

Research and Development of Emission Free Aircraft Technologies

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Subject Category: Aeronautical Technology

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● Abstract

This research and development treats a turbo-electric hybrid propulsion system and aircraft configuration with Boundary Layer Ingestion for electrized systems, which aims at raising the technical maturity level of emission free aircrafts.

Ref. URL: <https://www.aero.jaxa.jp/eng/research/frontier/feather/>

● 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 thermo-aerodynamics and fan blades, JSS3 is essential for the execution of this research and development.

● Achievements of the Year

In this fiscal year, aerodynamic shape of hybrid electric aircraft with BLI(Boundary Layer Ingestion) fans was designed. Using FaSTAR-Move with an actuator disc function as a CFD solver, analysis was carried out by changing the shapes of fuselage tail, BLI fan nacelle, and tail wing.(Figure1, Figure2)

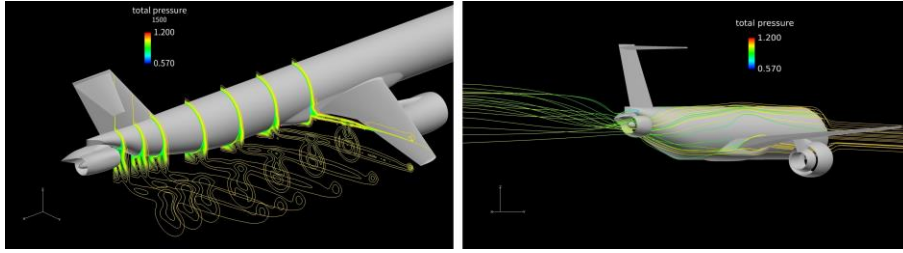


Fig. 1: Streamline and total pressure contour of a hybrid electric aircraft with BLI fans.

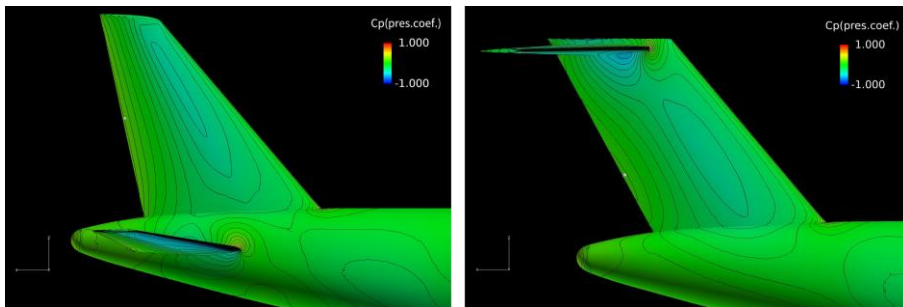


Fig. 2: Surface pressure contour of conventional tail wing(left) and T-tail wing(right)

- **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*¹(%): 0.10

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage* ² (%)
TOKI-SORA	2,216,747.67	0.11
TOKI-ST	50,064.72	0.06
TOKI-GP	0.00	0.00
TOKI-XM	0.00	0.00
TOKI-LM	1,131.56	0.08
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* ² (%)
/home	287.09	0.29
/data and /data2	73,741.19	0.79
/ssd	2,519.24	0.65

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage* ² (%)
J-SPACE	7.47	0.05

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

*²: 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*2(%)
ISV Software Licenses (Total)	308.03	0.22

*2: Fraction of Usage : Percentage of usage relative to each resource used in one year.