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### Title

## Research and Development of the Small LOX/Methane Propulsion System for an Experimental Reusable Winged Rocket WIRES#015

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### Abstract

This paper reports the research and development status of the small LOX/Methane propulsion system, which will be installed and demonstrated in the flight of an experimental reusable rocket WIRES#015 (Winged Reusable Sounding rocket).

In Japan, research and development of LOX/Methane engine has been conducted since the early 2000s [1-4], and the combustion tests of 30kN class full-expander cycle engine were carried out in 2021. The test data showed that the engine performed as designed and the design methodology on LOX/Methane engine was verified. Based on the successful combustion test results, the engine is going to be installed in the WIRES#015[5] and demonstrated in the first flight in 2025 under the collaborative research contract with Tokyo University of Science.

In order to operate the engine, the vehicle needs propulsion system, for example, tanks, fuel and oxidizer supply units, electrical control units and engine gimbaling units. Therefore, the research and development on the propulsion system is being carried out and the status of the activities is described in this paper.

The results of this research and development are expected to contribute to the practical application of reusable propulsion systems for future space transportation systems to and from the Moon and Mars.

### References

- [1] Ideo Masuda et al., “JAXA’s Current Activities for the Research of a LOX/LCH<sub>4</sub> (LNG) Engine”, Space Propulsion 2016, Roma, Italy, 2-6 May 2016.
- [2] Hiroya Asakawa, et al. “Component tests of a LOX/methane full-expander cycle rocket engine: Electrically actuated valve”, EUCASS2019-222, Madrid, Spain, 2019
- [3] Toru Tsukano, et al. “Component tests of a LOX/methane full-expander cycle rocket engine: Single-shaft LOX/methane turbopump”, EUCASS2019-301, Madrid, Spain, 2019
- [4] Satohi Ukai, et al. “Component tests of a LOX/methane full-expander cycle rocket engine: Injector and regeneratively cooled combustion chamber”, EUCASS2019-223, Madrid, Spain, 2019
- [5] Koichi Yonemoto, et al. “Development Status and Flight Demonstration Plan of Experimental Winged Rocket WIRES#015 at Tokyo University of Science”, IAC-22-D2,5,2,x69845, the 73rd International Astronautical Congress, 18-22 Sept. 2022.