Prediction of Aeroelasticity of Rotor blades

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Abstract

The aeroelasticity of rotor blades affects the aerodynamic performance of the rotor. The prediction technologies for aeroelastic deformation of the rotor blade are important for rotorcraft design. The objective is to establish and validate simulation technologies for the aeroelastic analysis of the rotor. The rotorcraft community is conducting an international workshop. A wind tunnel test will be conducted, and numerous experimental data will be measured in various flight conditions. Numerical results will be validated with the experimental data and compared with other organizations in the international workshop. A preliminary analysis of the wind tunnel test is performed this year, and the test conditions are discussed.

Reasons and benefits of using JAXA Supercomputer System

Computational resources and computational capability are required to perform many numerical simulations.

Achievements of the Year

Numerical simulations are performed in hover, high-speed forward flight, descent flight, high load, and high advance ratio conditions (Fig. 1). The simulation results are compared with other organizations, and the test conditions are discussed based on the results. The prediction results by the rotorcraft CFD tool, rFlow3D, developed at JAXA show good correlations.

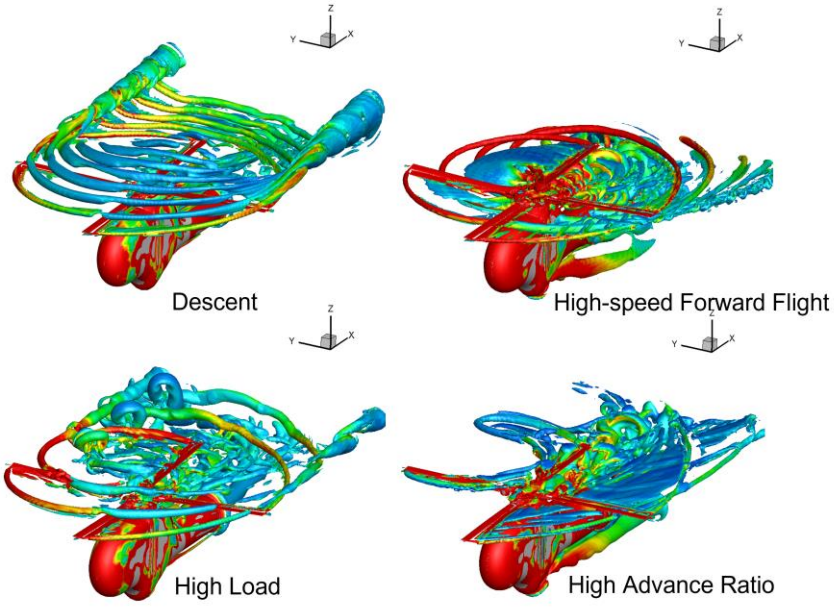

Fig. 1: Flowfield at each flight condition

Publications

- Oral Presentations

van der Wall, B. G., Lim, J. W., Riemenschneider, J., Kalow, S., Wilke, G. A., Boyd, D. D., Bailly, J., Delrieux, Y., Cafarelli, I., Tanabe, Y., Sugawara, H., Jung, S., N., Kim, D, Kang, H, J., Barakos, G., Steininger, R., "Smart Twisting Active Rotor (STAR) - Pre-Test Predictions,", 48th European Rotorcraft Forum, 2022.

Usage of JSS

Computational Information

Process Parallelization Methods	N/A
Thread Parallelization Methods	OpenMP
Number of Processes	1
Elapsed Time per Case	336 Hour(s)

- **JSS3 Resources Used**

Fraction of Usage in Total Resources[*1](%): 0.39

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage[*2](%)
TOKI-SORA	949,631.27	0.04
TOKI-ST	2,534,825.16	2.53
TOKI-GP	0.00	0.00
TOKI-XM	0.00	0.00
TOKI-LM	0.00	0.00
TOKI-TST	262,929.80	6.93
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	60.70	0.05
/data and /data2	4,210.73	0.03
/ssd	621.46	0.09

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)	26.10	0.02

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