Basic research for system integration of silent supersonic airplane

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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/

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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, the biggest issue in the operation of inlets for supersonic aircraft, is caused by the inflow of shear layers generated in the external compression region of the inlet. For surpressing the buzz, we study on a design concept applying constant area duct which owns bypass duct to the inlet instead of conventional subsonic diffuser (Fig. 1). In order to asses feasibility of the inlet concept, a two dimensional inlet model which does not have the bypass was designed as a performance reference and evaluated by CFD analysis. The CFD results show the inlet model has adequate characteristics in total pressure recovery and aerodynamicl drag (Fig. 2).

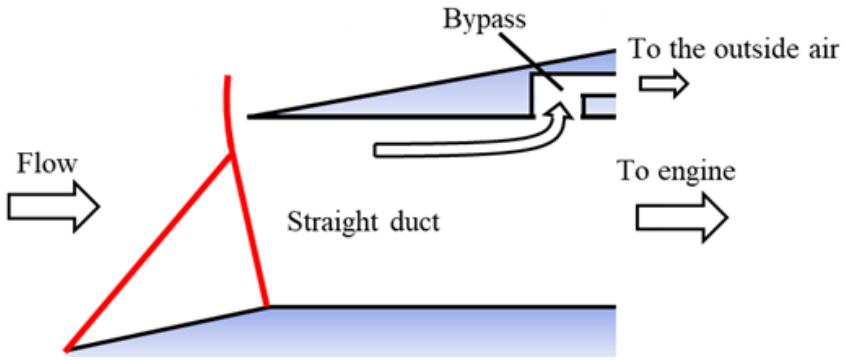

Fig. 1: Inlet concept for buzz suppression

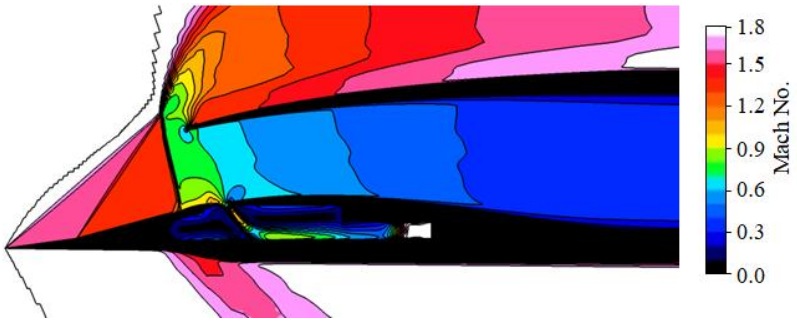

Fig. 2: Flow field around the inelt model

- **Publications**

  N/A

- **Usage of JSS**

- **Computational Information**

Process Parallelization Methods	MPI
Thread Parallelization Methods	Automatic Parallelization
Number of Processes	128 - 144
Elapsed Time per Case	24 Hour(s)

- **JSS3 Resources Used**

Fraction of Usage in Total Resources[*1](%): 0.03

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage[*2](%)
TOKI-SORA	249,790.39	0.01
TOKI-ST	79,237.94	0.10
TOKI-GP	0.00	0.00
TOKI-XM	0.00	0.00
TOKI-LM	133.72	0.01
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[*2](%)
/home	1,455.00	1.45
/data and /data2	88,165.00	0.94
/ssd	5,645.00	1.46

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage[*2](%)
J-SPACE	7.41	0.05

[*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.

- **ISV Software Licenses Used**

ISV Software Licenses Resources		
	ISV Software Licenses Used (Hours)	Fraction of Usage*2(%)
ISV Software Licenses (Total)	1,519.32	1.06

*2: Fraction of Usage：Percentage of usage relative to each resource used in one year.