

## **Active removal of orbital debris by induced hypervelocity impact of injected dust Grains\***

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Collisions of an active satellite with a small (1mm – cm) hard-to-track orbital debris can be mission ending. It has been established that we are at the tipping point for collisional cascade of larger objects to exponential growth of small orbital debris. This will make access to near-Earth space hazardous without first clearing the existing debris from this region. While there are concepts for removing larger debris objects, the more numerous (millions) smaller debris are difficult to eliminate by precision targeting one at a time. We present a concept for elimination of swarms of small debris by deploying micron scale dust to artificially enhance the drag on the debris. The key physics that makes this technique viable is the possibility of large momentum boost realized through hypervelocity dust/debris collision. By deploying high mass density micron scale dust in a narrow altitude band temporarily it is possible to artificially enhance drag on debris spread over a very large volume to force rapid reentry. By synchronizing the dust and debris orbit decay rates a narrow dust layer can be used as a net to capture and force reentry of numerous small debris objects simultaneously. The injected dust will also reenter the atmosphere leaving no permanent residue in space.

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