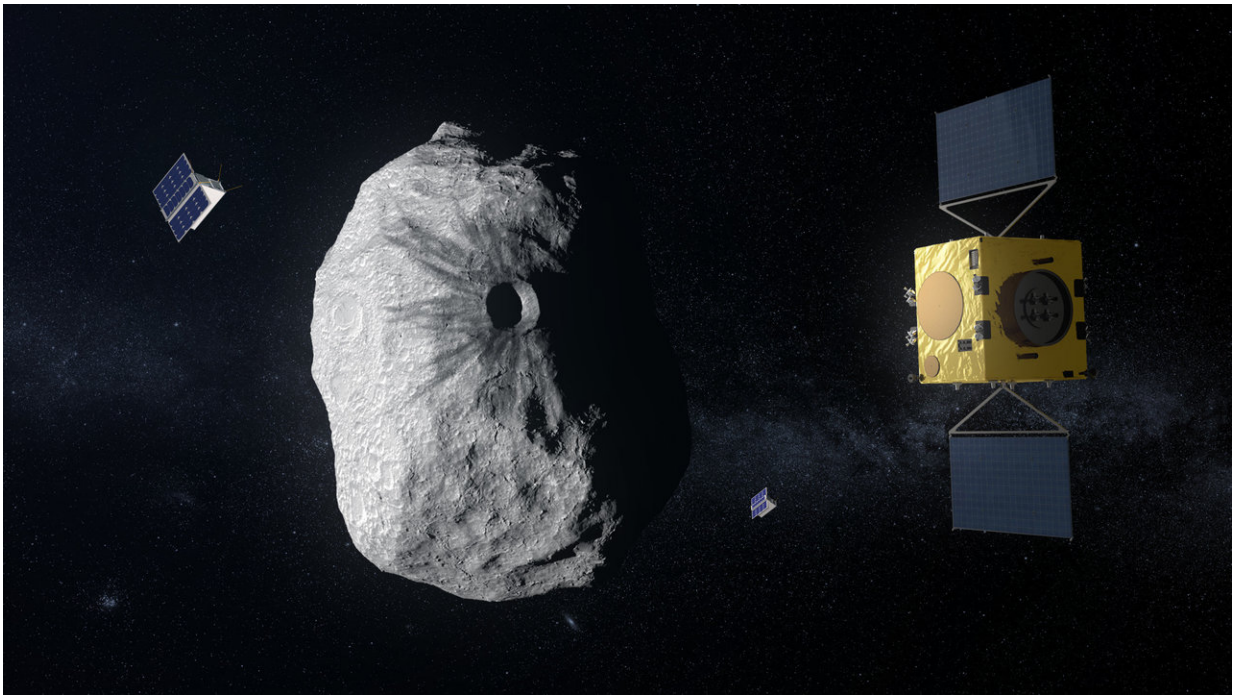
CubeSats joining Hera mission to asteroid system

January 7 2019



ESA’s Hera mission concept, currently under study, would be humanity’s first mission to a binary asteroid: the 800 m-diameter Didymos is accompanied by a 170 m-diameter secondary body. Hera will study the aftermath of the impact caused by the NASA spacecraft DART on the smaller body. Credit: ESA–ScienceOffice.org

When ESA's planned Hera mission journeys to its target binary asteroid system, it will not be alone. The spacecraft will carry two tiny CubeSats

for deployment around – and eventual landing on – the Didymos asteroids. Each companion spacecraft will be small enough to fit inside a briefcase, as compared to the desk-sized Hera.

CubeSats are nanosatellites based on standardised 10 cm-sized units. Hera has room to deliver two 'six-unit' CubeSat missions to the Didymos asteroid system – a 780 m-diameter mountain-sized main body is orbited by a 160 m moon, informally called 'Didymoon', about the same size as the Great Pyramid of Giza.

The Hera mission received proposals for CubeSats from across Europe, and an evaluation board has now made the final selection.

"We're very happy to have these high-quality CubeSat missions join us to perform additional bonus science alongside their Hera mothership," explains Hera manager Ian Carnelli.

"Carrying added instruments and venturing much closer to our target bodies, they will give different perspectives and complementary investigations on this exotic binary asteroid. They will also give us valuable experience of close proximity operations relayed by the Hera mothercraft in extreme low-gravity conditions. This will be very valuable to many future missions."

