Innovative Green Aircraft Technology : High Efficiency and Low Noise Aircraft I

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Abstract

The purpose of the iGreen research is to develop and mature a bunch of advanced and innovative technologies on aerodynamics, aeroacoustics, and structures to enable airframe design with higher environmental performances. In addition to verifying practical application of these technologies, we will also work on the development of elemental and system technologies.

Ref. URL: https://www.aero.jaxa.jp/eng/research/ecat/igreen/

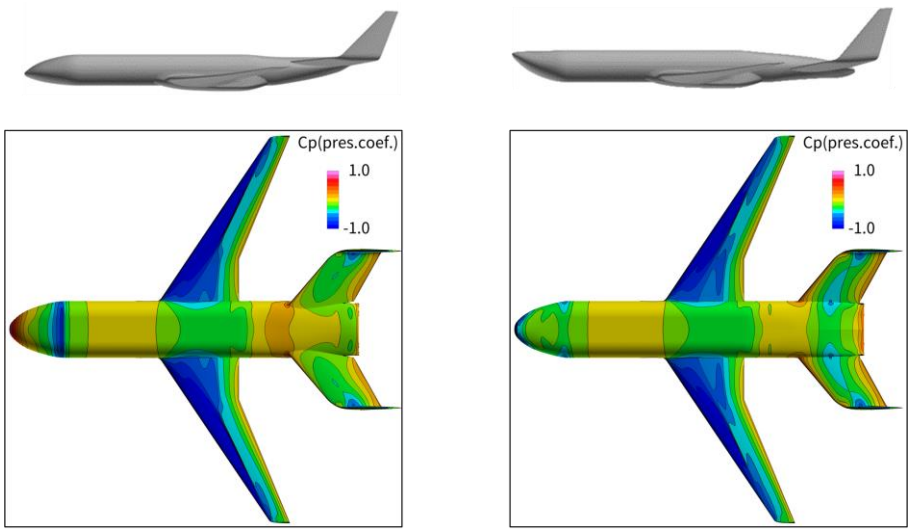
Reasons and benefits of using JAXA Supercomputer System

CFD analysis are used for the understanding of aerodynamic characteristics and evaluation of the performance in the aircraft design phase. Huge calculation resources and costs were required for the high fidelity and quick response CFD analysis for the optimum aerodynamic design process on complex aircraft geometry. JSS3 can achieve those requirements, the cost and time are drastically saved on the CFD analysis.

Achievements of the Year

Collaborative research activities with universities have been conducted for aerodynamic technologies to improve the environmental performances of subsonic aircraft such as low fuel consumption and low noise. In this year, aerodynamic design of anti-contamination devices on laminar wing, the fuselage design on a double bubble aircraft configuration (JAXA TRA2035A) and

blended wing body configuration(BWB). On the fuselage design on TRA2035A, improvement of the Lift-to-drag ratio on the transonic cruise conditions were obtained by modifying the nose and tail geometries comparing with baseline configuration. The camber effects on the wide fuselage and interactions with main wing and tails causes lift increment without obvious increment drag. At the same time, it was understood that pitching moment is very sensitive on rear fuselage geometry including the propulsion system.



(A) Baseline configuration (B) Fuselage designed configuration

Fig. 1: Comparison of the upper surface pressure distributions on baseline configuration and fuselage designed configuration of TRA2035A

Publications

- Oral Presentations

Kenya Takahashi, Ryutaro Furuya, Toshiyuki Nomura, Dongyoun Kwak, Katsuyoshi Fukiba : Parametric Studies of the Fuselage Geometry of a Double-Bubble Aircraft Configuration, 2021 Asia-Pacific International Symposium on Aerospace Technology, Jeju, Korea, 15-17 Nov, 2021.

Usage of JSS

Computational Information

Process Parallelization Methods	MPI
Thread Parallelization Methods	N/A
Number of Processes	64 - 1024
Elapsed Time per Case	10 Hour(s)

- **JSS3 Resources Used**

Fraction of Usage in Total Resources[*1](%): 0.78

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage[*2](%)
TOKI-SORA	17,791,676.38	0.87
TOKI-ST	130,345.16	0.16
TOKI-GP	0.00	0.00
TOKI-XM	0.00	0.00
TOKI-LM	0.03	0.00
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	1,360.18	1.35
/data and /data2	95,313.14	1.02
/ssd	830.14	0.21

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage[*2](%)
J-SPACE	10.97	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)	3,391.34	2.38

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