

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

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● Responsible Representative

Takashi Yamane, Aeronautical Technology Directorate, En-Core Project team

● Contact Information

Kazuaki Matsuura, Japan Aerospace Exploration Agency, Aeronautical Technology Directorate, En-Core Project team(matsuura.kazuaki@jaxa.jp)

● Members

Kazuaki Matsuura, Jun Iino, Kinya Saito, Kunihiko Sakata, Aya Yoshida, Kodai Kato, Mitsumasa Makida, Naoki Nakamura

● Abstract

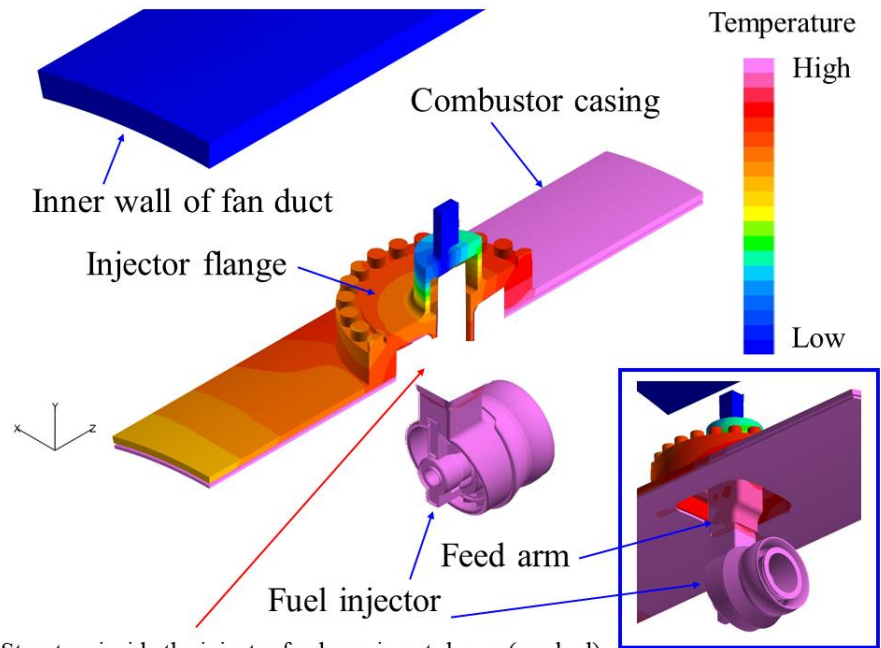
Our study is focusing on the improvement of fuel injector performance. Numerical simulations on air-flow, atomization, fuel/air mixing, combustion, and thermal analysis on such injectors in realistic shapes are of our interest.

● Reasons and benefits of using JAXA Supercomputer System

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

In order to avoid fuel coking in fuel circuits of a coaxially-staged lean-burn fuel injector, improvement of thermal-protection design and its numerical evaluation were carried out. An example of fluid/solid coupled heat transfer analysis of the fuel injector is presented in Fig.1, in which the environment between the simplified fuel duct inner wall and the combustor casing is also taken into account.



Structure inside the injector feed arm is not shown (masked).

Fig. 1: Example of fluid/solid coupled heat transfer analysis of the fuel injector, considering the environment between the simplified fun-duct inner wall and the combustor casing.

- **Publications**

N/A

- **Usage of JSS**

- **Computational Information**

Process Parallelization Methods	MPI
Thread Parallelization Methods	N/A
Number of Processes	1024
Elapsed Time per Case	2584 Hour(s)

● **JSS3 Resources Used**

Fraction of Usage in Total Resources*1(%): 2.52

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage*2(%)
TOKI-SORA	68,315,750.01	3.09
TOKI-ST	57,542.15	0.06
TOKI-GP	0.00	0.00
TOKI-XM	0.00	0.00
TOKI-LM	0.00	0.00
TOKI-TST	0.00	0.00
TOKI-TGP	0.00	0.00
TOKI-TLM	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage*2 (%)
/home	235.83	0.20
/data and /data2	178,382.50	1.10
/ssd	0.00	0.00

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage*2 (%)
J-SPACE	0.09	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.

● **ISV Software Licenses Used**

ISV Software Licenses Resources		
	ISV Software Licenses Used (Hours)	Fraction of Usage ^{*2} (%)
ISV Software Licenses (Total)	926.93	0.42

*2: Fraction of Usage : Percentage of usage relative to each resource used in one year.