

Collaboration work on research and development for eco-wing technology (future aircraft design)

Report Number: R18EA0622

Subject Category: Aeronautical Technology

URL: <https://www.jss.jaxa.jp/en/ar/e2018/9059/>

● Responsible Representative

Yoshikazu Makino, Unit Head, Aeronautical Technology Directorate, Aviation Systems Research Unit

● Contact Information

morizawa@mech.tottori-u.ac.jp (morizawa@mech.tottori-u.ac.jp)

● Members

Seiichiro Morizawa, Keisuke Tokura

● Abstract

For the future aircraft design, the aerodynamic characteristics of swept-back and swept-forward wings are compared using CFD. Through the parametric study of the planforms, the influences of the design parameters on the aerodynamic characteristics and flow fields are clarified.

● Reasons for using JSS2

In order to conduct the parametric study of three-dimensional shapes with CFD, huge computational costs are required. It is impossible to make such computations with the workstation at our laboratory. That is the reason we have used JSS2.

● Achievements of the Year

A parametric study of the planforms of tapered swept-forward and swept-back wings has been conducted, and comparisons of the aerodynamic characteristics have been made. Figure 1 shows that the best swept-forward wing has the same aspect ratio and taper ratio as the best swept-back wing. As seen in Fig. 2, on the whole, the latter is superior in the lift-to-drag ratio to the former. Furthermore, the lift-to-drag ratio of the swept-forward wing decreases rapidly around the lift coefficient of 0.7, or the AoA of 4 degrees. This seems to be caused by flow separation near the root of the swept-forward wing.

	後退角 or 前進角	アスペクト比	テーパー比
後進翼	33.92°	12	0.267
前進翼	20.92°	12	0.267

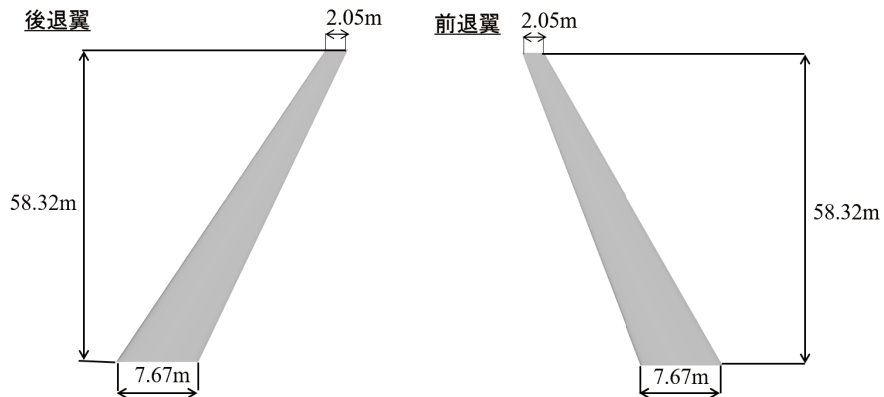


Fig. 1: Planforms of swept-back and swept-forward wings

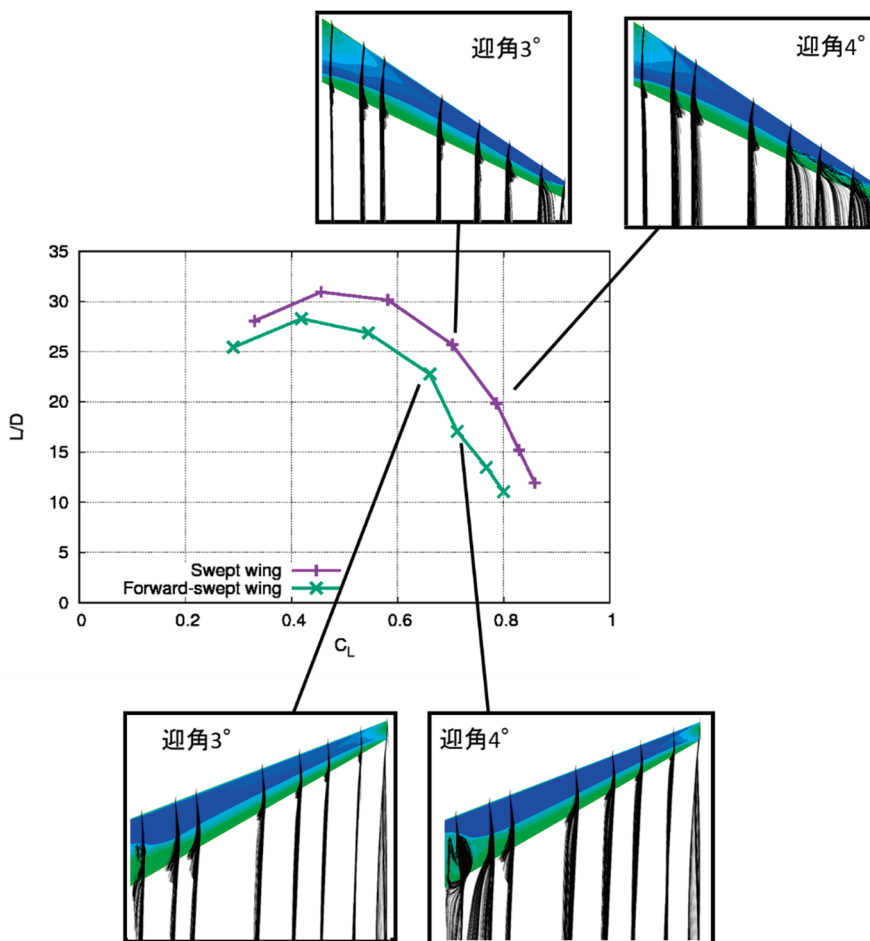


Fig. 2: Aerodynamic characteristics and flow fields of swept-back and swept-forward wings

● Publications

N/A

- Usage of JSS2

- Computational Information

Process Parallelization Methods	N/A
Thread Parallelization Methods	Automatic Parallelization
Number of Processes	1
Elapsed Time per Case	11 Hour (s)

- Resources Used

Fraction of Usage in Total Resources*1 (%): 0.32

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage*2 (%)
SORA-MA	2,863,496.20	0.35
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	662.27	0.69
/data	13,563.37	0.24
/ltmp	2,712.67	0.23

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage*2 (%)
J-SPACE	0.00	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.