

MICROGRAVITY SCIENCES AND PROCESSES (A2)  
Microgravity Sciences onboard the International Space Station and Beyond (6)

Author: Prof. Mark Weislogel  
Portland State University, United States, mmw@cecs.pdx.edu

APPLICATIONS OF ISS EXPERIMENTAL RESULTS TO SPACECRAFT SYSTEMS DESIGN:  
EXAMPLES IN CAPILLARITY

**Abstract**

Experiment operations have currently been completed for 3 of 11 handheld vessels designed to study certain capillary flow phenomena in the low-g environment of the ISS. The second Capillary Flow Experiments (CFE-2) have contributed significantly to our concerns and confidence for advanced systems design. In this paper, several practical problems of low-g fluids management are presented that serve as examples of how design methods may be improved using results suggested or confirmed by data collected on ISS, in NASA drop towers, and in 1-g laboratories. These examples touch on problems requiring passive phase separations for low-g waste water processing, multi-phase flow, static fluids positioning and stability, and means for both simple dynamic analytically-based designs and complex static numerically-based designs. Sample design methods will be outlined and a new open source numerical tool will be highlighted allowing for rapid modeling of complex geometric interfacial phenomena. The example design problems selected are ones in which an insufficient understanding of capillary phenomena could lead to poor performance in the low-g environment aboard orbiting spacecraft.