IAF MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)
Life and Physical Sciences under reduced Gravity (7)

Author: Dr. Michele Balsamo
Kayser Italia Srl, Italy

Dr. Alessandro Donati
Kayser Italia Srl, Italy
Dr. Gianluca Neri
Kayser Italia Srl, Italy
Mr. Luca Pieroni
Kayser Italia Srl, Italy
Dr. Valfredo Zolesi
Kayser Italia Srl, Italy
Dr. David Zolesi
Kayser Space Ltd., United Kingdom
Mr. Alessandro Mariani
Kayser Italia Srl, Italy

EXPLOITING THE POTENTIAL OF COMMERCIAL FLIGHT-PROVEN HARDWARE FOR BIOLOGICAL EXPERIMENTATION IN SPACE.

Abstract

Space life science research is of paramount importance for the future planned human activities on board International Space Station (ISS), the Lunar Gateway, or for the colonization of Mars because either gives insights into the effects of space flight on a number of biological model systems or provides countermeasures to fight the hostile effects of the space environment on the human body. State of the art experiment hardware proven to be successful in space operations and scientific results is therefore a valuable asset for the support of scientific investigations because it offers solutions that are reliable, cost-affordable, and scientific sound. Such space-proved hardware is also an asset for private entities exploiting research results stemming from the space environment (i.e. commercially-driven activities for utilizing space facilities). Kayser Italia (KI) develops space hardware systems and provides mission support for investigations on biological systems in space. Several types of bioreactors (experimental units or EU), have been developed. EUs reduce a laboratory into a hand-sized device dedicated to life science research experimentation on space platforms. They allow the autonomous execution of a scientific protocol, being designed to contain the cell culture and all the chemicals required by the experiment. To maintain a desired temperature during the experiment execution an incubator is employed. Driven by the current demand in the commercialization of the space, KI has launched a commercial service called "BIOREACTOR EXPRESS", which aims to establish an "express" way to perform scientific and/or technological experiments on board the International Space Station (ISS). It offers a large portfolio of bioreactors and biological experiment units complemented by a complete set of experiment containers (Kayser Italia Containers, KIC) providing multiple Levels of Containment (LoC) and embedded or stand-alone control electronics modules (KAB) for fully automatic execution of biological experiment protocol. BIOREACTOR EXPRESS is a service that exploits the KUBIK incubator facility of the European Space Agency (ESA) which is permanently installed on the Columbus module of the ISS. With this approach several categories of experiments can be performed using available miniaturized bioreactors dedicated

to biological, biotechnological and biochemistry experiments. A wider typology of experiments (plant physiology, food production, material science, fluid science, educational, etc.) can also be supported inside KUBIK. Standard units can be adapted to specific requirements since the available hardware portfolio is in continuous evolution and can be used on board several facilities/incubators for microgravity research.