

IAF SPACE OPERATIONS SYMPOSIUM (B6)  
Innovative Space Operations Concepts and Advanced Systems (2)

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AI-BASED SPACECRAFT OPERATIONS AND THE ISSUE OF LACKING TRUST - FIRST  
RESULTS OF AN AI TRUSTABILITY SURVEY IN THE SPACE DOMAIN

**Abstract**

The wave of Artificial Intelligence (AI), and in particular Machine Learning (ML) and Deep Learning (DL), has reached the space sector due to the methods efficiency and advanced performance. However, AI-based systems in spacecraft operations or on board of spacecraft have not progressed beyond the research domain. One of the reasons for this is that end-users, in this case the spacecraft operators, who are not experienced in AI, claim that the complexity and black-box behaviour leads to a lack of understanding and trust in such AI systems. Therefore, the use of ML and DL models is associated with uncertainty about how these models operate and make decisions. To build trust, AI-based concepts need to be evaluated based on their explainability and interpretability, their performance and robustness, as well as their testing-concept and overall verifiability, taking into account the needs and knowledge of both the developer and the end-user.

The aim of this study is to understand and present the reasons of why AI-based space systems are not trusted and what tools, techniques, or guidelines and standards need to be established to increase their usability and enable the use of AI-based space systems outside of the research domain. For this purpose, a questionnaire is conducted among space operations professionals of the German and European space ecosystem to understand the concerns and reservations towards the deployment of AI-based space systems. First results from the evaluation of the questionnaire are presented in this study, together with suggestions for concepts and processes to improve the explainability of AI-based space systems are presented in this study. The focus is laid on users and applications in the field of spacecraft operations.