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PUBLIC-PRIVATE PARTNERSHIPS TO DEVELOP NEW APPLICATIONS FROM SPACE  
RESOURCE UTILISATION: THE CASE OF GREEN AIR EXPERIMENTS ON BOARD THE ISS

**Abstract**

Green Air is a project held in joint venture between the Italian Space Agency (ASI) and AGT Engineering, an Italian small company specialized in technology transfer, to develop two scientific experiments on board the ISS: ICE - Italian Combustion Experiment, in partnership with the National Research Institute (CNR) – Istituto Motori; and Diapason in partnership with DTM, an Italian SME. The two experiments were carried out by the Italian astronaut Luca Parmitano during the Volare Mission, increment 36 (May-November 2013).

Green Air is the first public private partnership (PPP) project between ASI and an Italian SME for the use of the ISS equipment and services. By this partnership ASI (in partnership with NASA), AGT and its partners shared the access on board the ISS and its facilities, the Astronauts' skills and time and the scientific knowledge to carry out the experiments.

ICE is the study of the evaporation and combustion regimes of second and third generation biofuels and fundamental biofuel surrogates. The combustion in microgravity (taking place into the NASA Combustion Integrated Rack) allows to spray liquids into perfect spherical shaped micro drops which means ideal conditions for combustion. Thanks to this experiment it is possible to produce a library of ideal parameters which are then used to optimize the combustion of next generation fuels in earth-working engines and combustion chambers.

Diapason is a simple portable and light instrument, developed by DTM, able to analyze the particles contained in the air. It can capture nanoparticles from 2 to 1000 nanometers into a cartridge that can be removed and analyzed by an analytical instrument. Diapason was placed and switched on in 5 different locations within the ISS in order to measure the air quality on the ISS and to tune the instrument in the ideal conditions for the subsequent use on the Earth. In addition to the air quality checks, AGT and DTM have identified the collection and identification of some types of virus and bacteria in the air as a possible development, extending the Diapason use to hospitals surgery rooms and special environments.

The Green Air team is working into the analysis of the scientific results coming from the experiments with the aim of targeting new applications and their related markets. The paper will describe how the scientific outputs are being turned into their applications and will include recommendations for further policy implementation mechanisms on the Aerospace PPPs.