

Pluto Express¹ - Out of The Darkness

Pluto, discovered in 1930, is the largest of a class of primordial bodies at the edge of our Solar System that have comet-like properties and remain relatively unmodified by warming from the sun². Its large moon, Charon, has properties very different from Pluto, and is part of a unique double body system. It is the only one planet left in our solar system that we have not explored via robotic spacecraft. Its orbit is 248 years in duration and is currently receding from earth. Pluto Express is the proposed mission to send two "Sciencecraft" out to enable us to answer many questions about these bodies and our solar system.

The mission to Pluto presents one of the greatest challenges for the deep space communications due to its tremendous distance from earth (~31 AU or 4.6 e09 km), limited spacecraft prime power and mass. To significantly reduce mission costs the Pluto Express spacecraft dry mass is less than 1 (K) kg. This allows the use of smaller launch vehicles (e.g., Delta class). However, smaller spacecraft designs significantly affect the telecommunication subsystem architecture, because limited prime spacecraft power translates to limited transmitter power. Reduced spacecraft mass directly affects the size of the antenna aperture. Insertion of advanced technology enables us to formulate a mission that allows us to achieve the required science objectives and quickly return the data back to earth. Increasing the downlink frequencies from 8 GHz (X-Band) to 32 GHz (Ka-Band) is an important way to increase data volume returned.

This lecture will begin with a briefing on the status of the Pluto Express preproject (science objectives, trajectory, and sciencecraft approach) and then focus upon the telecommunication subsystem. Low-mass low-profile antenna, advanced packaging of high-frequency microelectronics for transponders and transmitters are the key technologies that are currently being pursued.

The goal of Pluto Express is to have a mission that provides valuable science and is exciting for the public. The Pluto Express preproject has an extensive outreach program and project information is accessible via the world wide web.

¹The work described in this talk is being performed at the Jet Propulsion Laboratory, California Institute of Technology, under contract with the National Aeronautics and Space Administration.

²H.W. Price, "Pluto Express Sciencecraft", JPL internal publication, 30 Sept. 1995.