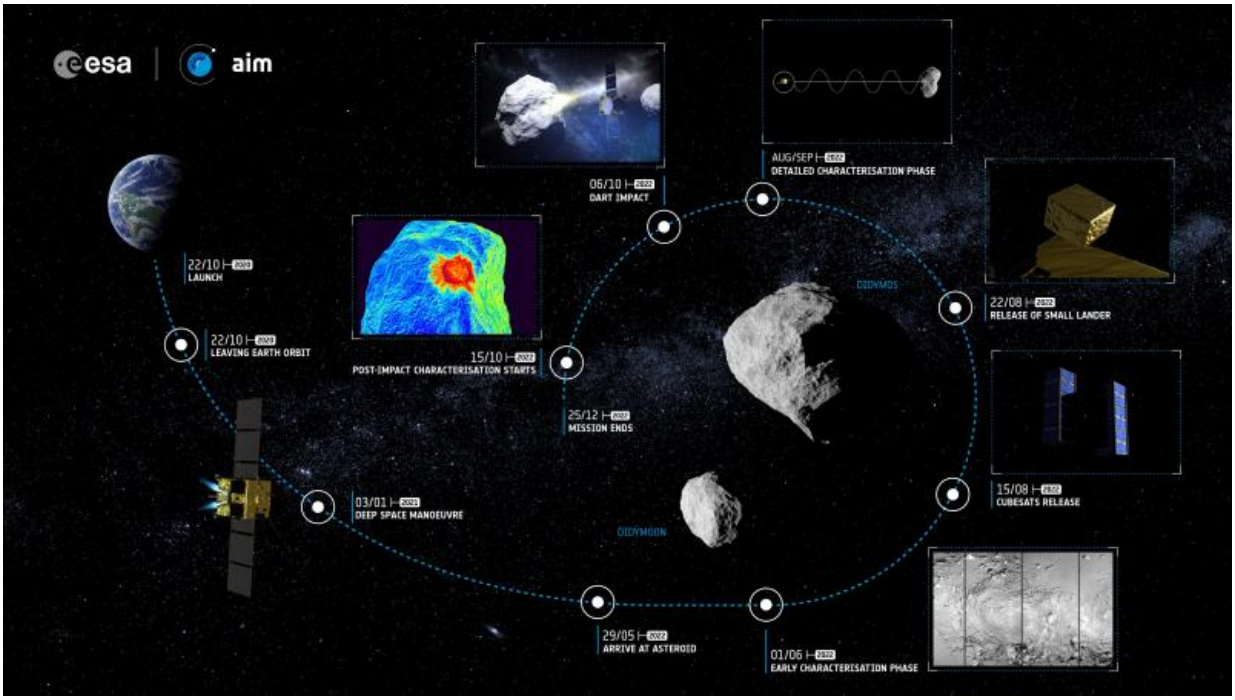
AIDA double mission to divert Didymos asteroid's Didymoon

September 30 2015



Infographic of the AIM mission. Credit: ESA/Science Office

An ambitious joint US-European mission, called AIDA, is being planned to divert the orbit of a binary asteroid's small moon, as well as to give us new insights into the structure of asteroids. A pair of spacecraft, the ESA-led Asteroid Impact Mission (AIM) and NASA-led Double Asteroid Redirection Test (DART), will rendezvous with the Didymos asteroid and its small natural satellite, known informally as 'Didymoon'.

