Environment Conscious Aircraft Systems Research in Eco-wing Technology:Aerodynamic System Design Technology

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Responsible Representative

Yoshikazu Makino,
Aeronautical Technology Directorate Next Generation Aeronautical Innovation Hub Center

Contact Information

Dongyoun Kwak　kwak.dongyoun@jaxa.jp

Members

Yoshihisa Aoki, Mitsuhiro Murayama, Dongyoun Kwak, Naoko Tokugawa, Takashi Atobe,
Tatsunori Yuhara, Fumitake Kuroda, Yoshine Ueda, Keisuke Ohira, Hikaru Aono,
Kisa Matsushima, Satoshi Kondo, Tohru Hirai, Kentaro Tanaka, Takashi Matsuno,
Sasamori Monami, Shinsuke Nishimura, Minoru Yoshimoto, Kazuhiro Kubota

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.

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

Reasons for using of 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

Aerodynamic design of the TRA2022 (JAXA Technology reference Aircraft) was performed to reduce the drag on the cruise flight using CFD analysis(Fig.1).

The second configuration of the TRA2022 were designed by applying several drag reduction concepts

and know-hows(Fig.2). At first, a low drag airfoil which can reduce not only the friction drag but also the pressure drag was derived from the NLF design process. The low drag airfoil was chosen on the TRA2022, and the twist angle of the main wing was optimized to reduce induced drag by controlling the lift distribution. The shock induced separation on the pylon was restricted by modify the wing lower surface and the pylon geometries. Also, shock characteristics on the upper surface caused by the wing body interaction were improved. Comparing with the TRA2012A, 10% of the drag reduction were obtained on the 2nd configuration of TRA2022.

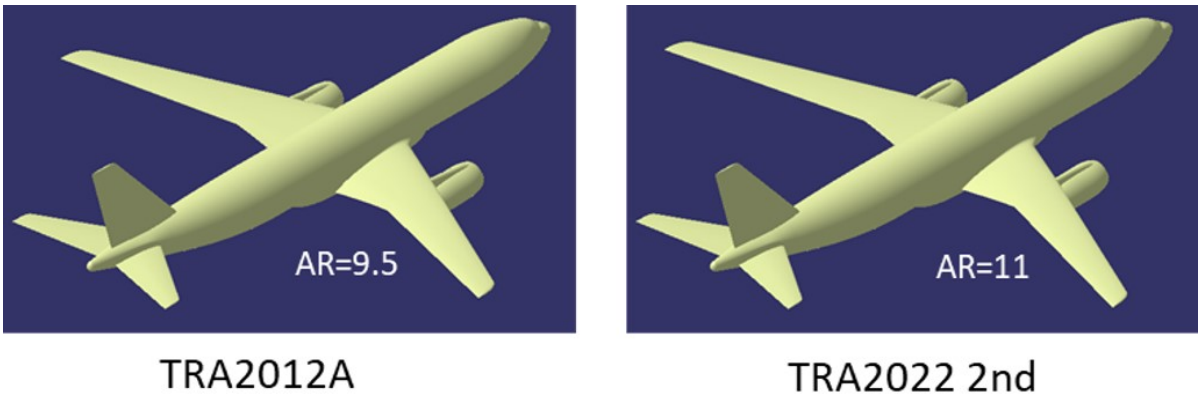

Fig.1 Configurations of the TRA2012A and TRA2022 2nd.

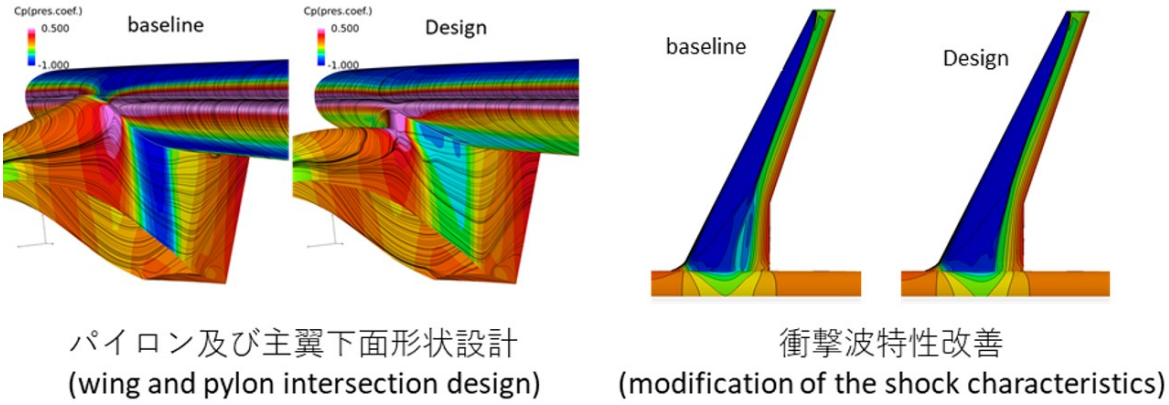

Fig.2 Aerodynamic design of the TRA2022 2nd configuration

Publications

N/A

Usage of JSS2

Computational Information

Parallelization Methods	MPI
Thread Parallelization Methods	OpenMP
Number of Processes	15 - 300
Elapsed Time per Case	5.00 hours

Resources Used

Fraction of Usage in Total Resources*1 (%): 0.96

Details

Computing Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage*2 (%)
SORA-MA	7,366,417.13	0.97
SORA-PP	79,733.34	1.00
SORA-LM	46.53	0.02
SORA-TPP	0.00	0.00

File System Resources		
File System Name	Storage assigned(GiB)	Fraction of Usage*2 (%)
/home	803.85	0.56
/data	48,805.53	0.90
/ltmp	19,594.81	1.48

Archiver Resources		
Archiver System Name	Storage used(TiB)	Fraction of Usage*2 (%)
J-SPACE	9.15	0.39

*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