Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

The Effect of Nose Shape on Water-Entry Cavity Formation JEREMY ELLIS, TADD TRUSCOTT, Brigham Young University — We examine the effect of nose shape and wetting angle on the threshold velocity at which an underwater cavity will form in the wake of a slender axisymmetric rigid body. The study covers a range of Reynolds numbers ($1E4 < Re < 1.5E5$), wetting surface conditions (hydrophilic, hydrophobic and super-hydrophobic), and impacting nose shapes (cone, ogive, flat, and two concave profiles: cusp and hemisphere). Cavity formation is visualized using high-speed cameras and impact forces were determined using an embedded inertial measurement unit (IMU). More streamlined nose shapes require higher impact velocities in order to form a cavity. However, the concave profiles generate a uniquely different cavity due to a strong vortex ring formed in front of the nose at impact. Additional results of this experiment and variable dependence on threshold velocity will be presented during the water entry of rigid slender bodies.

Tadd Truscott
Brigham Young University

Date submitted: 31 Jul 2014 Electronic form version 1.4