

Cooperative Research: Research on Dynamic Stability Analysis

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● Abstract

The aircraft dynamic stability is an essential information for evaluating the flight stability and designing the aircraft maneuver control systems. But there are limitations for the textbook-based estimations and the wind tunnel tests and, therefore, the CFD-based stability analysis is expected to dissolve the limitations. Our objective in this research is to apply FaSTAR, a high-speed solver for compressible flow developed in JAXA, for predicting the dynamic derivatives to validate the accuracy of the code.

● Reasons and benefits of using JAXA Supercomputer System

The prediction for the dynamic derivatives requires quite a bit of numerical simulations, both for steady and unsteady states. The vast computational resources provided by JSS allow us to enhance the process and make it much faster than we do them on desktop computers.

● Achievements of the Year

We conducted unsteady simulations over a Standard Dynamics Model (SDM) for predicting the dynamic derivatives. We employed Spalart-Allmaras based DDES (Deleyed Detached Eddy Simulation) method for simulating the turbulent flows over the model. We compared the derivatives with experimental results and confirmed that the simulation could provide accurate predictions for aircraft's dynamic stability.

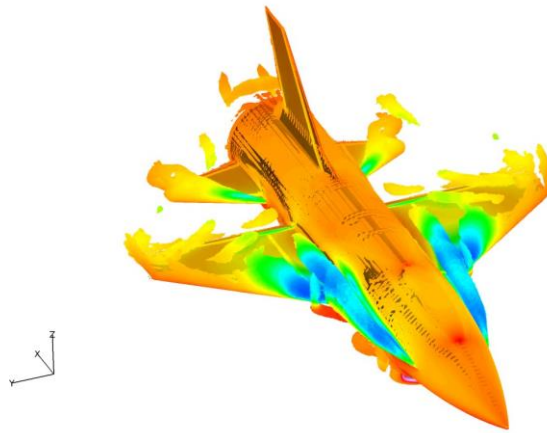


Fig. 1: Flow visualization over the model (Video. Video is available on the web.)

- **Publications**

N/A

- **Usage of JSS**

- **Computational Information**

Process Parallelization Methods	MPI
Thread Parallelization Methods	N/A
Number of Processes	64 - 128
Elapsed Time per Case	144 Hour(s)

- **JSS3 Resources Used**

Fraction of Usage in Total Resources*1(%): 0.01

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage*2(%)
TOKI-SORA	336,470.19	0.01
TOKI-ST	80.66	0.00
TOKI-GP	0.00	0.00
TOKI-XM	0.00	0.00
TOKI-LM	0.00	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	433.07	0.39
/data and /data2	40,896.42	0.32
/ssd	1,405.56	0.19

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage* ² (%)
J-SPACE	39.24	0.17

*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)	0.00	0.00

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