

## Aerodynamic analysis of Japan's next generation mainstay launch vehicle

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### ● Abstract

Japan's next generation mainstay launch vehicle which reuses the first stage is being studied in order to reduce the space transportation cost drastically. The aerodynamic characteristics in the reentry phase is estimated analytically to evaluate the feasibility of vehicle system design using the analytical results.

### ● Reasons and benefits of using JAXA Supercomputer System

Many cases of aerodynamic characteristics data of the 1st stage for wind tunnel test are needed in order to evaluate the flight feasibility of the launch vehicle in the reentry phase.

JAXA super computer system is used to prepare the data set in a short period and supports the quick feasibility study.

### ● Achievements of the Year

The results of CFD analyses which were corrected by the data from wind tunnel test were obtained using JSS. These results included the analytical results on many cases of aerodynamic characteristics data of the reusable 1st stage. This means the flight trajectory analysis of the vehicle is modified and the flight environmental condition of the vehicle becomes able to be estimated more precisely. Hence, the analytical results with JSS were very beneficial because designing the vehicle system and components is more progressing with these results.

### ● Publications

N/A

## ● Usage of JSS

### ● Computational Information

Process Parallelization Methods	MPI
Thread Parallelization Methods	N/A
Number of Processes	480 - 3840
Elapsed Time per Case	24 Hour(s)

### ● JSS3 Resources Used

Fraction of Usage in Total Resources\*1(%): 0.41

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage*2(%)
TOKI-SORA	11,134,701.75	0.51
TOKI-ST	70.09	0.00
TOKI-GP	0.00	0.00
TOKI-XM	944.21	0.46
TOKI-LM	2,232.17	0.16
TOKI-TST	879.06	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* <sup>2</sup> (%)
/home	437.50	0.30
/data and /data2	27,339.29	0.13
/ssd	717.14	0.04

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage* <sup>2</sup> (%)
J-SPACE	0.46	0.00

\*<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.

#### ● ISV Software Licenses Used

ISV Software Licenses Resources		
	ISV Software Licenses Used (Hours)	Fraction of Usage* <sup>2</sup> (%)
ISV Software Licenses (Total)	0.00	0.00

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