

Morphing Wing for the Future of Aviation

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There are growing concerns about the increasing environmental impact of aircraft due to global air traffic growth. In civil aviation, environmental performance is becoming one of the most important indicators for determining market competitiveness. Therefore, there are greater needs than ever for environmentally friendly aircraft.

JAXA promotes Eco-Wing Project to demonstrate the technologies to reduce aircraft carbon emissions. Aircraft drag reduction is considered as one of the more important topics for the reduction of carbon emissions. There are three primary approaches to reducing aircraft drag; (1) expanding the laminar flow region by developing a natural laminar flow wing design technique, (2) reducing turbulent skin friction drag by using riblets, (3) the induced drag reduction through the optimization of lift distribution. In this presentation, the morphing wing concept is applied to wing camber in order to optimize lift distribution.

Some people are still too skeptical of the benefits to adopt a morphing wing design, because the morphing wing can result in penalties in terms of cost, complexity or weight. However, new smart materials and actuation systems have been developed and various morphing wing concepts have been proposed. The morphing wing should be considered as indispensable technology to realize ultra-efficient aircraft.

In the scientific environment, JAXA has supercomputer system and various test facilities including wind tunnels, structural tests, engine tests, flight simulators and experimental aircrafts. In the social environment, JAXA has training programs which young researchers temporarily transfer to the division of management in JAXA, or related ministry in Japan, or aircraft/engine manufacturers (about 2 years). JAXA has also exchange programs to overseas research institutes or universities (about 1 year).