BREAKOUT SESSION 5.
ENTRY, DESCENT AND LANDING

Concern: When navigating to landmarks, would GPS be working with the satellites or on or the other?
Response: A big factor here is cost. GPS requires multiple satellites and is a more expensive option. NASA uses satellite imagery to identify the large scale features.

Concern: Would you be interested in being introduced to other forms of mathematics or is this area pretty set?
Response: Surface feature recognition is evolving. It is weird lighting conditions and it's very challenging sometimes to identify what you would think would be a parent feature. I would think that algorithmic improvements would be of interest. Also, if you are doing it real-time you are limited by the processing power of the lander that is also multi-tasking.

Concern: Do you have terrain surveillance that you are matching to or are you doing it by matching landmarks for landing the aircraft?
Response: You are using the satellite imagery for landing but getting closer impacts the view.

Concern: What level of processing power is currently available on the system? What GSD of data is available for larger bodies we've visited? For bigger object how fine is the resolution and what percentage of surface do you have mapped?
Response: No response for the processing power. Mars data is most accurate to date. There is list of landing sites and as the mission advances they may get go down to maybe four. And the final selection will be made sometimes after the launch. In those areas they have very accurate view of the surface – 1x1 meter. There is also a database of available landing sites. In the case of Mars, yes, but in the case of Europa, for instance, you won't have a good reconnaissance map, and the features can change with time.

Concern: Could you walk through the EDL process on high level and which sensors are used at what point? What was your experience with what worked and what hasn't?
Response: Terrain avoidance hasn't been used yet – it's being developed. For EDL, we are not looking at the ground for a while.

Concern: Do you have just visual imagery or do you have multiple views to get photogrammetric 3D view?
Response: It is all from the orbiters – they get multiple passes. Different orbiters have different resolution. A simulation of the data is available.

Concern: Can you elaborate on the types of sensor technologies desired for health monitoring in EDL? Are you talking about people or equipment health?
Response: The sensors technologies focus on the system and the materials for now.

Concern: Would rigid, low-density TPS materials be of interest for a deployable system, perhaps in a segmented or grid-like pattern that could be expanded without causing failure in the TPS parts?
Response: NASA looked at that originally and found that it didn't work for this type of size. So we turned to woven materials since the mass was an issue.

Concern: Is there interest in additive manufacturing processes for complex TPS parts and support components for hot structures as well?
Response: Look at the structures related topic. If it meets the requirements, NASA is interested.

Concern: For the current inflatable re-entry device, are you interested in any inflating type of materials; are you ready to test newer materials?
Response: NASA is interested in any concept that can help push heat flux capability and durability of the system. The current designs have insulators that decompose during heating. Right now we have materials that can withstand the heat but we have issues with packing it into a case.

Concern: What sort of testing capabilities would you have for parachute materials?
Response: We would like to be able to measure the material properties under flight-like loads. Temperature, stresses and strengths.

Concern: Has the work under FSA analysis framework started?
Response: The work has been started.

Concern: Is there any communications loss problem and if so is there any approach to address this issue?
Response: There is so called communication blackout due to shock waves. There are two ways to address that: one way is develop communication capability that can penetrate the plasma and the other one is to come up with ways to mitigate the plasma generation in the first place. There is an interest.

Concern: This is specific to deployable 3D woven thermoset topic. Technical feasibility has to be demonstrated and could that be achieved through simulation or does it have to be fabrication?
Response: For Phase I, a weave plan or design with the description of the set up that would be enough.

Concern: What type of G forces are acceptable at the final landing? How much time and atmosphere do you plan to go through?
Response: Cargo or robotic missions can be higher in terms of G forces. In terms of how much atmosphere do you have to go through, at that point the density is so low that you fall like a stone, so it is a propulsion problem.