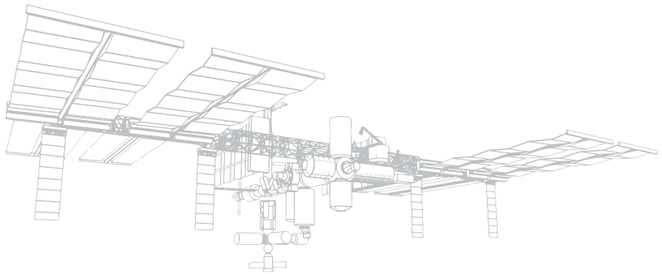
17

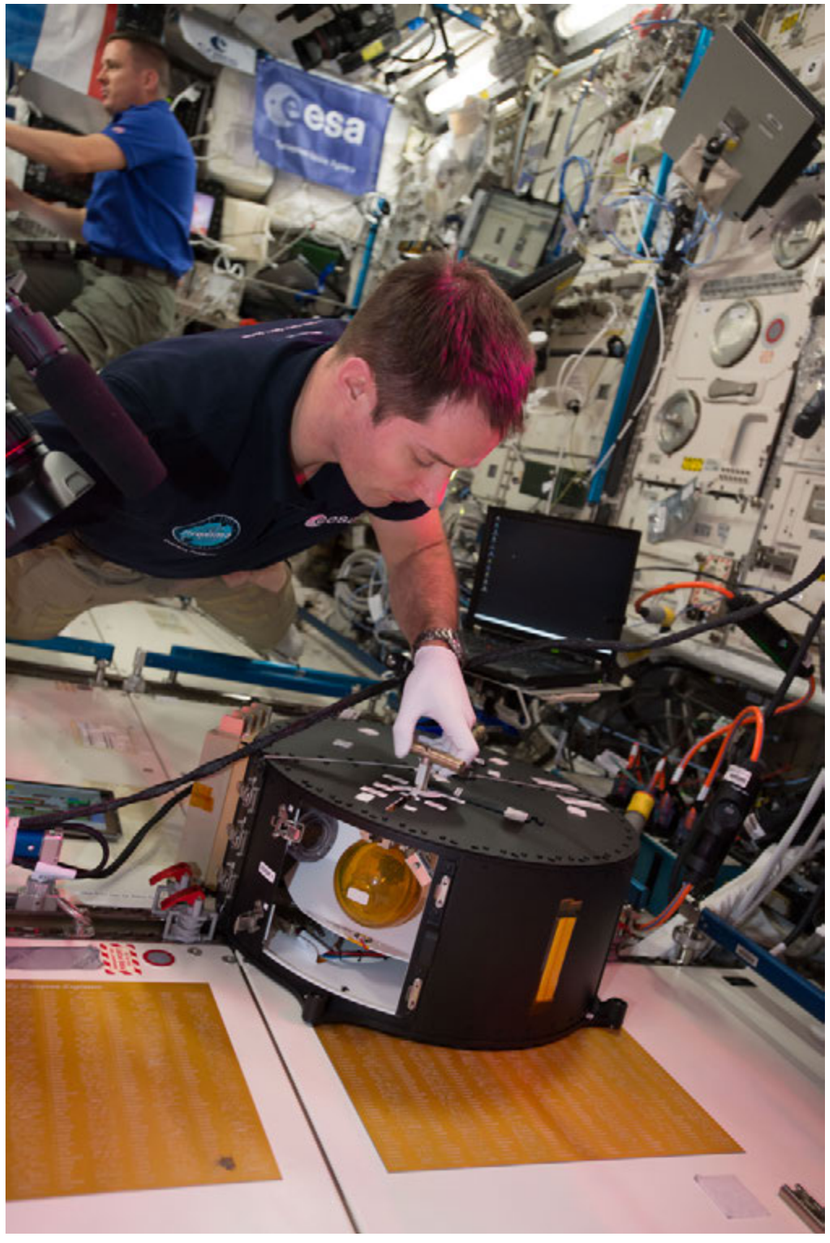
MATERIALS SCIENCES IN SPACE



7 MATERIALS SCIENCES IN SPACE

CNES leads a programme in the field of physical sciences offering microgravity conditions to French laboratories. Most of the time we offer access to weightlessness campaigns, which provide 100 periods of 20 seconds of micro-G. When longer periods of microgravity are required, after validation of the prototype we look for international opportunities to share our knowledge and access experiments in sounding rockets or on the ISS. The general goal of physical science in microgravity is to understand the self-organization of matter during phase transitions. Microgravity on the one hand simplifies problems by removing the gravity term in the equations, and on the other hand suppresses the disturbing phenomena induced by gravity such as convection, sedimentation or buoyancy. The fields covered by CNES include fluid physics, complex materials, biophysics, solidification of matter and combustion.

/ FLUIDICS



FLUIDICS.
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FLUIDICS is an example of an instrument developed by CNES dedicated to studying the behaviour of fluids subjected to mechanical excitation. A transparent sphere containing liquid is shaken angularly. In microgravity, the liquid spreads by capillarity over the entire surface of the sphere, thus eliminating the edge effects inevitably encountered in a test pool on the ground. Cameras and liquid film height sensors record the movements of the free surface. Installed in the ISS, the theory of capillary wave turbulence this experiment verified the theory of capillary wave turbulence for the first time. Since then, ESA has been using the instrument aboard the ISS for many European laboratories, in particular to simulate sloshing of propellants in the tanks of launchers or satellites. However, to overcome angular excitation artefacts and improve research, CNES is launching a project for a new instrument including a linear exciter for larger spheres.

REFERENCES

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