Cooperative Research on Landing Gear in the FQUROH Project

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Abstract

This collaborative research is being carried out as part of the FQUROH project aimed at raising the technical maturity level of the noise reduction technology for landing gear, which draws international attention to reduce noise in areas around airports, to a level applicable to future development of aircraft and related equipment. This contributes to reduction of aircraft noise in local communities around the airport and airline operating costs by reducing landing fee.

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

Reasons for using of JSS2

The JSS2 enabled low-noise devices to be designed based on Reynolds-averaged Navier-Stokes simulations, thermo-fluid coupling simulations and more advanced computational simulations, such as large eddy simulations, using Siemens STAR-CCM+. Computational simulations using the JSS2 made it possible to design low-noise devices by understanding detailed physical phenomena, which was difficult only with wind tunnel tests and tests with an actual aircraft.

Achievements of the Year

Computational simulations of brake cooling was conducted for baseline and low-noise configurations of the main landing gear of JAXA's jet research aircraft, "Hisho," under a condition similar to that during the temperature measurement in Noto Airport, Ishikawa, Japan during the second flight demonstration on airframe noise reduction technologies. No significant influence was observed in time required for brake cooling with the low-noise configuration, which had a porous plate mounted between the tires and the wheels had no holes.

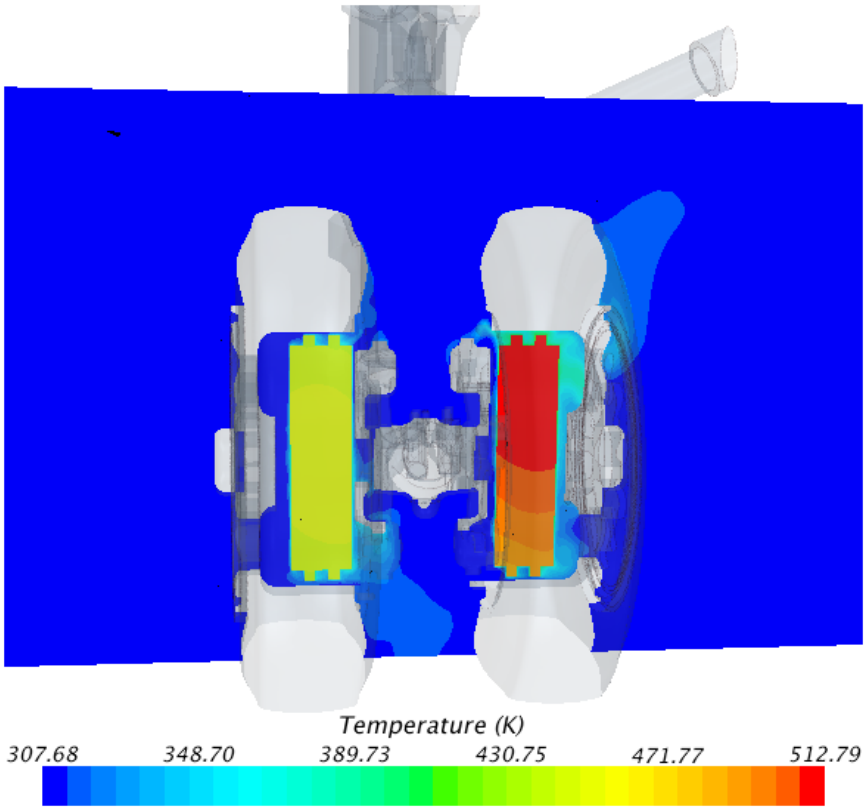

Fig.1 Initial temperature distribution (without porous plate and with wheel holes)

