SPACE LIFE SCIENCES SYMPOSIUM (A1)
Biology in Space (7)

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MICE DRAWER SYSTEM (MDS): OUTCOMES FOR FIRST MISSION AND SCENARIOS FOR A SECOND MISSION TO THE INTERNATIONAL SPACE STATION

Abstract

In the frame of the first ISS Utilization Plan, ASI initiated the MDS Program, including the development of the facility and the preparation and execution of first mission. TAS-I (Milan plant) was the Prime Contractor and developed the MDS facility. Genoa University lead the research organization and execution.

In its first mission, MDS was launched to ISS with the STS-128/17A flight on August 28, 2009 and re-entered with STS-129/ULF3 on November 27, 2009, after 91 days in space.

Three (1 wild type and 2 transgenic) of the 6 launched mice, appeared in excellent health at landing, and became the mammals with the longest exposure to μG other than human. Our studies examined a wide range of physiological systems, such as muscle, bone, different organs and glands, blood, brain (and behavior), and neurosensory, and collectively offer an integrative view of the mammal's physiological response to μG. Our joint experiments involved scientists from 5 nations, reflecting international collaboration and cooperation to reach a scientific goal. A first report on the obtained data is being published in a collection of articles in the journal PLoS One.

Undoubtedly, the MDS experiment presented a major limitation regarding the number of the investigated animals. A re-flight of the facility appears as a mandatory need to be able to perform reliable statistical analyses. In fact, the MDS experiment represented a unique opportunity to perform an experiment designed to study the effect of a long term exposure of a mammal to a microgravity environment, collect data that could guide the planning of future similar experiments and favor the development of countermeasures for astronauts in future long term space missions.

In view of a MDS re-flight, an alternative to the Shuttle transportation system to/from the ISS shall be identified. Most of the carriers available at the moment do not permit the downloading of payloads at the end of the mission since they burn out during the atmospheric re-entry. So far, only the Russian Soyuz and the Dragon SpaceX are able to provide this downloading capability. In addition, during both uploading and downloading phases the carrier shall permit to power the payload and shall provide adequate mounting interfaces, thermal dissipation and air revitalization capabilities.

The paper presents programmatic, technical and scientific aspects of a second MDS mission, including a preliminary assessment about available carriers and related possible utilization scenarios.