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Mini Magnetospheric Plasma Propulsion (M2P2)

Space Transportation Technology Workshop or Section Title:

- ◆ The M2P2 concept is based on the Transfer of momentum from the solar wind to an artificial magnet field structure like that naturally occurs at all magnetized Planets in the solar system, called a Magnetosphere.



Space Transportation Technology Workshop or Section Title:
Mini Magnetospheric Plasma Propulsion

(M2P2)

- ◆ **Demonstrate artificial magnetospheric inflation through cold plasma filling in vacuum.**
- ◆ **Demonstrate deflection of a surrogate solar wind by an artificial magnetosphere in the laboratory vacuum chamber.**
- ◆ **Compare theoretical calculations for thrust forces with laboratory measurements.**
- ◆ **Develop flight control algorithms for planning mission specific trajectories.**
- ◆ **Develop M2P2 system concept**

Space Transportation Technology Workshop or Section Title:

Technology Goals and Objectives

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Space Transportation Technology Workshop or Section Title:

- ◆ **Two experiment campaigns were completed in FY'00:**
 - **Two weeks in July and two weeks in September.**
- ◆ **Experiments were conducted in the MSFC Test Area 300 large vacuum chamber, which is a cylinder 20 feet in diameter and 35 feet long, oriented vertically**
- ◆ **Work was performed in partnership with the University of Washington, with support from the University of Alabama, Southwest Research Institute, and Arnold Air Force Base personnel.**

Space Transportation Technology Workshop or Section Title:

Current Status

- ◆ **A dipole magnetic field line inflation of almost a factor of 30 was demonstrated, in a laboratory vacuum chamber, limited by chamber size**
- ◆ **The M2P2 plasma filled magnetic bubble was shown to push against the Earth's magnetic field and against an artificial solar wind.**
- ◆ **Even in an otherwise collisional plasma regime, plasma confinement within the M2P2 magnetic bubble was observed to a distance approximately 30 times the magnetic coil radius.**
- ◆ **Plasma density and temperature measurements were performed near the M2P2 device and in the magnetic equatorial plane a multiple distances from the device.**
- ◆ **Initial estimates for possible M2P2 radiation shielding were obtained**

Space Transportation Technology Workshop or Section Title:

Major Accomplishments

Space Transportation Technology Workshop or Section Title:

Major Accomplishments

- ◆ **Quantitatively measure force exerted on the M2P2 magnetic bubble by the Earth's magnetic field and by an artificial solar wind**
- ◆ **Measure (quantitatively) in situ plasma and magnetic field conditions simultaneously at multiple locations through the M2P2 magnetic field structure**
- ◆ **Extend modeling of M2P2 radiation shielding properties**
- ◆ **Create a technology roadmap for the development of a flight M2P2 propulsion system**

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Space Transportation Technology Workshop or Section Title:

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