The Confined Helium eXperiment (CHeX): The Successful Return of the Low Temperature Platform Facility (LTPF) To Space

Melora Larson, David Pearson, Steve Elliott, Ulf Israelsson and Thomas Luchik
Jet Propulsion Laboratory, California Institute of Technology

The Low Temperature Platform Facility (LTPF) flew on STS-87 in late November 1997 as the Confined Helium eXperiment (CHeX). The CHeX mission was a success because the LTPF dewar provided a stable and long lived cooling source for the CHeX instrument. The LTPF is a NASA facility that is designed to accommodate space shuttle based science experiments or instruments that need cryogenic temperatures near 2K. The LTPF consists of a cryostat to cool the experiment and electronics that provide the interface between the experiment and the Space Shuttle. The LTPF has now flown three times on the United States Space Shuttle. The LTPF flew initially in 1984 as the Superfluid Helium Experiment on Space Lab-2; it flew again in 1992 as the Lambda Point Experiment (LPE) as part of the First United States Microgravity Payload (USMP-1); and it flew most recently this past fall on STS-87 as CHeX as part of USMP-4. Between every flight, the facility has been substantially upgraded. For the most recent mission, the improvements to the facility were driven by the need to meet updated Shuttle requirements and by the desire to increase the scientific return from the mission. These improvements involved changes to both the cryostat and the facility electronics. The cryostat was modified to increase the liquid helium lifetime to take advantage of most of the length of an extended duration shuttle mission. The facility electronics improvements included higher resolution readout electronics for the housekeeping sensors. We will report on the flight performance of the LTPF during the most recent mission (CHeX) and on some of the lessons learned during this mission. One important improvement in the facility since the 1992 flight was the enhanced dewar lifetime which gave the CHeX instrument 22% more time on orbit to take data compared to the previous flight as the Lambda Point Experiment. Also, during the preflight processing, the dewar vent lines became contaminated with solid air. We will discuss how these blockages were removed on the ground with out warming up the experiment installed in the facility. We will also discuss how the presence of the contamination modified the in flight performance of the facility. The performance of both the bath equilibrium temperature and the removal of exchange gas used during launch were affected by the remnant air contamination.