Aerodynamic and Aeroelastic analysis for rotorcraft

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Abstract

This project involves numerical simulations related to the aerodynamics and aeroelasticity analysis for rotorcraft, which is being carried out in the aviation technology directorate. The aerodynamic performance of next-generation rotorcraft is evaluated, and technology issues and newly designed shapes are investigated through numerical simulations. Additionally, numerical simulation results are provided for preliminary studies supporting wind tunnel tests and flight tests.

Reasons and benefits of using JAXA Supercomputer System

It is necessary to perform efficient computations using the JAXA supercomputer to analyze detailed flow fields around rotorcraft for numerous computational cases.

Achievements of the Year

CFD analysis is conducted in preliminary wind tunnel tests for the development of next-generation rotorcraft and helicopter rotor blades for international workshop. In the development of next-generation rotorcraft, aerodynamic analysis is conducted based on the initial rotorcraft design, and several technology issues are identified through numerical simulations. Additionally, the results of the numerical simulations are used in the planning of the wind tunnel tests. Figure 1 shows examples of numerical simulation results. For the international workshop, aeroelastic analysis of the rotor blades is mainly carried out. The numerical results are compared with those of the workshop partners and issues related to numerical simulations and wind tunnel testing plans are discussed.

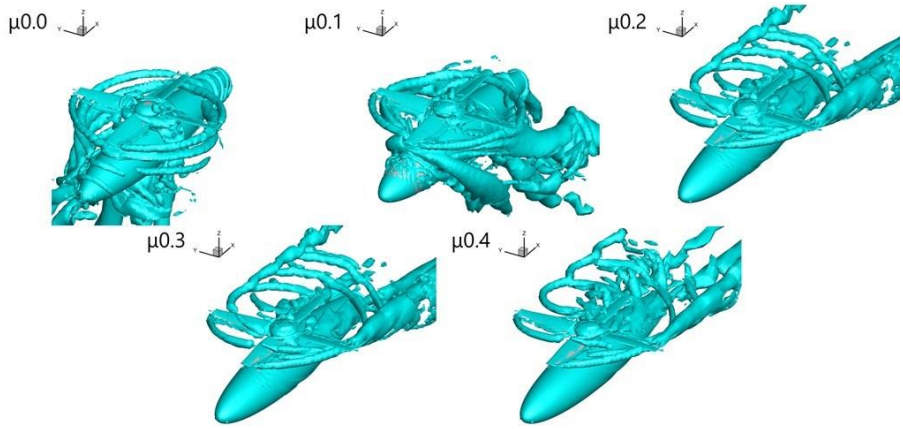

Fig. 1: examples of numerical simulation results

Publications

- Non peer-reviewed papers

Sugawara and Tanabe, "Evaluation of Airframe Aerodynamics for Electric Vertical Take-Off and Landing Aircraft," 62nd Aircraft Symposium

Tanabe and Sugawara, "Induced Velocity Distribution on a Lift-Rotor of an eVTOL Aircraft," 62nd Aircraft Symposium

Usage of JSS

Computational Information

Process Parallelization Methods	N/A
Thread Parallelization Methods	OpenMP
Number of Processes	1
Elapsed Time per Case	240 Hour(s)

- **JSS3 Resources Used**

Fraction of Usage in Total Resources[*1](%): 0.17

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage[*2](%)
TOKI-SORA	30.09	0.00
TOKI-ST	1,328,026.19	1.36
TOKI-GP	0.00	0.00
TOKI-XM	0.00	0.00
TOKI-LM	108.01	0.01
TOKI-TST	34,483.20	0.62
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	59.00	0.04
/data and /data2	112,671.60	0.54
/ssd	604.42	0.03

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage[*2] (%)
J-SPACE	0.00	0.00

[*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)	53.09	0.04

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