

HUMAN SPACEFLIGHT SYMPOSIUM (B3)
Utilization & Exploitation of Human Spaceflight Systems (3)

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ESA'S UTILISATION PROGRAMME ON THE ISS

Abstract

Since 2008 the European Columbus module is for the European Space Agency (ESA) the key laboratory to exploit the unique potential of the International Space Station (ISS) in a broad range of utilisation areas. For ESA, life and physical sciences are still focal areas comprising human research, biology/astrobiology, radiation and materials science, fluids and fundamental physics. In addition, an increasing number of technology demonstrations are providing further knowledge necessary for Earth-related services and future human exploration in space. ESA has performed more than 150 experiments on the ISS since the launch of Columbus, namely within the scientific context of ELIPS (European Programme for Life and Physical Sciences in Space). Selected ISS utilisation highlights performed by ESA will be presented to show the latest accomplishments and forward plans of the very active and broad European user community, including international scientific cooperation.

The most rewarding part of ISS utilisation is progressing well with a challenging and intense experimental programme. A variety of important new experiments is being continuously prepared for implementation on-board the ISS. In human research – essential for human exploration and earthbound health problems – the second generation of scientific experiments is already in progress in the neurophysiological/cardiovascular/respiratory/musculoskeletal areas and new medical measures and smart biomedical instruments will be tested in this year's short-duration ISS mission by an ESA astronaut. In biology

research the cell, developmental, microbial and plant studies will be expanded using the Columbus capabilities. The new Expose-R2 astrobiology experiment package has been installed on the external surface of the ISS for 1.5 years of exposure to open space. In physical sciences applied research is focused on complex fluids behaviour and metal alloy solidification in combination with the new capability for high-precision thermophysical properties measurement for optimisation of casting processes. In fundamental physics the next generation of cold dusty plasma research has just started and the unique Atomic Clock Ensemble in Space (ACES) will in the future provide universal unprecedented time and frequency accuracy and test Einstein's theory of general relativity. The SOLAR payload will soon complete almost a decade of unprecedented data acquisition throughout a solar cycle.

International science collaboration with ISS partners is further expanding, having already provided great mutual benefits. The continuously increasing yield of unique scientific knowledge and simultaneous operational optimisations demonstrate the exploitation value of the ISS as a human outpost in Low Earth Orbit (LEO) for fundamental science, applications and technology demonstrations.