Re-BooT project

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Abstract

This project aims to contribute to the realization of commercial supersonic aircraft capable of supersonic flight over land and to the promotion of Japanese aircraft manufacturing industry related to supersonic aircraft. The project will conduct flight demonstrations of robust low-boom design technology, which is a key technology, design a practical supersonic concept aircraft, contribute to the establishment of civilian supersonic aircraft standards, and conduct ground demonstrations and research and development of related technologies.

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

Reasons and benefits of using JAXA Supercomputer System

The development of a flight demonstrator aircraft that demonstrates robust low-boom design technology requires accurate numerical simulation to estimate aerodynamic performance and sonic boom characteristics. JSS is used to accurately and efficiently estimate the aerodynamic characteristics of complex geometries and to design a low-boom supersonic flight demonstrator aircraft.

Achievements of the Year

The flight demonstrator aircraft with robust low-boom design technology is based on an airliner geometry that is 16% scaled model of the actual low-boom designed airliner. However, in order to conduct flight demonstration tests, various constraints are imposed to meet the requirements of the actuator installation, the structural strength, etc. Therefore, aerodynamic design using CFD analysis was conducted, and numerical analysis data confirmed that both aircraft feasibility and low boom characteristics. And then, CFD analyses were conducted over a wide range of flight speeds from Mach=0.8 to 1.4, assuming actual flight of the designed flight demonstrator aircraft. The obtained aerodynamic data (Fig.1) (Fig.2) and aerodynamic model were used for structural analysis and flight

analysis. Its feasibility for the flight test is confirmed and the basic design of the demonstrator aircraft was completed by using the CFD analysis results.

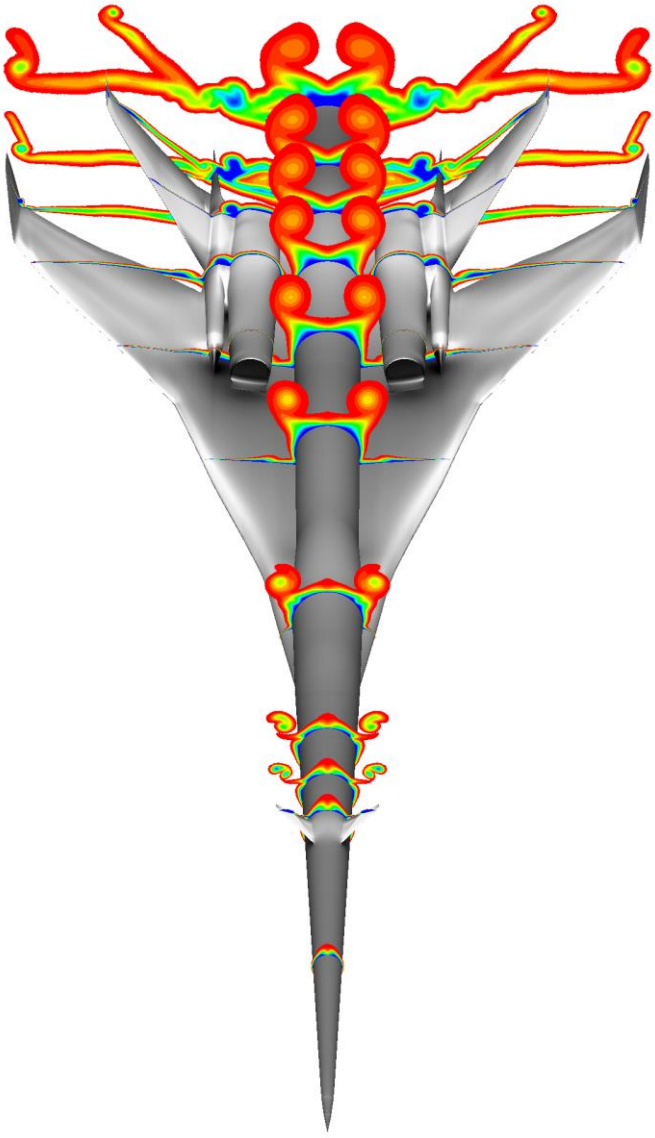

Fig. 1: Total pressure distribution around Re-BooT flight demonstrator
(Mach=0.8, AoA=4.22deg.)

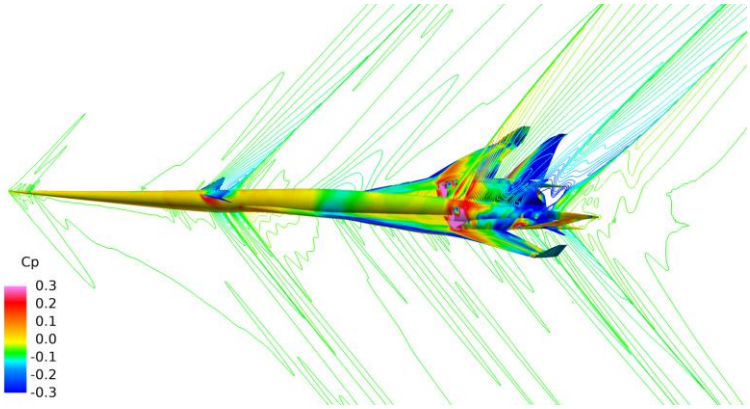

Fig. 2: Pressure distribution on the surface and symmetric plane of Re-BooT flight demonstrator (Mach=1.25, AoA=3.91deg.)

Publications

N/A

Usage of JSS

Computational Information

Process Parallelization Methods	MPI
Thread Parallelization Methods	Automatic Parallelization
Number of Processes	960 - 2400
Elapsed Time per Case	14 Hour(s)

JSS3 Resources Used

Fraction of Usage in Total Resources[*1](%): 1.64

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage[*2](%)
TOKI-SORA	44,254,228.91	2.03
TOKI-ST	77,901.28	0.08
TOKI-GP	0.00	0.00
TOKI-XM	142.67	0.07
TOKI-LM	5,717.57	0.41
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	898.67	0.61
/data and /data2	152,140.90	0.73
/ssd	1,721.14	0.09

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage*2 (%)
J-SPACE	22.84	0.07

*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)	567.92	0.39

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