

Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Spray Formation during the Impact of a Flat Plate on Water Surface¹ AN WANG, JAMES H. DUNCAN, University of Maryland-College Park — Spray formation during the impact of a flat plate on a water surface is studied experimentally. The plate is mounted on a two-axis carriage that can slam the plate vertically into the water surface as the carriage moves horizontally along a towing tank. The plate is 122 cm by 38 cm and oriented with adjustable pitch and roll angle. The port (lower) edge of the plate is positioned with a 3-mm gap from one of the tank walls. A laser sheet is created in a plane oriented perpendicular to the axis of the horizontal motion of the carriage. The temporal evolution of the spray within the light sheet is measured with a cinematic laser induced fluorescence technique at a frame rate of 800 Hz. Experiments are performed with a fixed plate trajectory in a vertical plane, undertaken at various speeds. Two types of spray are found when the plate has nonzero pitch and roll angles. The first type is composed of a cloud of high-speed droplets and ligaments generated as the port edge of the plate hits the water surface during the initial impact. The second type is a thin sheet of water that grows from the starboard edge of the plate as it moves below the local water level. The geometrical features of the spray are found to be dramatically affected by the impact velocity.

¹The support of the Office of Naval Research under grant N000141310587 is gratefully acknowledged.

An Wang
University of Maryland-College Park

Date submitted: 30 Jul 2015

Electronic form version 1.4