ISS and Human Research Project Office Highlights
March 25, 2011

ISS Research Project

Capillary Channel Flow (CCF) experiment completes first phase of operations aboard ISS.
CCF completed the first phase of operations on March 16, 2011. Over 1300 data points have been collected for the Experimental Unit #1 (EU#1), with 900 consisting of high speed, high resolution video image. CCF is a joint German-U.S. ISS flight experiment lead by Principal Investigator (PI), Professor Michael Dreyer (ZARM, The Center of Applied Space Technology and Microgravity) and U.S. Co-PI, Professor Mark Weislogel (Portland State University). CCF was developed by ZARM and funded by the German Aerospace Center (DLR) and NASA.

The international team, consisting of four Americans and five Germans, has supported 1574 hours of operation, (nearly 24/7 operation) of this experiment since early January. The CCF hardware was removed from the Microgravity Science Glovebox (MSG) facility on March 17, 2011 to allow the ISS crew to install the Boiling eXperiment Facility on March 22, 2011. CCF will be re-installed in the MSG in August 2011 to perform the second phase of CCF operations with the EU#2 corner channel geometry unit.

CCF is a joint NASA/DLR fluid physics experiment to investigate capillary flow through a flat plate channel geometry (Experimental Unit #1) and corner channel geometry (Experimental Unit #2) under pressure-driven conditions in the inertia flow regime. The U.S. Co-PI role in the CCF experiment involves EU#2 which investigates both the corner flow stability at high flow rates and the ability of the corner flow geometry to passively perform two-phase flow separation. (POC: RET/Robert D. Green, (216) 433-5402, MAH/Robert W. Hawersaat, (216)433-8157)

ISS026E022581

Figure 1. ISS Increment 26 commander, Scott Kelly, installing the Capillary Channel Flow (CCF) hardware in the Microgravity Science Glovebox (MSG) on December 27, 2010

Figure 2. CCF team on-console at ZARM in Bremen, Germany.

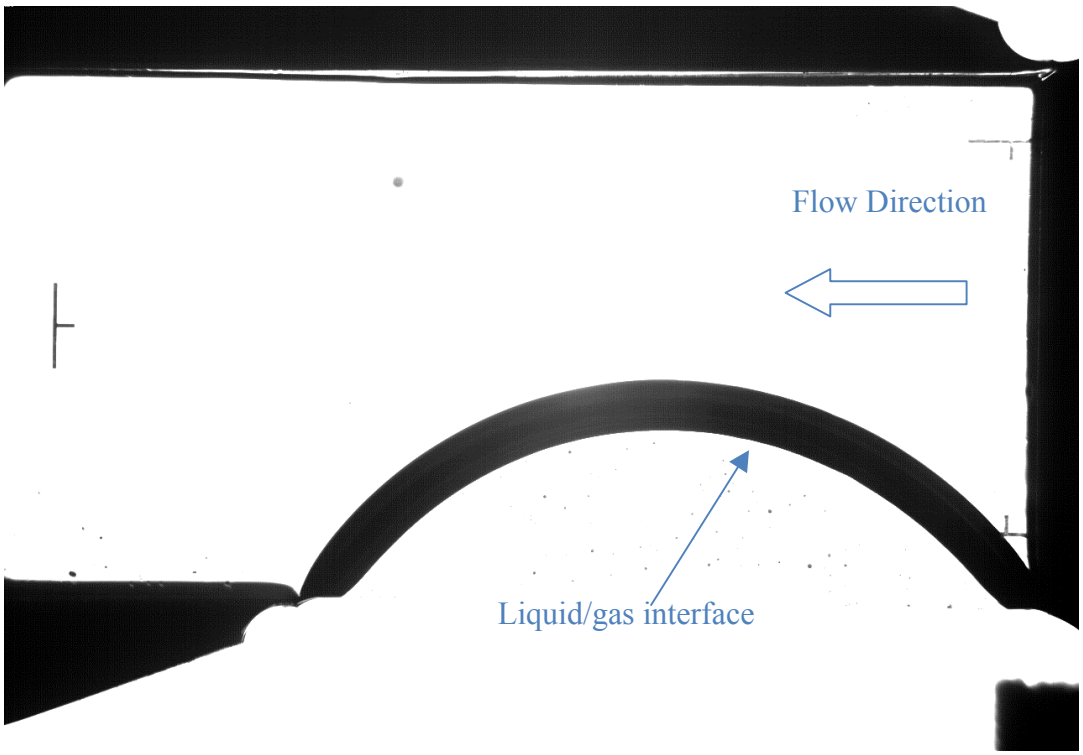

Figure 3. A down-linked CCF video image of the EU#1 test cell with groove channel flow geometry with slot door closed (at top of image). The free surface, or gas/liquid interface, assumes a curved shape under subcritical flow conditions as its mean curvature adjusts to the pressure drop in the channel. At a critical condition, i.e. where the maximum flow rate occurs, this free surface will "collapse" and gas is ingested into the channel. The results of this CCF experiment will verify models developed by CCF science team on modeling the flow in this geometry under subcritical flow conditions, confirm model predictions of where the critical conditions occur, and identify any new critical or unstable conditions (yes, this has occurred!) where the models need to be revised.