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DART: DOUBLE ASTEROID REDIRECTION TEST

Abstract

NASA's Double Asteroid Redirection Test (DART) mission will be the first space experiment to demonstrate asteroid impact hazard mitigation by using a kinetic impactor. The DART target is the near-Earth binary asteroid 65803 Didymos, which will make a close approach to Earth in October, 2022. The DART spacecraft will impact the Didymos secondary at 7 km/s at that time to demonstrate the ability to modify the asteroid trajectory through momentum transfer. The DART mission entered Phase C in June 2018, and will reach the mission Critical Design Review (CDR) milestone in June 2019. DART's primary goals are (1) to perform a full-scale demonstration of the spacecraft kinetic impact technique for deflection of an asteroid; (2) to measure the resulting asteroid deflection; and (3) to study hyper-velocity collision effects on an asteroid. DART will validate models for momentum transfer in asteroid impacts, including effects of long-term dynamics of the impact ejecta, by measuring physical properties of the asteroid surface and sub-surface. The DART impact will change the orbital period of the binary, which will be measured by Earth-based optical telescopes and radar. The impact will release a large volume of particulate ejecta that may be directly observable from Earth or even resolvable as a coma or an ejecta tail by ground-based telescopes. The DART mission will be the first in the planetary defense flight line, and will demonstrate a variety of new technologies. The newly proposed baseline launch readiness date is in July, 2021, to impact the Didymos secondary at the end of September 2022. The Italian Space Agency will contribute a CubeSat (LICIACube) to be carried by DART to Didymos. The CubeSat would be released prior to the impact, so as to perform a separate flyby and to image the impact ejecta. In addition, DART is part of a larger AIDA international collaboration effort between NASA and ESA. ESA continues to study a rendezvous mission Hera to contribute to AIDA, to measure outcomes of the kinetic impact and to characterize the target body. Hera is preparing for funding review in the up-coming 2019 ESA Ministerial Conference.