

Research on the performance improvement of practical aero-engine fuel injector

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● Abstract

Our study is focusing on the improvement of fuel injector performance. Numerical simulations on air-flow, atomization, fuel/air mixing, combustion, and thermal analysis on such injectors in realistic shapes are of our interest.

● Reasons for using JSS2

In order to analyze air-flow, atomization, fuel/air mixing, combustion, and thermal analysis of a realistic shape fuel nozzle precisely, we conduct the flamelet combustion analysis using large size of database, and the use of super computer is necessary.

● Achievements of the Year

Effects of pilot nozzle design on the performance of a lean-staged fuel injector near a lean-blow-out condition was simulated. Blow-out took place for “U8-type” nozzle, whereas it did not for “D8-type” nozzle.

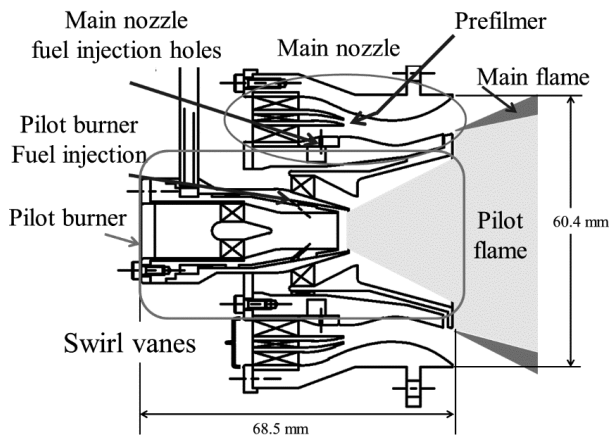


Fig. 1: Lean staged injector

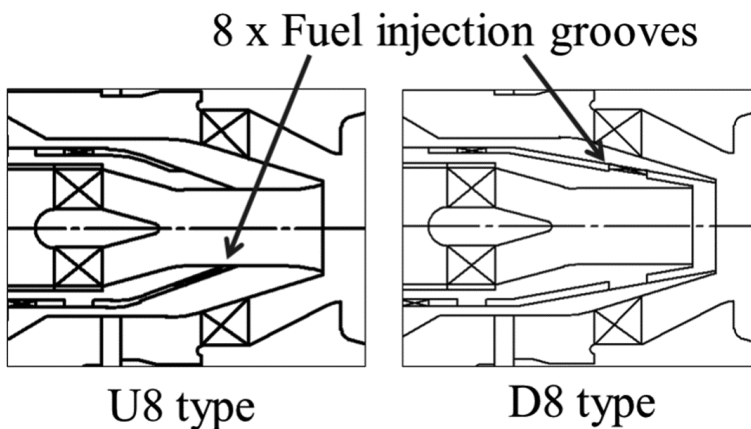
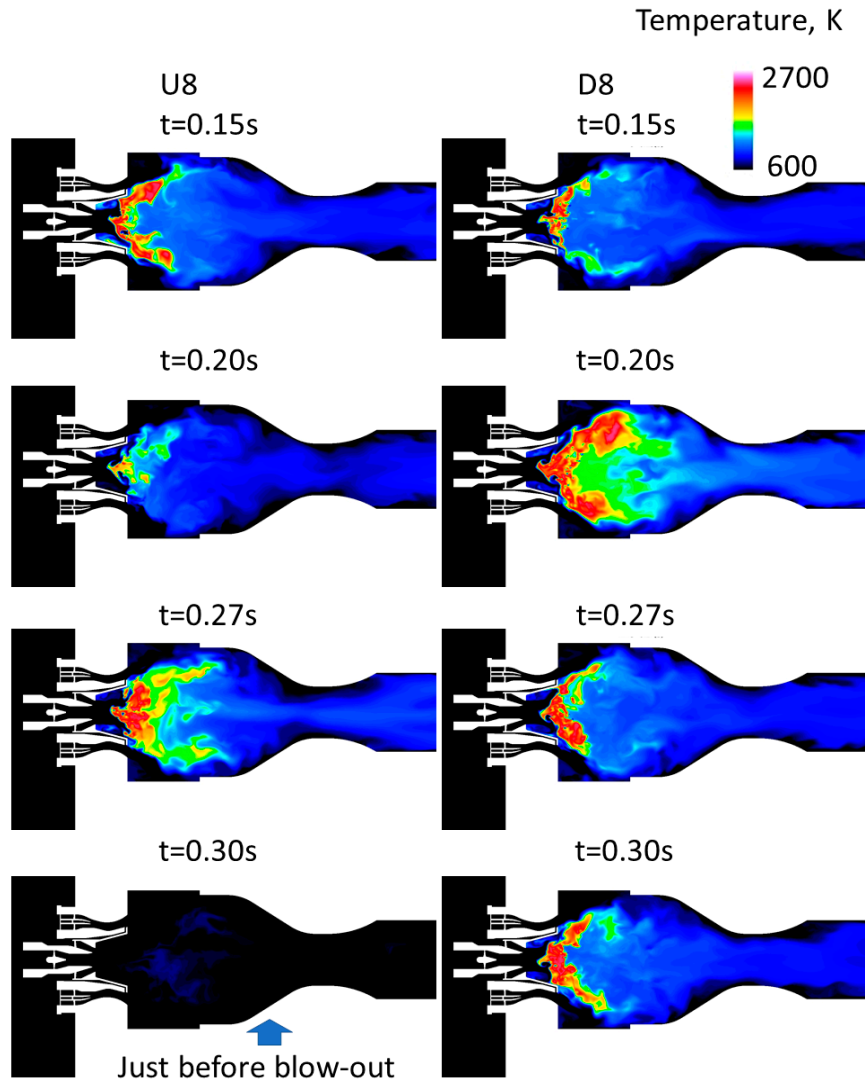


Fig. 2: Magnified view of pilot nozzle (Left: U8. Right: D8)



Courtesy of Prof. Kurose of Kyoto Univ. for technical advice on CFD method

Fig. 3: Time evolution of spatial distribution of gas temperature (Left: U8, Right: D8)

● **Publications**

N/A

● **Usage of JSS2**

● **Computational Information**

Process Parallelization Methods	MPI
Thread Parallelization Methods	N/A
Number of Processes	512
Elapsed Time per Case	4 Hour (s)

- **Resources Used**

Fraction of Usage in Total Resources*¹ (%): 1.02

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage* ² (%)
SORA-MA	9,286,721.23	1.14
SORA-PP	0.00	0.00
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	360.90	0.37
/data	42,857.05	0.76
/tmp	9,263.40	0.79

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage* ² (%)
J-SPACE	0.11	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.