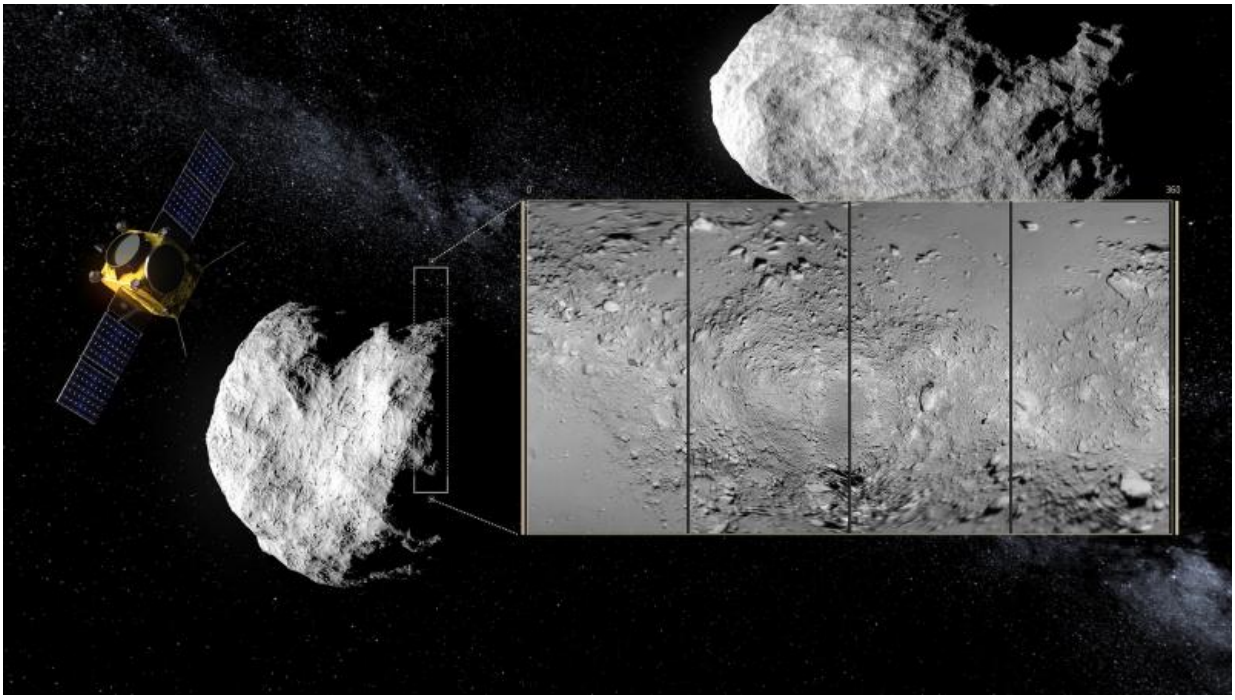
Following a period of study of both asteroids and detailed mapping of Didymoon by AIM, DART will impact with Didymoon and AIM will assess the mission's effectiveness in diverting the moon's orbit around Didymos. The AIDA mission is being discussed today at the European Planetary Science Congress (EPSC) 2015 in Nantes, France.

Patrick Michel, the lead of the AIM Investigation Team, said, "To protect Earth from potentially hazardous impacts, we need to understand asteroids much better – what they are made of, their structure, origins and how they respond to collisions. AIDA will be the first mission to study an asteroid binary system, as well as the first to test whether we can deflect an asteroid through an impact with a spacecraft. The European part of the mission, AIM, will study the structure of Didymoon and the orbit and rotation of the binary system, providing clues to its origin and evolution. Asteroids represent different stages in the rocky road to planetary formation, so offer fascinating snapshots into the Solar System's history."

AIM is due for launch in October 2020 and rendezvous with the binary system (65803) Didymos in May 2022. Binary systems make up around 15% of the asteroid population. Egg-shaped Didymoon (about 160 metres in diameter) orbits the diamond-shaped Didymos asteroid (about 750 metres in diameter) every 12 hours at an altitude of 1.1 kilometres. Ground-based observations show that Didymos is probably a common 'chondrite', or stony asteroid formed of dust from the primitive solar system. At present, Didymoon's mass and density are unknown.

AIM will measure Didymoon's mass shape, density and dynamic properties and map the asteroid's surface at visible and infrared wavelengths, as well as using radar to probe beneath the surface. It will deploy a small lander, MASCOT-2 (built by the German aeronautics and space research centre, DLR), in order to transmit and receive radio signals through Didymoon to investigate the internal structure. In

October 2022, AIM will move to a safe distance to observed DART's impact with Didymoon and analyse the plume of material ejected. It will then resume its mapping and monitoring mission to study internal material revealed in the crater and any changes to Didymoon's orbit.



