

HUMAN SPACE ENDEAVOURS SYMPOSIUM (B3)
ISS Utilisation (3)

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ESA CONDITIONED CONTAINER: A SYSTEM FOR PASSIVE TEMPERATURE CONTROLLED
TRANSPORTATION OF EXPERIMENTS FOR THE INTERNATIONAL SPACE STATION**Abstract**

The ESA ISS scientific utilization includes the performance of several biological experiments, exploiting different facilities available on board the ISS. Many of these experiments require transportation to/from the ISS in temperature-controlled conditions. Meeting temperature requirements as well as volume and mass constraints for thermally conditioned transportation of scientific samples to and from the International Space Station has always been challenging. This has become even more difficult after retirement of the Shuttle. To cope with these challenges, ESA developed a family of passive containers with very high thermal performances, the ESA Conditioned Containers (ECCO). The core of the system is a container with very good thermal insulation. The technology chosen for the container is the Vacuum Insulation Panel (VIP). The VIP uses the insulation effects of vacuum to produce much higher insulation values than conventional materials (about one order of magnitude). Furthermore, the VIP have adequate stiffness and resistance to withstand the launch, landing and on-board crew induced loads. To absorb the environmental heat transferred inside the container, high efficiency Phase Change Materials (PCM) are used. They are thermally conditioned on ground for experiment upload, and using ISS refrigerators / freezers for experiment download. They can be selected with different melting temperature, to meet different experiment requirements. Until now, they have been selected to keep experiments below -15 deg C, between 2 deg C and 10 deg C or above 23 deg C. In this case, the ECCOs are capable of keeping for more than four days the experiments within the required range. The ECCO fleet includes containers of two sizes (ECCO and ECCO-b) developed to cope with launches/retrieval on Soyuz, Progress, ATV and HTV. Special outfitting elements, reproducing the NASA middeck locker configuration, are available for hard mounted installation in Progress. Another smaller container (Mini-ECCO) has been developed to allow return of experiments in the Soyuz crew re-entry capsule. Finally, it is under assessment the utilization of ECCO with the new Dragon space vehicle. At the moment, one ECCO unit has supported the WAICO-2 experiment in 2010, two units are stored on the ISS, after transportation within the logistic module HTV-1 and two Mini-ECCO have been uploaded with ATV-2. One of these Mini-ECCO will return with Soyuz 28S, transporting frozen samples from ESA experiments SOLO and CARD.