



## ESA's Hera mission to asteroid Dimorphos

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The Hera mission contributes to the international effort towards the validation of the kinetic impactor asteroid deflection technique by retrieving all the physical and dynamical properties of Dimorphos in order to validate numerical impact codes. In particular, Hera's core objectives from the point of view of the deflection demonstration are the following:

- (i) Measuring the mass of Dimorphos to determine the momentum transfer efficiency from DART to the asteroid;
- (ii) Investigating the crater in detail to improve our understanding of the cratering process and the mechanisms by which the crater formation drives the momentum transfer efficiency;
- (iii) Observing subtle dynamic effects (e.g. libration imposed by the impact, orbital and spin excitation of the secondary) that are difficult to detect for remote observers;
- (iv) Characterising the physical properties of Dimorphos (including size, shape, volume, density, porosity, size distribution of surface material) to allow scaling of the momentum transfer efficiency to different asteroids.

In addition, the Hera mission will allow the demonstration of two key technologies for future deep-space missions:

- (v) The use of CubeSats for multipoint investigations operated via an inter-satellite network link via Hera;
- (vi) Autonomous visual-based navigation for very low altitude flybys over the surface of Dimorphos.

The Hera spacecraft will launch in October 2024 onboard an Ariane 6 launcher with an 18-days launch window. The trajectory foresees a Mars swing-by in mid-March 2025 and the rendezvous phase with Didymos starting end-December 2026. Following the operationally safe capture sequence, the asteroid close-proximity operation phase will start from a gate position of about 30 km. Operations will continue for about 6 months and allow for detailed investigations of the Didymos

surface down to few kilometres or less from the surface of Dimorphos depending on the performance of the onboard feature-tracking navigation system.

The mission is currently in phase B2 with OHB System as prime contractor together with GMV, Qinetic, Spacebel and OHB-I as core team members. The preliminary design review is scheduled in October 2020. The paper will provide an overview of the mission together with its latest system and payload configuration.