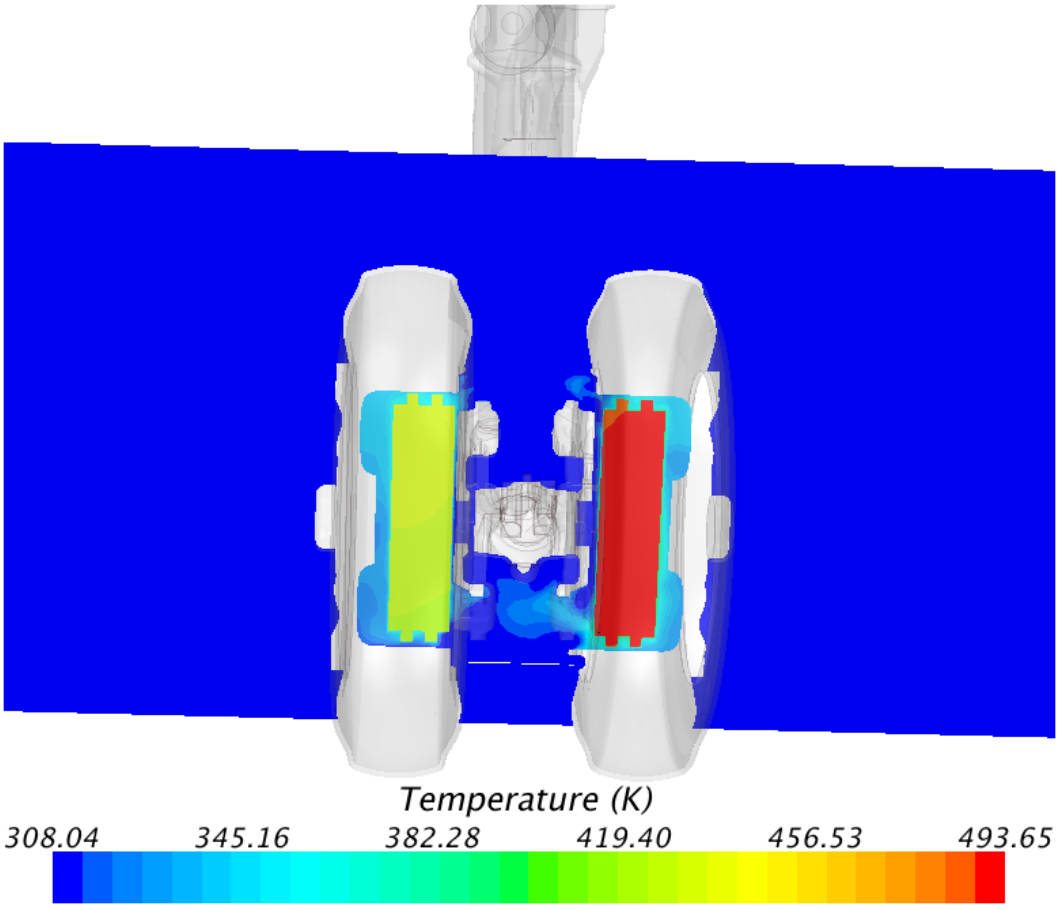

Fig.2 Initial temperature distribution (with porous plate and without wheel holes)

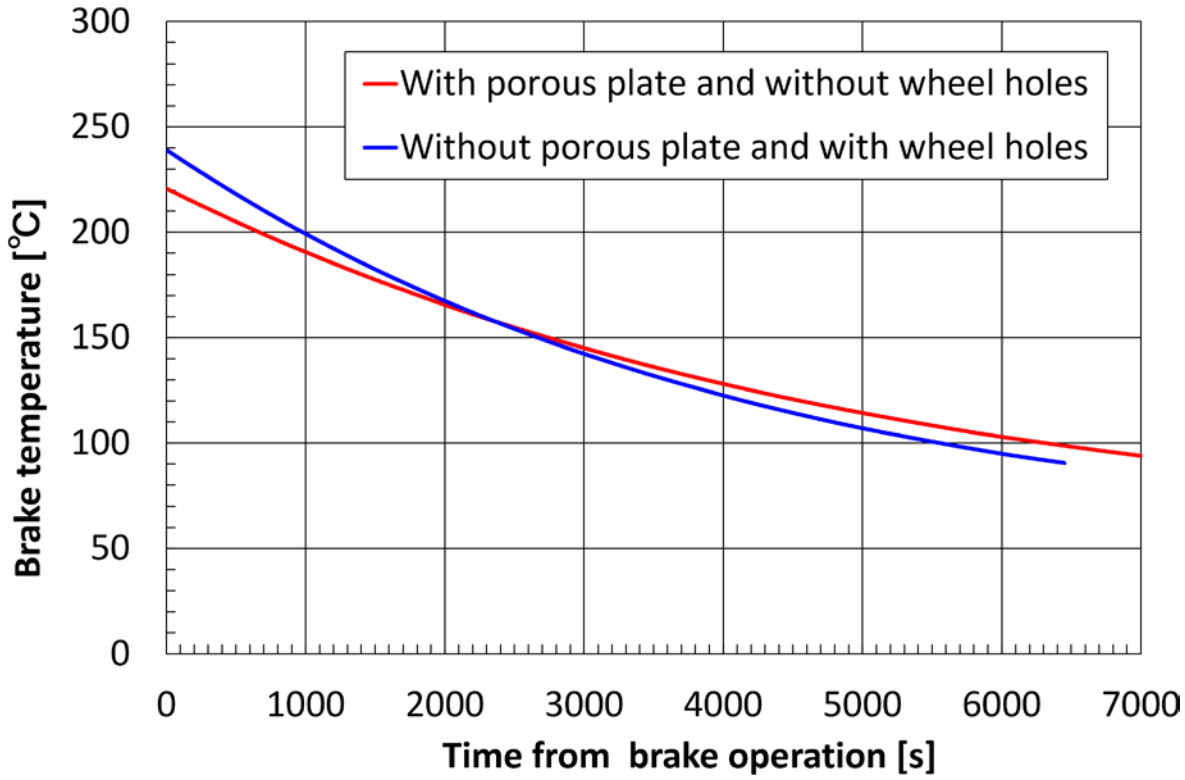

Fig.3 Time history of brake temperature after brake operation

Publications

- Non peer-reviewed papers

1) Yamamoto, K., Takaishi, T., Murayama, M., Yokokawa, Y., Ito, Y., Arizono, H., Sakai, R., Shoji, H., Ueno, Y., Isotani, K., Lee, H.-H., Inoue, T. and Kumada, T., "FQUROH: A Flight Demonstration Project for Airframe Noise Reduction Technology - the 1st Flight Demonstration," AIAA Paper 2017-4029, 23rd AIAA/CEAS Aeroacoustics Conference, Denver, CO, 2017, DOI: 10.2514/6.2017-4029.

2) Takaishi, T., Inoue, T., Lee, H.-H., Murayama, M., Yokokawa, Y., Ito, Y., Kumada, T. and Yamamoto, K., "Noise Reduction Design for Landing Gear toward FQUROH Flight Demonstration," AIAA Paper 2017-4033, 23rd AIAA/CEAS Aeroacoustics Conference, Denver, CO, 2017, DOI: 10.2514/6.2017-4033.

Usage of JSS2

Computational Information

Parallelization Methods	MPI
Thread Parallelization Methods	N/A
Number of Processes	120
Elapsed Time per Case	12.00 hours

Resources Used

Fraction of Usage in Total Resources*1 (%): 0.08

Details

Computing Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage*2 (%)
SORA-MA	0.00	0.00
SORA-PP	79,527.35	1.00
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	057.07	0.04
/data	6,836.68	0.13
/ltmp	6,583.16	0.50

Archiver Resources		
Archiver System Name	Storage used(TiB)	Fraction of Usage*2 (%)
J-SPACE	89.59	3.85

*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