SPACE OPERATIONS SYMPOSIUM (B6)
Sustainable Utilization of the ISS Beyond 2015 - Joint Session of the Human Space Endeavors and Space Operations Symposia (6.-B3.4)

Author: Mr. Yusuke Muraki
Asian Development Bank (ADB), The Philippines

Mr. Masato Uesugi
Japan Aerospace Exploration Agency (JAXA), Japan

THE SUSTAINING ENGINEERING FOR JEM LONG TERM OPERATION

Abstract

Upon successful assembly and checkout of JEM (Japanese Experiment Module; KIBO) on ISS, long term operation more than 10 years is expected to derive the experimental results as much as possible. Sustaining engineering with preventive maintenance and break down maintenance by launching spare equipments and Intra Vehicular Activity (IVA) by astronauts is one of the key points to achieve that. This sustaining engineering for such a long duration is a new experience for Japan whose JEM is the first manned space system, because satellites, that it is not capable to fix problems on orbit, don't require it.

In this paper, the overview of the sustaining engineering for JEM, such as the plan of preventive maintenance and breakdown maintaince for JEM ORUs(Orbital replacable Unit), the procurement plan of spare, and efforts to reduce costs for the maintenance is introduced.

The maintaince plan of JEM consists of preventive maintenance and breakdown maintenance. As preventive maintenance, on orbit 'Inspection' such as telemetry check by laptops, 'Cleaning' for the equipments such as filters or smoke detectors, and 'Replacement' of consumables are performed. As breakdown maintenance, failed ORU is replaced by new spare ORU. At the beginning of the program, failed ORU was planned to be returned to ground and launched again after fixing the problems on ground. However, after the shuttle retirement, it is expected that the return of ORUs is difficult. Therefore, procurement of spare is necessary. The number of ORUs require for breakdown maintance is calculated using the MTBF(Mean Time Between Failure). JEM Spare parts have been procured based on the procurement plan with this number.

In order to reduce the procurement costs of JEM spare parts, the following efforts have been made. 1) Utilizing the CSP (Common Spare Pool) service provided by NASA, 2) Utilizing PM (Proto Model) or EM (Engineering Model, that is functionally Flight Equivalent Unit used for Environmental Test) as Spare, 3) Utilizing commercial devices for Spare. The detail of these efforts is also introduced.