IAF SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)
On Track - Undergraduate Space Education (3)

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MULTITROP: THE CHALLENGE OF USING A REFURBISHED HARDWARE FOR AN EDUCATIONAL AND SCIENTIFIC EXPERIMENT ON THE ISS

Abstract

It is current opinion that sustainable future in space is based on affordable initiatives. Reused rocket is a dream come true but in addition to the drastic reduction of flight expenses, new efforts should reduce costs of research experiments in space. The use of refurbished hardware can be a valid but challenging solution for researchers that have to reach their scientific goals accepting the technical constraints of hardware originally designed for satisfying requirements of different experiments. In 2017, ASI promoted YiSS (Youth ISS Science), a call for educational and scientific experiments to be performed on ISS during the VITA mission with astronaut Paolo Nespoli. Peculiarity of the call was the requirement to perform the experiment using hardware belonging to ASI and used for previous experiments in microgravity. The hardware was originally designed, developed and flight-certified by KAYSER ITALIA that was also responsible for its refurbishment. Among the 13 projects submitted for the competition, MULTITROP (MULTITROPism: interaction of gravity, nutrient and water stimuli for root orientation in microgravity) was the winner. The project was elaborated by scientists of University of Naples Federico II in collaboration with students from the University and the High School 'Liceo Scientifico Silvestri'. In addition to the educational aims of enhancing young people's interest in space biology, the experiment had a scientific

goal in plant space biology. It aimed to disentangle the role of gravity from other two stimuli for root orientation: hydrotropism and chemotropism. ASI has funded and coordinated the program, also providing access to the space resources thanks to a bilateral agreement with NASA. MULTITROP was performed in a BIOKON container equipped with two Experiment Units previously flown for the Yeast In No Gravity (YING) experiment supported by ESA in 2009. The hardware was refurbished and slightly re-adapted to fulfill the mission requirements and to ease the accommodation and retrieval of the biological samples. Pre-flight and In-flight phases have been successfully completed while the Post-flight one is in progress. Students were much involved in experimental activities (including project design, laboratory tests, data elaboration) and dissemination events. They took part in the late access activities at NASA-KSC launch site. Students also stimulated people interest to space science and technology with a significant coverage by media. Specific aim of this paper is highlighting the methodological approach and student involvement to tackle the problems derived from using refurbished hardware. Lessons learned from this perspective are also reported.