Environment Conscious Aircraft Systems Research in Eco-wing Technology

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● **Abstract**

Innovative drag reduction technologies are investigated to reduce the fuel consumption for a conventional aircraft configuration. Aircraft noise prediction technologies and the conceptual design technologies are also developed for future aircraft which achieve low noise and high efficiency.

Ref. URL: http://www.aero.jaxa.jp/eng/research/ecat/ecowing/

● **Reasons for using JSS2**

CFD analysis are used for the understanding of aerodynamic characteristics and evaluation of the performance in the aircraft design phase. Huge calculation resources and costs were required for the high fidelity and quick response CFD analysis for the optimum aerodynamic design process on complex aircraft geometry. JSS2 can achieve those requirements, the cost and time are drastically saved on the CFD analysis.

● **Achievements of the Year**

The natural laminar wing design was performed on 120pax subsonic aircraft (Technology reference aircraft; TRA2022) to reduce the friction drag on the cruise flight condition. Wide area of the laminar flow was achieved until just upstream of the shock occurrence at the outboard wing (Fig. 1). The aerodynamic performance of an unconventional low-noise aircraft with engines mounted over the rear-fuselage was evaluated by CFD. The initial evaluation to investigate the influence of engine locations on the aerodynamic performance and noise level was conducted (Fig. 2).
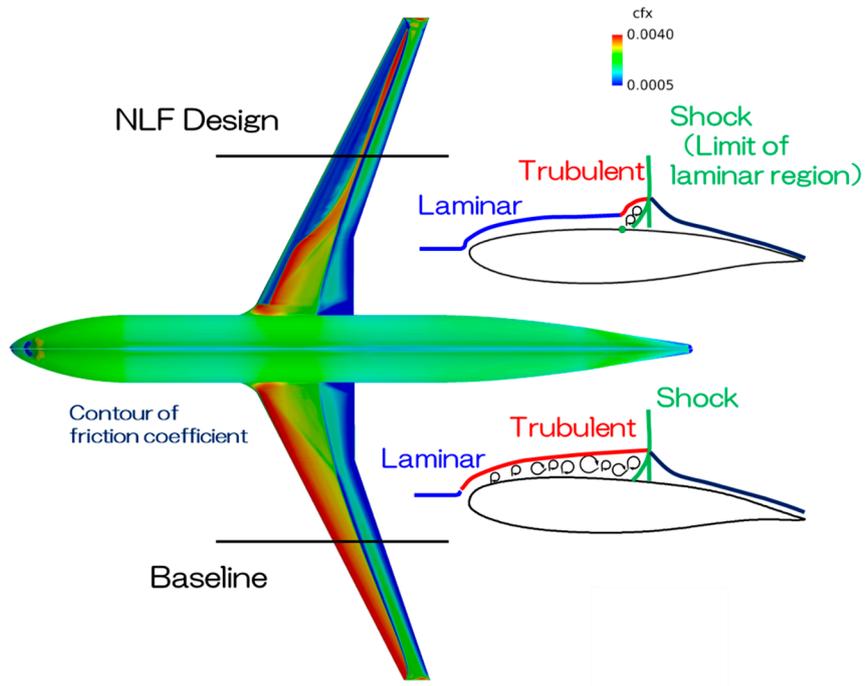
Fig. 1: Surface friction coefficient distributions by Natural laminar flow design on a 120pax subsonic aircraft (TRA2022).
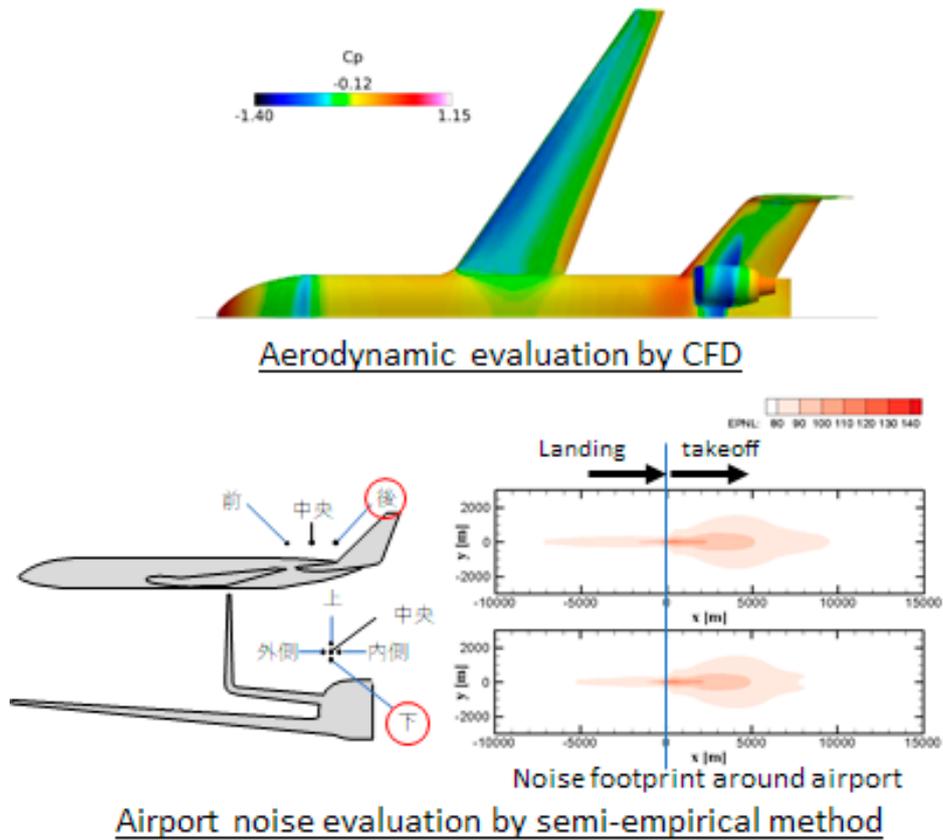

Fig. 2: Evaluation of aerodynamic performance andp noise level by change of engine locations

● **Publications**

N/A

● **Usage of JSS2**

● **Computational Information**

Process Parallelization Methods	MPI
Thread Parallelization Methods	OpenMP
Number of Processes	128 - 256
Elapsed Time per Case	25 Hour (s)

● **Resources Used**

Fraction of Usage in Total Resources[*1] (%): 0.28

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage[*2] (%)
SORA-MA	1,916,187.21	0.23
SORA-PP	29,121.54	0.23
SORA-LM	920.48	0.43
SORA-TPP	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage*2 (%)
/home	1,561.60	1.62
/data	47,752.54	0.84
/ltmp	22,854.29	1.96

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage*2 (%)
J-SPACE	68.57	2.40

[*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.