Aerodynamic analysis for high-speed rotorcraft

Report Number: R24EDA201C20
Subject Category: Aeronautical Technology
URL: https://www.jss.jaxa.jp/en/ar/e2024/27290/

Responsible Representative

Kanako Yasue, Aviation Technology Directorate, Aviation Integration Innovation Hub

Contact Information

Hideaki Sugawara(sugawara.hideaki@jaxa.jp)

Members

Fumihiro Kajiwara, Yuki Kishi, Keita Kimura, Hideaki Sugawara, Ryo Takahashi, Yasutada Tanabe, Kanako Yasue

Abstract

This project aims to contribute to improvement in the flight range and flight speed of rotorcraft , and is conducting research and development for technologies to reduce aerodynamic drag. Rotorcraft consists of non-streamlined parts such as rotor hub, and it is necessary to reduce the drag of these parts. The purpose of this study is the development of drag reduction device to improve the aerodynamic performance of rotorcraft.

Reasons and benefits of using JAXA Supercomputer System

For the larges-scale analysis and complex flow field analysis, it is necessary to perform efficient analysis using JAXA supercomputer.

Achievements of the Year

The analysis of complex helicopter fuselage is carried out using FaSTAR, an unstructured grid solver developed at JAXA. Based on the numerical results, the drag is broken down for each component, and high drag components are identified. CFD analysis is used to evaluate the results of a design to reduce drag for high drag components. In addition, the optimal design of the rotor blades using CFD analysis (rotorcraft CFD tool, rFlow3D) are performed. The optimal blade is achieved the high performance than existing blades.

Publications

N/A

Usage of JSS

Computational Information

Process Parallelization Methods	MPI
Thread Parallelization Methods	OpenMP
Number of Processes	480 - 1920
Elapsed Time per Case	336 Hour(s)

JSS3 Resources Used

Fraction of Usage in Total Resources[*1](%): 1.49

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage[*2](%)
TOKI-SORA	21,607,018.59	0.99
TOKI-ST	3,821,949.60	3.92
TOKI-GP	0.00	0.00
TOKI-XM	0.00	0.00
TOKI-LM	123.09	0.01
TOKI-TST	2,290,546.98	41.14
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	218.28	0.15
/data and /data2	123,256.85	0.59
/ssd	604.42	0.03

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage*2 (%)
J-SPACE	7.01	0.02

*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)	701.06	0.48

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