Paolo Martino, Hera spacecraft lead engineer adds: "The idea of building CubeSats for deep space is relatively new, but was recently validated by NASA's InSight landing on Mars last November, when a pair of accompanying CubeSats succeeded in relaying the lander's radio signals back to Earth – as well as returning imagery of the Red Planet."

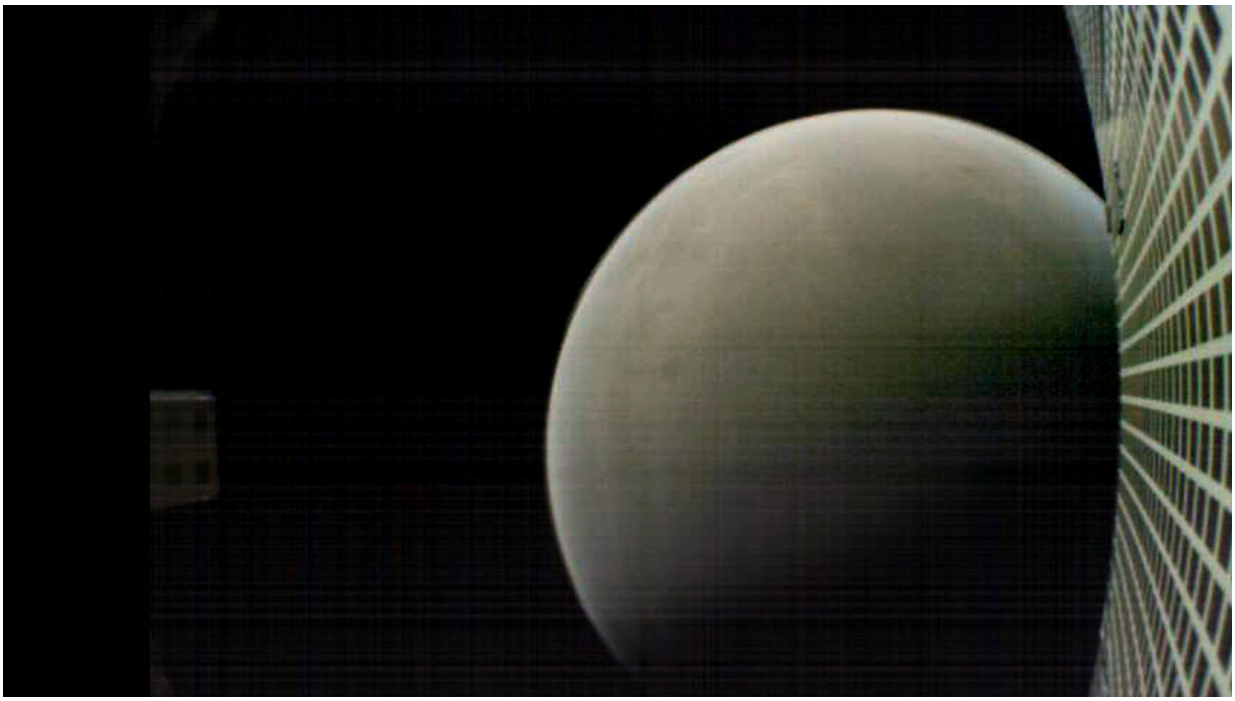
APEX CubeSat. Credit: Swedish Institute of Space Physics

The first CubeSat companion is called the Asteroid Prospection Explorer (or 'APEX'), and was developed by a Swedish/Finnish/Czech/German consortium. It will perform detailed spectral measurements of both asteroids' surfaces – measuring the sunlight reflected by Didymos and breaking down its various colours to discover how these asteroids have interacted with the space environment, pinpointing any differences in composition between the two. In addition, APEX will make magnetic readings that will give insight into their interior structure of these bodies.

Guided by a navigation camera and a 'laser radar' (lidar) instrument, APEX will also make a landing on one of the asteroids, gathering

valuable data in the process using inertial sensors, and going on to perform close-up observations of the asteroid's surface material.

The other CubeSat is called Juventas, developed by Danish company GomSpace and GMV in Romania, and will measure the gravity field as well as the internal structure of the smaller of the two Didymos asteroids.



