



Engineering Better Material Solutions

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## News Release

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**For Immediate Release**  
**6/29/00**

### **Surmet's UltraC Diamond™ Hard Carbon Coating To Get First Flight Test on Hubble Hardware**

Surmet Corporation is pleased to announce that NASA's Goddard Space Flight Center in Greenbelt, Md., has chosen its UltraC Diamond™ Hard Carbon Coating to make its first trip into space next year aboard the Hubble Space Telescope.

The high performance microcoating enables the use of tiny titanium alloy parts of an experimental cryogenic cooler, or "cryocooler," that will be attached onto Hubble's Near Infrared Camera and Multi-Object Spectrometer (NICMOS) during a servicing mission in 2001. The cryocooler cools the detectors in the instrument and maintains them at 70 degrees Kelvin. This infrared instrument has been dormant since exhausting its supply of nitrogen ice in 1999. The cryocooler will restore NICMOS to full operation and extend its useful life.

During the cryocooler's normal operation, a tiny circulator shaft spins at a speed of 6000 revolutions per second. To minimize friction and wear, the circulator shaft and bearings required a very thin, extremely hard and slippery coating. A strongly adherent thin film coating of UltraC Diamond™ only about a micron thick (approximately 1/100th the thickness of a human hair) was found to provide the answer. In addition, the coating application process is such that very small parts with just millionths of an inch between them can be successfully coated.

Goddard's Hubble Project undertook a rigorous test program using Surmet's UltraC Diamond™ coating, to verify if it could operate in the extremes of space and its qualification for flight. "This new coating virtually eliminates wear and tear on moving parts," said Frank Cepollina, Manager of NASA's Hubble Space Telescope Development Project. "It has enormous potential for U.S. manufacturing--especially in high tech, rotating machinery such as high speed turbines and pumps. The new coating also has many medical uses, such as in ventricular assist heart pumps and prosthetic implants for hips and knees."

Use of the coating will mark the material's first use on titanium in space and the first use of any hard, carbon coating on such a small, complex, and precise machine component.

The coating is ultra hard (6000-8000 DPHN), has a coefficient of friction below 0.05 in air and can be deposited at temperatures below 100°C. UltraC Diamond™ can be deposited on a wide range of materials, including metals, titanium alloys, ceramics, polymers, and composites. The UltraC Diamond™ coating is manufactured and applied at the Burlington, Mass. facilities of Surmet Corporation. A technology-based small business, Surmet specializes in developing and commercializing innovative coating technologies. For more information contact, Dr. Suri Sastri, (781) 272 3250, e-mail: [ssastri@aol.com](mailto:ssastri@aol.com)



Tiny bearings and turbine shafts like these are part of a new cooling system for Hubble's infrared NICMOS instrument. To minimize friction and wear, shafts and bearings are covered with a slippery, diamond-hard coating approximately 1/100th the thickness of a human hair. These tiny parts are pictured with a dime for size comparison.

Astronauts Steve Smith and Mark Lee prepare to close Hubble's doors during the February 1997 servicing mission. NICMOS is visible inside the instrument bay.



a



b

**PHOTOGRAPHS OF A TAPERED ROLLER BEARING A) AS RECEIVED AND B) ULTRAC DIAMOND™ COATED**