BREAKOUT SESSION 3.

ROBOTICS FOR PLANETARY MISSIONS

Concern: Could you get into more details on robotic operations, planning autonomy and reuse?
Response: Developments driven by the need and use of information technology, one of four things that are needed are technologies that can fundamentally increase autonomy of robotics: diagnostics, prognostics, anything that will allow robots to operate independently.

Concerns: Which agencies/centers will be involved in it?
Response: We have activity in Kennedy and Johnson. We have lead centers and participating centers, the center that reviews the proposals will leverage the other centers to create the best match.

Concerns: How do we pick your brains? Do we contact a specific technological person?
Response: We have the CTTLs (Center Technology Transition Leads), each center has one. The idea is that these folks have an idea of what is going on. The outreach materials have the list of CTTLs. You cannot call them before the solicitation or while it's open and ask specific Concerns. Ex. Voltage. SBIR is a great tool, you have the opportunity to go with a Phase II-E or X and other opportunities down the line.

Concern: Concern about application, are you looking for a focus on in-transit and maneuvering near, or on planets, and relative or fixed grid. Celestial body specific.
Response: We are interested in any technology that enables a robot to do two things, navigation course (detect hazards) and localization. Not looking at navigation for spaceship, more for a robotic purpose. The types of hazard can vary depending on the type of environment.

Concern: What type of scale?
Response: In terms of planetary rovers, can be 10km or higher. Inside space station you will be talking about meters. There is range of need.

Concern: Does the requirement for new robot mobility technology apply to the Mars Rovers?
Response: We are really focused on what will happen in the future. Mars 2020 is not the final product mission to Mars. There will be numerous missions with humans and robots. We are looking for technologies that will support these future missions. We have not gone yet on radically steep slopes, mobility technology will help make some of these missions possible.

Concerns: Your presentation was broad; can you expand on the development component? Is this new for NASA?
Response: This has been something that has always been there. We are interested in building systems that are different than current systems. There is a lot of development within NASA to look at active control tension. We have systems that have a lot of components, we are dealing with systems that have a lot of stiffness in them. The sooner that we are able to develop ways to address these present constraints the better.

Concern: I haven't heard anything mentioned about Critical Technology Elements (CTE) and the readiness requirements.
Response: We expect those standards to become increasingly important in the future. Many SBIR/STTR technologies developed are in the lower technology readiness levels.

Concern: Can you speak to it (CTE) about reliability?
Response: Reliability is essential if the system is supposed to be long lived. You don't want something to fail. Reliability under NASA depends on the mission. Reliability has to do with the maintenance of the system, achieved with human interference or not.

Concern: As a small company, we have a component that can help with the mission. Advice where to find the people that need this component, help people in these special areas. Need to know who to partner with.
Response: Two ways: google the area as a whole and look for NASA mentions. You may find the NASA center folks, and email them directly. Two: a lot of the primes get brownie points for having SBIR/STTR technologies. Contact the primes to help make the connection. For the commercialization, you need to go out to the vendors, we deal with lower technology readiness levels.

Concern: Software structures and specific wants?
Response: In terms of software, take a look at prior year's topics and this year. Interested in software for different reasons, for specific applications. Also interested in reusable frameworks for difficult tasks. One of the things NASA makes use of is CFS, also can use the robotic system framework. Importance on sustainability.

Concern: Multi sensor responsiveness?
Response: Multi-level interaction is a goal. Use of sound, body motion, arm motion. Using all the different channels to let us express the information that we want to communicate.

Concern: You mentioned that you will have free flyer robot, in this solicitation?
Response: Is included this year and has been in the prior years. I refer you to the ISS spheres facility, managed by the team at NASA Ames.

Concern: Is there a cross-cutting need for secure middleware for a variety of applications of robotic systems?
Response: Software focused on performance and sustainability is key but something like DDS (Data Distribution Service) is an example of middleware which has scaled to air traffic control.

Concern: Will there be experts looking at contamination control?
Response: The working practice is to avoid contamination.

Concern; You mentioned precursor systems, please provide details and what you envision for these areas?
Response: We use the term to differentiate between robotic missions and human missions. The type of tasks that the robots will be carrying will be different.

Concern: There are several companies doing lunar regolith, is it ever going to change to have purely commercial?
Response: STTR is set up to team with nonprofit research institutions. Topic for STTRs may be different year to year.

Concerns: Comment: there was a Concern about secure middleware. We are that little company from 20 years ago, now these technologies are deployed in multimillion dollar projects. It's a testament of what can

happen with this program with hard work. We have the technology at low/no cost for small business readily available.

Response: Thank you for sharing. We like to collect success stories; we would love for firms to reach out.

Concern: Is your scope only interested in funding robotic or novel robotic composition?
Response: Only the robotics portion of ISEU, this workshop provides broad concepts. From the robotics point of view, the robotics is focused on ISEU processing or manipulation.

Concern: Scope usage - what kinds of devices are of interest and at what levels? Is there interest in quantifying robotic usage?
Response: I recommend looking at past and future calls. Engineering is interested in numbers, how much is this technology better than another one.