

SPACE OPERATIONS SYMPOSIUM (B6)
Human Spaceflight Operations Concept (1)

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EVALUATION OVERVIEW FOR THE JEM GROUND OPERATION SYSTEMS AS JAPAN'S FIRST
HUMAN SPACEFLIGHT OPERATION

Abstract

The Japanese Experiment Modules (JEM) were launched and attached to the International Space Station (ISS) core on March and June, 2008, and Japan's first human spaceflight ground operation has been started since then. The Design and development of the JEM Ground Operation and Control Systems (JEM OCS) had been started since 1996 and the JEM OCS end-to-end test with NASA, the integrated system test, and the verification test with JEM flight systems on the ground had been completed by 2007. After these JEM integrated system tests were completed, JEM OCS was provided to the NASA/JAXA Joint Multi System Test (JMST) for the JEM mission simulation as the final pre-launch software verification. JEM OCS is the first Japan's Ground Operation Systems for the human spaceflight operation which is connected to ISS/JEM on orbit through NASA Houston Mission Operation Center (MCC-H). The 24-hour daily operation using JEM OCS has been performed at JAXA Mission Control Room (MCR) in Japan. At the very beginning of the JEM OCS development, the following basic design concepts were required as high reliability systems. 1) To implement the duplicate systems; 2) To identify and control for the hazardous commands; 3) To secure the system security; JEM OCS software reliability prediction from the reliability growth curve was assumed 99.7% at the end of the final software verification phase on March, 2008. Against this assumption, a lot of serious failures appeared during the first one year operation and these failures caused significant impact to the JEM real time operation. The five hundred squawks (problems) were identified including operation failure from one year JEM operation and 22 failures caused serious damage to the JEM real time operation for telemetry monitoring and commanding loss. In this paper, the evaluation overview for the JEM Ground Operation Systems as the Japan's first human spaceflight operation will be described showing one year real time operation result.