Weekly CEAFM Seminar: Fall 2014

JOHNS HOPKINS
Center for Environmental
& Applied Fluid Mechanics

Date: **Friday, October 10, 2014**

Time: 11:00 AM

Location: Gilman Hall # 132

Speaker: **Prof. Steven L. Ceccio** (University of Michigan at Ann Arbor)

Title: ***"Partial Cavity Shedding Due to the Propagation of Bubbly Shock Waves"***

Abstract

Gas cavities, natural and ventilated, can occur on ship propulsors, control surfaces, and hull. These cavities can be significant sources of small bubbles in the ship wake and lead to noise and vibration. In the present work we will identify examine the breakup mechanisms of both ventilated and natural open partial cavities, as they form behind a wedge and a backward facing step. With the aid X-ray densitometry measurements, we show that cavity collapse and pinch-off is associated with due to the propagation of condensation shock front inside the partial cavity. For this flow, the shock-wave mechanism is the primary cause of large-scale cavity shedding, and the re-entrant flow at the cavity closure is a secondary mechanism. Shock waves in the bubble mixtures are identified as the dominant mechanism, while collapse due to re-entrant jet as secondary. From the time resolved X-ray videos, the two break-off mechanisms are identified and their dynamics are related to the underlying void fraction flow field. A physical explanation based on the conservation laws for bubbly mixtures is then proposed for the observed cavity dynamics, collapse mechanism, and void fraction flow field. We also examine how the injection of non-condensable gas into the cavity alters the cavity shedding.