aFJR Lightweight low-pressure turbine technology development

● **Responsible Representative**

Toshio Nishizawa, aFJR Project Team, Aeronautical Technology Directorate

● **Contact Information**

Junichi Kazawa　kazawa.junichi@jaxa.jp

● **Members**

Junichi Kazawa, Toshio Nishizawa, Yasuo Horiguchi

● **Abstract**

The purpose of aFJR project is to advance research on jet engine component technologies so that Japanese manufacturers can join more effectively in international joint-development projects on next-generation jet engines. In order to suppress the weight increase of the low pressure turbine, we develop ultra lightweight　low pressure turbine technology applying heat resistant composite (ceramic based composite material (CMC)) by developing over-rotation prevention design technology and high reliability evaluation. As a part of the evaluation of high reliability, we will develop flutter boundary prediction technology considering structural characteristics and flutter prediction technology of CMC made low pressure turbine blade , after confirming the prediction accuracy of flutter occurrence point of low pressure turbine blade with comparison of experiment and CFD.

http://www.aero.jaxa.jp/eng/research/ecat/afjr/

● **Reasons for using of JSS2**

Since flutter analyses have many parameters and the number of analysis cases is enormous, it is necessary to use supercomputers to obtain results within a limited period of time.

● **Achievements of the Year**

We analyzed the flutter characteristics when the material of the blade was changed from SUS to CMC using the airfoil used in the experiments in last year. It was confirmed that flutter characteristics analyses were possible also for CMC made blades, and flutter characteristics for blades of different materials could be grasped.
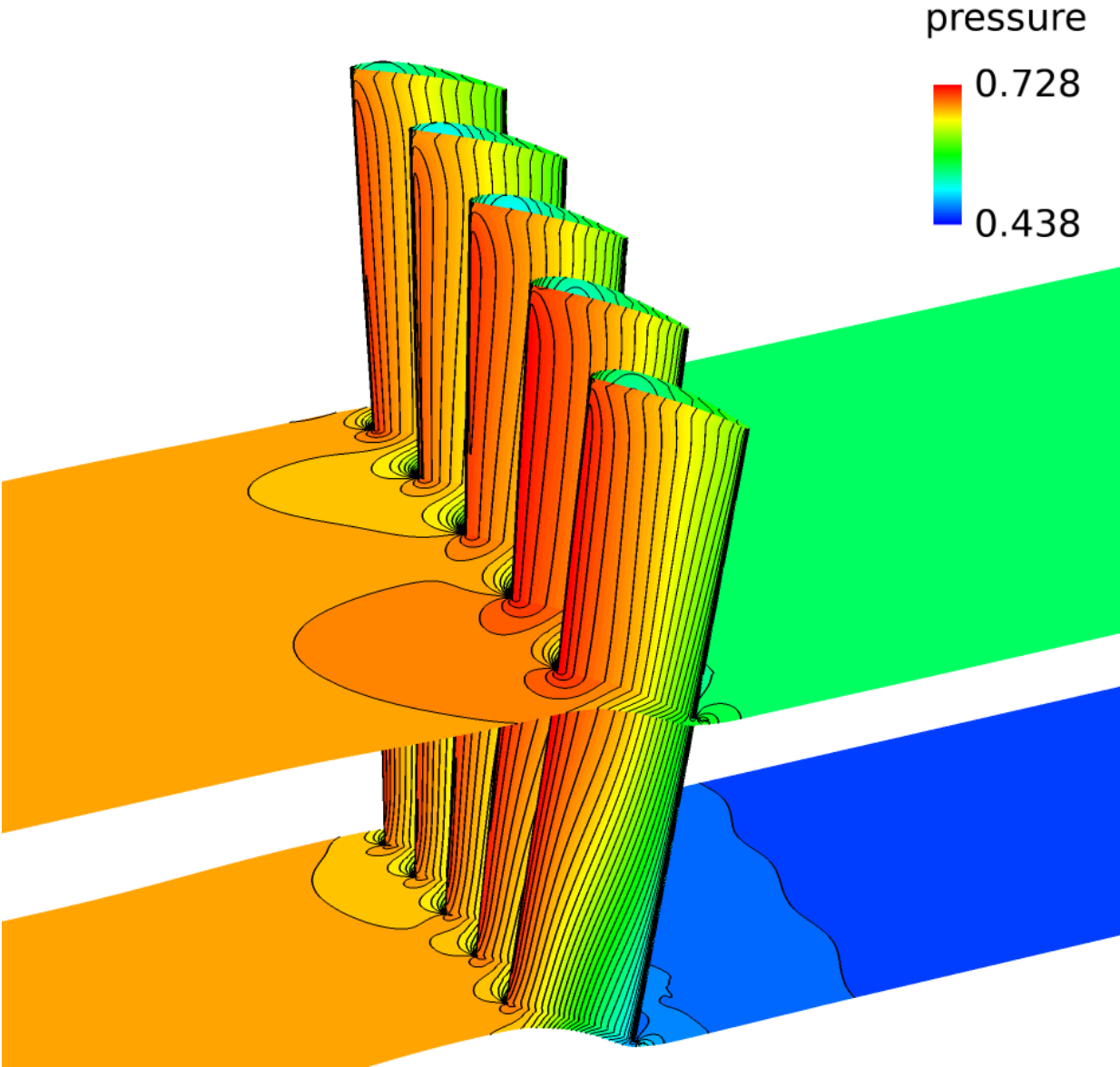
Fig.1 static pressure distribution on wall

🔵 **Publications**

N/A

🔵 Usage of JSS2

● Computational Information

Parallelization Methods	MPI
Thread Parallelization Methods	N/A
Number of Processes	24 - 48
Elapsed Time per Case	30.00 hours

● Resources Used

Fraction of Usage in Total Resources*1 (%): 0.16

Details

Computing Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage*2 (%)
SORA-MA	0.85	0.00
SORA-PP	238,282.78	2.98
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	067.44	0.05
/data	3,897.80	0.07
/ltmp	1,441.59	0.11

Archiver Resources		
Archiver System 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