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TOPIC: Deflection / Disruption Modeling & Testing

PI – TERMINAL PLANETARY DEFENSE

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ABSTRACT

We present a practical and effective method of planetary defense (PI – “Pulverize It”) that allows for extremely short mitigation time scales. The method uses an array of small hypervelocity kinetic penetrators that disrupt and disassemble an asteroid or small comet. This mitigates the threat using the Earth's atmosphere to dissipate the energy in the fragment cloud. The system enables a planetary defense solution using existing technologies. This approach will work in extended time scale modes where there is a large warning time, as well as in short interdiction time scenarios with intercepts of minutes to days before impact. In longer time intercept scenarios, the disassembled asteroid fragments largely miss the Earth. In short intercept scenarios, the asteroid fragments of maximum ~10-meter diameter allow the Earth's atmosphere to act as a "beam dump" where the fragments burn up and/or air burst, with the primary channel of energy going into spatially and temporally de-correlated shock waves. It is the de-correlated blast waves that are the key to why PI works so well. The effectiveness of the approach depends on the intercept time and size of the asteroid, but allows for effective defense against asteroids in the 20-1000m diameter class and could virtually eliminate the threat of mass destruction posed by these threats with very short warning times, though longer warning is always preferred. A 20m diameter asteroid (~0.5Mt, similar to Chelyabinsk) can be mitigated with a 100s prior to impact intercept with a 10m/s disruption. With ~1m/s internal disruption, a 5 hours prior to impact intercept of a 50m diameter asteroid (~10Mt yield, similar to Tunguska), a 1 day prior to impact intercept of 100m diameter asteroid (~100Mt yield), or a 10-20 day prior to impact intercept of Apophis (~370m diameter, ~4Gt yield) would mitigate these threats.

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Comments: *N/A*