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### Title

## Interactive System Modeling for Designing a New Concept Launch Vehicle

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### Abstract

In the upstream design phase of systems engineering, stakeholder analysis, requirements analysis, and system definition are conducted[1]. In this phase, it is very important to obtain a common understanding and consensus for the system among stakeholders and project members. However, when designing new concept systems (rather than updating existing systems), it could be difficult to reach a common understanding and consensus. Then we have developed a cloud-based modeling tool named "Balus" which enables stakeholders and project members to construct system models through dialogue and collaboration[2]. By using this tool, participants can conduct interactive system modeling which makes conceptual and upstream design effective. In this presentation, we will show practical examples of interactive system design using Balus in the development of a new concept rocket.

The practical examples in this presentation are activities in the ATRIUM (Air Turbo Rocket for Innovative Unmanned Mission) project[3] led by JAXA/ISAS. The launch vehicle developed in the ATRIUM project is a new concept system which has both the air-turbo engine and the rocket-engine. Currently, we are developing the sub-scale FTB (Flying Test Bed) to demonstrate the various technologies required for this new type of rocket[4]. The FTB will fly within the next two or three years. Interactive modeling with Balus is practiced in the system design for the sub-scale FTB.

In the system design of the sub-scale FTB, we used Balus for the following activities

- context and stakeholder analysis
- mission definition and breakdown
- definition of system configuration and structure
- definition of interfaces between airframe systems and ground systems
- definition of interfaces within the airframe system
- connecting development documents and the system architecture (document map)

For each of the above activities, system models were constructed on Balus. We will introduce the concept of interactive modeling, the features of Balus and the system models constructed in practices in this presentation.

### References

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