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Spaceplane/Hypersonic Technology Research Programme

—Recent Progress and Future Perspective—

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Abstract

Having considered a number of possible future space activities and analyzing their implications for future launch vehicle requirements in terms of economics, technological and policy aspects by overcoming the disadvantages of the lower earth orbit, as driven by the clear need for affordability and operational flexibility, would be key issues.

In Japan, the Spaceplane Technology Research programme is under way by the National Aerospace Laboratory (NAL)¹⁾ to define the concept and to develop the required hypersonic technologies as well as to provide a base of research and development capabilities in critical disciplines for the development of future space transportation system.

Also within the framework of the spaceplane programme, the NAL has been developing the ground test facilities. (Ramjet Engine Test Facility in 1994, 1.27m Mach 10 Hypersonic Wind Tunnel in 1995, High Enthalpy Shock Tunnel in 1997, Numerical Space Engine in 1998.)

In June 1996, the Science and Technology Agency established the Committee on Fully Reusable Space transportation System to define the direction and to plan the R&DTE programs for the 21st century. Final report was issued in June 1997.

Incremental R&D programme toward the final concept of SSTO Spaceplane powered by airbreather/rocket combined propulsion with the interim Rocket SSTO concept was proposed.

Based upon the Committee's new policy, the NAL will enhance the current technology developments and system studies on an experimental vehicle for key technology flight verifications.

The present paper overviews the NAL's spaceplane program and related hypersonic

technology research activities with an emphasis on the recent progress.

I Programme Summary

Based upon the long-term space policy²⁾ by the Space Activities Commission (SAC) of Japan, the Science and Technology Agency of Prime Minister's Office established the Committee on Fully Reusable Space Transportation System to define the new direction for Japan and to plan the R&DTE programs for the 21st century. Final report was issued in June 1997.³⁾

The Committee set up the SSTO Spaceplane as Japan's final goal (ref. Picture 1) and the all rocket-powered SSTO as interim goal. Critical problem areas to be further developed and flight-verified were identified and to promote the programme effectively, the incremental R&D approach was proposed, as illustrated in Figure 1.

—SSTO Spaceplane Concept—

The Spaceplane Programme consists of Technology Development (present phase), Key Technology Flight-Verification Phase (2010's), and Experimental Spaceplane Development Phase to promote the research and development based on the time-phased scenario to attain the goal of SSTO spaceplane vehicle development and operation in 2020's.

The SSTO Spaceplane's system objectives are summarized as follows;

- Flexible and sustained operability
 - Enhanced safety and reliability for manned system
- Abort capability (exclude abort blindness)