

## Numerical analysis for LE-9 engine turbopumps

Report Number: R20EK2305

Subject Category: Space Technology

URL: <https://www.jss.jaxa.jp/en/ar/e2020/14369/>

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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

In order to carry out large-scale numerical analysis of multiple cases in a short period of time and reflect those results quickly because redesign as feedbacks of engine firing test is needed.

### ● Achievements of the Year

Large-scale and high fidelity CFD of multiple design proposals of turbine blades has been carried out, and aerodynamic damping ratio, which indicates the margin for flutter, has been evaluated. Quick reflection of results helped to secure the overall schedule of H3 project.

### ● 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)

- **Resources Used(JSS2)**

Fraction of Usage in Total Resources<sup>\*1</sup>(%): 8.60

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage <sup>*2</sup> (%)
SORA-MA	52,316,548.39	9.90
SORA-PP	32,429.68	0.25
SORA-LM	0.00	0.00
SORA-TPP	60.15	0.01

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage <sup>*2</sup> (%)
/home	3,598.80	3.30
/data	14,974.81	0.29
/ltmp	5,886.50	0.50

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage <sup>*2</sup> (%)
J-SPACE	8.64	0.29

<sup>\*1</sup>: Fraction of Usage in Total Resources: Weighted average of three resource types (Computing, File System, and Archiver).

<sup>\*2</sup>: Fraction of Usage : Percentage of usage relative to each resource used in one year.

- **Resources Used(JSS3)**

Fraction of Usage in Total Resources\*<sup>1</sup>(%): 5.48

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage* <sup>2</sup> (%)
TOKI-SORA	29,614,573.04	6.37
TOKI-RURI	2,434.76	0.01
TOKI-TRURI	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage* <sup>2</sup> (%)
/home	6,085.29	4.17
/data	116,807.32	1.96
/ssd	31,058.21	16.22

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage* <sup>2</sup> (%)
J-SPACE	8.64	0.29

\*<sup>1</sup>: Fraction of Usage in Total Resources: Weighted average of three resource types (Computing, File System, and Archiver).

\*<sup>2</sup>: Fraction of Usage : Percentage of usage relative to each resource used in one year.