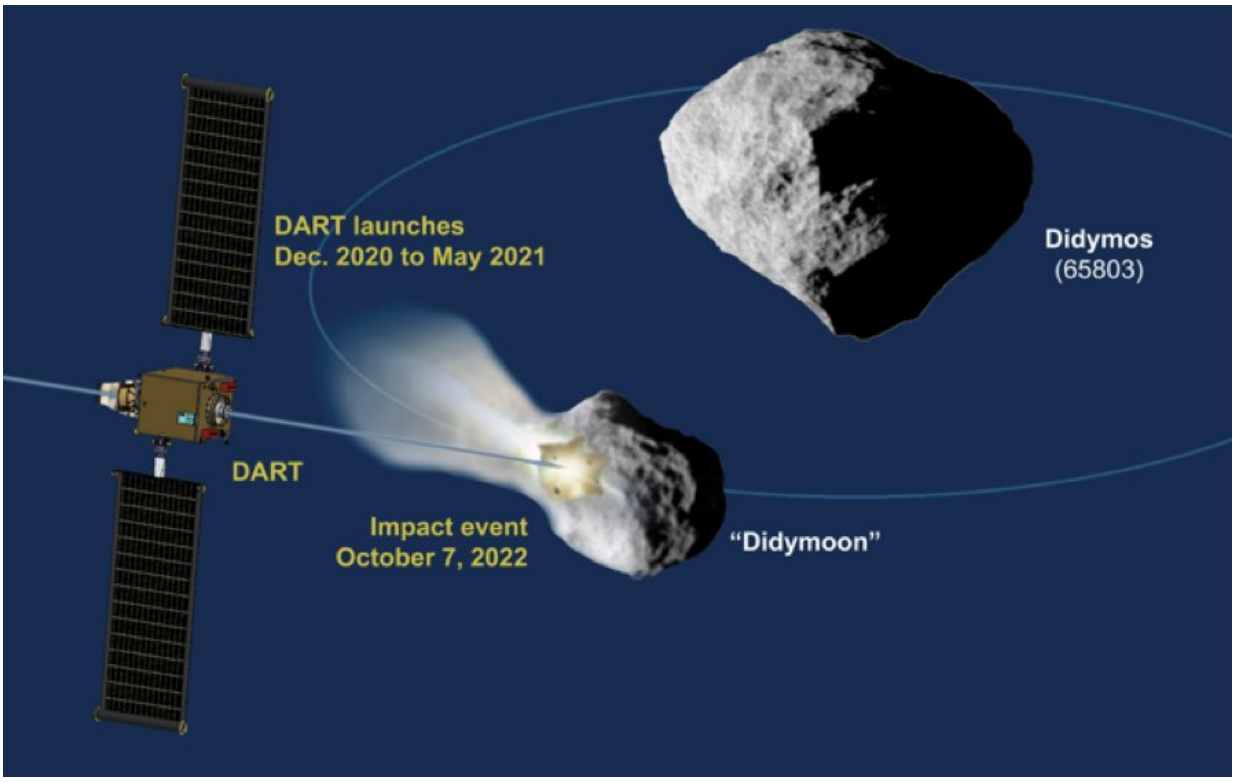
MarCO-B, one of the experimental Mars Cube One (MarCO) CubeSats, took this image of Mars from about 7,600 km away during its flyby of the Red Planet on 26 November 2018. MarCO-B was flying by Mars with its twin, MarCO-A, to attempt to serve as communications relays for NASA's InSight spacecraft as it landed on Mars. Credit: NASA/JPL-Caltech

In close orbit around Didymoon, Juventas will line up with Hera to

perform satellite-to-satellite radio-science experiments and carry out a low-frequency radar survey of the asteroid interior, similar to performing a detailed 'X-ray scan' of Didymoon to unveil its interior. The adventure will end with a landing, using the dynamics of any likely bouncing to capture details of the asteroid's surface material – followed by several days of surface operations.

Hera is set to be humankind's first mission to a binary asteroid system. As well as testing technologies in deep space and gathering crucial science data, Hera is designed to be Europe's contribution to an international planetary defence effort: it would survey the crater and measure orbital deviation of Didymoon caused by the earlier collision of a NASA probe, called DART. This unique experiment will validate the asteroid deflection technique referred to as kinetic impactor, enabling humankind to protect our planet from asteroid impacts.

Next, the two CubeSats will have their designs refined and interfaces with their mothership finalised, in line with continuing design work on the Hera mission itself, which will be presented to ESA's Space19+ meeting towards the end of this year, where Europe's space ministers will take a final decision on flying the mission.



DART mission profile. Credit: NASA

Provided by European Space Agency

Citation: CubeSats joining Hera mission to asteroid system (2019, January 7) retrieved 23 April 2024 from https://phys.org/news/2019-01-cubesats-hera-mission-asteroid.html