

SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Future Space Transportation Systems Technologies (5)

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STUDY ON REAL-TIME NETWORK FOR REUSABLE SOUNDING ROCKET

Abstract

Recently, in spite of existence of many launch demands for scientific researches using sounding rockets, launch opportunities are restricted because of high-cost of rocket launches, long period of launch preparations, etc. In order to make the access to space for researches much affordable and more frequent, a fully reusable sounding rocket has been proposed.

Vehicle systems and ground / flight operations are designed to investigate atmospheric phenomena, to conduct micro-gravity experiments, etc. The reusable sounding rocket is able to reach more than 100km in altitude and safely return to the launch site. In terms of system configuration, key features of the reusable sounding rocket are followings; 1) 14m high and 3m of fuselage width, 2) gross weight of 11tons, 4) LOX/LH2 propulsion system with four 40 kN engines, 5) vertical take-off and landing, 6) abort capability on single engine failure.

To realize abort capability, the reusable sounding rocket is equipped with on-board health management system. When failures are detected by the health management system, the reusable sounding rocket autonomously changes the flight plan for safe return. The main avionics equipment of health management system are, 1) health management computer and 2) high speed real-time network.

The health management computer is prepared to avoid heavy duty on flight control system in addition to the guidance, navigation and control computer. And the health management system can be upgraded easily by replacing the health management computer. High speed real-time network is necessary to communicate a vast amount of data, in real-time, to achieve the abort. However, since most of the existing high speed network does not guarantee real-time communication, it becomes necessary to develop and demonstrate such network system. Therefore, MHI has begun a research on the real-time network. Our approach is to apply commercial based network or Ethernet and construct the real-time response by using network traffic control via software. Such approach was selected considering the versatility and cost efficiency.

This paper describes the status of vehicle system design especially focusing on the health management system. Also the demonstration results of the real-time network are described.