Study of forward flight performance of multi-rotor

● Responsible Representative

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● Abstract

Study of forward flight performance of multi-rotor aircraft

● Reasons and benefits of using JAXA Supercomputer System

In order to perform a rotorcraft analysis tool.

● Achievements of the Year

Numerical analyses are performed on a rotor of a multi-rotor aircraft using rotorcraft CFD tool. To examine the advantages of a configuration with a propeller for propulsion and flying forward with a horizontal attitude (Fig. 1), the forward flight performance of the rotor was investigated by changing the forward tilt angle of the rotor. The results show that the smaller forward tilt angle improves the forward flight performance (Fig. 2).
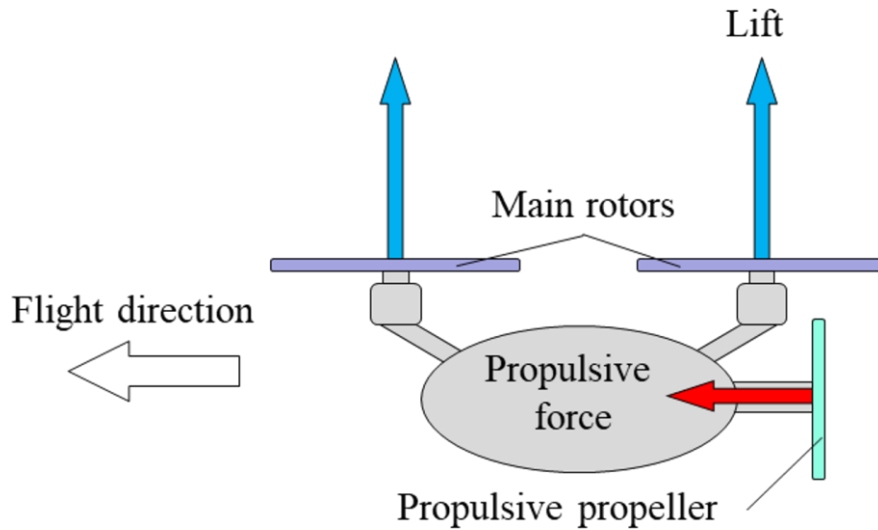
Fig. 1: Multi-rotor aircraft equipped with a propeller for propulsion and flying forward in a horizontal attitude.
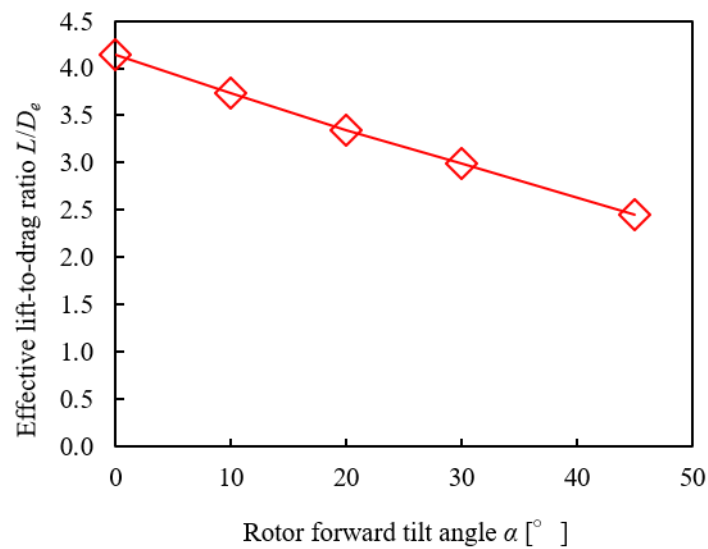

Fig. 2: Effective lift-to-drag ratio of a rotor relative to the rotor tilt angle.
Effective lift-to-drag ratio is a index of the forward flight performance of a rotor.

● **Publications**

  - Non peer-reviewed papers

  Sayama, Y., Hayami, K., Tanabe, Y., Sugawara, H., and Kameda, M., "PERFORMANCE OF A DUAL-CONTROLLED ROTOR IN LEVEL FLIGHT," 47th European Rotorcraft Forum, (2021).

  - Oral Presentations

  Sayama, Y., Hayami, K., Tanabe, Y., Sugawara, H., and Kameda, M., "PERFORMANCE OF A DUAL-CONTROLLED ROTOR IN LEVEL FLIGHT," 47th European Rotorcraft Forum, (2021).

● **Usage of JSS**

● **Computational Information**

Process Parallelization Methods	N/A
Thread Parallelization Methods	OpenMP
Number of Processes	1
Elapsed Time per Case	100 Hour(s)

● **JSS3 Resources Used**

Fraction of Usage in Total Resources[*1](%): 0.02

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage[*2](%)
TOKI-SORA	0.00	0.00
TOKI-ST	162,962.79	0.20
TOKI-GP	0.00	0.00
TOKI-XM	0.00	0.00
TOKI-LM	0.00	0.00
TOKI-TST	809.75	0.02
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	539.18	0.54
/data and /data2	33,814.51	0.36
/ssd	500.99	0.13

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)	152.96	0.11

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