**Implementation Strategy of Model-Based Systems Engineering at JAXA**

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1. **Abstract**

The main mission of the System Technology Unit (STU) of the Japan Aerospace Exploration Agency (JAXA) is to transform an idea leading to a space mission into a valuable and feasible plan. The STU’s activity focuses on the mission and system design for a wide range of studies from idea creation to Phase-A of new missions including that include conceptual development, conceptual design, and system trade-off analysis [1].

In order to enhance this role, for more than two years the STU has conducted a study on Model-Based Systems Engineering (MBSE) to improve systems engineering (SE) capability, focusing on the benefits of MBSE: single source of truth, rigor systems engineering, and the reusability of system models.

The study shows that MBSE does not always lead to improved systems engineering capability and efficiency. To exploit the benefits of MBSE, we must develop MBSE methodology suitable for JAXA’s systems engineering process and practices. Given the various aspects to be considered for implementing MBSE into organizations, we refer to the general framework for MBSE implementation described in [2] as follows:

* Process:

What are the features of SE and the project management process for systems development at JAXA?

* Methods (MBSE methodology):

How to model the SE activity of systems development at JAXA and how to apply SysML

* Tools:

What tools are suitable for our process and method?

* Environment:

What are the support infrastructures to conduct MBSE for systems development at JAXA?

From the standpoint of process, we will introduce a brief overview of project management reform in 2017 for space systems development, and illustrate how the reform affects SE at JAXA.

Considering the concept of project management reform and the current capability of MBSE at JAXA, the STU has devised a strategy for how to apply MBSE to space systems development at JAXA. The strategy consists of three types of MBSE methodology with different objectives. We developed one of the three methodologies covering pre-Phase A to Phase A, and have begun applying this methodology to certain missions as trials. This paper presents the objectives of those trials and shares the results thereof.

The preparation of tools and the environment for MBSE entails an ongoing process through an actual design study. The STU currently uses MagicDraw as a MBSE tool to identify the functions needed for our process and methodology. Moreover, the STU also develops a framework to exchange information with domain-specific tools such as MATLAB, STK, CAD and other specific tools brought by domain experts. This paper also presents the concept of MBSE infrastructure and future works.

1. **References**

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[2] Jeff A. Estefan, Survey of Model-Based Systems Engineering (MBSE) Methodologies, INCOSE MBSE Focus Group, 2007.