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A GENERALIZED TECHNOLOGY READINESS LEVEL MODEL FOR SPACE PROGRAM

Abstract

The Technology Readiness Levels (TRL) methodology is a globally accepted benchmarking tool for assessment maturity and risk of new, critical technology. Developed in 1974 by Stan Sadin with NASA it is now becoming a standard of technology maturity assessment in practice. Despite numerous other methodologies related to TRL being proposed recently, the methods of these have not been fully developed and need further improvements. Additionally, there has been insufficient research on the comprehensive and integrated use of the readiness levels involved in TRL, such as Manufacturing Readiness Levels (MRL), Design Readiness Levels (DRL), Product Readiness Levels (PRL), Integration Readiness Levels (IRL), and System Readiness Levels (SRL). This research paper will focus on the abilities and limitations of different maturity methods, how they will be integrated for comprehensive use, and how to make improvements to methods that have yet to be fully developed. Based on space programs, the concept of Generalized Technology Readiness Level (G-TRL) was put forward. This paper explores various relationships between this new methodology and the readiness levels. It takes a comprehensive look at the relationships of these readiness levels and establishes the G-TRL model and the assessment metrics model based on multidimensional characteristics of technology maturity. This research article also presented the application model for G-TRL and the best practice of the requirements for G-TRL in every milestone and decision point of the space program. At the decision point of a space program, if the key technology enters into the next stage in advance without reaching the G-TRL required in the best practice, there will always be several serious problems follow by. On the contrary, the more mature of the technology, the lower risk of the space program. This G-TRL and its application model have the ability to provide more comprehensive and accurate assessment on the maturity and risk of key technologies in the space program.