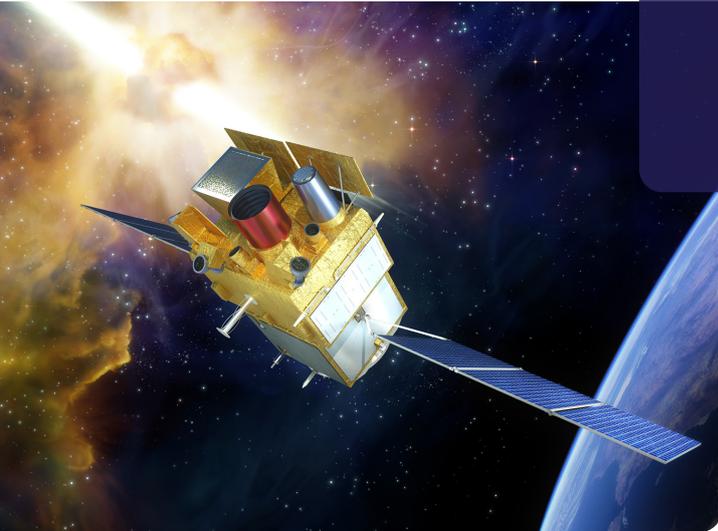


Successful Capella Landing on a CNES Operational Use Case



“ Digital engineering is the key to managing complex system development in a rapidly expanding spatial context. The model approach makes it possible to work in a more agile manner by offering a common reflection support to the various stakeholders, an analytical capacity and an information traceability capacity. - Julien REY

Context

The CNES (Centre National d'Etudes Spatiales), the French space agency, is currently developing the Space Variable Objects Monitor (SVOM), a space system dedicated to gamma ray detection and study, under joint development with China National Space Administration (CNSA), to be launched in 2023.

The SVOM system shall be able to trigger alerts of Gamma-Ray Burst (GRB) in real-time with a maximum of associated data. It is composed of a space segment (a set of various sensors embedded on a satellite) associated with a worldwide antenna ground network, all managed by the two agencies.

On this project, CNES decided assessing MBSE approach on dedicated domains. These activities were performed with Artal/Magellium, a company involved in the improvement of engineering processes and practices, mainly in avionics and space industries, with a real expertise in the field of the development of model-oriented engineering workshops, including for system engineering (MBSE).



Julien REY

SE/MBSE specialist at CNES, his role is to promote and implement these approaches within the CNES ecosystem in order to optimize and modernize, in particular, thanks to digital engineering solutions, the development processes of complex spa@ce systems.



Jonathan LASALLE

Currently in charge of the MBSE (Model-Based System Engineering) activities in Artal/Magellium, his work consists of guiding engineers to introduce and propagate the MBSE method within their activities. In addition to providing training (mainly based on the Capella tool), it takes care of customization activities of existing tools, such as the development of Capella viewpoints.

Solution

The design of this system was carried out using the historical CNES process, based on a set of textual, derived and refined documents, from the high-level requirements to the technical specification of the equipment. In this context, the validation of the specifications obtained is mainly based on human expertise and validation campaigns that are carried out. The complexity of such a system makes it a perfect candidate for experimentation with the MBSE (model-based systems engineering) process using Capella.

The solution built by ARTAL on this project consists of an operational model-based toolchain based on Capella to capture the system architecture and its associated V&V specification.

Two successive projects were carried out in this context: a first study made it possible to compare the current process with the principles of the MBSE to evaluate the benefits (on a sample of the system but through the different layers of engineering). Given the promising results, a second project, based on the Capella models carried out during the first project, focused on the operational capture of system validation data (validation scope, test sequences, etc.).

Result

The Capella's foray into the CNES engineering process was particularly well received by SVOM experts who perceived concrete benefits led by this new way of working:

- a real guide and useful help, by structuring the work and imposing rigor,
- non-ambiguous specifications,
- better communication and process coverage: from preliminary definition to project validation.

Even after the design has been already defined, a model-based operational toolchain for capturing the system architecture and the associated V&V specification has demonstrated benefits and the return on investment was confirmed.

This opened the door to a wider dissemination of the MBSE within the CNES.