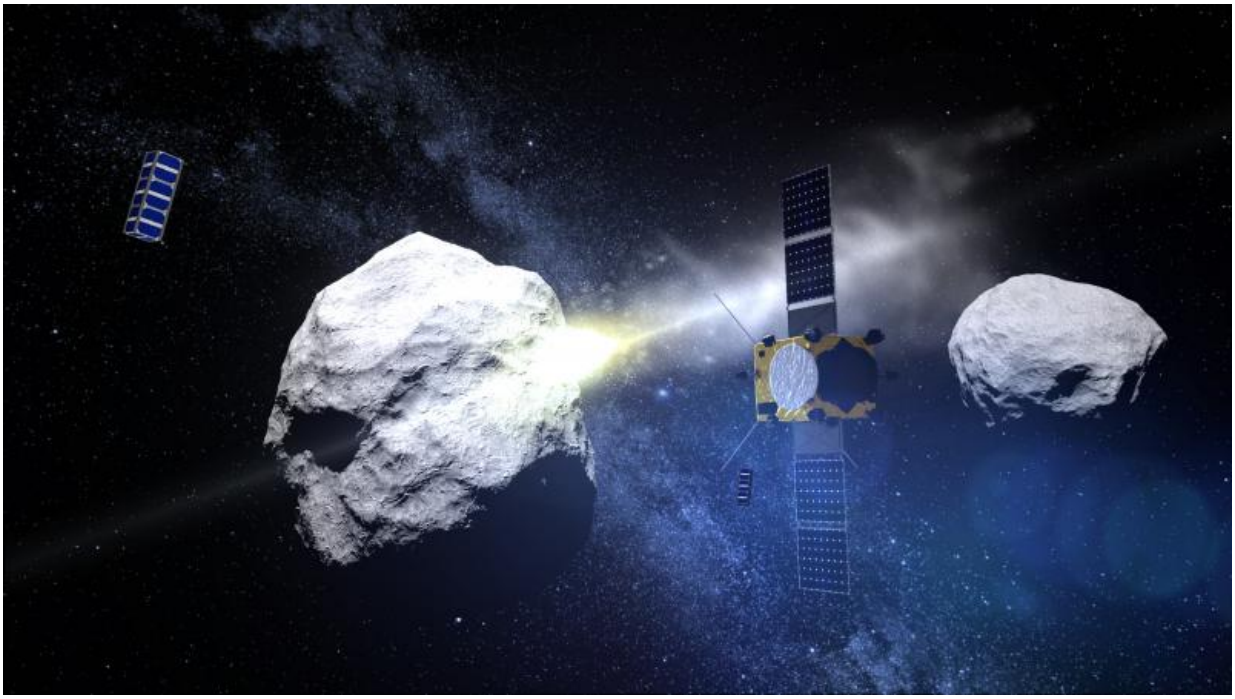
AIM scanning Didymoon. Credit: ESA/Science Office

Recent missions have shown that asteroids are extraordinarily diverse in their geology, structure and evolution. All asteroids appear to be covered by soil, or 'regolith', but this varies from fine grains to lumpy pebbles. Density measurements show that most asteroids are aggregates of material, rather than solid bodies, but it's not clear whether they are filled with large rocks and pockets of empty space, or gravel. The combination of AIM and DART will give new insights into the relationship between an asteroid's surface and its interior, and new

understanding of how asteroids and binary systems form.

AIM will also deploy three cubesat to assist with observations and to test new science and technology capabilities, including intersatellite communications links in deep space.

ESA's Project Scientist for the AIDA/AIM mission, Dr Michael Küppers, said, "As well as fascinating science, AIDA offers a unique opportunity to demonstrate new technologies for ESA. AIM will deploy MASCOT-2, the ESA's first lander since Philae, and will test operations that will give valuable experience for future Mars sample return missions and human exploration."



AIDA watches DART impact Didymoon. Credit: ESA/Science Office

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