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ASTEROFF: A COMPUTER CODE TO DEFLECT NEOs

BY MISSILES SHOT FROM L1 AND L3 (EARTH-MOON)

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We develop the mathematical theory for an automatic, space-based system to deflect NEOs by virtue of missiles shot from the Earth-Moon L1 and L3 Lagrangian Points.

A patent application has been filed for the relevant code, dubbed ASTEROFF (= Asteroids OFF !). This code was already implemented, and a copyright for it was registered.

In a paper published in Acta Astronautica, Vol. 55, pp. 991-1006 (2004), this author proved mathematically the following theorem (hereafter called the "confocal conics theorem"):

"Within the sphere of influence of the Earth, any NEO could be hit by a missile at just an angle of 90 degrees, was the missile shot from Lagrangian Points L1 or L3 of the Earth-Moon system, rather than from the surface of the Earth". As a consequence, the hitting missile would have move along a "confocal ellipse" (centered at the Earth) uniquely determined by the NEO's incoming hyperbola.

Based on the above theorem, the author further shows in this paper that:

1. The proposed defense system would be ideal to deflect NEOs that are small, i.e. less than one kilometer in diameter. Small NEOs are just the most difficult ones to be detected early enough and to such an orbital accuracy to be positively sure that they are indeed hazardous.

2. The traditional theory of Keplerian orbits can successfully be applied to get an excellent first-order approximation of the (otherwise unknown) mathematical formulae of the energy/momentum requested to achieve the NEO deflection. Many engineering details about the missiles shot from L1 and L3, however, still have to be implemented into our simulations, partly because they are classified.

3. Was one missile not enough to deflect the NEO completely, it is a great advantage of the “confocal conics” used here that the new, slightly deflected NEO’s hyperbola would certainly be hit at nearly 90 degrees by another and slightly more eccentric elliptical missile trajectory. A sufficient number of missiles could thus be launched in a sequence from the Earth-Moon Lagrangian points L1 and L3 with the result that the SUM of all these small and repeated deflections will finally throw the NEO off its collision hyperbola with the Earth.