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Technologies for Outer Planet Missions: A companion to the OPAG Exploration Strategy

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The Outer Planets Assessment Group (OPAG) advocates the need for a focused technology program for the next Outer Planet Flagship Mission after the Europa Jupiter System Mission (EJSM) in order to be ready for a launch in the mid-2020s. Current planning assumes that a mission to Titan and Enceladus will be the highest priority. The challenges common to all Outer Planetary (OP) missions—large distances, long [U+FB02]ight times, and stringent limitations on mass, power, and data rate—mean that all missions can signi[U+FB01]cantly bene[U+FB01]t from technical advances in a number of broad areas. Since technology development timescales are long, it is most productive to base technology requirements on the expected general characteristics of future missions. While the strate¬gic Flagship mission concepts are better understood, an estimate of the needs for the competed small class (Discovery) and medium class (New Frontiers) missions can be included in constructing an effective technology investment plan.
Technology investment priorities are guided by the requirements established in mission and system studies that are focused on the highest priority science objectives. The next OP mission (after EJSM) may involve orbiting one or both of the saturnian satellites Titan and Enceladus. Other potential OP missions include atmospheric probes of the giant planets, in situ exploration at Titan, flybys or orbiters to the ice giants Neptune and Uranus, and ultimately, landing on Europa or Enceladus. The breadth of technology needed for OP exploration clearly calls for an aggressive and focused technology development strategy that aligns with the Decadal Survey recommended mission profile, and includes technologies developed by NASA, as well as acquisition of applicable technologies from other government and commercial sectors. This presentation shows how the technologies discussed in the white paper derive from the Outer Planet science goals, with particular attention to those required by a mission to Titan and Enceladus. We explain why they are significant relative to current solar system goals/priorities and outline how they should influence the next generation of solar system exploration missions.

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