# Innovative Green Aircraft Technology : High Efficiency and Low Noise Aircraft I

Report Number: R20EA0601
Subject Category: Aeronautical Technology
URL: https://www.jss.jaxa.jp/en/ar/e2020/14162/

## Responsible Representative

Yoshikazu Makino, Aeronautical Technology Directorate, Aviation Systems Research Unit

## Contact Information

Dongyoun Kwak, Aviation Systems Research Unit(kwak.dongyoun@jaxa.jp)

## Members

Mitsuhiro Murayama, Dongyoun Kwak, Naoko Tokugawa, Fumitake Kuroda, Yoshine Ueda, Keisuke Ohira, Tohru Hirai, Kentaro Tanaka, Monami Sasamori, Takahiro Ishida, Kosuke Toyoda

## Abstract

The purpose of the iGreen research is to develop and mature a bunch of advanced and innovative technologies on aerodynamics, aeroacoustics, and structures to enable airframe design with higher environmental performances, thereby helping the Japanese aviation industry to enhance its share on the global market. In addition to verifying practical application of these technologies, we will also work on the development of elemental and system technologies.

Ref. URL: https://www.aero.jaxa.jp/eng/research/ecat/igreen/

## Reasons and benefits of using JAXA Supercomputer System

CFD analysis are used for the understanding of aerodynamic characteristics and evaluation of the performance in the aircraft design phase. Huge calculation resources and costs were required for the high fidelity and quick response CFD analysis for the optimum aerodynamic design process on complex aircraft geometry. JSS2 can achieve those requirements, the cost and time are drastically saved on the CFD analysis.

## Achievements of the Year

The attachment-line transition is one of mechanism which cause the boundary layer transition from laminar to turbulent on the transonic aircraft which has swept wing. Aerodynamic devices installed at wing root region were investigated to prevent attachment-line transition (ACD: Anti attachment-line Contamination Device). Many ACD concepts are installed on TRA2022 (JAXA Technology Reference Aircraft), aerodynamic characteristics are investigated including preventing boundary layer transition. A Chevron type ACD was selected from feasibility study. Parametric studies were performed on the Chevron ACD geometry. A initial geometry of the Chevron ACD was obtained which can be prevented the boundary layer transition without significant additional drag increment.

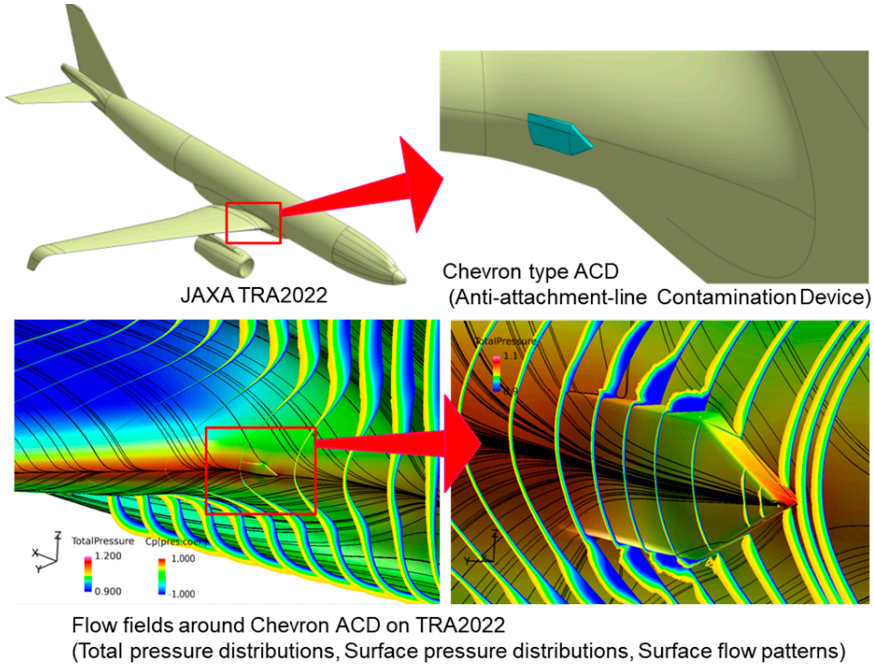


Fig. 1: Flow fields around a Chevron type ACD

## Publications

N/A

## Usage of JSS

### Computational Information

| | |
|---|---|
| Process Parallelization Methods | MPI |
| Thread Parallelization Methods | Automatic Parallelization |
| Number of Processes | 1024 |
| Elapsed Time per Case | 5000 Second(s) |

- **Resources Used(JSS2)**

Fraction of Usage in Total Resources[*1](%): 3.52

Details

| Computational Resources | | |
|---|---|---|
| System Name | Amount of Core Time (core x hours) | Fraction of Usage[*2](%) |
| SORA-MA | 20,340,013.97 | 3.85 |
| SORA-PP | 118,918.47 | 0.93 |
| SORA-LM | 1,328.29 | 0.78 |
| SORA-TPP | 0.00 | 0.00 |

| File System Resources | | |
|---|---|---|
| File System Name | Storage Assigned (GiB) | Fraction of Usage[*2](%) |
| /home | 241.02 | 0.22 |
| /data | 68,100.22 | 1.32 |
| /ltmp | 10,328.12 | 0.88 |

| Archiver Resources | | |
|---|---|---|
| Archiver Name | Storage Used (TiB) | Fraction of Usage[*2](%) |
| J-SPACE | 11.50 | 0.38 |

[*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](%): 1.81

Details

| Computational Resources | | |
|---|---|---|
| System Name | Amount of Core Time (core x hours) | Fraction of Usage[*2](%) |
| TOKI-SORA | 9,428,306.37 | 2.03 |
| TOKI-RURI | 43,820.41 | 0.25 |
| TOKI-TRURI | 0.00 | 0.00 |

| File System Resources | | |
|---|---|---|
| File System Name | Storage Assigned (GiB) | Fraction of Usage[*2](%) |
| /home | 374.29 | 0.26 |
| /data | 76,273.81 | 1.28 |
| /ssd | 479.11 | 0.25 |

| Archiver Resources | | |
|---|---|---|
| Archiver Name | Storage Used (TiB) | Fraction of Usage[*2](%) |
| J-SPACE | 11.50 | 0.38 |

[*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.