

SPACE EXPLORATION SYMPOSIUM (A3)  
Small Bodies Missions and Technologies (4)

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## AIDA: ASTEROID IMPACT &amp; DEFLECTION ASSESSMENT

**Abstract**

The abstract knowledge, that impacts on Earth by small bodies continue to occur to this day, became concrete reality for the residents of Chelyabinsk, Russia on Feb. 15, 2013 with the unexpected explosion of a small asteroid over the city, releasing several hundred kilotons of energy. ESA and NASA are studying techniques to protect the Earth from a potential asteroid impact, including deflection of the asteroid by a spacecraft impact. The AIDA mission will perform the first test of this technique for asteroid deflection. It is an innovative, low cost, international collaboration, consisting of two independent but mutually supporting missions, one of which is the asteroid kinetic impactor and the other is the characterization spacecraft. These two missions are, respectively, the US Double Asteroid Redirection Mission (DART) and the European Space Agency's Asteroid Impact Monitoring (AIM) mission. DART will deflect the trajectory of an asteroid and measure the deflection to within 10%. This will be done using a binary asteroid target with accurate determinations of orbital period by ground-based observations. AIDA will return vital data to determine the momentum transfer efficiency of the kinetic impact and key physical properties of the target asteroid.

AIDA follows the previous Don Quijote mission study performed by ESA in 2005-2007, with the objective of demonstrating the ability to modify the trajectory of an asteroid and measure the trajectory change. Don Quijote involved an orbiter and an impactor spacecraft, with the orbiter arriving first and measuring the deflection, and with the orbiter making additional characterization measurements. Unlike Don Quijote, DART envisions an impactor spacecraft to intercept the secondary member of a binary near-Earth asteroid, using ground-based observations to measure the deflection. In the joint AIDA mission, DART combines with the ESA AIM mission which will rendezvous with the asteroid. Each

of these missions has independent value, with greatly increased return when combined. AIDA will be a valuable precursor to human spaceflight to an asteroid, as it would return unique information on an asteroid's strength and internal structure and would be particularly relevant to a human mission for asteroid mitigation. AIDA will furthermore return fundamental new science data on impact cratering and collisional evolution of asteroids. AIDA will target the binary Near-Earth asteroid Didymos with two small launches, with the deflection experiment to occur in October, 2022.