Air flow distribution control by a fluidic element

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Abstract

Lean combustion is promising to reduce nitrogen oxide emission from jet-engines. To solve combustion instability, that is a problem of lean combustion, a pilot burner for ensuring stable combustion and a main burner for performing lean, low-NOx combustion are used. The purpose of this study is improvement of combustor performance by controlling air flow rate distribution between the pilot burner and the main burner using a fluidic element, which has no moving part.

http://www.aero.jaxa.jp/eng/research/basic/propulsion/advanced-core-engine/

Reasons for using of JSS2

It is necessary that numerous CFD analysis about geometry of fluidic elements to optimize its geometry.

Achievements of the Year

In order to improve the characteristics of the fluidic elements, numerical analysis were conducted for more than 25 computational grids of the fluidic element with different flow channel shape. As a result, by changing both the shape and position of the splitter that separates the two outlet flow channels, it was confirmed that the main flow jet was bent at the tip of the splitter, and the performance target of the fluidic elements could be achieved.

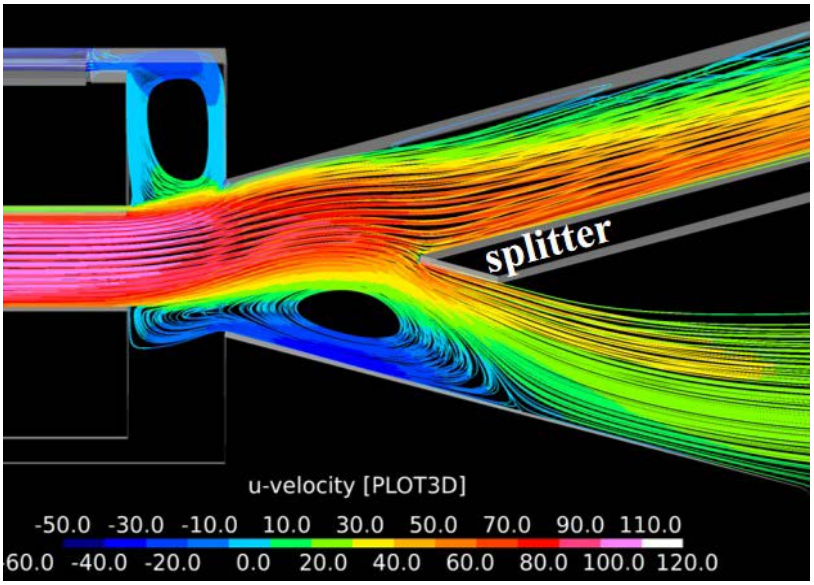

Fig.1 Visualization of streamlines inside the fluidic elements before changing the splitter shape

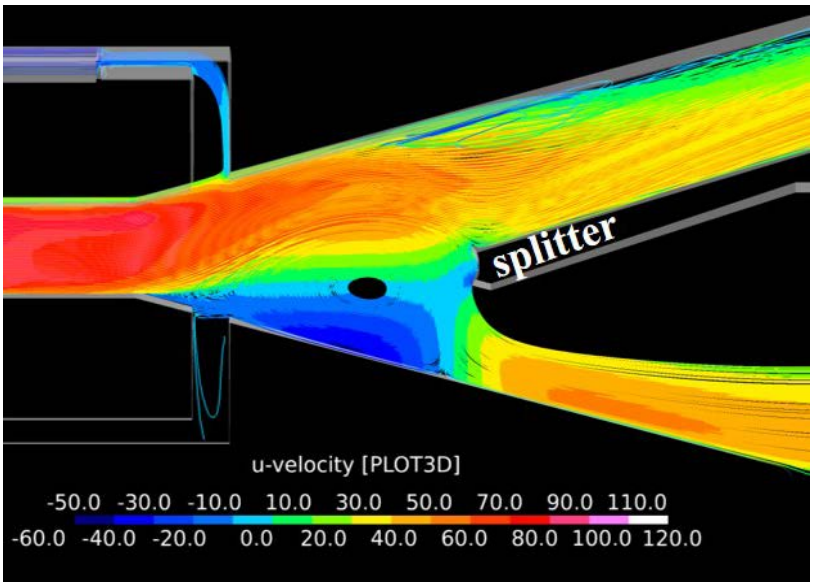

Fig.2 Visualization of streamlines inside the fluidic elements after changing the splitter shape

Publications

N/A

Usage of JSS2

Computational Information

Parallelization Methods	MPI
Thread Parallelization Methods	Automatic Parallelizatio
Number of Processes	36
Elapsed Time per Case	50.00 hours

Resources Used

Fraction of Usage in Total Resources*1 (%): 0.14

Details

Computing Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage*2 (%)
SORA-MA	1,115,250.61	0.15
SORA-PP	915.97	0.01
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	104.37	0.07
/data	3,158.78	0.06
/ltmp	3,472.22	0.26

Archiver Resources		
Archiver System Name	Storage used(TiB)	Fraction of Usage*2 (%)
J-SPACE	0.14	0.01

*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