IAF SPACE EXPLORATION SYMPOSIUM (A3)
Interactive Presentations - IAF SPACE EXPLORATION SYMPOSIUM (IP)

Author: Ms. Fatema Al Hameli
UAE Space Agency, United Arab Emirates

Dr. Jeremy Knittel
Laboratory for Atmospheric and Space Physics (LASP) at University of Colorado, United States
Dr. Jeffrey Parker
Advanced Space, United States
Mr. Mohamed Salem
UAE Space Agency, United Arab Emirates

THE EMIRATES MISSION TO THE ASTEROID BELT: AN OVERVIEW OF THE FLIGHT DYNAMICS SYSTEM

Abstract

The Emirates Mission to the Asteroid Belt (EMA) is a pioneering interplanetary exploration mission planned for launch in 2028. The mission is being developed in partnership between the UAE Space Agency and the Laboratory for Atmospheric and Space Physics (LASP) at the University of Colorado, Boulder. This ambitious project aims to study seven asteroids in the main belt between Mars and Jupiter, investigating their origins, compositions, and potential resource presence. This paper presents an overview of EMA's Flight Dynamics System (FDS), a critical component responsible for spacecraft navigation and trajectory control throughout its seven-year mission. The FDS architecture is designed to fulfill diverse mission objectives. It comprises two primary components: mission design and navigation. EMA is exciting and challenging due to the number of encounters being designed and the necessity of low-thrust propulsion. The mission design utilizes specialized software tools to design optimal interplanetary trajectories, considering factors such as launch window constraints, spacecraft operational constraints, propellent efficiency, safety margins, and asteroid encounter geometries. The navigation system consists of three primary ground based functional areas: orbit determination, optical navigation, and maneuver design . The FDS maintains interfaces to facilitate workflows and data exchange between the mission operations center (MOC), payload teams and deep space communication network. EMA's FDS represents a significant advancement in the UAE's space exploration capabilities. Its successful implementation will be crucial for navigating the spacecraft across vast interplanetary distances, enabling groundbreaking scientific discoveries and paving the way for future deep-space missions.