

Material Properties Evolution Affecting Demisability for Space Debris Mitigation

Authors : Chetan Mahawar, Sarath Chandran, Sridhar Panigrahi, V. P. Shaji

Abstract : The ever-growing advancement in space exploration has led to an alarming concern for space debris removal as it restricts further launch operations and adventurous space missions; hence numerous studies have come up with technologies for re-entry predictions and material selection processes for mitigating space debris. The selection of material and operating conditions is determined with the objective of lightweight structure and ability to demise faster subject to spacecraft survivability during its mission. Since the demisability of spacecraft depends on evolving thermal material properties such as emissivity, specific heat capacity, thermal conductivity, radiation intensity, etc. Therefore, this paper presents the analysis of evolving thermal material properties of spacecraft, which affect the demisability process and thus estimate demise time using the demisability model by incorporating evolving thermal properties for sensible heating followed by the complete or partial break-up of spacecraft. The demisability analysis thus concludes the best suitable spacecraft material is based on the least estimated demise time, which fulfills the criteria of design-for-survivability and as well as of design-for-demisability.

Keywords : demisability, emissivity, lightweight, re-entry, survivability

Conference Title : ICAAE 2023 : International Conference on Aerospace and Aeronautical Engineering

Conference Location : Paris, France

Conference Dates : March 27-28, 2023