Study of the Effect of Boundary Layer Ingestion (BLI) on Aircraft Propulsion

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Abstract

In this study, evaluation of unsteady aerodynamics in aircraft fan under strongly distorted inflow condition simulating airframe/engine integration configuration with Boundary Layer Ingestion (BLI) benefit suited for future electric aircraft. Under these BLI conditions, aircraft fan suffers almost all the flight path strongly distorted inflow conditions, the present study investigates the fan flows in detail through the numerical simulations.

Reasons and benefits of using JAXA Supercomputer System

The srudy deals with fan aerodynamic flows under inlet conditions of asymmetric distorsion inflow. For the purpose, high-resolution and full-annula duct flow analysis is necessary with the use of JSS2 supercomputer.

Achievements of the Year

Fan rotor unsteady aerodynamic flow analysis was conducted under the inflow distortion condition simulating airframe/engine integration configuration suited for future electric aircraft. By comparing non-distorted inflow condition case (left), Fig. 1 reveals the effect of distortion under BLI conditions (left in the figure) and performance data and flow characteristics (such as entropy shown in the figure) can be used for understanding the mechanisms of the fan aerodynamics under BLI configuration.

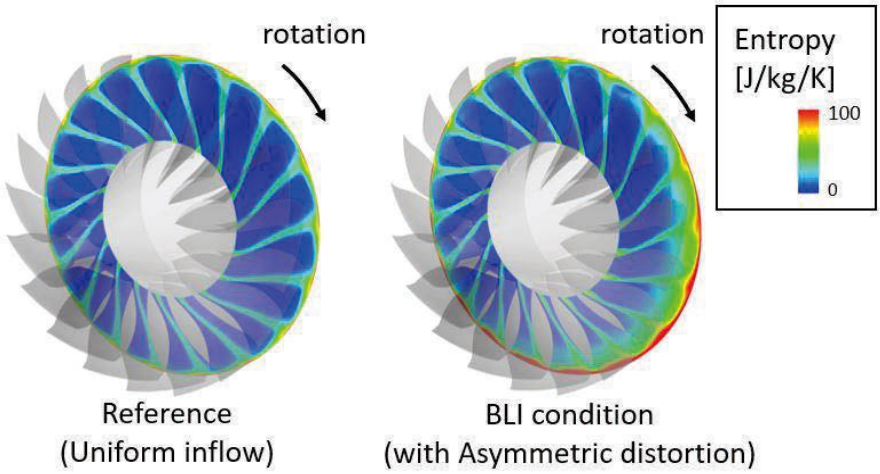

Fig. 1: Entropy distribution downstream of fan rotors

Publications

N/A

Usage of JSS2

Computational Information

Process Parallelization Methods	MPI
Thread Parallelization Methods	N/A
Number of Processes	486
Elapsed Time per Case	80 Hour(s)

- **Resources Used**

Fraction of Usage in Total Resources[*1](%): 2.00

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage[*2](%)
SORA-MA	17,822,100.28	2.17
SORA-PP	35,119.35	0.23
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	958.95	0.80
/data	19,583.96	0.34
/ltmp	4,985.61	0.42

Archiver Resources		
Archiver 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.