

SPACE EXPLORATION SYMPOSIUM (A3)
Solar System Exploration (5)

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DESTINATION PLUTO: NEW HORIZONS PERFORMANCE DURING THE APPROACH PHASE

Abstract

The New Horizons spacecraft began its journey to the Pluto-Charon system on 19 January 2006 on-board an Atlas V rocket from Cape Canaveral, Florida. As the first mission in NASA's New Frontier's program, the objective of the New Horizons mission is to perform the first exploration of ice dwarfs in the Kuiper Belt, extending knowledge of our solar system to include the icy "third zone" for the first time. Arriving at the correct time and correct position relative to the Pluto-Charon system on 14 July 2015 depended on the successful execution of a carefully choreographed sequence of events. The Core sequence which has been developed and optimized over multiple years and includes the highest-priority science observations during the closest approach period, was contingent on precise navigation to the Pluto-Charon system and optimal performance of the Guidance and Control (G&C) subsystem.

The flyby and gravity assist of Jupiter on 28 February 2007 was critical in placing New Horizons on the path to Pluto. Once past Jupiter, trajectory correction maneuvers (TCMs) became the sole source of active trajectory control since the spacecraft did not encounter any other planetary bodies along its flight path. During the Pluto approach phase, which began on 15 January 2015, optical navigation images were captured primarily with the Long Range Reconnaissance Imager to refine spacecraft and Pluto-Charon system trajectory knowledge, which in turn was used to design TCMs.

We provide an overview of the New Horizons mission and spacecraft, and in particular the role of the G&C subsystem in capturing optical navigation images and performing TCMs in the approach phase. We explore the connection between the design of the optical navigation campaigns, the implementation of spacecraft maneuvers to capture optical navigation images, the subsequent impact of refined trajectory knowledge on required trajectory corrections, and the spacecraft and team's ability to execute critical TCMs. We conclude with a high-level overview of final Pluto B-plane arrival conditions and Core sequence performance.