

high-fidelity analysis tools development for aerodynamic cascade design / Unsteady analyses of Compressor

Report Number: R22EDA101P12

Subject Category: Aeronautical Technology

URL: <https://www.jss.jaxa.jp/en/ar/e2022/20796/>

● Responsible Representative

Tatsuya Ishii, Aviation Technology Directorate, Aviation Environmental Sustainability Innovation Hub

● Contact Information

Junichi Kazawa, Aeronautical Technology Directorate, Aviation Environmental Sustainability Innovation Hub(kazawa.junichi@jaxa.jp)

● Members

Junichi Kazawa, Kenshi Yamashita

● Abstract

It contributes to the design of jet engines by improving the accuracy of stall point prediction in numerical analysis in multi-stage compressor blade rows.

● Reasons and benefits of using JAXA Supercomputer System

The unsteady analyses of a multi-stage compressor will be very large for satisfactory results. So we can not be calculated in a realistic time using anything other than JSS.

● Achievements of the Year

A full circumference unsteady analysis was performed to simulate rotating stall in the compressor cascade and investigate its mechanism.

● Publications

N/A

● Usage of JSS

● Computational Information

| | |
|---------------------------------|--------------|
| Process Parallelization Methods | MPI |
| Thread Parallelization Methods | N/A |
| Number of Processes | 36 - 1152 |
| Elapsed Time per Case | 2000 Hour(s) |

- **JSS3 Resources Used**

Fraction of Usage in Total Resources*1(%): 2.63

Details

| Computational Resources | | |
|-------------------------|--------------------------------------|------------------------|
| System Name | CPU Resources Used (core x hours) | Fraction of Usage*2(%) |
| TOKI-SORA | 39,446,111.51 | 1.72 |
| TOKI-ST | 9,464,976.24 | 9.46 |
| TOKI-GP | 0.00 | 0.00 |
| TOKI-XM | 0.00 | 0.00 |
| TOKI-LM | 0.00 | 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 | 5.70 | 0.01 |
| /data and /data2 | 7,281.78 | 0.06 |
| /ssd | 209.63 | 0.03 |

| Archiver Resources | | |
|--------------------|--------------------|-------------------------|
| Archiver Name | Storage Used (TiB) | Fraction of Usage*2 (%) |
| J-SPACE | 9.25 | 0.04 |

*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) | 269.87 | 0.19 |

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