X-RAY ASTRONOMY

Loss of ASTRO-E X-ray Satellite Hurts Japan's Space Science ...

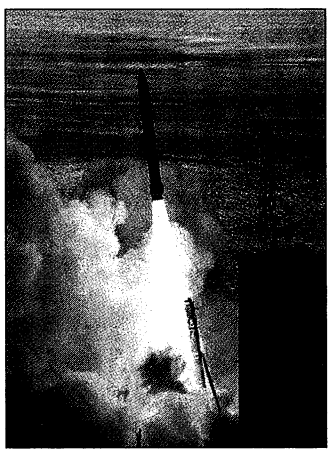
TOKYO—Astronomers and astrophysicists are mourning the loss last week of a Japanese-American x-ray satellite that promised to give them their closest look yet at the region surrounding black holes and other objects that emit high-energy x-rays. A rocket failed to lift the $105 million ASTRO-E spacecraft into a sustainable orbit. The loss pinches particularly hard into Japan's space science efforts, which rely heavily on a small number of carefully targeted satellites.

"It leaves a big gap in our research program," says Tsuneyoshi Kamae, an astrophysicist at the University of Tokyo who helped develop one of ASTRO-E's three major instruments. Scientists say it could take at least 3 or 4 years to build and fly a replacement mission, if a suitable rocket can be found.

Launched on 10 February from the Kagoshima Space Center of Japan's Institute for Space and Astronautical Science (ISAS), ASTRO-E was to be the third major space telescope launched in a span of less than 7 months to study cosmic x-rays. It was meant to complement NASA's Chandra X-ray Observatory and the European XMM-Newton Observatory (see story below). Both those satellites, which are already in orbit, are focusing on low- and medium-energy x-rays; ASTRO-E would have concentrated on the high-energy end of the spectrum. "One corner of the triangle is now missing," says x-ray astronomer Joachim Trümper of the Max Planck Institute for Extraterrestrial Physics in Garching, Germany. "It's a very big loss for x-ray astronomy."

It is especially bad news for Japan's astronomers, who have applied their modest budgets to carefully targeted niches. "Even though Japan's [space program] is small, we've been able to join the world's front ranks in x-ray astrophysics," says Kazuo Makishima, an astrophysicist at the University of Tokyo.

ASTRO-E would have been the fifth Japanese x-ray mission. Its predecessor, ASCA, launched in 1993, has made several groundbreaking discoveries, including the detection of iron in the x-ray emissions from accretion disks, the swirls of gas and dust around black holes. Distortions of the normal fingerprint of iron bore telltale evidence of the enormous gravitational pull of the black hole, something expected but never before observed.



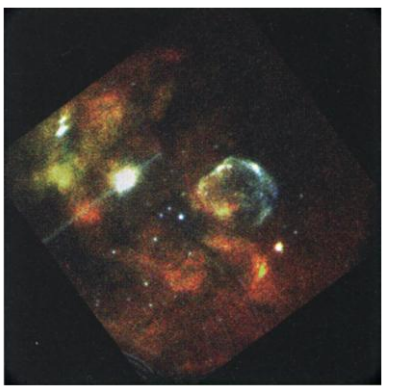
Not enough. Problems with Japan's M5 rocket after lift-off doomed the ASTRO-E satellite.

ASTRO-E's prime instrument, the x-ray spectrometer (XRS), developed by ISAS and NASA, is extremely sensitive, designed to measure the energy of individual x-ray photons hitting the detector. This would have allowed astrophysicists "to determine properties of accretion disks very close to black holes," says Richard Kelley, principal investigator for the XRS at NASA's Goddard Space Flight Center in Greenbelt, Maryland, who says that his team doesn't have any plans to relaunch a similar payload.

A second instrument, the hard x-ray detector (HXD), developed by ISAS and a group of astrophysicists at the University of Tokyo, was expected to set the direction for Japan's space x-ray efforts for the next decade. By focusing on very high energy x-rays, it would have ventured into relatively unexplored territory. These higher energies "are the least explored regions in astrophysics, and yet they contain some of the most violent astrophysical phenomena," says Tokyo's Kamae.

A group at Nagoya University is already at work on a next-generation very high energy x-ray instrument to be launched about 2007. But with ASCA nearing the end of its life, the loss of HXD leaves a gap in Japan's observational program. Makishima says that a dozen faculty members and 30 graduate students must now salvage what they can from 8 years spent planning and building HXD. "The most important thing will be to find some way to put this instrument in orbit," he says. In the meantime,

... While European Observatory Sends Back First X-ray Images



This view of supernova remnants in the Large Magellanic Clouds comes from Europe's new orbiting x-ray observatory, whose first pictures were released last week. Launched on 10 December, the X-ray Multi-Mirror Mission (XMM)–Newton—named after the father of spectroscopy—joins NASA's Chandra X-ray Observatory, which was sent into space last summer. Japan's ill-fated ASTRO-E was to have been the third in a planned trio of x-ray observatories (see accompanying story).

XMM-Newton will be able to detect much fainter emissions than Chandra can, although with less detail. The European observatory is "absolutely superior in doing certain types of observations, like taking spectra of faint, isolated neutron stars," says Martin Weisskopf of NASA's Marshall Space Flight Center in Huntsville, Alabama, a Chandra project scientist. "Chandra and Newton complement each other very well." In spite of the loss of ASTRO-E, "we are up for a prosperous new era in x-ray astronomy," predicts project scientist Fred Jansen of the European Space Research and Technology Centre in Noordwijk, the Netherlands.

–GOVERT SCHILLING

CREDITS: (TOP TO BOTTOM) ISAS; ESA