AIDA: ASTEROID IMPACT AND DEFLECTION ASSESSMENT MISSION UNDER STUDY AT ESA AND NASA. P. Michel[1], A. Cheng[2], I. Carnelli[3], A. Rivkin[2], A. Galvez[3], S. Ulamec[4], C. Reed[2], and the AIDA Team [1]Lagrange Laboratory, University of Nice, CNRS, Côte d'Azur Observatory (Observatoire de la Côte d'Azur, CS 34229, 06304, Nice Cedex 4, France; michelp@oca.eu) , [2]The Johns Hopkins University Applied Physics Laboratory (11100 Johns Hopkins Rd, Laurel, MD 20723, andrew.cheng@jhuapl.edu), [3]ESA HQ (Paris, France, andres.galvez@esa.int), [4]Deutsches Zentrum fuer Luft- und Raumfahrt (DLR)(Germany, stephan.ulamec@dlr.de).

Introduction: The Asteroid Impact & Deflection Assessment (AIDA) mission will be the first space experiment to demonstrate asteroid impact hazard mitigation by using a kinetic impactor to deflect an asteroid. AIDA is a joint ESA-NASA mission, which includes the ESA Asteroid Impact Mission (AIM) rendezvous spacecraft and the NASA Double Asteroid Redirection Test (DART) mission. The primary goals of AIDA are (i) to test our ability to impact a small near-Earth asteroid by an hypervelocity projectile and (ii) to measure and characterize the deflection caused by the impact. The AIDA target will be the binary asteroid (65803) Didymos, with the deflection experiment to occur in October, 2022. The DART impact on the secondary member of the binary at ~6 km/s will alter the binary orbit period, which can be measured by Earth-based observatories. The AIM spacecraft will monitor results of the impact in situ at Didymos.

Current status: Both AIM and DART have been approved for a Phase A/B1 study, starting in February 2015 for 15 months. Baseline payloads for AIM include a navigation camera, a lander (based on DLR MASCOT heritage), a thermal infrared imager, a monostatic high frequency radar, a bistatic low frequency radar (on the orbiter and on the lander), and some opportunity payloads based on cubesat standards. AIM is conceived as a small and simple platform with no mechanisms providing a flight opportunity to demonstrate technologies to advance future small and medium mission. As such, AIM will also demonstrate for the first time the use of deep-space optical communication. It will allow for the first time accessing direct information on the internal and subsurface structures of a small asteroid, and with DART, determining the influence of those internal properties on the impact outcome. The DART mission will use a single spacecraft to impact the smaller member of the binary near-Earth asteroid Didymos in October 2022. DART uses a simple, high-technology-readiness, and low-cost spacecraft to intercept Didymos. DART hosts no scientific payload other than an imager for targeting and data acquisition The impact of the >300 kg DART spacecraft at 6.1 km/s will change the mutual orbit of these two objects. By targeting the smaller, 150 m diameter member of a binary system, the DART mission produces an orbital deflection which is both larger and easier to measure than would be the case if DART targeted a typical, single near-Earth asteroid so as to change its heliocentric orbit. It is important to note that the target Didymos is not an Earth-crossing asteroid, and there is no possibility that the DART deflection experiment would create an impact hazard. The DART asteroid deflection demonstration targets the binary asteroid Didymos in Oct 2022, during a close approach to Earth. The DART impact will be observable by ground-based radar and optical telescopes around the world, providing exciting opportunities for international participation in the mission, and generating tremendous international public interest, in the first asteroid deflection experiment.

Conclusion: AIDA will return fundamental new information on the mechanical response and impact cratering process at real asteroid scales, and consequently on the collisional evolution of asteroids with implications for planetary defense, human spaceflight, and near-Earth object science and resource utilization. AIDA will return unique information on an asteroid's strength, surface physical properties and internal structure. Supporting numerical simulation studies and laboratory experiments will be needed to realize the potential benefits of AIDA and will be an integral part of the mission. Various communities will thus be involved and working groups are defined to support the mission studies.

Additional Information: Support from ESA and NASA is acknowledge.