



# Gravity Probe-B: *The Relativity Mission*

## EXAMINING THE VERY FOUNDATIONS OF SPACE AND TIME

Gravity Probe B is a relativity gyroscope experiment being developed by NASA, Stanford University, and Lockheed Martin to test two extraordinary, unverified predictions of Albert Einstein's general theory of relativity.

The experiment will check very tiny changes in the direction of the spin axis of four gyroscopes in a satellite orbiting at a 400-mile altitude directly over the Earth's poles. The gyroscopes will measure the amount that the presence of Earth has warped space and time, and, more pro-

foundly, how the Earth's rotation drags spacetime around with it. These effects, though small for the Earth, have far-reaching implications for the nature of matter and the structure of the Universe.

Gravity Probe B is attempting to measure two infinitesimal angles – a predicted 6.6 arcsecs of spacetime curvature, and a predicted 42 milliarc-secs of twist, or “frame-dragging.” Several cutting-edge technologies have been developed to distinguish these miniscule angles and “see” our invisible intangible spacetime.

- ⇒ The gyroscopes are the most spherical objects ever made; they are within three ten-millionths of an inch of perfect sphericity.
- ⇒ A superconducting niobium coating creates a magnetic field around the spinning gyroscopes at super-low temperatures (<9K), allowing us to detect each gyroscope's axis direction.
- ⇒ An nine-foot-tall dewar (or thermos) keeps the probe near absolute zero for longer than any other satellite using “porous plugs”.
- ⇒ The telescope, made of solid quartz, uses “dithering” to focus on the center of the star (IM Pegasus) The telescope locates the center of the star to within 0.1 milliarc-seconds.

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