Paper ID: 38708
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SPACE SYSTEMS SYMPOSIUM (D1)
Space Systems Engineering - Methods, Processes and Tools (2) (4B)

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MODEL BASED SYSTEMS ENGINEERING APPLIED TO ESA'S E.DEORBIT MISSION

Abstract

Model-Based Systems Engineering is implemented within ESA's e.Deorbit mission. The mission goal of e.Deorbit is to remove a large ESA-owned space debris from Sun-Synchronous Orbit in-between 600 and 800 km. It is a complex mission driven by requirements from robotics, guidance, navigation and control. It was first studied in 2012 at ESA's Concurrent Design Facility (CDF), and following the Pre-Phase A, an MBSE approach was adopted. The first model implemented was during the Pre-Phase A within ESA, for modelling the physical architecture. The model used was the Integrated Design Model (IDM), which has since been replaced by ESA's Open Concurrent Design Tool (OCDT). OCDT is currently used for modelling the physical architecture of all missions studied in the CDF.

Following the Pre-Phase A of e.Deorbit, three industrial contracts were implemented, one with each of the Large System Integrators (LSIs) of Europe namely Airbus Defense and Space (ADS), OHB and Thales Alenia Space (TAS). As part of the Phase A the contractors were requested to use MBSE for modelling both the physical and functional architectures. With successful completion of the Preliminary Requirements Review (PRR), it was recommended to increase the use of MBSE at system level.

The Phase B1 kicked-off at the end of 2015.There were two contracts, one led by Airbus with Qinetiq in the consortium, and another parallel competitive contract led by OHB with TAS in the consortium. The contractors were encouraged by ESA to apply MBSE wherever possible.

Within both contracts, each contractor adopted different tools and methodologies for MBSE in order to: • Elaborate the problem, system analysis, definition of the problem boundaries • Derive and manage the requirements • Identify the capabilities/functions required by the system • Develop the functional, logical and physical architecture • To track the verification/validation methods required • Manage the data exchange 'single truth'

This level of application of MBSE represents a significant increase in the usage of such methodologies within ESA missions. The end of the Phase B1 for e.Deorbit will be completed with an intermediate-Systems Requirement Review (iSRR) in March 2017. This review provides an opportunity for ESA to reflect on the advantages of MBSE, and potentially aid ESA in defining the approach for implementing MBSE within other missions.