

## Research and Development of Emission Free Aircraft Technologies

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### ● Abstract

With the ultimate goal of achieving emission-free (zero emissions) aircraft, research and development of electric hybrid propulsion system is conducted, which includes the WAT(Wake Adaptive Thruster) fans at the end of fuselage, and new configuration of electric aircraft that apply them, as well as system demonstration project.

Ref. URL: <https://www.aero.jaxa.jp/eng/research/program/megawatt/>

### ● Reasons and benefits of using JAXA Supercomputer System

The JSS3 is used to design a passenger aircraft equipped with an turbo-electric hybrid propulsion system. Because a huge computational resource is required to handle both thermodynamics and aerodynamics of fully configured aircraft, JSS3 is essential for the execution of this research and development.

### ● Achievements of the Year

This year, a fuel consumption estimation analysis of the aerodynamic geometry of an electric hybrid aircraft with WAT fan was conducted. FaSTAR-Move with a propulsion fan model analysis module was used as a solver to estimate fuel consumption, which includes interference with the propulsion system. In addition, inlet distortion of intake flow was assessed in that analysis. (Fig. 1)

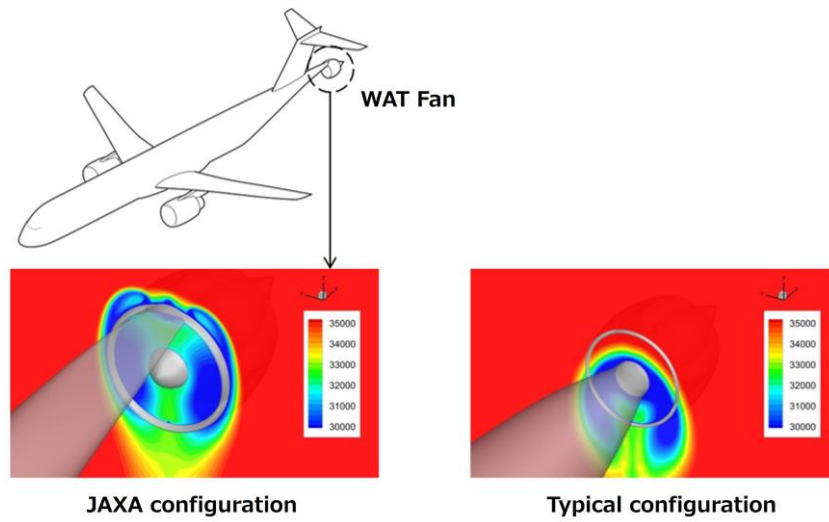


Fig. 1: Comparison of tail fan configuration for electric hybrid aircraft

● **Publications**

N/A

● **Usage of JSS**

● **Computational Information**

Process Parallelization Methods	MPI
Thread Parallelization Methods	OpenMP
Number of Processes	36 - 768
Elapsed Time per Case	12 Hour(s)

- **JSS3 Resources Used**

Fraction of Usage in Total Resources\*<sup>1</sup>(%): 0.76

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage* <sup>2</sup> (%)
TOKI-SORA	19,708,616.88	0.90
TOKI-ST	36,802.51	0.04
TOKI-GP	0.00	0.00
TOKI-XM	0.00	0.00
TOKI-LM	10,911.90	0.79
TOKI-TST	0.00	0.00
TOKI-TGP	0.00	0.00
TOKI-TLM	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage* <sup>2</sup> (%)
/home	1,217.55	0.82
/data and /data2	150,582.19	0.72
/ssd	32,434.89	1.74

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage* <sup>2</sup> (%)
J-SPACE	20.42	0.07

\*<sup>1</sup>: Fraction of Usage in Total Resources: Weighted average of three resource types (Computing, File System, and Archiver).

\*<sup>2</sup>: Fraction of Usage : Percentage of usage relative to each resource used in one year.

#### ● ISV Software Licenses Used

ISV Software Licenses Resources		
	ISV Software Licenses Used (Hours)	Fraction of Usage* <sup>2</sup> (%)
ISV Software Licenses (Total)	1,673.51	1.14

\*<sup>2</sup>: Fraction of Usage : Percentage of usage relative to each resource used in one year.