

SPACE DEBRIS SYMPOSIUM (A6)  
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MITIGATION OF SPACE DEBRIS FROM MEO USING SOLAR SAIL WITH PERFORMANCE INDEX  
OF ENERGY CONSUMPTION AND WEIGHT AS THE TWO OBJECTIVES FOR OPTIMIZATION**Abstract**

Population of debris in Medium Earth Orbit (MEO) is continuously increasing and consequently it may cause difficulties for operational satellites in this orbit or future launches of satellites bound for this orbit. Therefore, the mitigation of debris should be taken into consideration in future space programs. One of the categories of space debris consisting of one fifth of all the spacecraft population in space is satellites which are not operational. Operational spacecraft at the end of life-time or In-operational ones, stay in orbit as a debris or should be de-orbited to lower orbits or higher orbits. So far, Many methods for mitigation of debris have been presented such as: reentry, transfer to junkyard orbit, application of decomposable material in spacecraft's structure, utilizing active debris removal (ADR) such as Nanotubes and Nanorobots (which these ADR methods is not applicable until 2020). In this paper a novel and low in price approach is introduced for the purpose of mitigating space debris. In this approach, solar sail would be utilized for low-thrust maneuvers in order to de-orbit the satellite. Two scenarios are considered in this research; in the first scenario the debris is transferred to lower orbit in order to encounter the atmosphere and burn. In the second scenario the debris is transferred into interplanetary orbits. A two-objective optimization procedure is considered in this maneuver; the first objective is to minimize energy consumption and the other is to minimize weight of the satellite (which is a measure for the launch cost). In the first scenario the solar radiation pressure is used by solar sail to decrease the velocity of the satellite which leads to lessening of the satellite altitude and eventually the reentry would happen. In the second scenario the debris is transferred gradually toward moon orbit in order to execute a fly-by maneuver and enter interplanetary trajectories. Considering foregoing research, this would be possible to create a standard regulation for spacecraft design to take into account the disposal of satellites by this in early stage of design.