

## Noise suppression technology for aircraft jet engines

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### ● Abstract

Ultra high bypass ratio aviation jet engines have a smaller sound absorbing liner area than conventional engines. In this project, we will develop sound-absorbing device technology that provides high noise reduction performance even with a small-sized sound-absorbing liner.

Ref. URL: <https://www.aero.jaxa.jp/eng/research/ecat/dante/>

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

To perform many LES calculations by changing the shape of the sound absorbing liner and the incident sound frequency, the calculation performance and the storage capacity of JAXA supercomputer system were required.

### ● Achievements of the Year

The sound absorption performance of an acoustic liner was evaluated using the calculation method described in JAXA-SP-20-008. Numerical calculations were performed for a laminar flow of  $M=0.3$  in a two-dimensional geometry, which simulates the flowduct test facility to measure the sound absorption performance of the acoustic liner under a glazing flow environment. An example is shown in Fig. 1. Compared to the baseline geometry without glazing flow (BL  $M=0$ ), the sound absorption coefficient with glazing flow (BL  $M=0.3$ ) is much lower. In this fiscal year, we investigated a new sound absorption device and proposed a shape that shows sound absorption performance as shown in (new device  $M=0.3$ ). A model test based on this shape showed higher sound absorption performance than that of the conventional sound absorbing liner.

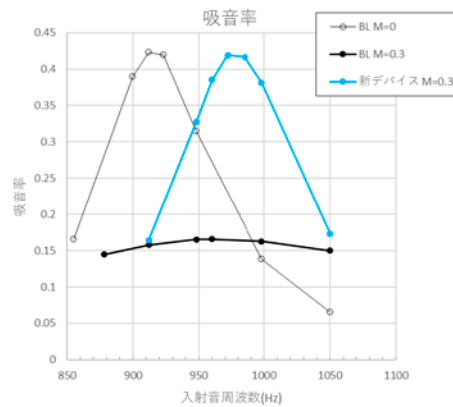


Fig. 1: Sound absorption coefficient

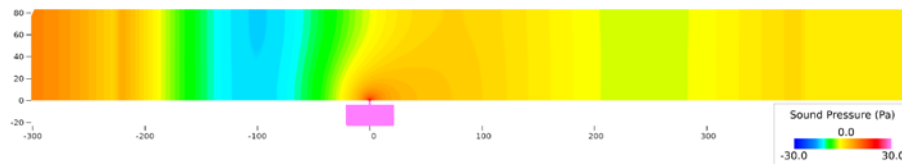


Fig. 2: Examples of instantaneous values of sound pressure (BL M=0)

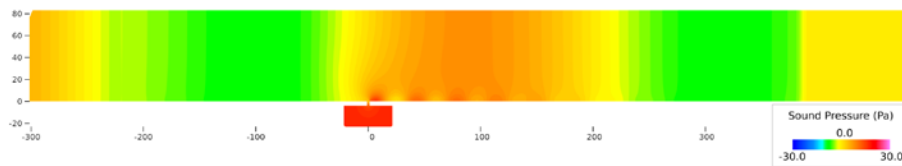


Fig. 3: Examples of instantaneous values of sound pressure (BL M=0.3)

## Publications

- Non peer-reviewed papers

1) ENOMOTO Shunji, ISHII Tatsuya, Evaluation of Sound Absorption Coefficient by Numerical Analysis of an Acoustic Liner with Glazing Flow, JAXA Special Publication: Proceedings of Fluid Dynamics Conference / Aerospace Numerical Simulation Symposium 2020 Online, JAXA-SP-20-008

## Usage of JSS

### Computational Information

Process Parallelization Methods	MPI
Thread Parallelization Methods	OpenMP
Number of Processes	1 - 144
Elapsed Time per Case	20 Hour(s)

- **Resources Used(JSS2)**

Fraction of Usage in Total Resources<sup>\*1</sup>(%): 0.89

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage <sup>*2</sup> (%)
SORA-MA	972,298.20	0.18
SORA-PP	331,573.43	2.60
SORA-LM	3.73	0.00
SORA-TPP	389,197.57	36.73

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage <sup>*2</sup> (%)
/home	28.56	0.03
/data	2,002.37	0.04
/tmp	4,428.52	0.38

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage <sup>*2</sup> (%)
J-SPACE	12.52	0.41

<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.

- **Resources Used(JSS3)**

Fraction of Usage in Total Resources<sup>\*1</sup>(%): 0.40

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage <sup>*2</sup> (%)
TOKI-SORA	793,350.37	0.17
TOKI-RURI	384,090.71	2.20
TOKI-TRURI	36,852.00	2.97

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage <sup>*2</sup> (%)
/home	13.53	0.01
/data	3,537.44	0.06
/ssd	567.22	0.30

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage <sup>*2</sup> (%)
J-SPACE	12.52	0.41

<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.