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

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DESIGN AND DEVELOPMENT OF NEW JEM GROUND OPERATION SYSTEMS FOR THE NEXT GENERATION

Abstract

The first module of Japanese Experiment Module (JEM) was launched and attached to the International Space Station (ISS) core in 2008, and Japan's first human spaceflight ground operation at JAXA Space Station Integration and Promotion Center (SSIPC) has been started since then. JEM Operation and Control System (JEMOCS) is the first Japan's ground operation systems for the human spaceflight operation to provide telemetry monitoring and direct commanding capability through Space Station Control Center (SSCC) at NASA/JSC. At the very beginning of the JEMOCS development, following design concepts were required for high reliability systems. 1) To implement the redundant systems; 2) To identify and control for the hazardous commands; 3) To ensure the system security; On the other hand, it's over ten years since the current JEMOCS design and development was started in 1996. JEMOCS computer systems had faced up to reliability problem for computer aging issue since JEM full-dress operation was started in 2008. To prevent JEMOCS from aging failure, the design and development of the JEMOCS computer systems and application software for the next generation had been started since 2007. The design precondition for the new JEMOCS software was to inherit current JEMOCS design concept except interface differences caused by Operating System's generation gap. However, unexpected number of major design problems with current JEMOCS had appeared during the first one-year operation and these problems caused significant impact to JEM real time operation. To perform the continual improvement to the next JEMOCS design, corrective and preventive design for all the problems must be reflected in the new software design effectively. Major improvement from the problems is to redesign the JEMOCS redundancy operation mode which enables reliable operation and shortening the JEMOCS primary/secondary switchover. As a result, JEMOCS replacement schedule was delayed for one year from the original schedule because this major problem must be improved to the new JEMOCS design for the next generation. Furthermore, transition from current JEMOCS to new JEMOCS is a major concern which will be introduction for a long term JEM mission operation. JAXA, aiming at completion of JEMOCS replacement and transition in 2011 successfully, has started the new JEMOCS system integration test using new computer systems in early 2010. In this paper, design and development of JEM Ground Operation Systems for the next generation including evaluation of the designing for transition and IV&V activities will be described.