

Numerical analysis for LE-9 engine turbopumps

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Subject Category: Space Technology

URL: <https://www.jss.jaxa.jp/en/ar/e2023/23625/>

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● Abstract

Design evaluation using numerical simulation is carried out for technical issues of the LE-9 engine turbo pump. Please refer to the following URL: <http://global.jaxa.jp/projects/rockets/h3/>

● Reasons and benefits of using JAXA Supercomputer System

Flutter analysis requires large-scale resources, and when a failure occurs, multiple cases must be performed in a short period of time and quickly reflected in the design by comparing them with the results of turbopump and engine firing tests.

● Achievements of the Year

Large-scale and high fidelity flutter analyses at off-nominal conditions have been carried out. As a result, it is clarified the region which is necessary to be considered and contributed to build the design method to avoid flutter occurrence by comparing computed aerodynamic damping ratio, which indicates the margin for flutter, against actual test results.

● Publications

N/A

● Usage of JSS

● Computational Information

Process Parallelization Methods	XPFortran
Thread Parallelization Methods	OpenMP
Number of Processes	20 - 960
Elapsed Time per Case	500 Hour(s)

● JSS3 Resources Used

Fraction of Usage in Total Resources*1(%): 0.09

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage*2(%)
TOKI-SORA	2,402,733.85	0.11
TOKI-ST	85.66	0.00
TOKI-GP	0.00	0.00
TOKI-XM	0.00	0.00
TOKI-LM	0.00	0.00
TOKI-TST	0.00	0.00
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	6,323.44	5.25
/data and /data2	133,539.37	0.82
/ssd	32,036.35	3.03

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage* ² (%)
J-SPACE	16.94	0.06

*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)	0.00	0.00

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