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Strategies for Rapid Implementation of Interstellar Missions: Precursors and Beyond (4)

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INTERSTELLAR PROBE – DESTINATION: UNIVERSE!

Abstract

The idea of an "Outer solar system probe: to be aimed away from the Sun in the plane of the ecliptic" dates from a report of the "Simpson Committee" of the Space Science Board of the National Academy of Sciences in March of 1960. After many studies and name changes, what is now known as "Interstellar Probe" has matured as a concept for making new discoveries that can be made in no other way, by going places yet to be explored. The central technical question has always been propulsion with "near-future" capabilities taken as the backdrop for defining the mission requirements. However, the real issue has always been to unite compelling science with engineering and technical reality. With that perspective in mind the Johns Hopkins University Applied Physics Laboratory has been tasked by the NASA Heliophysics Division to (re-)study the mission and provide a Technical Report to be delivered late 2021 for input to next Solar and Space Physics Decadal Survey. This "pragmatic Interstellar Probe" of the study is a mission through the outer heliosphere and to the nearby "Very Local" interstellar medium (VLISM), uses today's technology to take the first explicit step on the path of interstellar exploration, and can pave the way, scientifically, technically, and programmatically for more ambitious future journeys (and more ambitious science goals). To enforce these goals broadly-based engineering requirements include (1) readiness to launch no later than 1 January 2030; (2) capability to transmit useful scientific data from 1000 au; (3) powered by no more than 600 W (electric) at the beginning of the mission and no more than half of that at mission's end; and, (4) lifetime of no less than 50 years. To travel as far and as fast as

possible with available technology, the use of the Space Launch System Block 2 (SLS B2) cargo version is enabling: carrying the spacecraft as well as a 3rd and 4th stage, solar system escape speeds of at least twice that of Voyager 1 (i.e., up to 7.2 au/yr) should be possible. We provide a top-level summary of work accomplished to date, focusing on how the science goals drive and are affected by telecommunication options, guidance and control requirements, trajectory options, and the baseline system architecture and approach.

"It isn't about where we are going. It's about the journey out there."