UNH's Institute for the Study of Earth, Oceans, and Space

NASA

# UNH-Patented Invention Now Orbiting in Space

By Amy Seif
Communication and Information Coordinator
Institute for the Study of Earth, Oceans, and Space
603-862-5369

December 4, 2001

---

**Editors/News Directors:**
**For questions about the Surface Trace Electrical Feedthru, contact UNH Professor Mark Granoff at 603-862-4958 or Philip Demaine at 603-862-2824.**

DURHAM, N.H. -- An invention enabling the passage of electrical signals across a vacuum chamber patented in June by the University of New Hampshire offers promise for the semi-conductor processing industry, the electrical industry and space physics research.

This new device, called a "Surface Trace Electrical Feedthru," is currently orbiting between the sun and the Earth as an integral part of an instrument on NASA's Advanced Composition Explorer (ACE) satellite.

The feedthru was designed at UNH's Institute for the Study of Earth, Oceans, and Space, with assistance from Ceramic To-Metal Seals, Inc. of Melrose, Mass., during the development of the Solar Energetic Particle Ionic Charge Analyzer (SEPICA). SEPICA, an instrument on ACE, is studying the magnetic charges of solar and interplanetary energetic particles, helping to meet the satellite's larger mission to observe energetic particles within the solar system.

SEPICA has contributed to other advances, including being the prototype for a variation that is now used to make higher resolution mammograms in the detection of breast cancer.

"The conventional feedthru devices are very large bulky items, but we had a small space to work within SEPICA. We were forced to get creative," explains Mark Granoff, the project engineer and one of the four

inventors.

Typically, space instruments like SEPICA are encircled in a large pressurized chamber that contains gas. This gas acts to clean wires of previous electrical charges so the wires can be used pick up the charges of space particles. However, SEPICA is such a large instrument that space requirements on the satellite couldn't be met with the addition of an outside gas chamber. This new invention made the chamber smaller and brought it inside the instrument.

The new feedthru consists of a thin conductive film of silver that is deposited into a shallow ceramic trough, then fired and flush ground with the adjacent surfaces of the insulating material. This technique allows for electrical conduction across a pressure or vacuum envelope.

Philip Demaine, senior project machinist in UNH's Space Science Center and co-inventor, describes the Surface Trace Electrical Feedthru as "a significant improvement in feedthru technology." He explains, "we needed to get many electronic signals out of a pressurized container in a limited amount of space."

Granoff can be certain this device is unique, having successfully defended the invention against five other U.S. patents that had challenged it. The approach of flush grinding the conductive metal into the surface of the insulator had never been used before in developing an electrical feedthru.

The Surface Trace Electrical Feedthru has benefits other than just a space conservative design. The device also offers simplicity of assembly and construction without the use of epoxy glues, avoiding problems stemming from breakdown of the glue bonds and outgassing contamination.

UNH is currently conducting research into potential commercial applications of the design.

Back to UNH News Bureau