SIGNIFICANT SCIENCE AT TITAN AND NEPTUNE
FROM AEROCAPTURED MISSIONS

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In 2001 NASA began assembling the Aerocapture Systems Analysis Team, a team of scientists and engineers from multiple NASA centers. Their charter is to perform high-fidelity analyses of delivering scientifically compelling orbital missions that use aerocapture for orbit insertion at their destinations. After establishing scientific credibility, studies focus on aerocapture systems design and performance, including approach navigation, flight mechanics, aerothermodynamics, and thermal protection.

The team’s Oct. 2001 to Sept. 2002 study examined a mission to explore the organic environment of Titan and its chemical, geological, and dynamical context. Its architecture includes a Titan polar orbiter that would complete and extend Cassini’s soon-to-begin global mapping, aiding global extrapolation of findings from a mobile in situ element (rover, blimp, etc.). The in situ element would perform remote sensing and in situ investigations, for analysis and characterization of Titan’s surface, shallow subsurface, atmosphere, processes occurring there, and energy sources driving it all. The study concentrated on the orbiter and orbit insertion, largely treating the in situ element as a black box with data relay requirements.

Oct. 2002 to Sept. 2003 the team studied a mission to perform Cassini/Huygens-level exploration of the Neptune system. Before aerocapture this mission would deploy and support multiple Neptune atmospheric entry probes. After aerocapture the orbiter uses Triton as a "tour engine", in much the same manner as Cassini uses Titan, to provide many Triton flybys and orbit evolution for detailed investigation of Neptune’s interior, atmosphere, magnetosphere, rings, and satellites.
This presentation summarizes the missions’ science objectives, instrumentation, and data requirements that served as the foundations for the studies, and describes mission design requirements and constraints that affect the science investigations. Following the Cassini/Huygens example these missions present abundant opportunities for international collaboration.

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