

UNVEILING DIDYMOS MYSTERIES: THE HERA MISSION

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The European component of the joint ESA-NASA Asteroid Impact and Deflection Assessment (AIDA) mission has been redesigned from the original version called Asteroid Impact Mission (AIM), and is now called Hera. The main objectives of AIDA are twofold: (1) to perform an asteroid deflection test by means of a kinetic impactor under detailed study at NASA (called DART, for Double Asteroid Redirection Test); and (2) to investigate with Hera the changes in geophysical and dynamical properties of the target binary asteroid after the DART impact. This joint mission will allow extrapolating the results of the kinetic impact to other asteroids and therefore fully validate such asteroid deflection techniques. Hera leverages technology and payload pre-developments of the previous AIM, and focuses on key measurements to validate impact models such as the detailed characterisation of the impact crater. As such, AIDA will be the first documented deflection experiment and binary asteroid investigation. In particular, it will be the first mission to investigate a binary asteroid, and return new scientific knowledge with important implications for our understanding of asteroid formation and solar system history. The baseline target is the binary near-Earth asteroid (NEA) (65803) Didymos. In particular, its secondary component, called hereafter Didymoon (163 ± 18 m diameter), is the target of the DART mission. The baseline payload of Hera includes a Framing Camera, a miniaturized LIDAR and for the first time a 6U CubeSat dedicated to asteroid characterization carrying two additional instruments. The spacecraft design allows for 40 kg of additional payload mass. Current options under investigation include the Small Carry-on Impactor proposed by JAXA (a replica of the one on-board the Hayabusa2 mission) and a high-frequency radar for the measurement of subsurface properties. Other options, such as a small lander, can also be considered. A Radio Science Experiment (RSE) will also be performed, which does not involve any additional on-board hardware but only complex on-ground data processing. Finally, a mission like Hera will certainly fire the imagination of young people and adults, as the science is accessible and understandable to those audiences and is associated with fascinating challenges and goals of planetary defence. The status of the study and payloads will be presented.