

High Speed Flight Demonstration Project

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Keyword: Reusable space transportation system

Abstract

The National Space Development Agency of Japan (NASDA) and the National Aerospace Laboratory of Japan (NAL) have been conducting joint research on reusable space transportation systems. Three flight experiment programs, the Orbital Re-entry Experiment (OREX), the Hypersonic Flight Experiment (HYFLEX), and the Automatic Landing Flight Experiment (ALFLEX), have been completed in support of this research, and a further flight experiment project, the High Speed Flight Demonstration (HSFD), was conducted. The HSFD project consists of two phases: Phase I and Phase II.

The objectives of Phase I are to evaluate technologies associated with steep approach that is characteristics for the return flight of winged reentry vehicles, and to develop autonomous flight technologies needed for unmanned vehicles, including the take off and landing. The Phase I vehicle is equipped with a jet engine, and takes off and lands automatically. The flight experiment of Phase I has been conducted in Christmas Island, Kiribati from October to November 2002. Three flights were conducted, and all of them have been successfully completed.

The objectives of Phase II are to clarify transonic aerodynamic characteristics of the H-II Orbiting Plane Experimental (HOPE-X) configuration as a typical winged reentry vehicle configuration and to evaluate them against data obtained from wind tunnel tests and Computational Fluid Dynamics (CFD), and to accumulate knowledge and technologies for the design of automatic flight control system at transonic speed. The experimental method is different from Phase I. The vehicle is released from a stratospheric balloon at about 31km altitude, accelerates in free fall, and lands using parachutes and airbags. The flight experiment of Phase II will be conducted at Esrange test site near Kiruna in Sweden in collaboration with Centre National d'Etudes Spatiales of France (CNES), and it was conducted in spring and summer of 2003.

This paper will overview the project, and it will report flight experiment results of Phase I and Phase II.

