



## **NASA SBIR 2011 Phase I Solicitation**

### **X2.01 Low Cost Heavy Lift Propulsion**

**Lead Center: MSFC**

**Participating Center(s): GRC, KSC**

Heavy lift launch vehicles envisioned for exploration beyond LEO will require large first stage propulsion systems. Total thrust at lift-off in will probably exceed 6 million pounds. There are available, in-production, practical propulsion options for such a vehicle. However, the cost for outfitting the booster with the required propulsion systems is in the hundreds of millions of dollars (2011 \$). This cost severely limits what missions NASA can perform. Low cost design concepts and manufacturing techniques are needed to make future exploration affordable.

Objectives include:

Development of propulsion concepts whose cost is less than 50% of currently available heavy-lift propulsion options but with similar performance (i.e., reduced parts count, increased robustness to allow less expensive manufacturing techniques, less complex parts to maximize vendor competition, maximization of common parts, etc.) - both solid and liquid options are desired.

Development and demonstration of low-cost manufacturing techniques (i.e., use of rapid prototype techniques for metallic parts, application of nano-technology for manufacturing of near net shape manufacturing, etc.).