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Title

Feasibility study of a single-score Life-Cycle Assessment for Space missions: preliminary results.

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Abstract

With a continuously growing number of satellites in orbit, it becomes increasingly important to assess their impacts on the Earth's environment in a standardized manner. While interest in Life-Cycle Assessment (LCA) for space missions has gained in strength in the past few years - particularly in Europe - no consensus has yet been reached on a single-score LCA system. In parallel, however, scoring systems for other sustainability aspects have been defined and are increasingly being used in the industry. A notable example is that of the Swiss-based Space Sustainability Rating (SSR) non-profit organization, which aims at incentivizing sustainable behaviors in space through a quantitative and qualitative assessment of the sustainability level of a mission according to several criteria such as collision avoidance, post-mission disposal strategy, compliance to existing space debris mitigation standards, detectability and trackability, data sharing, and readiness level to active removal.

This paper presents the preliminary results of a feasibility study for a single-score LCA module which could be integrated within the Space Sustainability Rating, to further broaden its scope. The focus of the study lies in the identification of the initial inputs and the methodology to assess them, as well as the normalization method to reach a single score. The latest literature on the subject and interviews with relevant parties in the industry are used for this, along with an investigation of the suitability of ESA's E-LCA Database and the Strathclyde Database.

Overall, this paper highlights the importance of an easy-to-understand LCA tool for space systems. It shows the necessity for a tool that is implementable during the design phase of the mission, to incentivize space actors to opt for more sustainable materials and designs, and to reassess their logistics. To that effect, this paper lays out the context of SSR, presents a literature review about LCA, explores a methodology for the LCA module and underlines the main aspects which still need further development and investigation.

References

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