Regolith-Derived Heat Shield for Planetary Body Entry and Descent System with In Situ Fabrication

Michael D. Hogue[1], Robert P. Mueller[2], Daniel Rasky[3], Paul Hintze[4], Laurent Sibille[5]

[1] Electrostatics & Surface Physics Laboratory, NE-S-1, NASA, Kennedy Space Center, FL 32899. (321) 867-7549, email: Michael.D.Hogue@nasa.gov.
[2] Surface Systems Office, NE-S, NASA, Kennedy Space Center, FL 32899. Email: Robert.P.Mueller@nasa.gov.
[3] Emerging Space Office, NASA, Ames Research Center.
[4] Corrosion Laboratory, NE-L, NASA, Kennedy Space Center, FL 32899. Email: Paul.E.Hintze@nasa.gov
[5] QNA ESC, Kennedy Space Center, FL 32899. Email: Laurent.sibile-1@nasa.gov.

E-Mail: Michael.D.Hogue@nasa.gov

ABSTRACT

In this paper we will discuss a new mass-efficient and innovative way of protecting high-mass spacecraft during planetary Entry, Descent & Landing (EDL). Heat shields fabricated *in situ* can provide a thermal-protection system (TPS) for spacecraft that routinely enter a planetary atmosphere. By fabricating the heat shield with space resources from regolith materials available on moons and asteroids, it is possible to avoid launching the heat-shield mass from Earth. Two regolith processing and manufacturing methods will be discussed: 1) Compression and sintering of the regolith to yield low density materials; 2) Formulations of a High-temperature silicone RTV (Room Temperature Vulcanizing) compound are used to bind regolith particles together. The overall positive results of torch flame impingement tests and plasma arc jet testing on the resulting samples will also be discussed.