Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Magnetohydrodynamic Augmentation of Pulse Detonation Engines[1] CHRISTOPHER ZEINEH, LORD COLE, ANN KARAGOZIAN, University of California, Los Angeles — Pulse detonation engines (PDEs) are the focus of increasing attention due to their potentially superior performance over constant pressure engines. Yet due to its unsteady chamber pressure, the PDE system will either be over- or under-expanded for the majority of the cycle, with energy being used without maximum gain. Magnetohydrodynamic (MHD) augmentation offers the opportunity to extract energy and apply it to a separate stream where the net thrust will be increased. With MHD augmentation, such as in the Pulse Detonation Rocket-Induced MHD Ejector (PDRIME) concept, energy could be extracted from the high speed portion of the system, e.g., through a generator in the nozzle, and then applied directly to another flow or portion of the flow as a body force. The present high resolution numerical simulations explore the flow evolution and potential performance of such propulsion systems. An additional magnetic piston applying energy in the PDE chamber can also act in concert with the PDRIME for separate thrust augmentation. Results show that MHD can indeed influence the flow and pressure fields in a beneficial way in these configurations, with potential performance gains under a variety of flight and operating conditions. There are some challenges associated with achieving these gains, however, suggesting further optimization is required.

[1]Supported by AFOSR

Ann Karagozian
University of California, Los Angeles

Date submitted: 03 Aug 2010 Electronic form version 1.4