



## NASA SBIR 2016 Phase I Solicitation

### H7.02 Diagnostic Tools for High Velocity Testing and Analysis

Lead Center: ARC

The company will develop diagnostics for analyzing ground tests in high enthalpy, high velocity flows used to replicate vehicle entry, descent and landing conditions. Diagnostics developed will be tested in NASA's high enthalpy facilities, which include the Electric Arc Shock Tube (EAST), Arc Jets, Ballistic Range, Hypersonic Materials Environmental Test System (HyMETS), and High Temperature Tunnel (HTT).

Development of improved diagnostics for hypervelocity flows allows us to better understand the composition and thermochemistry of our ground test facilities and are important for building ground-to-flight traceability. Characterizations in facilities may be used to validate and/or calibrate predictive modeling tools which are used to design and margin EDL requirements. This will reduce uncertainty in future mission planning.

Diagnostics of interest include measurement of temperature, velocity, electron number density, and information regarding byproducts of pyrolysis and ablation in CO<sub>2</sub> or air environments. Due to variation in facility operations, the diagnostics are required to obtain reasonable signals in test times down to approximately 4  $\mu$ s with resolution on sub- $\mu$ s time scales. Secondary methods of interest would relate to the detection of the shock front edge arrival to high accuracy (< 0.1  $\mu$ s). Proposals should detail information such as detection limits, expected signal to noise ratios and data acquisition frequency. Data acquisition channels with up to 200 MHz sampling rate are available.

Deliverable will be in the form of a diagnostic hardware system that can be employed by NASA engineers/scientists in the test facility.