ASTRODYNAMICS SYMPOSIUM (C1)
Guidance and Control (4)

Author: Dr. Per Bodin
OHB Sweden, Sweden

Mr. Ron Noteborn
Swedish Space Corporation (SSC), Sweden
Mr. Robin Larsson
OHB Sweden, Sweden
Mr. Camille Chasset
OHB Sweden AB, Sweden

SYSTEM TEST RESULTS FROM THE GNC EXPERIMENTS ON THE PRISMA IN-ORBIT TEST BED

Abstract

The PRISMA in-orbit test bed will demonstrate Guidance, Navigation, and Control strategies for spacecraft formation flying and rendezvous. The project is funded by the Swedish National Space Board and the prime contractor is the Swedish Space Corporation (SSC). The project is further supported by the German Aerospace Center (DLR), the Technical University of Denmark (DTU), and the French Space Agency (CNES).

The project is currently in the end of its system test phase and will complete its Flight Acceptance Review in May 2009. Launch will take place in the end of the same year. PRISMA consists of two spacecraft: MAIN and TARGET. The MAIN spacecraft has full orbit control capability while TARGET is attitude controlled only.

The Swedish Space Corporation is responsible for three groups of Guidance, Navigation, and Control Experiments. These experiments include GPS and Vision Based formation flying during which the spacecraft will fly in passive as well as forced motion. The three experiments are: Autonomous Formation Flying, Proximity Operations with Final Approach/Recede Maneuvers, and Autonomous Rendezvous. In the Autonomous Formation Flying experiment, the MAIN spacecraft will fly around TARGET in a relative orbit that makes use of the natural relative orbital dynamics. This is performed using the GPS-based navigation function developed by DLR. In the Proximity Operations with Final Approach/Recede Maneuvers experiment, MAIN will fly in forced motion around TARGET while navigating using either GPS or the Vision Based Sensor. Navigation takes place in a virtual structure spanned around TARGET. The experiment includes approach to TARGET to a relative distance of less than one meter. In the Autonomous Rendezvous experiment, MAIN will use the Vision Based Sensor to navigate autonomously from a distance of about 25 km from TARGET down to within one meter. This experiment is designed to represent a Mars Sample Return scenario.

This paper will present system test results from these three experiments as obtained with the flight-ready system. The system tests consist of a series of system simulations being performed on the Flight Model spacecraft with a large amount of hardware in the loop. The final paper includes a demonstration of these results together with a description of the test setup. The paper also gives a brief overview of the mission in general and the three Guidance, Navigation, and Control experiments to be performed by SSC.