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SYMPOSIUM ON STEPPING STONES TO THE FUTURE: STRATEGIES, ARCHITECTURES, CONCEPTS AND TECHNOLOGIES (D3)
Infrastructures and Systems to Enable International Future Exploration and Utilization of Space (3)

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ARYAVARTA - STOCHASTIC MODELLING OF RISK FOR SPACE MISSIONS

Abstract

The identification and selection of key technologies needed for next-generation space propulsion engines is one of the most challenging problems faced by engine designers. This is because all parts of a propulsion engine are tightly integrated together such that a technology introduced into one part of the system tends to have a ripple effect that impacts many other portions of the system. The results of this rippling effect can be difficult to predict, let alone predict quickly and inexpensively. Yet quick, accurate, and inexpensive evaluations are exactly what the research is demanding in order for research to remain constructive for exploring different fronts in space. Designs are evolving very rapidly and this makes the situation more complex which results in an exponential rise in demand of more reliable and sophisticated machines. This manuscript mainly comprises the literature survey for the risk associated with project ARYAVARTA. It will also explain how this risk can be predicted and managed using advanced modeling techniques.

The main aim of this project is to develop a Risk Engine (RgenX) which can take into account the deteriorating conditions of the propulsion system used in ARYAVARTA during the mission. The development of RgenX is the novel contribution to the knowledge. This model should be capable of comparing how different parameters including the operational envelope can lead to deterioration. Development of RgenX will be followed by its integration into the Technical Risk Assessment Model (TRAM) in order to perform a multi disciplinary assessment and optimization analysis. RgenX will comprise the stochastic approaches along with correlation developments and simulations. Probabilistic studies will address the important situations like how often is the risk of an event to occur and how reliable are the components during the mission. Risk associated with shifting orbits will be addressed as well. The deteriorated performance results of the various components constituting the propulsion engine will be than used within the TRAM architecture in order to identify the best possible technology selection.