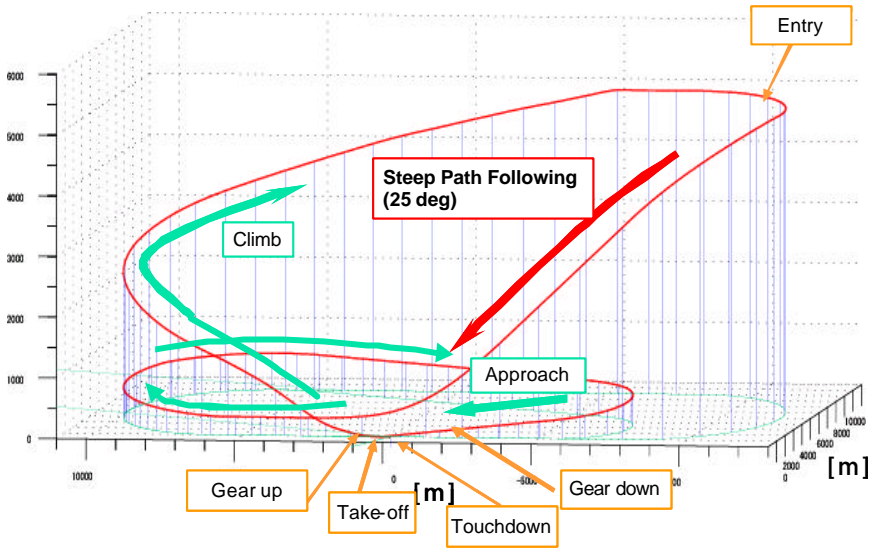


Fig.1 Trajectory of Phase I Flight #3

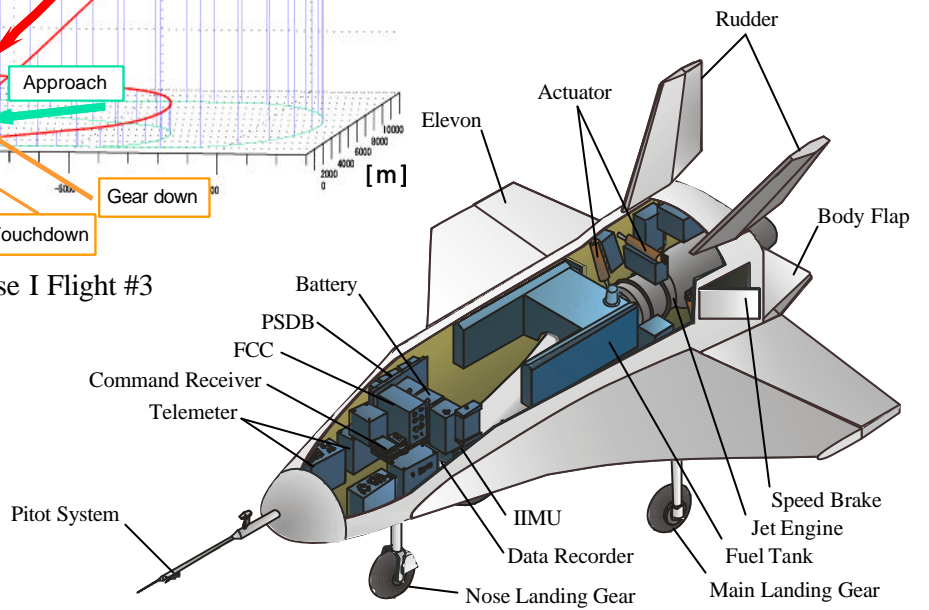


Fig.2 Onboard Equipment of HSFD I Vehicle

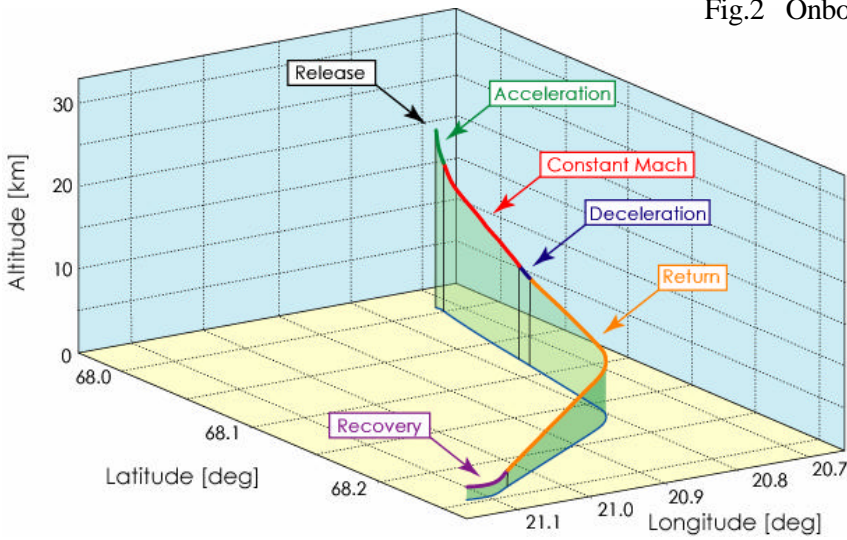


Fig.3 Trajectory of Phase II Flight #1

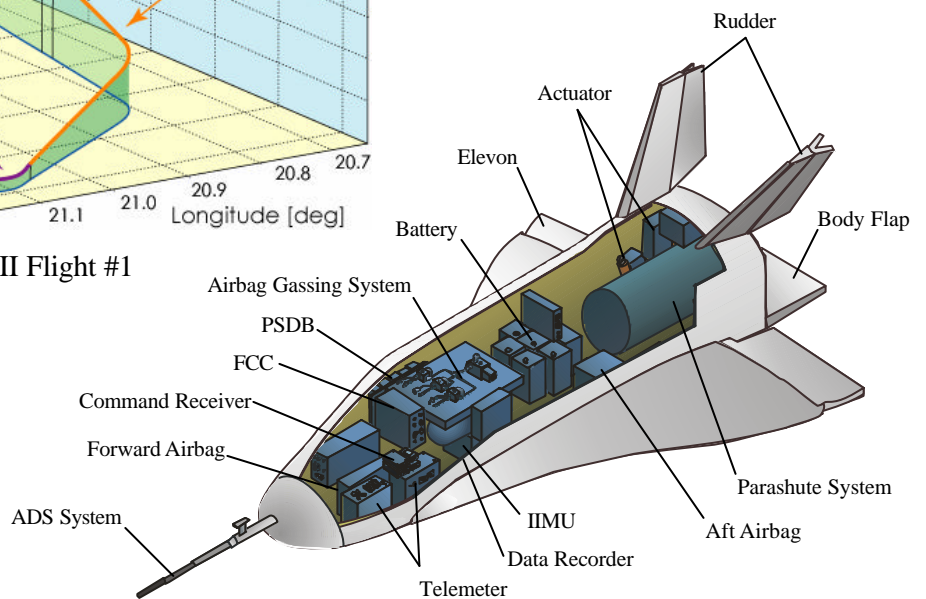


Fig.4 Onboard Equipment of HSFD II Vehicle