Select Font Size: A A A

New Gamma-Ray Space Telescope to Launch

By **Barry E. DiGregorio**

PHOTO: JIM GROSSMANN/NASA

29 May 2008—Next week, NASA will launch a new US $690 million gamma-ray space telescope, designed to explore the most energetic regions of the universe, where photons some billion times as energetic as visible light originate. The Gamma-ray Large Area Space Telescope (GLAST), a 4.3-metric-ton observatory, is set for launch on 3 June. A joint effort of NASA and the U.S. Department of Energy, the project also has electronic hardware contributions from international partners in France, Italy, Japan, and Sweden. Because Earth's atmosphere provides a natural shield against gamma rays, GLAST must be put into low Earth orbit to observe them.

GLAST's main mission during its expected five-year life is the study of gamma-ray bursts from stars collapsing to form black holes and other celestial sources. These brief events, lasting from a few milliseconds to several minutes, radiate the most energetic form of light in the universe—8000 electron volts to more than 300 billion electron volts. GLAST will be 30 times as sensitive at detecting these elusive bursts than its predecessor, the NASA Compton Gamma Ray Observatory, which operated from 1991 to 1999.

To hunt its quarry, GLAST is equipped with two unique instruments: the Large Area Telescope (LAT) and the GLAST Burst Monitor (GBM). The LAT is a 3-ton particle detector and tracker that can observe one-fifth of the sky at any given moment—it can cover the entire sky every three hours when in orbit. The detector is made up of 70 square meters of silicon-strip detectors—similar to those that detect particles in high-energy physics experiments. When a gamma ray strikes one of 16 thin tungsten sheets in the LAT, it is converted to an electron and a positron. A tracker made from silicon strips then measures the path of the electron and the positron, which in turn reveals the direction of the gamma-ray source. (The LAT is designed to reject cosmic rays from outside the solar system and those gamma rays that originate from the sun.)

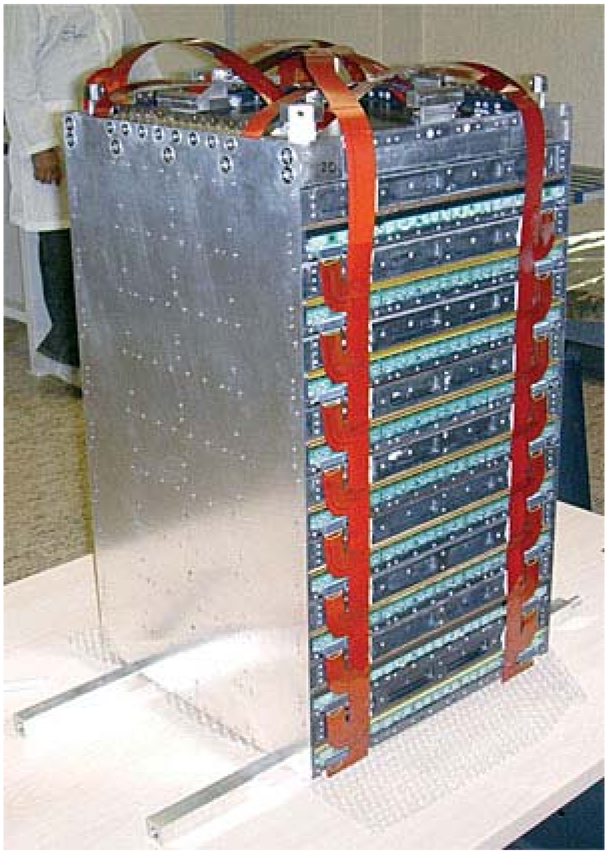

PHOTO: NASA
GAMMA CAMERA: One of GLAST's 16 towers, which house its gamma-ray converters and detectors.

The observatory's other instrument, the GBM, will work in tandem with the LAT to determine the source of the gamma rays. While the LAT can cover one-fifth of the sky, the GBM can view the entire sky. When it picks up a bright gamma-ray burst, the GBM will immediately send a signal to the LAT to observe that portion of the sky. The GBM contains 12 flat-disk detectors made of sodium iodide. When struck by a gamma ray, they produce a faint but detectable flash of light. Astronomers can then use triangulation to determine where in the sky the flash came from.

Gamma-ray bursts won't be the only phenomena GLAST tracks. It may also play a role in figuring out the nature of the mysterious dark matter that physicists say makes up 22 percent of the universe. One popular theory on dark matter is that it is made of as-yet-undetected particles. Astrophysicists have postulated that these alleged particles interact weakly with their environment but can interact with one another to produce gamma rays in an energy range that GLAST can detect. "If GLAST can find evidence of such particles, it would provide an astrophysical measurement that would complement direct searches for new particles being conducted at particle accelerators like Fermilab and the Large Hadron Collider," says David Thompson, a physicist with the NASA Goddard Space Flight Center and the deputy project scientist for GLAST.

Other intriguing phenomena that GLAST will look for include odd objects called blazars, which are jets of extremely energetic radiation emitted from the centers of some galaxies. "These highly variable jets are seen across the electromagnetic spectrum, from radio to gamma ray, and the relationship in time and intensity between different parts of the spectrum is a key diagnostic of how these jets are formed and how they work," says Thompson.

GLAST is expected to help answer some questions left behind by its predecessor observatory, but it's just as likely to generate new questions. "We know that over half the sources seen by the previous high-energy gamma-ray telescope [Compton] remain mysteries. In solving those mysteries, GLAST has a high potential for discovery. My greatest hope is that GLAST will provide surprises. That is an exciting prospect," says Thompson.

About the Author

Barry E. DiGregorio is a science writer and astroenvironmentalist from Middleport, N.Y. Earlier in May 2008 he reported on the development of an electric sail for spacecraft propulsion.