SPACE DEBRIS SYMPOSIUM (A6)
Mitigation and Standards (4)

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ASSESSMENT OF SPACE DEBRIS REDUCTION METHODS

Abstract

Since 1957, artificial satellites and launch vehicles have created an ever growing number of orbiting debris objects, from a few microns to several meters in size. In recent years a number of international agreements have been made to limit the growth rate of debris, but there is no serious program to reduce the amount of existing debris. Recent developments such as the proliferation of debris from the Chinese ASAT test of 2007 and increasing threats to US spacecraft have raised level of urgency to actively manage the debris situation. Many reduction techniques have been suggested, but none have yet been taken seriously. This paper anticipates the inevitable situation in which debris control becomes critical to national security. Suggested solutions have generally been perceived as either being prohibitively expensive and/or having negative environmental side effects. Finally, a serious and quantitative survey of potential technological aspects and operational methods for dealing with the reduction of existing and future orbiting debris has been completed at the Applied Physics Laboratory (APL) of Johns Hopkins University. The proposed paper discusses the selection of important metrics for realistic evaluation of debris reduction options and describes the quantitative methods used to assess the use of promising approaches to achieving a significant reduction in debris density and distribution in low Earth orbits. Evaluation metrics include lifecycle cost, risk assessments, systems complexity, timing and impact on orbital operations. It is clear that one approach will not be sufficient for all situations. Thus, viable approaches are divided into categories of application situations. Some methods apply to microscopic debris objects and some apply to large debris pieces. Debris altitude is another important factor in the selection of reduction approach. In summary, a complete spectrum of promising debris reduction scenarios will be addressed in this paper.