Microgravity Flammability Experiments for Spacecraft Fire Safety

As fire behaviour in manned spacecraft still remains poorly understood, an international topical team has been created to design a validation experiment that has an unprecedented large scale for a microgravity flammability experiment. While the validation experiment is being designed for a re-supply vehicle like the ATV or Orbital's Cygnus, a series of supporting experiments are being planned and conducted by the team members. In order to answer the appropriate scientific and engineering problems relevant for spacecraft fire safety, a canonical scenario that can improve the understanding of flame spread, and thus also the modeling thereof, in realistic conditions is described. Some of the parameters governing the flame spread are also identified and their scaling against the dimensions of the test specimen is briefly questioned. Then several of the current and scheduled efforts are presented in terms of their relevance for the flame spread problem.

Further, it is explained how the results can be combined to enhance the understanding of fire spread in the real scale configuration and thus improve the fire safety onboard spacecrafts. The results and particularly the ones from the large scale validation experiment are crucial to the ultimate goal of the project, which is the development of predictive tools that should be capable of selecting an adaptive response to fire spread in any manned spacecraft.

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