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# DESIGN OF A FLEXIBLE SATELLITE SYSTEM FOR THE MITIGATION OF LARGE SIZED ORBITAL DEBRIS

**Abstract**

With the continued increase in the number of objects located in Earth orbit, the probability of collisions on the scale of the 2009 collision between Iridium 33 and Kosmos-2251 will also increase. Collisions of this magnitude generate large quantities of debris which have the potential to make sections of Earth orbit too hazardous for use. To combat this growing problem, fourth year undergraduate students at Carleton University designed a satellite system to capture and decrease the overall time for re-entry of large objects in Low Earth Orbit. The students selected two targets in the highly populated Sun-Synchronous Low Earth Orbit: RADARSAT-1 and SURFSAT-1 as the debris targets to design for; this provided a basis for the analysis which was performed. Using an onboard, vision based navigation system, the target's geometry and body rates can be quantified. Due to the angular momentum present in the debris, a flexible net concept was selected to capture the debris, and a chemical propulsion system to bring the debris down to an orbit where re-entry will occur within a period of fifteen years. There is a significant degree of challenges associated with the capture of an uncooperative target. Therefore it was necessary to design a capture mechanism free of overbearing complexity, yet capable of fully encapsulating the target for the time required to undertake the re-entry sequence. The selected capture mechanism consists of a net which is to be launched from the debris mitigating satellite via four tractor masses that are free to slide along canted rails. As the masses slide along the aforementioned rails, the net is allowed to expand. Upon impact of the target, the net then envelops the target and is secured. Outlined within this paper is the top level design of the proposed solution.