Basic research for system integration of silent supersonic airplane technologies

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● **Abstract**

The system integration design technologies for achieving low sonic-boom, low aerodynamic drag, low landing and take-off noise, and light weight simultaneously are the key technologies for future supersonic airplanes. JAXA is promoting the R&D for these technologies based on our experiences of demonstrating the advanced low-drag and low-boom design concepts.

Ref. URL: http://www.aero.jaxa.jp/eng/research/frontier/sst/

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

To achieve low sonic-boom, low aerodynamic drag, low landing and take-off noise, and light weight simultaneously, the multi-objective optimization tools are utilized in the design study. The super computer is necessary to obtain the multiple objective function efficiently with many numerical simulations.

● **Achievements of the Year**

Buzz is self-excited oscillation phenomena of shock system, which appears at a supersonic diffuser of a supersonic inlet in subcritical operation. In order to suppress buzz, we proposed a new concept of supersonic inlet, which has a duct with constant cross-sectional area. Numerical analysis using the compressible fluid solver FaSTAR showed that flow field of the inlet based on proposed idea is more stable than traditional inlets.
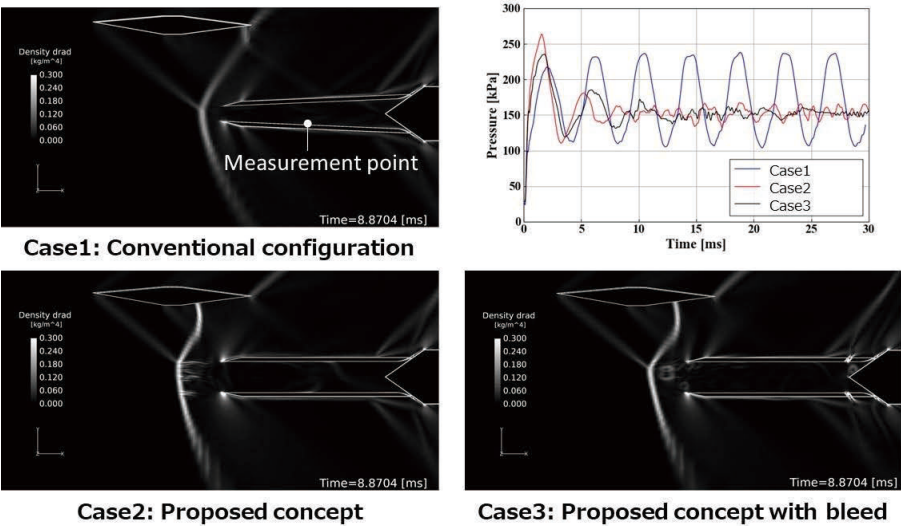
Fig. 1: Flow field and pressure time history

Publications

N/A

Usage of JSS2

Computational Information

Process Parallelization Methods	MPI
Thread Parallelization Methods	Automatic Parallelization
Number of Processes	128
Elapsed Time per Case	5.3 Hour(s)

Resources Used

Fraction of Usage in Total Resources[*1](%): 0.53

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage[*2](%)
SORA-MA	4,149,941.89	0.50
SORA-PP	64,731.42	0.42
SORA-LM	884.46	0.37
SORA-TPP	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage*2(%)
/home	1,472.18	1.23
/data	60,358.42	1.03
/ltmp	13,085.94	1.11

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage*2(%)
J-SPACE	0.88	0.02

*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.