

HUMAN SPACE ENDEAVOURS SYMPOSIUM (B3)
Space Station Utilization (3)

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ESA SCIENCE AND APPLICATIONS PROGRAMME ON ISS

Abstract

The European Columbus laboratory was launched and attached to the International Space Station (ISS) 5 years ago. This allows the European Space Agency (ESA) to permanently exploit the unique possibilities for research and applications in space in a broad range of utilisation areas: from fundamental physics, fluids and materials sciences through to biology and human research; from technology demonstrations of future space systems to acquiring the skills and knowledge necessary for future human exploration in space. Since 2008 ESA has performed more than 110 experiments on the ISS namely within the scientific context of ELIPS (European Programme for Life and Physical Sciences in Space). A variety of research highlights have been accomplished which will be presented to show the benefits of the European permanent man-tended laboratory in space. The most rewarding part of ISS utilisation still lies ahead until at least 2020 with a challenging experimental programme. Many important new experiments are soon to be deployed and operated on the ISS, such as applied research of fluids, particles and materials with the ElectroMagnetic Levitator (EML) for thermophysical properties measurements of industrial alloys, and the unique Atomic Clock Ensemble in Space (ACES) which will provide universal unprecedented time and frequency accuracy and make tests of Einstein's theory of general relativity. In human research - necessary for human exploration as well as in various ways improving health on Earth - there is already a comprehensive series of experiments in the areas of neurophysiological/cardiovascular/respiratory/musculoskeletal/etc science already underway and new experiments under preparation. In biology a variety of plant, cell and developmental experiments will be performed in several dedicated ESA processing facilities in Columbus. Within life sciences this domain also partially has close links with human research activities such as immunology. Also a new astrobiology experiment package is under preparation in continuation of the two previously flown Expose experiment complements. The SOLAR payload is already acquiring data since 2008 throughout a full solar cycle. International collaboration in ISS utilisation has already shown great benefits and a large number of joint experiments is planned for the future. With the already acquired scientific knowledge and operational experience the optimum use of the full ISS potential for science, applications and technology demonstrations in space is continuously progressing year by year. At the same time the majority of research activities in space is closely connected to ground-based research, which is encouraged and supported by ELIPS.