EPSC Abstracts,
Vol. 2, EPSC2007-A-00427, 2007
European Planetary Science Congress 2007

Future scientifically worthwhile missions to the Saturn system

T. Spilker

Jet Propulsion Laboratory / California Inst. of Technology, Pasadena, CA, USA,
(Thomas.R.Spilker@jpl.nasa.gov / Phone: 001.818.354.1868)

Data from the International Cassini/Huygens (CH) mission suggests multiple avenues for future scientific exploration of the Saturn system. Currently scientists and engineers think viable options for future missions include examining in more detail Saturn itself, Titan, Enceladus (and possibly other small icy satellites), and the ring system, in the near- to mid-term time frames and beyond.

But the very successes of the CH mission that revealed these exciting options also make it more difficult for future missions to provide science that extends significantly beyond CH. That very capable instrument complement, coupled with a tour that sampled well the diversity of the system, leaves only more difficult observations yet to be done. A recent study commissioned by NASA and led by the Jet Propulsion Laboratory concluded that only flagship-class missions can improve sufficiently on CH's observations of Titan and Enceladus to make them scientifically worth their mission costs [1]. That study's science advisory teams found that there are three avenues by which future missions can conduct scientifically worthwhile investigations at those destinations: make measurements not previously feasible (i.e., carry instruments different from or significantly improved over those on CH); extend coverage in space or time to unexplored areas; or make observations of previously unknown phenomena. Such improvements are not easily accomplished. Although the study identified some missions to the Saturn system that could be flown for $1B US (2006 dollars) or less, none of those were deemed of sufficient science value to be worth the cost.

What kinds of flagship-class missions have science returns that justify their costs? Fortunately the range of possibilities covers all the major system components mentioned

above. This paper will discuss the kinds of mission concepts that could address the major science questions at each one, and will describe what aspects of those missions make them unlikely to fit within smaller resource caps.

This work was performed at the Jet Propulsion Laboratory, California Institute of Technology, under contract to the US National Aeronautics and Space Agency.

[1] K. Reh et al., Titan and Enceladus $1B Mission Feasibility Study Report, JPL D-37401, Jet Propulsion Laboratory, 30 Jan. 2007.