Research on DX in Aircraft Certification

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Abstract

The objective of this research is to design test articles at the element level that is capable of reproducing the buckling behavior of the skin/stringer panel in aircraft wings.

Reasons and benefits of using JAXA Supercomputer System

High-performance computing is necessary, because numerous three-dimensional nonlinear finite element analyses need to be performed to design test articles at the element level of aircraft structures.

Achievements of the Year

Three-dimensional nonlinear finite element analyses were conducted on metallic skin/stringer panels at the element level under compressive loading, and the buckling loads and buckling induced deformations of the panels were studied.

The main results obtained from the analyses for panels with different lengths L (Fig. 1) are as follows.

(1)The buckling load (maximum load) was dependent on the panel length, and the buckling load for Case 1 (L/L1 = 1) was highest (Fig. 2).

(2)Except for Cases 1 (L/L1 = 1) and 9 (L/L1 = 1.17), the buckling induced deformations (out-of-plane deformations) of the panels were similar (Fig. 3).

(3)The finite element analysis results are useful for designing element test articles.

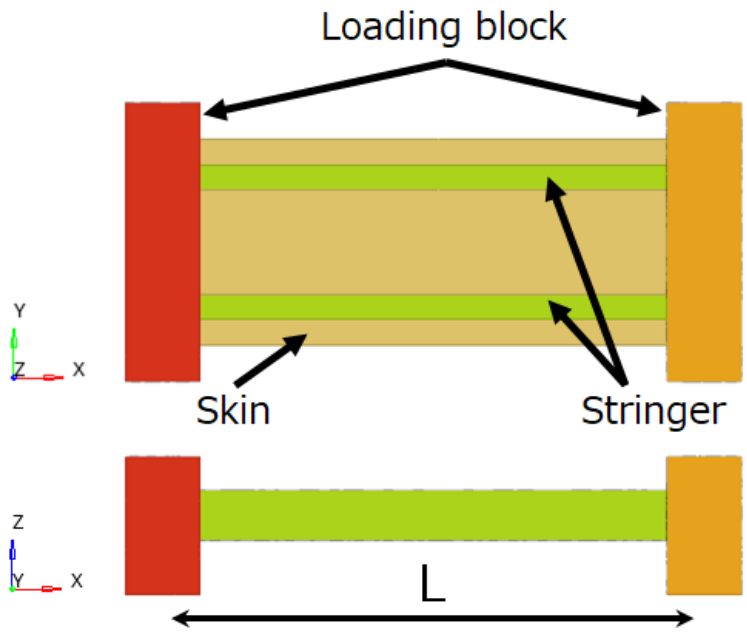

Fig. 1: Finite element model of metallic skin/stringer panel

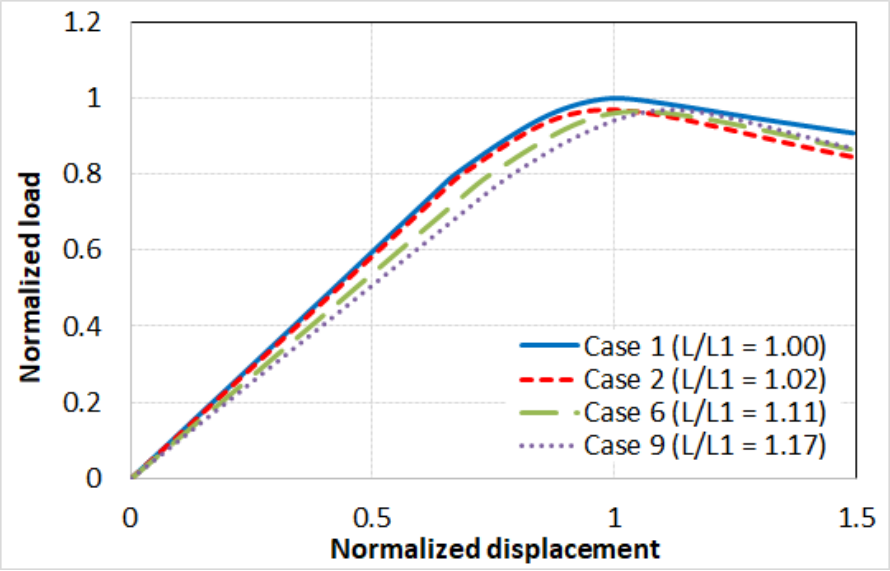

Fig. 2: Load-displacement curves of skin/stringer panels

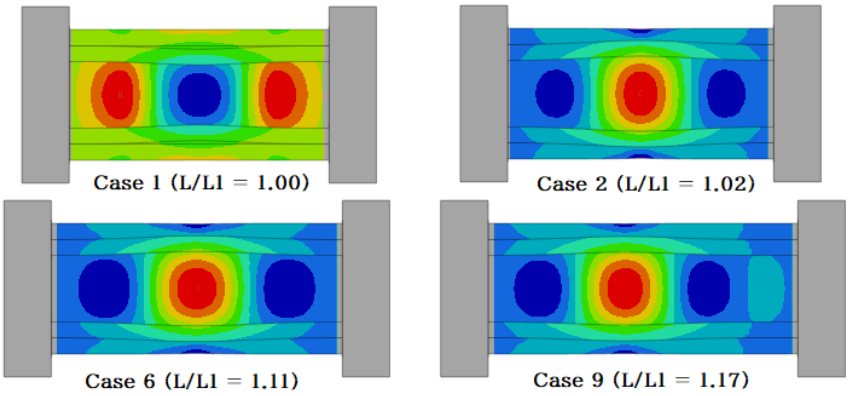

Fig. 3: Buckling induced deformations of skin/stringer panels

- **Publications**

  N/A

- **Usage of JSS**

- **Computational Information**

Process Parallelization Methods	N/A
Thread Parallelization Methods	N/A
Number of Processes	1
Elapsed Time per Case	45.01 Minute(s)

- **JSS3 Resources Used**

Fraction of Usage in Total Resources[*1](%): 0.01

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage[*2](%)
TOKI-SORA	0.00	0.00
TOKI-ST	1,582.22	0.00
TOKI-GP	0.00	0.00
TOKI-XM	3,478.80	1.91
TOKI-LM	0.00	0.00
TOKI-TST	17.83	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	1,269.00	1.05
/data and /data2	138,123.33	0.85
/ssd	0.00	0.00

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.

- **ISV Software Licenses Used**

ISV Software Licenses Resources		
	ISV Software Licenses Used (Hours)	Fraction of Usage[*2] (%)
ISV Software Licenses (Total)	0.00	0.00

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