

Progress on the Multi-Phase Flow Experiment for Suborbital Testing

Kathryn Miller Hurlbert¹, Ralph Marak¹, Richard Cable Kurwitz², Mike Ellis³

¹ NASA Johnson Space Center, Crew and Thermal Systems Division, Houston, Texas, USA

² Texas A&M University, Nuclear Power Institute, College Station, Texas, USA

³ Advanced Cooling Technologies, Inc., Lancaster, Pennsylvania, USA

Poster Abstract

The NASA Johnson Space Center (JSC), Crew and Thermal Systems Division (CTSD), had previously developed an orbital flight experiment to 1) test the feasibility of a water purifier for use in zero-gravity conditions, and 2) demonstrate sustained operation of a two-phase flow system with a passive gas/liquid separator. By design, the influent fluid was kept under pressure to saturate the water with gas; however, farther downstream, the fluid mixture is returned to near atmospheric pressure and fed into a vortex separator. The separator and overall system function was designed for operation in both Earth- and zero-gravity conditions. The gas within the system is vented off downstream of the separator, and most of the liquid is re-circulated in the processing loop over the duration of operations.

The Multi-Phase Flow Experiment for Suborbital Testing (MFEST) was originally designed for the Space Shuttle mid-deck, but was never flown due to mass, crew time, and other mission limitations. MFEST was proposed to the NASA Office of Chief Technologist (OCT) Flight Opportunities Program (FOP) and selected for parabolic and suborbital flight testing. The primary purpose of the test program is to verify functional operations of the flow system and unique separator for a relatively long duration with variable gravity, in support of future space vehicle designs and missions.

This poster will provide an overview of the project status. The original experiment hardware was minimally modified to test the two-phase flow and separation functions without using simulated or active water processing. Ground testing and two FOP-sponsored parabolic flight campaigns have been completed, and the experiment is ready to proceed to suborbital flight testing.

