interaction during the Impact of Flexible Plates on a Water Surface[1] AN WANG, KIT PAN WONG, MIAO YU, KENNETH T. KIGER, JAMES H. DUNCAN, University of Maryland — The controlled oblique impact of three flexible rectangular plates on a quiescent water surface is studied experimentally. The plates are made of 6061 aluminum and have the same lengths ($L = 108$ cm) and widths ($W = 41$ cm) but different thicknesses ($h = 6.35$, 7.94 and 12.7 mm). During testing, each plate is installed on a dual-axis carriage via a mounting structure that allows each end of the plate (width W) to rotate about a transverse axis located slightly above the plate. The pitch angle, α, of the undeformed plates is set to 10°, leading edge up, in all cases. The horizontal and vertical components of the carriage velocity, U and W, respectively, are held constant during the impact time, T_i, taken is the time interval between the trailing and leading edge of the plate passing through the still water level, $T_i = L \sin \alpha / W$. The total force and moment on the plate, out-of-plane deflection, in-plane strain and water surface profiles around the plate are measured. The roles of the component of the plate velocity normal to its undeformed surface, the direction of the plate velocity given by U/W, and the ratio of T_i to the natural period of the plate are explored.

[1]This work is funded by the Office of Naval Research under grant N00014-20-1-2349, Program Manager: Dr. Robert Brizzolara.

James Duncan
University of Maryland, College Park

Date submitted: 10 Aug 2020 Electronic form version 1.4