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Introduction: Supersonic Airplane

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A forecast of air traffic demand by Japan Aircraft Development Corporation indicates that the revenue passenger kilometer in the world has an annual increase rate of around 5% and it will be 10.579 trillion in 2026, which is approximately 2.5 times the rate it was in 2006. To satisfy such a future passenger demand, the role of aircraft is very important.

A supersonic transport (SST) is effective for high-speed transportation to satisfy the future passenger demand. The Concorde, which first operated commercially in 1976, was retired in 2003 due to a deficiency of cost and environmental acceptability. However, development of the next-generation SST based on technological innovation through lessons learned with the Concorde is required to satisfy the aforementioned passenger demand. If there is an SST that connects the dense populations of North America, Europe, and Asia in 5 or 6 h, it brings more benefit to international society. For the realization of the next-generation SST, the following fundamental issues must be resolved: 1) accomplishment of aircraft technologies, 2) viability of market, and 3) compatibility to environment.

Feasibility studies for the next-generation SST began in the late 1980s. In the United States, the HSRP (high-speed research program), a successor of the high-speed commercial transport program, was started by NASA in 1989, but ended in 1999 due to difficulty of solving environmental issues and budget problems. In Europe, the European supersonic research program was started in 1994 but was terminated in the same period as HSRP because Europe intended to focus on a large airplane. However, research and development for the SST are continued with NASA's Ultra Efficient Engine Technology project, etc. The U.S. National Research Council is discussing breakthrough technology for commercial supersonic aircraft.

Recently, the research and development of a small-size supersonic airplane with technical eligibility as a progressing step to the next-generation SST have once again been activated. The research and development of the propulsion system of small-size SST was started at NASA in 2003 for a target in 2014. A supersonic business jet based on present technology is being promoted by industry for market entry sometime around 2012. A European research and development consortium launched a small-size next-generation SST in 2005.

In Japan, the Society of Japanese Aerospace Companies, Inc. executed a feasibility study of the Japanese supersonic research program under the support of the Ministry of International Trade and Industry (presently, Ministry of Economy, Trade and Industry) from 1989 to 2001. JAXA (Japan Aerospace Exploration Agency) has continued a feasibility study of the next-generation SST through the supersonic experimental airplane program that succeeded in flight tests in Woomera, Australia in 2005 and also sonic boom research as one of the major issues for environmental acceptability. On the advanced sonic boom research of JAXA, the Ministry of Education, Culture, Sports, Science, and Technology and JAXA started a five year project titled "Quiet Supersonic Technology" in 2007.

In such a situation, it is considered appropriate that a Special Section for Supersonic Airplanes is planned for Journal of Aircraft. This Special Section consists of one paper from Germany (DLR) and four papers from Japan (JAXA). We strongly wish that this Special Section contributes to the activation of the research and development of the next-generation supersonic airplane.

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