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Slamming pressures on the bottom of a free-falling vertical wedge[1] C.M. IKEDA, C.Q. JUDGE, United States Naval Academy — High-speed planing boats are subjected to repeat impacts due to slamming, which can cause structural damage and injury to passengers. A first step in understanding and predicting the physics of a craft re-entering the water after becoming partially airborne is an experimental vertical drop test of a prismastic wedge (deadrise angle, $\beta = 20°$; beam, $B = 300$ mm; and length, $L = 600$ mm). The acrylic wedge was mounted to a rig allowing it to free-fall into a deep-water tank (5.2m x 5.2m x 4.2m deep) from heights $0 \leq H \leq 635$ mm, measured from the keel to the free surface. The wedge was instrumented to record vertical position, acceleration, and pressure on the bottom surface. A pressure mapping system, capable of measuring several points over the area of the thin (0.1 mm) film sensor at sampling rates up to 20 kHz, is used and compared to surface-mounted pressure transducers (sampled at 10 kHz). A high speed camera (1000 fps, resolution of 1920 x 1200 pixels) is mounted above the wedge model to record the wetted surface as the wedge descended below the free surface. The pressure measurements taken with both conventional surface pressure transducers and the pressure mapping system agree within 10% of the peak pressure values (0.7 bar, typical).

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