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EVALUATION AND FINDINGS OF HTV-1 TRAJECTORY AND THE PLANNING OPERATION

Abstract

The H-II Transfer Vehicle (HTV) is an unmanned cargo transport and waste disposal vehicle for the International Space Station (ISS) developed by the Japan Aerospace Exploration Agency (JAXA). The demonstration flight (HTV-1) was launched by the H-IIB launch vehicle on September 11, 2009, and the whole mission was successfully completed on November 2, 2009, with confirmation of safe atmospheric reentry.

In the flight phase, the HTV-1 executed all maneuvers nominally compared to the pre-determined trajectory plan with the ground commands to allow the maneuver sequence to start. The actual flight profile was also nominal as planned. Such evaluation results of flight data showed that rendezvous and reentry functions of the onboard software worked correctly with the preset orbit guidance parameters, which had been calculated by the prelaunch analysis.

The trajectory operation of the HTV is composed of several activities. One such activity is preparation of the nominal trajectory plan based on the ISS ephemeris and any other constraints. During flight, updating it appropriately is one of the most important contributions toward mission success because the updates are input data to monitor the HTV's predicted ephemeris and to execute space debris conjunction analysis. Another is drawing up the recovery trajectory plan when the HTV encounters unexpected off-nominal conditions on orbit. In such situations, the plan must be released quickly according to the pre-defined rules for ISS safety.

This paper shows evaluation results and findings relating to the HTV-1 trajectory and the planning operation, including future works for following yearly flights.