Internship opportunity

Title: Interaction among flame spreads over cylindrical samples in microgravity.

Terms: Applicants should be motivated individuals and pursue a graduate degree in Mechanical Engineering and/or Physics. The position is expected to start from the beginning of 2016 and will last 6 months. The monthly allowance is 450 Euro. A PhD may follow this internship.

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Topic context: The main objective that drives the current projects dealing with fire safety for manned spacecraft is to create a comprehensive data set to enable a suitable paradigm for fire safety in spacecraft and space infrastructure. To face this challenge within the context of the future manned mission to Mars, a topical team gathering experts from NASA, CNES, JAXA, ESA, and ROSCOSMOS, has started working on the definition of a complete series of demonstration and validation experiments. These experiments must capture the fundamental science of ignition, spread and extinction of a flame in both normal and microgravity and enable demonstration of the fire sensing and growth prediction tool that will be developed along the project.

The experimental investigation aims for a final validation data set gathered in-situ through a series of large-scale experiments that are being designed for the Cygnus Spacecraft.

Scientific objectives: The specific internship objective is to assess the interaction that concomitant spreads can experience when flames are established over a set of cylindrical wires in microgravity. Soot is especially expected to play a major role due to its contribution to radiative heat transfer that govern flame spread in microgravity. Therefore, soot concentration needs to be mapped along the spread. To this end, a light extinction technique will have to be set up. Experiments conducted in microgravity will have to be contrasted with those performed at normal gravity.

Expected progress: The student will join a team of experimentalists at Institut Jean le Rond d’Alembert (Université Pierre et Marie Curie-Paris 6) to take part into a parabolic flight campaign scheduled in May 2015. The experimental core of this work is a rig that has been developed at Institut d’Alembert. It especially enables the study of flame spread over cylindrical wires onboard the Airbus ZeroG. The student will have to conduct experiments in microgravity and at normal gravity.

References:
3 See the story of the UPMC rig’s 1st parabola performed in October 2014: http://www.dalembert.upmc.fr/home/legros/index.php/component/content/article/14-articles-exemples/75-flame-propagation-in-microgravity-small-scale-experiments