

SPACE EXPLORATION SYMPOSIUM (A3)
Small Bodies Missions and Technologies (5)

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AN ESA NEO TECHNOLOGY DEMONSTRATION MISSION: PROBA-IP

Abstract

ESA's PROBA programme has been based in the past on the in-flight validation of new space technologies for Earth-bound missions. Now, ESA is promoting a preliminary study for an interplanetary mission (PROBA-InterPlanetary or PROBA-IP for short) for close-up reconnaissance of a Near Earth Object (NEO) within the same programme. This study started in mid-2008 and will be ended in the summer of 2009.

The main objective of the PROBA-IP mission is the in-orbit validation of autonomous onboard guidance, navigation and control technologies for interplanetary cruise and for the targeting of other celestial bodies, primarily using onboard optical systems technologies. PROBA-IP will also demonstrate micro/mini-spacecraft's capabilities into the interplanetary missions' domain.

The PROBA-IP mission will implement and validate the following technologies and functionalities: 1) Onboard GNC technology elements for autonomous spacecraft navigation, guidance and control for interplanetary cruise primarily using onboard optical systems, 2) Autonomous targeting of, and rendezvous with, a NEO, 3) Autonomous achievement and maintenance of a safe closed orbit around the target object, 4) Use of (power limited) SEP throughout the entire mission and in all mission phases after Earth orbit escape, 5) Autonomous onboard resources management and FDIR, including autonomous SEP management, 6) Application of novel ground support and operations concepts, whenever necessary to support the autonomy level described above, 7) Demonstration of methodology, tools and infrastructure required for the development and implementation of an interplanetary mission including ground validation of the mission's autonomous characteristics.

Additionally to the previous objectives some scientific objectives are considered as potential experiments in order to determine target's properties as shape, rotation state, gravity field, surface properties and accurate orbit determination by means of a Radio Tracking Experiment (RTE). If resources are available the RTE should allow a precise determination of the asteroid orbit.

Current design foresees a three-year mission launched with VEGA in 2015. Escape from Earth is achieved by means of an upper stage. 2.5 years would be devoted to the low-thrust transfer to the asteroid and six months for in-orbit operations. RTE would expand for three months in a photogravitational stable orbit. Current estimate of spacecraft wet mass is in the 350 kg range. By the time the 60th IAC will take place the preliminary study of PROBA-IP will be already ended and definite results of the study will be available.