

## Improvement of numerical analysis for internal flow with complicated configuration inside aero-engine

Report Number: R20EA2120

Subject Category: Aeronautical Technology

URL: <https://www.jss.jaxa.jp/en/ar/e2020/14180/>

### ● Responsible Representative

Takashi Aoyama, Aeronautical Technology Directorate, Numerical Simulation Research Unit

### ● Contact Information

Taisuke Nambu, Aeronautical Technology Directorate, Numerical Simulation Research Unit(nambu.taisuke@jaxa.jp)

### ● Members

Shunji Enomoto, Junichi Kazawa, Atsushi Hashimoto, Takashi Ishida, Mitsumasa Makida, Hiroki Ugajin, Taisuke Nambu, Keiji Ueshima, Kanako Yasue, Takashi Aoyama, Kenji Hayashi

### ● Abstract

Unstructured-grid flow solver FaSTAR-Move are applied to aero-engine analysis with complicated configuration. Through the calculation, these programs are tested and investigated for the deficiency and future issue for improvement of accuracy.

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

For large scale computations in the future, programs should be tested under the same computational environment.

### ● Achievements of the Year

In order to validate the complex shape analysis function and sliding mesh function in the engine analysis module of FaSTAR-Move, an analysis of the linear cascade (T 106) with a bar and an analysis of the rotating cascade (stage 37) are conducted. It is confirmed that the function is appropriate comparing with the experimental value and the numerical result of the past research

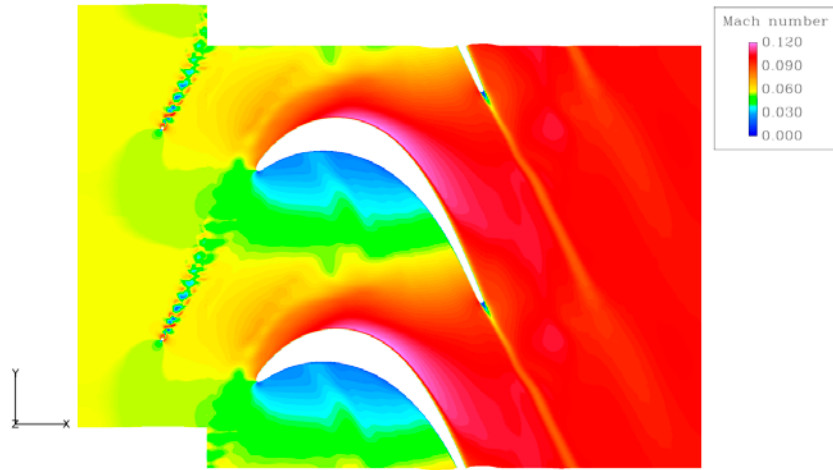


Fig. 1: Distribution of Mach number around the linear cascade (T106) with a moving bar

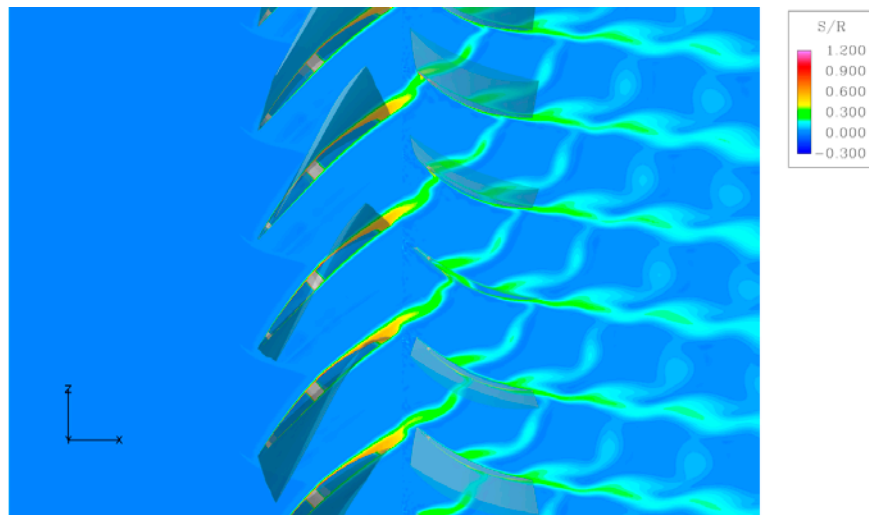


Fig. 2: Entropy distribution around the rotor cascade (Stage 37)

● **Publications**

N/A

● **Usage of JSS**

● **Computational Information**

Process Parallelization Methods	MPI
Thread Parallelization Methods	N/A
Number of Processes	32 - 768
Elapsed Time per Case	74 Hour(s)

- **Resources Used(JSS2)**

Fraction of Usage in Total Resources\*1(%): 0.20

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage*2(%)
SORA-MA	661,746.02	0.13
SORA-PP	76,987.11	0.60
SORA-LM	0.00	0.00
SORA-TPP	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage*2(%)
/home	146.30	0.13
/data	19,915.53	0.38
/tmp	3,657.51	0.31

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage*2(%)
J-SPACE	11.14	0.37

\*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.

- **Resources Used(JSS3)**

Fraction of Usage in Total Resources\*1(%): 0.17

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage*2(%)
TOKI-SORA	685,082.84	0.15
TOKI-RURI	31,676.61	0.18
TOKI-TRURI	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage*2(%)
/home	197.36	0.14
/data	28,433.46	0.48
/ssd	1,250.27	0.65

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage*2(%)
J-SPACE	11.14	0.37

\*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.