

Noise suppression technology for aircraft jet engines

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● Abstract

Noise generated from the jet engine is dominant to total aircraft noise level and it is very important to reduce this. In this project, demonstration of exhaust noise reduction by changing exhaust duct shape, and study of noise reduction technique by numerical analysis are carried out.

<http://www.aero.jaxa.jp/eng/research/ecat/greenengine/>

● Reasons for using of JSS2

The calculation was LES with a large amount of computation and storage usage. It was necessary to use SORA-PP and SORA-FS.

● Achievements of the Year

In order to investigate the behavior when sound waves pass through a jet, LES calculation of a jet was performed using UPACS-LES, and sound waves were injected from the side of the jet. The temperature distribution is shown in Fig. 1. Jet's Mach number is 0.8. Figure 2 shows the sound pressure. It turned out that the sound reflected, refracted, and diffused by the jet. Also 3-D flow field around the aperture of the acoustic liner was simulated to study the mechanism of the improvement of sound absorbing performance when the bias flow presents for the aperture. Figure 3 shows the vorticity contour near the tapered aperture and we can observe that the distribution of the turbulent vortices, which is considered to be the dissipation source, is wider in space in the bias flow case.

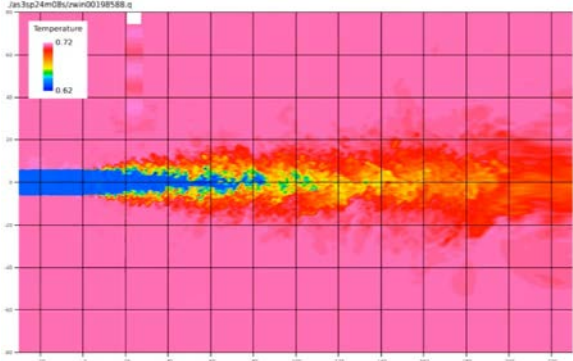


Fig.1 Temperature

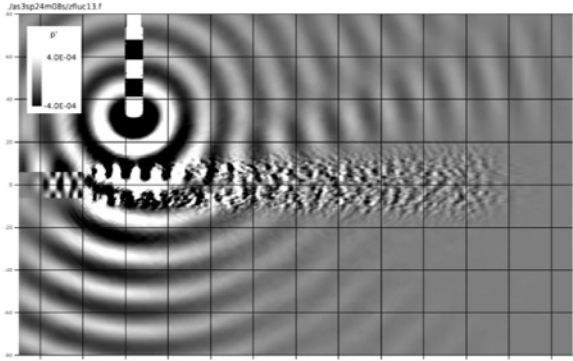


Fig.2 Sound pressure

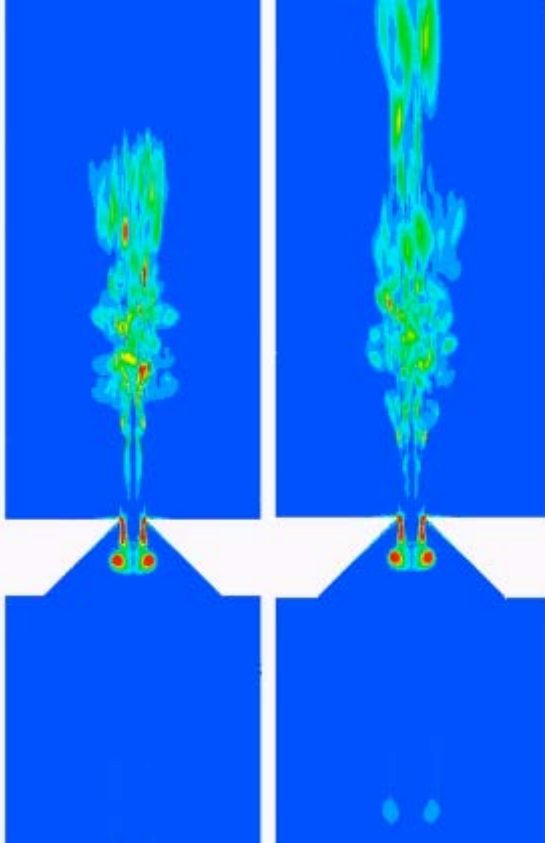


Fig.3 Vorticity contour near the aperture, without(left) and with(right) the bias flow.

● **Publications**

N/A

● **Usage of JSS2**

● **Computational Information**

Parallelization Methods	MPI
Thread Parallelization Methods	N/A
Number of Processes	12 - 36
Elapsed Time per Case	39.00 hours

● **Resources Used**

Fraction of Usage in Total Resources*1 (%): 0.18

Details

Computing Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage*2 (%)
SORA-MA	0.45	0.00
SORA-PP	252,793.70	3.17
SORA-LM	0.00	0.00
SORA-TPP	8,282.24	0.92

File System Resources		
File System Name	Storage assigned(GiB)	Fraction of Usage*2 (%)
/home	022.12	0.02
/data	2,213.67	0.04
/ltmp	2,678.57	0.20

Archiver Resources		
Archiver System Name	Storage used(TiB)	Fraction of Usage*2 (%)
J-SPACE	11.28	0.49

*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