



College of Engineering
Department of
Mechanical & Industrial Engineering

The Sidney E. Fuchs Seminar Series

3:30-4:20pm, Friday, January 31, 2014
Frank H. Walk Design Presentation Room

Coming Full Circle: Cryo-solid to Paraffin to Cryo-solid – Research for Affordable Access to Space

by **Adam Baran***

Staff Engineer, Lockheed Martin Space Systems
Lecturer, Louisiana State University



The topic has origins in circa-1990s NASA / Air Force Research Laboratory (AFRL) research on cryogenic hybrid rockets and high energy density matter (HEDM) propellants. A novel advanced in-line reusable vehicle concept has been proposed by the speaker (Baran et al (2013), AIAA 2013-3921) which involves use of a monolithic cryogenic propellant as a load bearing member and phase-change in flight in an end-consuming manner to enable reuse of main-stage engines.

The talk describes a development program utilizing a set of design concepts for similarly configured small-scale end-burning solid and hybrid rocket powered glider vehicles to assess/demonstrate feasibility of various key technology issues for the full-scale vehicle concept. The development program has a sequential plan to: (1st) work with propellants that are solid at ambient temperature; i.e., common solid propellants and paraffin hybrid rocket propellants then (2nd) progress with propellants with melting points below ambient temperature.

* Dr. Adam Baran received his B.S. and M.S. in Aerospace Engineering (1985, 1994) from the University at Buffalo, then his Ph.D. in Mechanical Engineering (2009) from Tulane University for his work on rapid melting of a cryogenic surface with a high temperature vapor jet. He has extensive experience in the aerospace industry. This includes Calspan Corporation (1986-1996) research in propulsion systems and reentry vehicles, Lockheed Martin (1997-present) work on the Space Shuttle Program and Satellite Propulsion Systems, and a part-time affiliation with LSU (2011-present) teaching courses on Propulsion and Aerodynamics and performing research on aerospace topics including affordable access to space; a significant obstacle to realizing thriving economically viable human endeavors beyond Earth.