STEVENS INSTITUTE OF TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING

Thursday March 1, 2007
EAS Room 222, 3 pm
****** Note special date & time ******

Redesign and Retrofit of Conventional Turbomachinery to Enable Extreme Temperature Space Simulations

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The extreme temperatures found in the space environment must be simulated to enable realistic testing of spaceflight hardware. Turbomachines that circulate heat transfer fluids over a temperature range of -130C to +130C are critical components of modern thermal control systems used in large space simulation chambers.

During the modernization of a large space simulation chamber at JPL, a new 40 hp blower of conventional design was installed by a vendor. Instead of providing the high reliability required when testing one-of-a-kind spaceflight hardware, this blower failed within hours of initial startup. Simple repairs did not produce the desired performance. A detailed technical review revealed a number of design flaws.

This talk will address the redesign and retrofit of this 40 hp blower to reliably circulate gaseous nitrogen over a temperature range of -130C to +130C. The presentation will focus on the flaws in the conventional design, how they led to the failures, and how they were systematically addressed in the redesign. A pictorial chronology of the rebuilding and installation of the Blower will be presented. The technical "lessons learned" apply directly to mechanism design for extreme thermal environments.

Dr. Mark Balzer is currently a Senior Staff Engineer in the Robotics and Mechanisms Group at the NASA Jet Propulsion Laboratory at the California Institute of Technology. He obtained his BE in Mechanical Engineering from Stevens Institute of Technology in 1987, his MSME from SUNY at Buffalo while working at Moog, Inc., and his PhD from the University of Illinois in 1998. Since then Mark has been designing spaceflight mechanisms at JPL for NASA missions like the GALEX ultra-violet telescope now in orbit, the Mars Exploration Rovers currently driving around Mars, the Antenna Actuator and Launch Latch Assembly for the MLS instrument on the Aura spacecraft now in orbit, and many more. His professional interests include materials science, structures and mechanism design.

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