

out that the disaster was caused by a nuclear explosion, but some persons have at times suggested that an earthquake disastrously ruptured the underground nuclear waste repository. An in-

quiry by SCIENCE NEWS to the National Earthquake Information Service, however, revealed that no significant earthquake occurred within a 130-kilometer radius of Kyshtym during 1957-58. □

HEAO-A awaits long-delayed launching

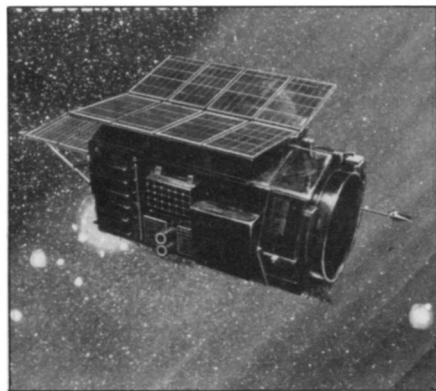
The long-awaited HEAO-A satellite, first in a series of three High-Energy Astronomy Observatories designed to study the X-ray, gamma-ray and cosmic-ray sky, may be launched as early as Aug. 5, or it may slip into the month of September. A series of problems with the satellite's gyroscopic stabilization system has delayed the launch repeatedly from its former April 15 date, and project officials were meeting this week to decide whether further changes or additions to the gyro system need to be made.

The HEAO series has been a major astrophysics priority of the Astronomy Missions Board of the National Academy of Sciences ever since the project was conceived in 1968. Originally planned for only two satellites, each 12 meters long and weighing 9,900 kilograms, the project was less than a year into its first "hardware" contract when it was abruptly suspended, largely for reasons of cost, to reemerge 17 months later with a plan for three satellites, each half the size of the originals.

The total number of experiments was reduced from 13 to 9, and a number of the surviving ones were reduced in size and sensitivity, but the mission is still unusually rich in the proportion of the program that is really devoted to the scientific payload. Of the total estimated \$270 million cost of the project, more than 60 percent is devoted to the experiments themselves, and 1,350 kilograms of HEAO-A's 3,150-kilogram weight is taken up by research instrumentation. This is in sharp contrast to many programs in which the bulk of the money and weight are consumed by a spacecraft carrying a relatively small science payload.

There are four experiments aboard HEAO-A. A Large X-ray Survey will map the sky for X-ray sources from 0.15 to 20.0 kilovolts, following in the steps of pioneering satellites such as Uhuru (see p. 36) but with increased accuracy and sensitivity. Another instrument will measure the precise positions of selected sources over a similar energy range (1 to 15 keV), while a third records the diffuse "background" of cosmic X-rays for the whole sky over a 0.2-to-60-keV range. The remaining experiment has the widest range of all, monitoring the distribution and intensities of "hard" X-rays and gamma rays from 10 to 10,000 keV (10 MeV).

Next year, HEAO-A is scheduled to be followed by HEAO-B, a single-minded spacecraft carrying only one experiment: an X-ray telescope designed to take closer looks at sources identified by its predecessor. The 1979 HEAO-C will concentrate on cosmic rays and gamma rays.



First High-Energy Astronomy Observatory satellite—Waiting in the wings.

Fortunately, says HEAO-A project scientist Frank B. McDonald of the National Aeronautics and Space Administration's Goddard Space Flight Center, HEAO-A's science plans are not suffering appreciably from the protracted delay. Unlike planetary probes such as the upcoming Voyager spacecraft, HEAO-A is not dependent on a precise launch date for its targets to be in view, nor is degradation of the experiment packages expected to pose a problem. The mission's scientists are thus able to fully support the project engineers in seeking the safest possible resolution of the satellite's gyro problems, rather than fearing that they will miss some time-critical astronomical event.

This does not mean that the delay in launching poses no serious consequences, however. Investigation of the problems has involved three NASA centers, TRW, Bendix (the gyro contractor), another company and the University of Tennessee, with costs running more than \$1.5 million a month. □

Improved nuclear security proposed

To improve the safeguards against criminal intrusion of nuclear facilities, the Nuclear Regulatory Commission has proposed extensive revisions of current controls. They are published in the July 5 FEDERAL REGISTER and would affect "companies licensed to fabricate nuclear fuel and conduct scrap recovery operations" and transport the materials. They do not pertain to nuclear reactors, for which security improvements already began earlier this year.

Proposals affecting the conveyance of special nuclear material (plutonium, U-233, or uranium enriched in U-233 or U-235) would restrict access to and activity around transport vehicles and strengthen the effectiveness of armed escorts. They would also assure that proper communications are maintained between a convoy's vital elements.

Shipments by road, like those most generally envisioned, would be hauled by either armored cars or special penetration-resistant vehicles that could be immobilized in an emergency. Deflating the tires of a besieged truck, for instance, would hamper efforts to hijack it with the contents.

Convoys would not stop except for refueling, rest, or emergency, and would always be accompanied by nine armed escorts. A present convoy is typically protected by fewer escorts, and radio communication occurs less intensively than the NRC proposals would have it. Similar regulations pertain to shipments by sea, rail and air.

Shipments by truck would occur over main highways only. In this respect, there is an acknowledged trade-off between traversing well-policed main arteries but simultaneously exposing a greater population to risk, or using remote secondary roads but also being

removed from local police support.

Propositions from the NRC affecting the physical protection of fixed sites permit access to and handling of nuclear material by authorized personnel only in a restricted area. This would be enclosed within at least two physical barriers, like fences, and circumjacent, illuminated isolation zones. These would be continuously monitored, for example, by elevated human sentries and closed-circuit television cameras.

There would be two continuously manned alarm stations designed so that no single act could sabotage both simultaneously. Although existing facilities generally have at least guards and closed-circuit television, an overall security system as depicted by the NRC proposals is now just in the prototype stage.

All authorized personnel within a facility would wear a numbered picture badge that is coded to indicate those areas to which the wearer is allowed access. Employees' whereabouts could be monitored by and stored in a computer. Furthermore, all individuals and vehicles trafficking across controlled check points would be searched.

The NRC is also proposing minimum physical and mental quality standards by which to judge a facility's security personnel. Once hired, they would be required to participate in various training programs and be subject to annual re-evaluation.

Spokespersons for several of the companies affected by the announcement generally had a favorable reaction to it, saying the proposed regulations were essentially expected. The General Electric Co., in fact, is already complying with several of them, according to William A. Smith, manager of nuclear safety and quality assurance. □