

## **228. MAGNETO-ELASTIC SENSING FOR STRUCTURAL HEALTH MONITORING**

### **PROJECT AT-A-GLANCE**

- **AST RDAB POC:** Demidovich, Nick
- **AST RESEARCH AREA:** 2.2 Vehicle Safety - Technologies
- **PRINCIPAL INVESTIGATOR:** Zagrai, Andrei
- **EXECUTION ENTITY:** NMT
- **PERIOD OF PERFORMANCE:** Jan 3, 2011 - Jan 4, 2013
- **STATUS:** Ongoing

### **PROJECT DESCRIPTION**

**PURPOSE:** Our prior work and experience in SHM of space structures indicates that a robust, reliable and low maintenance approach is needed to monitor integrity of space vehicles.

- OBJECTIVES:**
1. Develop adequate analytical and numerical models which describe magneto-elastic damage detection.
  2. Investigate potential of the magneto-elastic SHM for characterization of interfaces in space structures and assessment of incipient fatigue damage before crack development.
  3. Explore damage manifestation in the magneto-mechanical sensor signature and suggest respective feature extraction algorithms.
  4. Consider methodologies for features classification / damage characterization that enable integration of the above mentioned components into a comprehensive SHM system.

**GOALS:** Near-Term: explore if embedding sensors that can be pulsed with magnetic fields can yield reduction of space vehicle qualification time (and cost) via real time monitoring of structural interfaces during and after assembly, on-orbit diagnosis and system characterization – would enable rapid turnaround/flight rates of RLVs

Far-Term: deploy to industry if successful

### **STATEMENT OF WORK**

- 1. Analytical and numerical magneto-elastic modeling.
- 2. Magneto-elastic characterization of interfaces and fatigue damage.
- 3. Damage manifestation in magneto-elastic sensing.
- 4. Damage classification algorithms for magneto-elastic sensing.