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CLOSE-PROXIMITY OPERATIONS CONCEPT OF THE ASTEROID IMPACT MISSION (AIM)

Abstract

The Asteroid Impact Deflection Assessment (AIDA) mission is an international collaboration of ESA and NASA, with the primary goals to test the ability to perform a spacecraft impact on a near-Earth asteroid and to measure and characterize the deflection caused by the impact. The ESA led Asteroid Impact Mission (AIM) is to be designed on a low-cost approach and to be launched in 2020. Its primary objective is to characterize the asteroid 65803 Didymos (1996 GT) and then to assess the consequences of an impact from a NASA provided spacecraft named DART (Double Asteroid Redirection Test) on the secondary asteroid in the binary asteroid system. Prior to the arrival of DART, AIM is planned to rendezvous with the asteroid system in mid-2022. On arrival, AIM would conduct observations that can be used to complement and prepare for the DART impact and perform technology demonstration. In addition, it is planned to release a number of CubeSat opportunity-payload and place the MASCOT-2 lander on the surface of the secondary asteroid. Further, a demonstration of deep space optical communications is planned. AIM is currently studied in the scope of a Phase B1 under ESA contract by two consortia, one of those being led by OHB System. This paper presents OHB's current mission and asteroid operations strategy, addressing mission design and operational challenges. The tight schedule (launch in 2020) and the low cost approach for spacecraft design and operations are challenging, especially in context of the high complexity and performance requirements connected to deep space mission operations and navigation. Special focus is therefore placed on asteroid local operations, the planned payload operations, the deployment of MASCOT-2 to the surface of the secondary asteroid in the binary system, the navigation strategy of AIM, and how OHB plans to overcome the challenges posed by this unique mission scenario.