

Abstract Submitted  
for the CAL09 Meeting of  
The American Physical Society

**Investigation on Novel Methods to Increase Specific Thrust in Pulse Detonation Engines via Imploding Detonations<sup>1</sup>** IVAN HO — Pulse Detonation Engines (PDE) is seen to be the next generation propulsion systems due to enhanced thermodynamic efficiencies. One of the limitations in fielding practical designs has been attributed to tube diameters not exceeding 5 inches, thus affecting specific thrust. Novel methods via imploding detonations were investigated to remove such limitations. During the study, a practical computational cell size was first determined so as to capture the required physics for detonation wave propagation using a Hydrogen-Air test case. Through a grid sensitivity analysis, one-quarter of the induction length was found sufficient to capture the experimentally observed detonation wave structure. Test case models utilizing axi-symmetric head-on implosions were studied in order to understand how the implosion process reinforces a detonation wave as it expands. This in effect creates localized overdriven regions, which maintains the transition process to full detonation. A parametric study was also performed to determine the extent of diameter increase for such that practical designs could be fielded. It was found in the study that diameters of up to 12 inches could be achieved with reasonable run length distances.

<sup>1</sup>This project is funded by Office of Naval Research.

Ivan Ho

Date submitted: 15 Oct 2009

Electronic form version 1.4