

Research and Development of Emission Free Aircraft Technologies

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● Abstract

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

● Reasons and benefits of using JAXA Supercomputer System

The JSS3 is used to design a passenger aircraft equipped with a 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 order to investigate an aerodynamics of whole aircraft configuration with BLI (Boundary Layer Ingestion) fans and to evaluate an influence of the inlet distortion by incoming non-uniform flow to the BLI fan blade in next fiscal year, fundamental analysis for a single fan nacelle equipped with the actuator disc(Fig.1) and ducted rotary blade(Fig.2) were carried out.

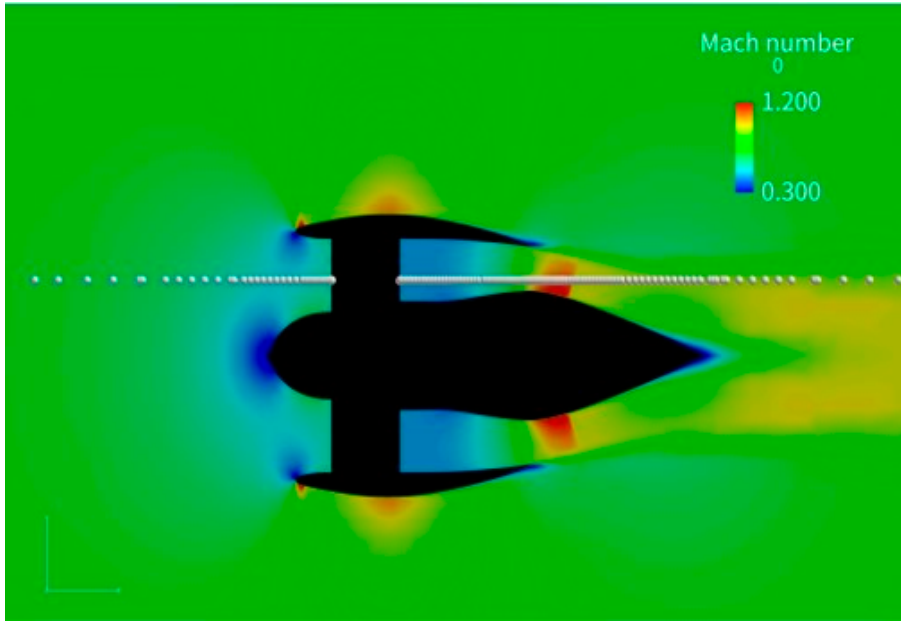


Fig. 1: Mach number contour of a single fan nacelle equipped with the actuator disc.

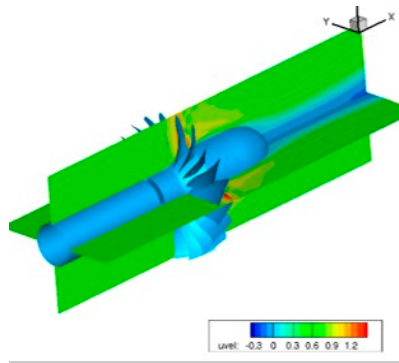


Fig. 2: Flow velocity contour of ducted rotary blade.

● **Publications**

N/A

● **Usage of JSS**

● **Computational Information**

Process Parallelization Methods	MPI
Thread Parallelization Methods	Automatic Parallelization
Number of Processes	36 - 768
Elapsed Time per Case	20 Hour(s)

- **Resources Used(JSS2)**

Fraction of Usage in Total Resources^{*1}(%): 0.02

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage ^{*2} (%)
SORA-MA	45,185.24	0.01
SORA-PP	442.82	0.00
SORA-LM	147.96	0.09
SORA-TPP	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage ^{*2} (%)
/home	46.68	0.04
/data	10,591.94	0.20
/ltmp	4,072.11	0.35

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage ^{*2} (%)
J-SPACE	0.02	0.00

^{*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.

- **Resources Used(JSS3)**

Fraction of Usage in Total Resources*1(%): 0.37

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage*2(%)
TOKI-SORA	1,905,273.57	0.41
TOKI-RURI	7,912.99	0.05
TOKI-TRURI	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage*2(%)
/home	175.05	0.12
/data	20,956.22	0.35
/ssd	1,113.72	0.58

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage*2(%)
J-SPACE	0.02	0.00

*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.