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Author: Dr. Per Bodin
OHB Sweden, Sweden

Mr. Thomas Karlsson
OHB Sweden, Sweden
Mr. Robin Larsson
OHB Sweden, Sweden
Mr. Björn Jakobsson
OHB Sweden, Sweden
Mr. Niklas Ahlgren
OHB Sweden, Sweden
Mr. Bengt Larsson
Sweden
Mr. Magnus Paulsson
OHB Sweden, Sweden

IRIDES: NEW RENDEZVOUS OBJECTIVES FOR THE PRISMA MISSION

Abstract

PRISMA consists of two spacecraft: Mango and Tango. The Mango spacecraft is 3-axis stabilized and has a propulsion system providing full 3D orbit control. Tango is 3-axis stabilized with a solar magnetic control system and does not have orbit control capability. The two spacecraft were launched clamped together into a 700 km SSO and Tango was successfully separated from Mango on August 11, 2010. This marked the start of a one-year mission of nominal experiments within the area of formation flying and rendezvous. This was followed by an extended mission phase which was completed by February 2013.

In March 2013, the Mango spacecraft will start an approximately one and a half year long journey towards another target object to demonstrate rendezvous and inspection within the IRIDES experiment (Iterative Reduction of Inspection Distance with Embedded Safety).

The Tango spacecraft will be shut down permanently and the Mango spacecraft will initiate a series of optimized orbit manoeuvres that will put the spacecraft on a drift towards the new object. The rendezvous is expected in the second half of 2014 and will demonstrate optical relative navigation technologies and the characterization of the rendezvous object and its motion with the use of the on-board video system. The rendezvous strategy within IRIDES includes a series of collision free drift manoeuvres past the rendezvous object successively reducing the closest relative distance. The demonstrated technologies for this rendezvous are believed to play an important role in the future developments associated with space debris mitigation.

The paper will present the rendezvous experiment including optimized drift orbit acquisition, orbit alignment and safe rendezvous orbit acquisition. The paper will also give a brief introduction to the navigation and object characterization strategies planned for the rendezvous. For completion the paper will also give a retrospective of the highly successful PRISMA mission.

PRISMA demonstrates strategies and technologies for formation flying and rendezvous. OHB Sweden is the prime contractor for the project which is funded by the Swedish National Space Board with additional support from DLR, CNES, and DTU. The mission includes flight qualification of several sensor and actuator systems and in-flight execution of a range of GNC experiments using this equipment.

The spacecraft are equipped with Vision Based, GPS, RF-sensor navigation systems and have three different propulsion systems. Apart from OHB Sweden's GNC experiments, the propulsion manufacturers (ECAPS, NanoSpace) and the participating organizations DLR, CNES, DTU act as experimenters in the mission.