Thursday, June 14, 2012
TECHNOLOGY AND ENABLING CAPABILITIES:
MARS SAMPLE RETURN ARCHITECTURES, STRATEGIES, AND VEHICLES
8:00 a.m. Lecture Hall

Connolly J. F. P.E. *
A Comparison of Alternate Mars Sample Return Mission Architectures **[#4058]**
MSR missions involve a complex series of mission architecture choices that each affect performance, cost and risk. A systems engineering analysis of the choices presents a finite set of unique mission architectures distinguishable by cost and mission success probability.

Niles P. B. * Abell P. Andrews-Hanna J. Archer P. D. Baldridge A. M. Bell J. F. III Bishop J. Bleacher J. E. Bourke M. C. Brown A. J. Chevrier V. F. Corrigan C. M. Crown D. A. Draper D. S. Ehlmann B. L. Evans C. A. Fergason R. L. Fries M. Gibson E. K. Glotch T. Graff T. G. Graham L. D. Grotzinger J. Gruener J. Hausrath E. M. Hynek B. M. Jones J. H. Kite E. S. Knauth L. P. Knudson A. T. Kounaves S. P. Lederer S. M. Lemmon M. T. Michalski J. Ming D. Murchie S. Newsom H. E. Noe Dobrea E. Oehler D. Z. Osterloo M. M. Rogers A. D. Seaman C. H. Searls M. L. Stern J. C. Socki R. A. Sutter B. Vaniman D. Weitz C. M. Williams R. M. E. Wray J. J. Wright S. P. Zolotov M.
Multiple Smaller Missions as a Direct Pathway to Mars Sample Return **[#4234]**
Recent discoveries have revealed multiple compelling landing sites for Mars Sample Return. We propose to replace the single flagship-class sample caching mission architecture with a series of smaller missions to multiple landing sites.

Wadhwa M. * Leshin L. Wiens R. Jurewicz A. J. G. Clark B.
SCIM: Sample Collection for Investigation of Mars, A Low-Cost, Low-Risk Concept for the First Mars Sample Return Mission. **[#4286]**
SCIM is a revolutionary concept for a low-cost, low-risk sample return from Mars to fundamentally advance knowledge of the geology, climate and habitability of Mars. SCIM would be a pathfinder for future unmanned and manned missions to Mars.

Adler M. Guernsey C. Sell S. Sengupta A. Shiraishi L. (Presenter: R. Grover *)
Low Cost High Value Mars Sample to Orbit **[#4367]**
A mid-size lander, rover, and MAV using the MSL CEDL architecture and a three-stage Falcon 9 can collect scientifically high-quality Mars surface samples consisting of rock cores collected by a roving platform, and deliver those samples to Mars orbit.

Cohen B. A. *
Groundbreaking Mars Sample Return for Science and Human Exploration **[#4119]**
A simplified Mars Sample Return mission holds significant benefits for science, human exploration, and programmatic risk, enabled by new technologies. We encourage a reexamination of this mission in the mid-term of the Mars Next Decade planning.

Muirhead B. K. Stansbery E. K. Wilcox B. H. Rivellini T. P. Strange N. J. McElrath T. (Presenter: R. Manning)
Toxicity Sample Return Tech Demo **[#4107]**
Before humans can explore Mars we must have soil and atmospheric samples to determine the nature of any toxicity threat. We propose a single-string, sample return, technology demo-class mission that would retire a broad range of mission risks.

May T. A. Creech S. D. *
NASA's Space Launch System (SLS) Program: Mars Program Utilization **[#4098]**
By providing direct trajectories to Mars, SLS eliminates the need for complicated gravity-assist missions around other bodies in the solar system, reducing mission time, complexity, and cost.

McElrath T. P. * Elliott J. O.
Earth and Mars Based SEP Tugs for Increased Payload Delivery to Mars **[#4322]**
SEP tugs based at Earth and Mars could increase the delivered mass to Mars by ~2× to entry and ~2.5× to aerobraking, with current technology, using a 12-hr initial orbit. The Earth tug is usable every synodic period, and the Mars tug every other.

Folta D. C. * Vaughn F. J. Rawitscher G. S. Westmeyer P. A.
Fast Mars Transfers Through On-Orbit Staging **[#4181]**
The concept of On-Orbit Staging (OOS) enables fast transits to and from Mars, resulting in total round-trip times of less than 245 days. Combined with pre-positioned fuel it increases payload mass and reduces overall cost, schedule, and risk.

Trinidad M. A. * Calvignac J. G. Lo A. S.
High-Performance Mars Ascent Propulsion Technologies with Adaptability to ISRU and Human Exploration **[#4222]**
Northrop Grumman's novel, high performance Mars ascent propulsion system that provides maximized mission flexibility and provides a propulsion technology path to *in situ* resource utilization (ISRU) as well as ascent vehicles for human exploration is summarized.

Chandler A. A. Karabeyoglu M. A. * Cantwell B. J. Reeve R. Goldstein B. G. Hubbard G. S.
A Storable, Hybrid Mars Ascent Vehicle Technology Demonstrator for the 2020 Launch Opportunity **[#4342]**
A Phoenix sized mission including a reduced payload, two-stage, hybrid Mars Ascent Vehicle technology demonstrator is proposed for the 2020 opportunity. The hybrid MAV is storable on Mars and would retire risk for a Mars Sample Return campaign.

Vozoff J. M. Fisher D. J. Mungas G. S. *
NOFBX™ Mars Ascent Vehicle: A Single Stage to Orbit Approach **[#4353]**
NOFBX™, a nitrous-oxide-based monopropulsion technology, provides the performance and implementation benefits to enable the first liquid monopropulsion Single Stage to Orbit Mars Ascent Vehicle (MAV) design.

Marinova M. M. McKay C. P. Wooster P. D. * Karcz J. S. Lemke L. G. Heldmann J. L. Stoker C. R. Gonzales A. A. Davila A. F.
A First, Single-Launch Mars Sample Return Mission: Achieving the Key Human and Science Exploration Goals **[#4327]**
We describe the rationale for a simple, first, low-cost Mars sample return mission, which collects local samples and returns them to Earth within a single launch opportunity. The samples will answer key questions for human and science exploration.

Zacny K. * Beegle L. Onstott T. Mueller R.
MarsVac: Actuator free Regolith Sample Return Mission from Mars **[#4263]**
We describe a Mars Sample Return scheme whereby regolith is acquired from tubes embedded underneath each lander footpad and pneumatically transferred directly into Mars Ascent Vehicle. This approach was vacuum tested and has no actuators.

Ehlmann B. L. * Grotzinger J. P. Manning R. M. Rivellini T. P. Backes P. G. Ganino A. J. Shiraishi L. R. Klein K. J. Allen W. C. Kahn C. L. Ziemer J. K. Sherwood B. Eisen H. J.
MER Caching Rover for 2018 Exploration of Ancient Mars **[#4228]**
A modern, minimally updated MER rover can begin sample return in 2018. We demonstrate MER accommodates a caching system and robust science payload. A guided entry airbag landing system enables exploration and sample collection at high priority sites.

Munk M. M. * Glaab L. J.
Mars Sample Return Earth Entry Vehicle: Continuing Efforts **[#4175]**
Enabling components of the Mars Sample Return Earth Entry Vehicle have been analyzed and demonstrated for over a decade at NASA-Langley. This presentation will highlight recent developments and suggest a path to high-reliability mission readiness.

PANEL DISCUSSION