# 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/analyis 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 peformance in a timely manner and the technology developments.

## Achievements of the Year

Studes 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 drag and performances by installing short inlet nacelles and BLI nacellesa have been clarified in the studies. Figure 1 shows TRA2035A configuration used in the studies. In addition, CFD prediction accuracy of drag and pitching moment near the condition of buffet have been validated in CFD Drag Prediction Workshop.

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

## Publications

- Oral Presentations

Murayama, M., Ito, Y. and Furuya, R., "JAXA's TAS Code Results for the 7th AIAA CFD Drag Prediction Workshop," 7th AIAA CFD Drag Prediction Workshop, 2022.

## Usage of JSS

### Computational Information

| | |
|---|---|
| Process Parallelization Methods | MPI |
| Thread Parallelization Methods | OpenMP |
| Number of Processes | 100 - 648 |
| Elapsed Time per Case | 10 Hour(s) |

- **JSS3 Resources Used**

Fraction of Usage in Total Resources[*1](%): 0.75

Details

| Computational Resources | | |
|---|---|---|
| System Name | CPU Resources Used (core x hours) | Fraction of Usage[*2](%) |
| TOKI-SORA | 20,356,700.92 | 0.89 |
| TOKI-ST | 25,288.37 | 0.03 |
| TOKI-GP | 0.00 | 0.00 |
| TOKI-XM | 0.00 | 0.00 |
| TOKI-LM | 3,701.17 | 0.25 |
| 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 | 175.71 | 0.16 |
| /data and /data2 | 11,642.43 | 0.09 |
| /ssd | 3,466.07 | 0.48 |

| Archiver Resources | | |
|---|---|---|
| Archiver Name | Storage Used (TiB) | Fraction of Usage[*2] (%) |
| J-SPACE | 76.08 | 0.34 |

[*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) | 44.38 | 0.03 |

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