Vibration Isolation System for Thermal-Vacuum Testing of the NASA Spitzer Space Telescope
Cryogenic Telescope Assembly (CTA)

Low-frequency vibrations in the thermal-vacuum chamber used to test the Cryogenic Telescope Assembly (CTA), the "eyes" of the NASA Spitzer Space Telescope, presented a challenge. Ball Aerospace selected a Minus K ½ Hz vacuum-compatible vibration isolation system that successfully met this challenge.

The Spitzer Space Telescope (formerly SIRTF, the Space Infrared Telescope Facility) was launched into space by a Delta rocket from Cape Canaveral, Florida on 25 August 2003. During its 2.5-year mission, Spitzer will obtain images and spectra by detecting the infrared energy, or heat, radiated by objects in space between wavelengths of 3 and 180 microns (http://www.spitzer.caltech.edu/about/index.shtml).

One of the main components of the Spitzer Space Telescope is the Cryogenic Telescope Assembly (CTA), which contains the telescope and a superfluid helium cryostat. Thermal-vacuum testing of this assembly presented a challenge because of horizontal low-frequency vibrations in the test chamber at about 4.5 Hz. Ball Aerospace selected a Minus K ½ Hz vacuum-compatible vibration isolation system that successfully met this challenge. With the help of this system the jitter in the focus mechanism, a critical parameter for the CTA, was shown to be well within the requirements.

The Minus K isolation system consisted of three custom 1000 lb capacity vacuum-compatible isolators that provided a horizontal natural frequency of ½ Hz. Materials were selected to meet a vacuum level of about 10^{-7} torr. The isolators were thermally isolated and heated so they did not have to withstand the temperature extremes of the test. The figures show one of isolators mounted at the bottom of the chamber and the Cryogenic Telescope Assembly. The CTA supporting structures is not shown.