

## **Aerodynamic evaluation of an annular plug inside a flow-through nacelle of an aircraft model.**

Report Number: R21EDA201N05

Subject Category: Aeronautical Technology

URL: <https://www.jss.jaxa.jp/en/ar/e2021/18203/>

### **● Responsible Representative**

Takashi Aoyama, Aeronautical Technology Directorate, Aircraft Lifecycle Innovation Hub

### **● Contact Information**

Makoto Ueno, Aviation Technology Directorate, Aircraft Lifecycle Innovation Hub

([ueno.makoto@jaxa.jp](mailto:ueno.makoto@jaxa.jp))

### **● Members**

Chigusa Hamada, Kenji Hayashi, Takashi Ishida, Fumitake Kuroda, Masaru Naruoka, Hiroya Toriida, Makoto Ueno, Takahiro Uchiyama, Yuko Ueno, Kento Yamada, Takahiro Yamamoto

### **● Abstract**

The air flow rate in the engine nacelle is adjusted using annular plugs placed in the nacelle to evaluate the effect of the air flow rate in the engine nacelle on the aerodynamic characteristics of the aircraft.

### **● Reasons and benefits of using JAXA Supercomputer System**

It is necessary to perform CFD computation including flow around a whole aircraft because it requires highly parallelized computation. Additionally, the JSS2 was chosen because the FaSTAR CFD solver is optimized, as well.

### **● Achievements of the Year**

Flowfields around the wind tunnel testing model for detailed aerodynamic modeling with and without an annular plug inside a flow-through nacelle were obtained using FaSTAR.

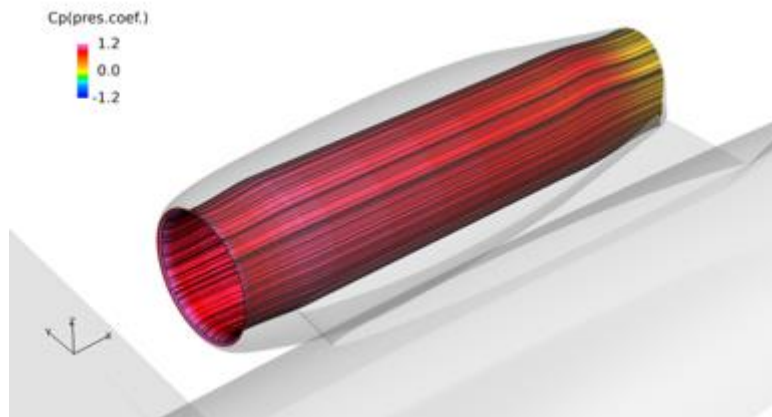


Fig. 1: Limiting streamlines inside a flow-through nacelle without an annular plug (Mach 0.8, AoA 3deg)

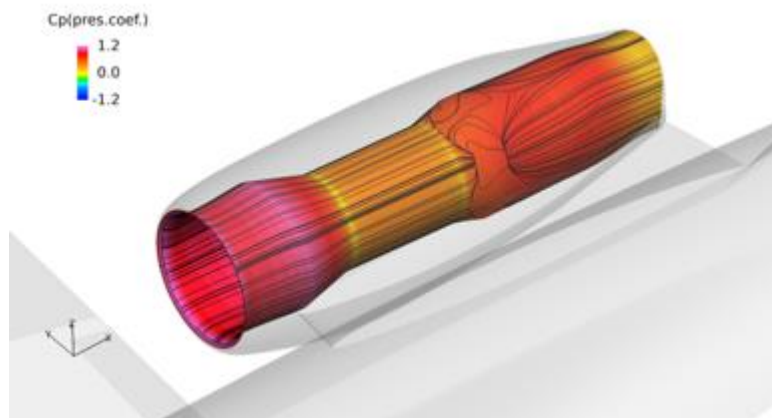


Fig. 2: Limiting streamlines inside a flow-through nacelle with an annular plug (Mach 0.8, AoA 3deg)

## ● Publications

N/A

## ● Usage of JSS

## ● Computational Information

|                                 |              |
|---------------------------------|--------------|
| Process Parallelization Methods | MPI          |
| Thread Parallelization Methods  | N/A          |
| Number of Processes             | 25           |
| Elapsed Time per Case           | 12.5 Hour(s) |

● **JSS3 Resources Used**

Fraction of Usage in Total Resources<sup>\*1</sup>(%): 2.77

Details

| Computational Resources |                                      |                                     |
|-------------------------|--------------------------------------|-------------------------------------|
| System Name             | CPU Resources Used<br>(core x hours) | Fraction of Usage <sup>*2</sup> (%) |
| TOKI-SORA               | 65,869,676.35                        | 3.20                                |
| TOKI-ST                 | 5,701.32                             | 0.01                                |
| 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 <sup>*2</sup> (%) |
| /home                 | 752.15                 | 0.75                                |
| /data and /data2      | 131,318.39             | 1.40                                |
| /ssd                  | 398.89                 | 0.10                                |

| Archiver Resources |                    |                                     |
|--------------------|--------------------|-------------------------------------|
| Archiver Name      | Storage Used (TiB) | Fraction of Usage <sup>*2</sup> (%) |
| J-SPACE            | 71.32              | 0.48                                |

<sup>\*1</sup>: Fraction of Usage in Total Resources: Weighted average of three resource types (Computing, File System, and Archiver).

<sup>\*2</sup>: 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<br>Used<br>(Hours) | Fraction of Usage <sup>*2</sup> (%) |
| ISV Software Licenses<br>(Total) | 21.20                                    | 0.01                                |

<sup>\*2</sup>: Fraction of Usage : Percentage of usage relative to each resource used in one year.