

: Mission Definition and Conceptual Design

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Overview

JAXA is developing RApid Innovative payload demonstration SatellitE-3 (RAISE-3), a 100kg-class satellite to provide on-orbit demonstration opportunities, as part of the Innovative Satellite Technology Demonstration Program. Seven on-orbit demonstration missions were selected in a category of "parts, components and subsystems" and will be demonstrated on RAISE-3.

Mission Definition

- To provide appropriate on-orbit demonstration opportunities to the seven selected demonstration missions, and
- To enhance global competitiveness of domestic space industries in Japan as a result of those missions

System Specifications

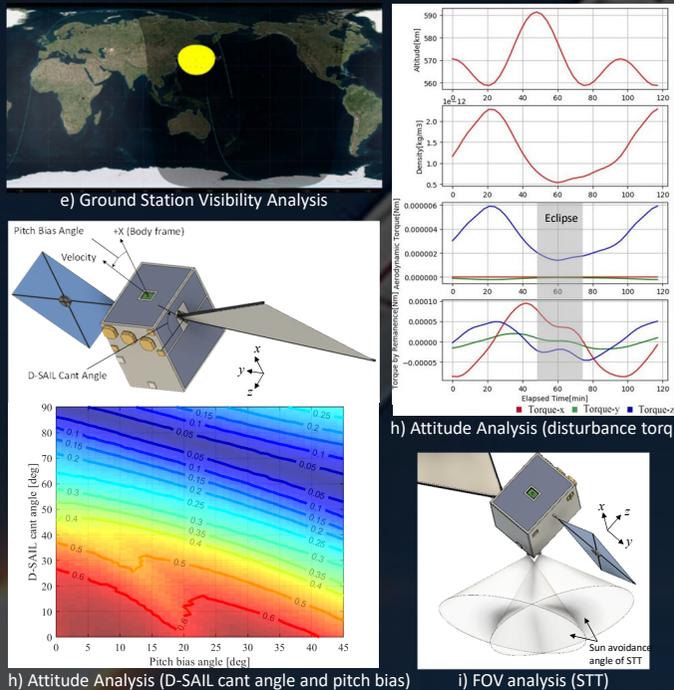
- Operational period: 14 months
- Altitude: 560km (SSO)
- Dimension: 1m x 0.75m x 1m
- Power: > 215W (BOL), > 180W (EOL)
- Communication: S-band for telecommand, X-band for mission data
- Data recorder: 8GB
- Attitude: 3-axis stabilized
- Launch: FY2022
- LST: 9:30
- Mass: < 110kg



KIR: On-Orbit Demonstration of Micro-propulsion System using Water Propellant
 D-SAIL: On-Orbit Demonstration of Deployable Membrane Deorbit Mechanism for Micro-satellite
 HELIOS: On-Orbit Demonstration of Lightweight Deployable Membrane Structure with Power Generation and Antenna Function for Society 5.0

Conceptual Design Result

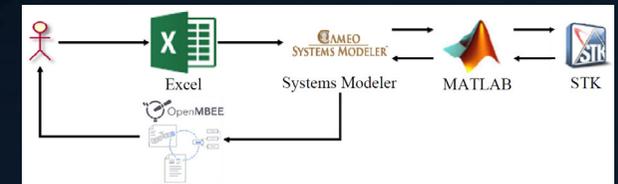
To evaluate the feasibility of the system specifications, conceptual design has been conducted, including a) Configuration Design, b) Mass Budget, c) Orbit Analysis, d) Power Analysis, e) Ground Station Visibility Analysis, f) Data Budget Analysis, g) Communication Link Analysis, h) Attitude Analysis, i) FOV Analysis, j) Structural Analysis, k) Thermal Analysis



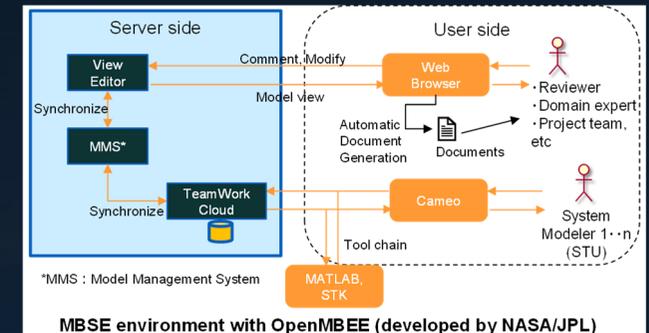
Digital Development Method

A part of the analyses was conducted using digital development method, based on recent studies of MBSE methodology in JAXA;

- ✓ To ensure "Single Source of Truth" in design and analysis
- ✓ To ensure accessibility to the latest design parameters and information to whoever and whenever needed
- ✓ To enable rapid re-analysis once design parameters are updated



MBSE environment with OpenMBEE has been established to provide document-style views from a System Model so that project reviewers can easily access the information in the System Model during review processes



Project Plan and Technical Challenges

- RAISE-3 is scheduled to be launched in FY2022 and therefore the development of the satellite in one-year time frame is the biggest challenge of the project
- Since the satellite accommodates two large deployable membrane structures, the characteristics of the deployable structure need to be further evaluated
- The feasibility of on-orbit performance evaluation of micro-thrusters, which generate small thrust forces ranging from μN to mN , is one of technical issues and more detailed studies will be required on operational plans to improve measurement accuracy on orbit
- Application of MBSE methodology to the development process of the project is being planned and detailed methodology needs to be further studied so that a part of the satellite development processes will be enhanced by utilizing MBSE approach