**Concurrent**

**Development**

**Outline**

Liberation Research Document

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**Laser Satellite**

*Originally known as VacumSat*

The first aim was always to build a technology demonstration attempting to prove that nanosecond pulsed lasers could be used to ablate and deorbit space debris of size 1cm – 10cm. This technology was first proposed in “Laser-based removal of irregularly shaped space debris” by Stefan Scharring, Jascha Wilken, and Hans-Albert Eckel (doi:10.1117/1.OE.56.1.011007). This technology was later proven in “Experimental verification of high energy laser-generated impulse for remote laser control of space debris” (doi:10.1038/s41598-018-26336-1).

These tests have confirmed the possibility in a vacuum of firing a laser at debris to ablate material, creating a burst of energy and removing it from Low Earth Orbit. Statistics wise, there are 128,000,000+ pieces of debris smaller than 1cm, and 900,000+ pieces of debris between 1cm and 10cm. There are 34,000 pieces of debris larger than 10cm. NASA, the ESA, JAXA, and other agencies are working to mitigate the amount of debris above 10cm, however little attention has been paid to the smaller debris pieces, which could accumulate. With the power of a laser, that could be mounted on a 2U or 3U CubeSat unit, targeting the 128M+ pieces of debris would achieve maximum efficiency. While this technology would not be able to ablate and fully de-orbit debris at this size, nanosecond pulses would be able to change trajectory measurably, and attempt to achieve movement towards a graveyard orbit for these smaller pieces, even with just one or two laser blasts.

The issue with solo development of a CubeSat of this caliber is the size, for a nanosecond laser, and supporting equipment, as well as a pointing mechanism as pointed out by Charles, would require at least a size of 2U if not 3U or larger. This results in an unfavorably large design for the NASA CubeSat Space Launch Initiative, especially for a younger team’s maiden flight.