

## **ON THE FEASIBILITY OF A NEW FRONTIERS CLASS SATURN PROBE MISSION**

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The 2006 Update of NASA's Solar System Exploration (SSE) Road Map pointed to the possible inclusion of a New Frontiers (NF) class Saturn Probe mission to compete for the next opportunity against four other missions, including one targeting Jupiter with Deep Entry Probes. If subsequently selected, this new mission would provide compositional measurements of Saturn's atmosphere, ultimately addressing science questions about the formation of our Solar System. Since the SSE Road Map set other priorities for all Flagship class opportunities over the next three decades, a Saturn Probe mission would only be possible if it would fit under the NF category. Therefore, the selection of trade space options were driven by measures, which would potentially reduce mission cost. The science based baseline architecture calls for two shallow probes descending to 10 bar pressure elevation, utilizing Galileo probe heritage. One probe would target the equatorial region and the other one would aim towards mid-latitudes. In order to measure atmospheric composition to 100 bars, the flyby spacecraft would be equipped with a microwave radiometer, using Juno heritage. The explored mission architecture trade space options include both high-thrust ballistic and low-thrust Solar Electric Propulsion enabled trajectories. For communications, both Direct-to-Earth and relay through the flyby spacecraft are addressed. The spacecraft would be powered by batteries and solar panels, based on Juno heritage LILT technology. Thermal Protection System (TPS) availability and sizing are also discussed. The probe mission concept is costed for various mission architectures. Consequently, the results of this study provide a definitive answer on the feasibility of such a mission, which in turn could assist NASA with the decision making process regarding future NF Announcement of Opportunities.