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Generation and Sustainment of a Plasma Magnetic Sail JOHN SLOUGH, LOUIS GIERSCH, Plasma Dynamics Laboratory, University of Washington — Plasma sail propulsion based on the plasma magnet is a unique system that taps the ambient energy of the solar wind with minimal energy and mass requirements. The coupling to the solar wind is made through the generation of a large-scale ($\sim>$ 30 km) dipolar magnetic field. Unlike the original magnetic sail, the coil currents are conducted in a plasma rather than a superconducting coil with the mass of the sail is reduced by orders of magnitude. Unlike a solid magnet or sail, the plasma magnet expands with falling solar wind pressure to provide constant thrust. The plasma magnet consists of a pair of polyphase coils that produce a rotating magnetic field that drives the necessary currents in the plasma to inflate and maintain the large-scale magnetic structure. The plasma magnet is deployed by the Lorentz self-force expanding outward until the expansion is halted by the solar wind pressure. The results from the initial experiments demonstrated that the appropriate high β, high current plasma can be created and sustained in the geometry suitable for the space application of the concept. Sufficient current was generated in the plasma magnet to produce a plasma magnetosphere of sufficient pressure to push out well beyond the 30 km scale required. Work is now underway to measure the thrust imparted to the plasma magnet by a large scale surrogate solar wind source.

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