

22nd IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND
DEVELOPMENT (D3)

Space Technology and System Management Practices and Tools (3)

Author: Mr. Bernd M. Weiss
Luleå University of Technology, Sweden

Mrs. Bethany Clarke
Electronic & Electrical Engineering / University of Strathclyde, United Kingdom

Mr. Mohamed Elnourani
Luleå University of Technology, Sweden

Prof.Dr. Anna Ohrwall Ronnback
Luleå University of Technology, Sweden

Prof. Rene Laufer
Luleå University of Technology, Sweden

Prof. Malcolm Macdonald
University of Strathclyde, United Kingdom

LEVERAGING SMART MAINTENANCE FOR SATELLITE HEALTH PRESERVATION

Abstract

This paper presents a comprehensive literature review of smart maintenance techniques used in manufacturing, aviation, and electric automobiles, with the objective of identifying strategies to optimize the longevity and sustainability of satellite operations. This study assesses the latest advancements in smart maintenance, including data analytics, machine learning, artificial intelligence, and the integration of sensor technologies. These methods are suggested to reduce downtime, cut overall maintenance costs, and increase functional or component reliability and reusability. This study explores state-of-the-art maintenance approaches and industry best practices and examines their applicability in space. The research outlines the advantages of applying smart maintenance techniques to satellites, including enhanced operational efficiency, operational life-time extension, and overall cost-effectiveness. Moreover, the research proposes that the space industry can utilize the findings as a blueprint for customized satellite maintenance solutions and towards the establishment of standards and policies.

This paper emphasizes the importance of adopting advanced maintenance procedures as a critical step towards a circular space economy that prioritizes sustainability and efficiency in space missions. This research contributes towards the sustainable future of the space industry by starting the dialogue on advanced smart maintenance technologies. It offers insights into improving satellite maintenance practices and encourages further research and collaboration to overcome implementation barriers. Furthermore, maintenance strategies are presented as a vital component towards space sustainability, enabling sustainable, reliable space missions, also aligning with the goals of a circular space economy.