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

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ROSETTA VISITS ASTEROID (21-)LUTETIA

Abstract

The International Rosetta Mission, cornerstone of the European Space Agency Scientific Programme, was launched on 2nd March 2004 on its 10 years journey to comet Churyumov-Gerasimenko. Rosetta will reach the comet in summer 2014, orbit it for about 1.5 years down to distances of a few Kilometres and deliver the Lander Philae onto its surface. After its successful asteroid fly-by in September 2008, Rosetta came back to Earth, for the final gravity acceleration towards its longest heliocentric orbit, up to a distance of 5.3 AU. This revolution around the Sun will last several years, during which the spacecraft will have to be spun-up and put into hibernation mode, with most of the systems deactivated, to minimise power consumption. It is during this phase that Rosetta will cross for the second time the main asteroids belt and will perform a close encounter with asteroid (21-)Lutetia on the 10th of July 2010 with a planned miss distance of ca. 3160 km and a relative velocity of 15 km/s. The payload complement of the spacecraft will be activated to perform highly valuable scientific observations. The approach phase to the celestial body will require a careful and accurate optical navigation campaign; this will also constitute the final rehearsal of the operations required for the comet approach phase in 2014. The experience gained with first asteroid flyby in 2008 will be fed back into the operations definition and preparation for this second, highly critical phase. Lessons learned affect particularly the operations of the navigation camera for the close-loop autonomous asteroid tracking and of the main scientific camera for high resolution imaging. In view of this complex and delicate manoeuvre a full payload check-out has been scheduled together with a test of the spacecraft dynamics. During this phase Rosetta will also break its current Sun distance record (2.26 AU) and shortly later the absolute record Sun distance for a spacecraft powered by solar generators (2.72 AU). This paper presents the activities carried out and planned for the definition, preparation and implementation of the asteroid flyby, including the test campaign conducted to improve the performance of the spacecraft and payload compared to the previous flyby. The results of the flyby itself are presented, with the operations implemented, the achieved performance, and the lessons learned. The implications of operating a solar-powered mission at heliocentric distances beyond the main asteroid belt are analysed and discussed.