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# APPLICATION OF MODEL BASED SYSTEMS ENGINEERING IN VIRTUAL TESTS OF THE SPACECRAFT

**Abstract**

The design of the spacecraft is complex system engineering due to the complexity and multidisciplinary nature of space systems. On the one hand, the spacecraft is becoming more and more complex, especially for multidisciplinary problems to solve structure system, electrical system, flight control system, power system, environmental system. On the other hand, in the design processing, a spacecraft is designed and integrated by different research institutes or suppliers of products, and in the early stage of design it is a Gordian knot to accredit the reliability of the spacecraft through the integrated system tests. This indicates that the spacecraft engineers should consider all relevant aspects of the space product life cycle.

In this paper, a Model Based Systems Engineering (MBSE) platform for the spacecraft virtual simulation of multi domain physical system was constructed. The prototype was specified on the requirement definition, system physical design, spacecraft performance analysis and optimization, function analysis and verification of the spacecraft. The performance evaluation and virtual flight test of the spacecraft system are completed with this MBSE platform. Based on the model with a multidisciplinary collaborative simulation, a unified data source specification and standard design flow model is established.

Compared with the traditional text based design, MBSE can be used to analyze the requirements of the system at all stages of the design, and verify whether the system requirements are in line with the original requirements of stakeholders. The use of a variety of models enables the move from a document centric to a model based approach powered by multidisciplinary coupling. Through the use of such tools, requirement correctness can be validated in every stages of design and complex interfaces can be analyzed. The critical aspects of their specific metrics and key parameters as the design evolves can be timely verified and updated. This can ensure that the system design to meet the system function and capability requirements and achieve the optimal design of the integrated system. This also supports the spacecraft digital design and early verification, and effectively solves the problems of the system, such as machine, electricity, heat, control, and environment and so on.