OPAG

Titan Working Group Evaluation of Mission Studies and Future Priorities

OPAG Meeting

Arlington, VA

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Ralph Lorenz (U. Arizona, chair)

Chris McKay (NASA Ames)

Sushil Atreya (U. Michigan)

Mike Brown (Caltech)

Geoff Collins (Wheaton College)

Eric Wilson (JPL)

J. Hunter Waite (U. Michigan)

Elizabeth Turtle (U. Arizona)

Frank Crary (SwRI)

(ex officio : Fran Bagenal
Curt Neibur)

OPAG Titan Working Group

Activity so far has been 1 telecon plus email and deep thought

Charge so far has been

- Provide feedback on mission studies presented at OPAG in June
- Begin/continue an ongoing discussion of future science priorities and needed mission studies

Future task (6-12 mo) is to generate document and 10slide presentation on key next steps.

Studies Reported at Last OPAG

(Advanced RPS Mission Studies Team : Robert Abelson, JPL)

• RPS Orbiter at 1400km. 2015 launch : 2022 arrival. Delta IV-Heavy with aerocapture allows 5000kg delivered to Titan! 1kWe 15x Advanced RPS. 700kg instrument payload. Precipitation Radar/Altimeter, CRISM-type spectral imager, Wide-angle camera, SAR, INMS, X/Ka Radio Science. ~370kg entry package (unspecified lander/balloon/blimp)

High power Ka downlink to upgraded DSN (180x12m) permits impressive 2.3 Mbps

2 year mission

Studies Reported at Last OPAG

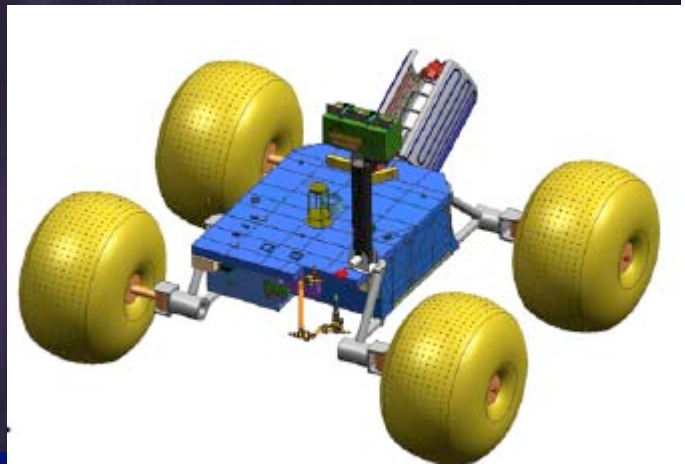
(Advanced RPS Mission Studies Team : Robert Abelson, JPL)

- RPS Rover.

Inflatable 1.5m wheels : up to 0.5km/day

28.8 Mbits/day through articulated 0.5m X-band HGA direct to Earth (180x12m DSN)

Somewhat MSL-like payload suite



TWG Reaction

- Useful points in mission space - demonstrate scope of rover and high-power orbiter mission for high-data rate, long-duration missions addressing important science.
- Orbiter mission scientifically attractive as-is (in the sense of mass,power, data for payload), but likely expensive.
- Rover mission attractive, but not at only one or two sites. Uncertainty of trafficability argues against rover mission (steep slopes, gullies, soft/sticky/rubbly surface?)
- TWG suggests to consider lower-power orbiter variant (fewer RPSs), with smaller radar instrument or lower duty cycle.
- TWG prefers aerial mobility to conventional rover (range)

Priorities for Future Titan Science

- Global surface characterization (topography) at ~100m scale (O)
- Tropospheric cloud activity and precipitation processes. Detection of surface changes and liquids (O/I)
- In-situ characterization of surface composition at several locations. (I)
- Decimeter-scale surface imaging at many locations (I)
- Seasonal changes - temperature, winds and composition (stratosphere, troposphere). (O)
- Upper atmospheric variability (O)

(I = in-situ explorer ; O = Titan Orbiter)

Comments on Titan Mission Architecture

- Cassini data coming in : overall goals unlikely to change, although specific targets/emphasis may emerge.
- Portfolio of mission options exists - in-situ with direct-to-earth, orbiter-only, and orbiter+in-situ. Range of costs and capabilities (but these need to be presented). Suggest need to retain flexibility to attain maximum science return within realistic fiscal and technological constraints.
- Today, a Titan orbiter offers wide range of science with low technical risk. A modest in-situ package (a trial balloon ??) could be easily accommodated and would reduce risk for future missions.