The experiment ARTE successfully conducted on board the ISS

Thermal Exchange is an experiment designed and developed by Argotec inside the Italian Space Agency project titled ARTE. This project allowed us to verify the behavior of a heating system, in microgravity conditions.

Turin/Rome, April 5, 2016 - Yesterday, April 4, 2016, the experiment ARTE (Advanced Research for Passive Thermal Exchange) was successfully conducted on board the International Space Station. It is a technology demonstrator of heat pipes designed and built by Argotec and coordinated by the Italian Space Agency (ASI) to satisfy the notice "Human Space Flight for Research and Technological Demonstration on the ISS". Politecnico di Torino took part in the initial design phase of the experiment electronics. They delivered a first prototype used to validate its architecture. On March 23, the payload was delivered to the station by the Cygnus CRS OA–6, an Orbital/ATK vehicle.

Reliability and simplicity are two of the most sought after features in aerospace. These objectives are of greater importance as human missions explore more and more distant destinations. In the context of heat transfer, the passive solutions meet the need of systems that do not require human intervention. They also simplify maintenance operations since failures occur less frequently than with active systems. The heat pipes are passive transfer devices which exploit fluid phase change to transfer heat from a hot area (for example on-board electronics) to an area where this heat can be dissipated.

At the moment, some heat pipes are installed externally on the International Space Station. They are not currently used internally because they contain ammonia, a toxic fluid that, if released into the inhabited environment, would create a catastrophic hazard to the astronauts and on-board systems. Inside the Station, heat transfer is achieved by active systems. Such systems have rotating parts which increase the complexity, especially in the case of failures: in many cases maintenance of the components is not possible so, to remove the failed component and to launch a replacement is costly. It is also necessary to use crew time and additional upmass capabilities on subsequent vehicles to deliver the replacement parts.

In this scenario, ARTE aims to demonstrate the scientific validity of the heat pipe in order to replace more complex systems. The four heat pipes contain low toxicity working fluids in order to make the devices more suitable for inhabited modules and vehicles.

The experiment was conducted installing ARTE inside the Microgravity Science Glovebox (MSG) which is located in the American module, Destiny. The sequence of the experiment, lasting six hours, took place nominally. Engineers followed and supported the operations from the Argotec Mission Control Centre in Turin. Now, they are working to compare the results collected with the numerical simulations and with the data collected in the baseline data collection obtained before the launch analyzing tests conducted on the ground with the flight model.

"With this test in microgravity Argotec made a big step for on-orbit validation of a new Italian made heat transfer system - said David Avino, Managing Director of Argotec. ARTE is the result of 4 years of investment and research carried out by Argotec, to address the need for heat dissipation in space. ARTE is another milestone for Argotec that in 11months has sent two hardware models, entirely made in its laboratories, to the ISS.

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