MICROGRAVITY SCIENCES AND PROCESSES (A2)
Facilities and Operations of Microgravity Experiments (5)

Author: Mr. Giorgio Trinchero
Thales Alenia Space Italia, Italy, giorgio.trinchero@thalesaleniaspace.com

ISS FLUID SCIENCE LABORATORY ON-ORBIT OPERATIONS: HARDWARE AND SOFTWARE ENHANCEMENTS, MVIS COMMISSIONING AND ISS MICROGRAVITY MEASUREMENTS

Abstract

FSL on-orbit activities started on March 10th, 2008, and are proceeding as planned, fully exploiting the FSL scientific performances. In particular, the fluid science research activities in space reached a fundamental milestone on August 7th, 2008, with the successful completion of the first experiment run in the FSL facility. The experiment - called GeoFlow - has concluded and completed ten further runs until mid of January 2009. Very good live images were received during the experiment and good quality experiment data was stored on the hard disk of the FSL Video Management Unit.

Since that date, FSL has undergone specific enhancements in the hardware and software capabilities in order to further increase system flexibility. In particular: 1) The Video Management Unit short term data storage (hard disks) and long term data storage (tape recorder) for later data retrieval/replay and downlink/evaluation have been significantly increased to record a large amount of experiment data. 2) FSL main system software has been updated to include additional flexibility for controlling the thermo-electrical interface between FSL and its experiments.

In addition, the FSL Microgravity Measurement Assembly (MMA) has been exploited to measure acceleration during ISS external load events (e.g. vehicles docking/undocking, ISS re-boosts) and experiment execution (e.g. GeoFlow, PCDF). MMA measurements have demonstrated once more the FSL flexibility and have significantly increased ISS scientific know-how wrt microgravity environment.

The Canadian Space Agency furnished Microgravity Vibration Isolation Subsystem (MVIS) installed on FSL has been fully commissioned in orbit. The MVIS has been designed to allow experiments to be conducted in low gravity without interference from vibrations produced by the ISS. MVIS has demonstrated how is possible to improve the opportunities for the exploitation of microgravity vibration isolation technology.

Also, a lot of advantages have been gathered by the remote monitoring and commanding from ground, so local monitoring and control by astronaut is not a frequent event. In addition, the full automatic experiment conduction has saved crew time and has given the scientists the possibility to keep under direct control the experiment execution.

Thanks to FSL modular philosophy and the decentralized approach to operations, a number of scientists, from all over the world can perform experiments, sending commands and receiving data directly in their laboratories. It is possible, through this approach, to maximize as much as possible the scientific results expected by the Fluid Science scientific community.