Abstract

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Neptune Orbiter

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PERSPECTIVE

The results from the highly successful Voyager Neptune encounter posed many profound questions that only follow-on missions will be able to answer. Recent investigations of other star systems have resulted in fundamental questions that may be approached through probing our solar system's gas giants as astrophysical analogs and solar system laboratories. The Neptune Orbiter mission is a high priority part of the Mission and Technology Roadmap that defines the framework for the future NASA Solar System Exploration program. Thepotential science returned from aNeptune Orbiter mission is in the break through category and enabled by advanced technologies described in the paper. Technology needs are predicted based on mission/system design studies carried out over the past year. Mission/system designs are described to which the technology needs can be related.

SCIENCE GOALS

The science community has provided measurement goals for the Neptune Orbiter mission:

- atmospheric structure & circulation at Neptune & Triton
- ring particle physical properties, dynamics, & distribution
- magnetosphere structure & dynamics
- map of the gravity field (Neptune)
- composition, structure, & dynamics of Triton surface

MISSION ARCHITECTURE

Investigation of Neptune as a system is required in order to understand fundamental science questions. So not only are time history studies of Neptune required, but exploratory investigations of Triton, Neptune's largest moon, are also needed. This paper examines a strategy of combining both types of investigations and evaluating delivery of a sufficiently capable payload via several different modes dependent on technology advances.

TECHNOLOGY NEEDS

Several technology advances make desirable Neptune Orbiter missions possible for relatively low cost; examples are ion propulsion, aero-assist orbit insertion, highly efficient power subsystems, and miniaturized spacecraft subsystems in general.

MISSION/SYSTEM DESIGN & COST DRIVERS

In addition to new ways of delivering sufficient mass to Neptune, orbiter delivery has been analyzed with new strategies that allow collection of data during repeated Triton flybys while in Neptune orbit.

Low cost is a major driver, with science and technology benefit, in today's mission selection criteria. A number of cost driving factors have been isolated which make such complex missions as Neptune Orbiter possible for relatively low cost.