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Proximity Operations by the Asteroid Impact and Deflection Assessment (AIDA) mission

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ABSTRACT

The moon of the near-Earth binary asteroid 65803 Didymos is the target of the Asteroid Impact and Deflection Assessment (AIDA) mission. This mission is a joint effort between NASA and ESA to investigate the effectiveness of a kinetic impactor in deflecting an asteroid. The mission is composed of two components: the NASA-led Double Asteroid Redirection Test (DART) that will impact Didymos' moon (henceforth Didymos B), and the ESA-led Asteroid Impact Mission (AIM) that has been planned to survey the Didymos system. Both will undertake proximity operations to characterize the physical and dynamical properties of the Didymos system that are of maximum importance in the joint AIDA mission to understand the factors at play when assessing the momentum transfer that follows DART's impact at

Didymos B. At the time of writing, the implementation of the AIM mission remains uncertain so we focus primarily on DART proximity activities prior to impact. Any new developments concerning AIM will be made available at the time of the presentation. DART will primarily undertake three phases of imaging. The first phase begins approximately 30 days before arrival, where a suite of long-range images is obtained to supplement light curve data collected from Earth. These data will refine the orbit period of Didymos B and provide constraints for modeling the shapes of both Didymos A and B. These data may provide information on additional material or a distant tertiary not seen from Earth. The second phase begins just under an hour before impact when resolved imaging of the Didymos system provides further shape model constraints for the visible parts of both Didymos A and B and any additional material or objects in the system. In the last phase, about 5 minutes from impact, surface features are sufficiently well resolved to provide key geological information of both objects and the impact site. The images of the impact site will be critical to predict some of the consequences of the DART impact.

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