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Post Deflection Impact Risk Analysis of the Double Asteroid Redirection Test (DART)

S. Eggl (1), **D. Hestroffer** (2)

(1) Jet Propulsion Laboratory, California Institute of Technology, CA, USA

(2) IMCCE, Observatoire de Paris, PSL Res. Univ., CNRS, Paris, France

Abstract

Collisions between potentially hazardous near-Earth objects and our planet are among the few natural disasters that can be avoided by human intervention. Kinetic impact based asteroid orbit deflection counts among the most mature impact hazard mitigation concepts, but it is yet to be demonstrated successfully. NASA is currently investigating the DART (Double Asteroid Redirection Test, [1,2]) mission concept that is intended to close this knowledge gap. The DART spacecraft would target the moonlet of binary asteroid (65803) Didymos. This action would help to understand in more detail how a kinetic impact affects the moonlet's orbit in a relatively controlled environment.

Although the main goal of DART is to alter the orbit of the moonlet, the imparted momentum would also slightly affect the heliocentric orbit of the whole binary asteroid system. Due to the fact that the Didymos system has several close approaches with the Earth over the next centuries, small changes in Didymos' orbit are amplified over time. Hence, possible future encounter distances between Didymos and the Earth have to be monitored taking into account uncertainties involved in the deflection process. To this end, we conducted a post deflection impact risk assessment [3] for the most recent DART mission concept scenarios. In this contribution, we present the latest results of the post deflection impact risk assessment confirming that no planetary safety issues would arise in the foreseeable future, were DART to be flown.

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References

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