NASA SPACE CRYOCOOLER PROGRAMS — A 2003 OVERVIEW

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Mechanical cryocoolers represent a significant enabling technology for NASA's Earth and Space Science Enterprises, as well as augmenting existing capabilities in space exploration.

An overview is presented of ongoing cryocooler activities within NASA in support of current flight projects, near-term flight instruments, and long-term technology development.

NASA programs in Earth and space science observe a wide range of phenomena, from crop dynamics to stellar birth. Many of the instruments require cryogenic refrigeration to improve dynamic range, extend wavelength coverage, and enable use of advanced detector technologies. Over the last two decades, NASA has supported cryocooler technology development in support of many projects.

Although the largest utilization of coolers has been for instruments operating at medium to high cryogenic temperatures (55 to 150 K), reflecting the relative maturity of the technology at these temperatures, important new developments are now focusing at the lower temperature range from 6 to 20 K in support of studies of the origin of the universe and the search for planets around distant stars. NASA's development of a 20 K cryocooler for the European Planck spacecraft and its new Advanced Cryocooler Technology Development Program (ACTDP) for 6-18 K coolers are examples of the thrust to provide low temperature cooling for this class of missions.