Systematic improvement of build and comparison of aerodynamic models of aircraft

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Abstract

A research to realize efficient validation of numerical simulation using experimental data such as flight test and wind tunnel test data utilizing mathematical model.

Reasons and benefits of using JAXA Supercomputer System

It is necessary to perform CFD computation including flow around a whole aircraft because it requires highly parallelized computation. Additionally, the JSS2 was chosen because the FaSTAR CFD solver is optimized, as well.

Achievements of the Year

Computational fluid dynamics (CFD) analysis was performed to compare the aerodynamic characteristics estimated in the flight test of the business jet shape with the ground test results. Specifically, a large-scale CFD with varying Reynolds number, Mach number, airspeed angle, and stabilizer steering angle was conducted within the range including flight test conditions to make a quasi-static comparison between ground test and flight test. Made possible. In addition, using this CFD result, we are developing a tool for setting the angle of attack, speed, and altitude in flight to desired conditions.

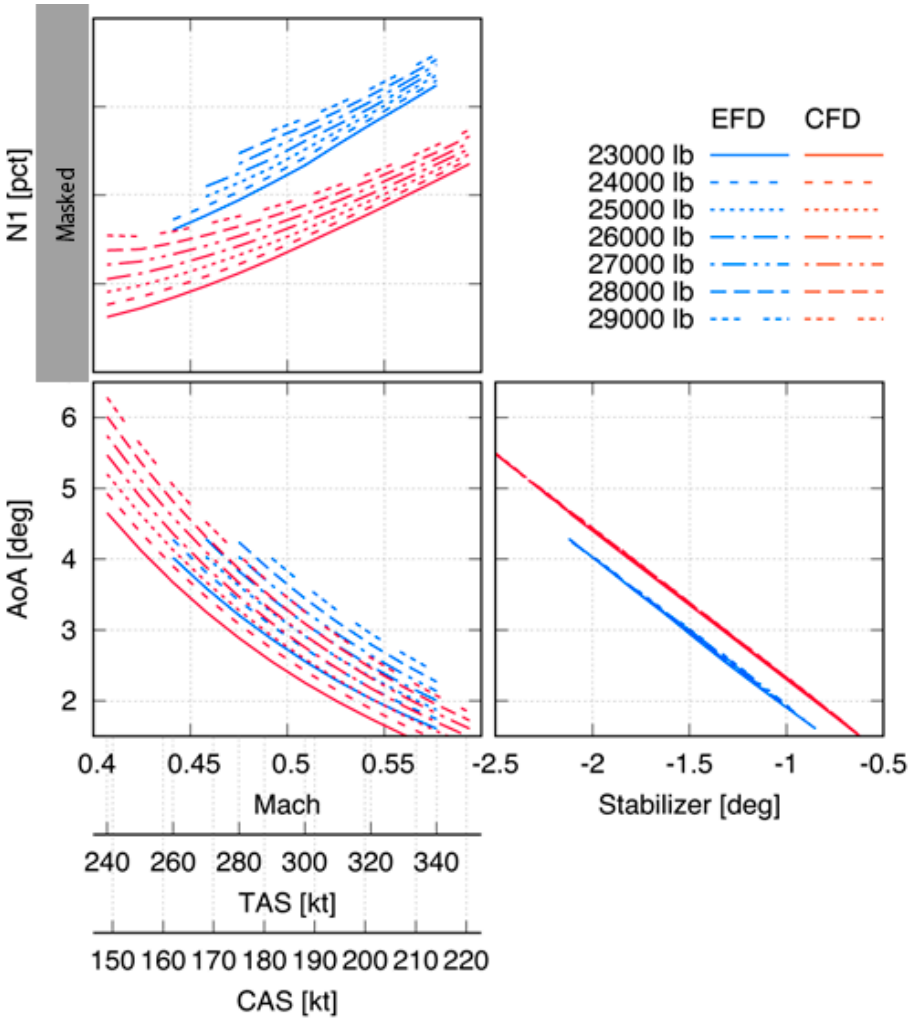

Fig. 1: An example output of the trim condition estimation tool.

Publications

N/A

Usage of JSS

Computational Information

Process Parallelization Methods	MPI
Thread Parallelization Methods	N/A
Number of Processes	25
Elapsed Time per Case	12.5 Hour(s)

- **Resources Used(JSS2)**

Fraction of Usage in Total Resources[*1](%): 1.57

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage[*2](%)
SORA-MA	9,223,562.00	1.75
SORA-PP	13,787.86	0.11
SORA-LM	0.00	0.00
SORA-TPP	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage[*2](%)
/home	643.89	0.59
/data	103,458.50	2.00
/ltmp	5,335.55	0.45

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage[*2](%)
J-SPACE	2.40	0.08

[*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.

- **Resources Used(JSS3)**

Fraction of Usage in Total Resources[*1](%): 1.01

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage[*2](%)
TOKI-SORA	5,144,727.60	1.11
TOKI-RURI	167.25	0.00
TOKI-TRURI	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage[*2](%)
/home	650.44	0.45
/data	104,622.58	1.75
/ssd	273.58	0.14

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage[*2](%)
J-SPACE	2.40	0.08

[*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.