NASA Facts

National Aeronautics and
Space Administration

Goddard Space Flight Center
Greenbelt, Maryland 20771
(301) 286-8955

The Rossi X-ray Timing Explorer

The Rossi X-ray Timing Explorer is a unique satellite designed to observe the fast-moving, high-energy worlds of black holes, neutron stars, X-ray pulsars, and bursts of X-ray light, including those associated with gamma-ray bursts.

Mission Overview:

Launched: 8:48 A.M. EST, December 30, 1995 aboard a Delta II rocket from Cape Canaveral.

Name: Originally the X-ray Timing Explorer; renamed in early 1996 in honor of Bruno Rossi, the late MIT astronomer who pioneered two fields of observational space astrophysics, X-ray astronomy and space plasma physics. Bruno died in 1993. Today the satellite is typically referred to as the Rossi Explorer or RXTE.

Orbital parameters:

- Altitude: 360 miles (580 kilometers)
- Period: 100-minutes
- Inclination: 23 degrees
- Lifetime: 2-year design, 5-year goal; both well exceeded

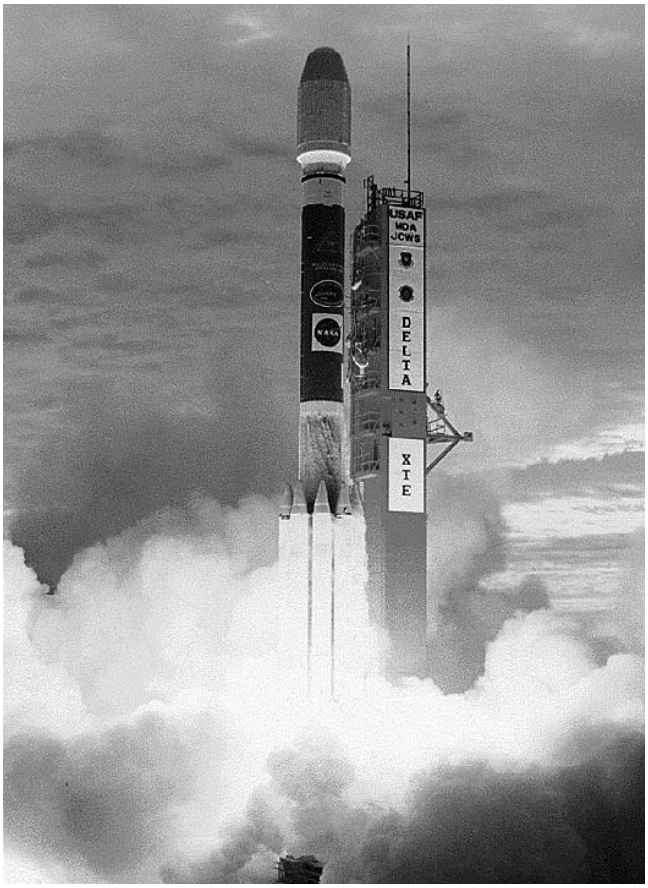
Spacecraft Overview:

Weight: 7,055 pounds (3,200 kilograms)

Size: 6ft x 6ft x 18ft (1.8m x 1.8m x 5.4m)

Nominal Power Output: 800 Watts

Operations and management: the NASA Goddard Office of Space Science



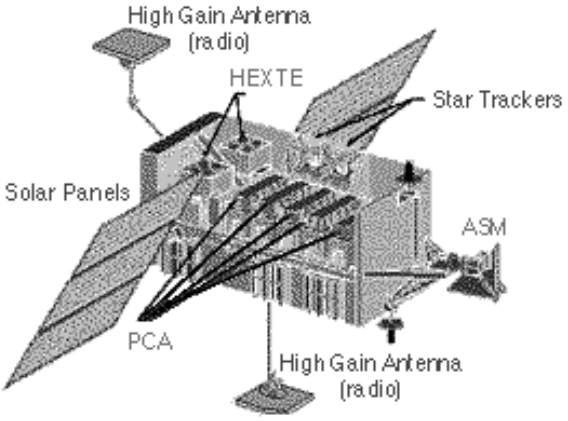
Instrument Overview:

Instruments: Contains three instruments designed to provide detailed coverage of X-ray sources. Broad energy range from 2 to 200 keV, covering nearly the entire X-ray portion of the electromagnetic spectrum. Time-resolution of one microsecond, able to detect up to 150,000 counts per second.

- PCA - Proportional Counter Array
- HEXTE - High-Energy X-ray Timing Experiment
- ASM - All Sky Monitor

The PCA and HEXTE work in concert as the largest satellite X-ray telescope in operation. The ASM observes the long-term behavior of X-ray sources and monitors the sky for targets of opportunity (TOOs) for the PCA and HEXTE. The ASM scans about 80 percent of the sky every orbit of the spacecraft and enables the spacecraft to quickly reposition itself to look at TOOs.

The PCA was built at NASA Goddard Space Flight Center Laboratory for High-Energy Astrophysics. The HEXTE was designed, constructed, and tested at the Center for Astrophysics & Space Sciences at the University of California, San Diego. The ASM was designed and built by researchers at the Massachusetts Institute of Technology's Center for Space Research.



Selected Science Highlights from the Rossi Mission:

- Discovery of the first accreting millisecond pulsar, SAX J1808.4-3658, in 1998, followed by four more such pulsars.
- First observational evidence of "frame-dragging," the dragging of spacetime itself in the vicinity of a black hole. Such an effect was predicted in 1918 as a consequence of Einstein's Theory of General Relativity.
- Discovery of the "Old Faithful" black hole accreting matter off of a companion star and ejecting large amounts of material. Every half hour or so, disruptions in the in-flowing accretion disk cause the gas to be expelled in the opposite direction in jets moving at nearly the speed of light. The black hole than starts pulling in matter off the companion again, completing the cycle.
- New probes of the physics of matter very close to neutron stars and black holes, including high-frequency (kilohertz) quasi-periodic oscillations.
- New constraints on the mass, radius, and equation of state of neutron stars.
- New evidence for cosmic-ray acceleration in supernova remnants.
- First determination of polar cap size on a magnetic white dwarf.
- Discovery of a "magnetar," a neutron star with a magnetic field on the order of 100 trillion Gauss, a thousand times stronger than ordinary neutron stars.