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Solar System Explorations using DESTINY: the Demonstration and Experiment of Space Technology for Interplaneta

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Demonstration and Experiment of Space Technology for Interplanetary Voyage (DESTINY), which is a candidate mission of Epsilon Launch Vehicle, aims to demonstrate new technologies of high energy orbit insertion, large scale ion engine, ultra light-mass solar panel, etc. for low-cost deep space mission. It also plans to observe using scientific instruments with the mass of up to 10 kg during transfer and Halo orbit of sun to earth Lagrangian point L1 or L2.

Potential scientific objects include in-situ observation and remote sensing from L1 or L2 are, such as, plasma and energetic particles around the plasma sheet of terrestrial magnetosphere. X-ray Telescope will make imaging of the solar wind charge exchange (SWCX) with a full coverage from the distance of the Moon and the first full imaging for the magneto-sheath, cusp, and magnetopause. Ultraviolet Telescope with 10 cm diameter will simultaneously observe the Lyman Alpha emission from the geocorona. Neutral and Ion Camera will provide a side-view of the dynamical magnetosphere. It would be able to provide the first composite movies of how the terrestrial global magnetosphere changes in the solar wind. DESTINY is considered to be useful for the pilot observations for future infrared, gamma-ray, and cosmic-ray space astronomical telescope. It is probable to observe and monitor Near Earth Objects (NEO), inter-planetary and inter-stellar dust. Dust Analyzer and High Vision Camera will provide physical parameters, such as the size and density, and chemical features, such as the metallic and organic composition of the interstellar dust to elucidate the original material of the solar system and the life. These instruments would observe one of the most unusual asteroids 3200 Phaethon which has dust tails. High Vision Camera and Thermal Infrared Imager would also observe the impact flash of the Moon.

Applied missions of DESTINY will be able to go to deep space with higher mass of payloads. Using the Epsilon Launch Vehicle, it will convey instruments of up to 50 kg to the space between Venus and Mars. Ultraviolet Telescope with the larger size will observe the absorption lines from the extra-solar planets such as the hot Jupiter and the super earth. Infrared Telescope settled on the orbit of outside the ecliptic plane will observe the cosmic background radiation. DESTINY launched by the improved launch vehicle with the power of M-V rocket will carry payloads of up to 200 kg into the orbit of Venus and Mars. In this phase, climate observations of Venus using two orbiter, and dust-transport mechanism observation of Mars with the combination of Martian airplane and stationary satellite will be realized.

We will present the possible instruments and model missions for solar system sciences and space astronomy in the DESTINY series.

Keywords: Epsilon Rocket, DESTINY, solar system exploration, deep space, Lagrangian point