Sample Handling Requirements

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June 12, 2002

JPL In-Situ Instruments Workshop

Functional and Resource Requirements

- **Functional Elements**
  - Receiving, assessment, crushing, distribution, transport, cleaning, temporary storage, waste dumping
- **Mass** (current prototype designs < 32kg)
  - Budget includes everything between acquisition device and instrument
- **Energy** (current prototype designs < 35wt)
  - Nominal will be less than 10% of total power generated by delivery platform
- **Volume**
  - TBD (dependent on Option selected and rover sizing for Option A)
- **Process Sensors**
  - Flow, instrument cycling, power use monitoring
- **Communications**
  - Subset of entire landed system (baseline DTE 31 Mbtg/sol, UHF 97.3 Mbtg/sol)

Interface Requirements

- **Mechanical**
  - Interface between acquisition device and instrument will be through hopper and ports
- **Electrical and Data**
  - Power will conform to 22 to 36 volt primary bus
  - Both command and data interfaces will be serial
- **Position/Orientation**
  - Rover/lander deck will be 0.6 to1 m above ground
  - Max tilt will be 10°, max roll will be 5° for Option A, max inclination of 30° in any direction for Option B

Performance Requirements

- **Time (solar/180 sol mission)**
  - 3 sols/sample (Option A), 2 sols/sample (Option B)
- **Sample Routing**
  - Delivery to any single instrument port for destructive analysis, to within sampling range for non-destructive instruments
- **Number of Samples**
  - Option A: 3 drill hole, and 12 additional corer samples
  - Option B: 1 drill hole and 48 additional samples from the rover
- **Material to Process**
  - Regolith, subsurface samples, mini-cores of rocks which may include basalt, sandstone, limestone
  - Corer/drill samples delivered in segments <= 10cm length with a preferrable diameter <= 1cm, rock samples 2-3cm dia.
- **Sample Processing**
  - Crushing to < 1mm, sieves as an option for smaller fines
- **Autonomy**
  - Will not be resident in SPAD beyond process monitoring and flow control

Two possible scenarios for the Mars Smart Lander (MSL) 2009 mission have been generated by the Science Definition Team (SDT) – Option A: large Mobile Geobiology Rover with a DOA lander, and Option B: Multidisciplinary Platform of a medium-size rover and a live lander. Both options will require the development of new technology for the preparation and distribution of samples prior to analysis by the onboard science instrument suites. This talk presents the Sample Preparation and Distribution (SPAD) system requirements relevant to the MSL'09 mission that were derived from a two month study chartered by the Mars Program Systems Engineering Team (MPSET) and the Mars Technology Program (MTP) at JPL.