

Research on Aircraft Multidisciplinary Design Technology

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● Abstract

The purpose of the research is to develop and mature a bunch of advanced and innovative elemental technologies on aerodynamics, aeroacoustics, and structures to enable airframe design with higher environmental performances of future aircraft application, thereby helping the Japanese aviation industry to enhance its share on the global market.

● Reasons and benefits of using JAXA Supercomputer System

To develop and mature advanced and innovative technologies of aerodynamic drag reduction, aircraft noise reduction, and airframe-engine installation design for future aircrafts, development of CFD technologies and CFD-based design/analysis have been conducted in this research. The high-fidelity CFD analysis of the whole aircraft configurations with the airframe-engine installation requires large computational resources. JSS enables the high-fidelity evaluations of the performance in a timely manner and the technology developments.

● Achievements of the Year

Studies on airframe-engine installation design for low-noise JAXA Technology-Reference-Aircraft 2035A (TRA2035A, 220-seat class) with a wide fuselage have been conducted by steady-state RANS CFD analyses. The changes of aerodynamic performances by the location of the short inlet nacelles and modification of aft-fuselage geometry have been clarified in the studies. The design has significantly reduced drag. Figure 1 shows TRA2035A configuration used in the studies.



Fig. 1: JAXA Low-noise Technology-Reference-Aircraft 2035A (TRA2035A, 220-seat class) with a wide fuselage

● **Publications**

N/A

● **Usage of JSS**

● **Computational Information**

Process Parallelization Methods	MPI
Thread Parallelization Methods	OpenMP
Number of Processes	100 - 400
Elapsed Time per Case	32 Hour(s)

- **JSS3 Resources Used**

Fraction of Usage in Total Resources*1(%): 0.50

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage*2(%)
TOKI-SORA	13,575,402.83	0.61
TOKI-ST	3,880.84	0.00
TOKI-GP	0.00	0.00
TOKI-XM	0.00	0.00
TOKI-LM	64.50	0.00
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	190.71	0.16
/data and /data2	10,983.66	0.07
/ssd	2,091.67	0.20

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage*2 (%)
J-SPACE	14.32	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)	24.11	0.01

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