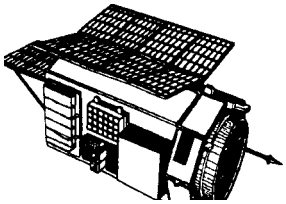
HEAO 1

High Energy Astronomy Observatory 1

Spacecraft Sketch	Mission Objective
	The primary scientific objective of the High Energy Astronomy Observatory (HEAD) mission is to obtain high quality, high resolution data on x-ray, gamma ray and cosmic ray sources. Experiments are flown on three observatories to provide data on the structure, spectra, polarization, synoptic variations and location of these sources. HEAD 1 is designed to survey and map x-ray sources throughout the celestial sphere and to measure low-energy gamma ray flux. HERO 2 is designed to study sources pinpointed by HEAO 2 and other x-ray spacecraft. HEAO 3 is designed to survey the sky for gamma and cosmic rays.

TYPE OF MISSION	PROGRAM OFFICE	PROJECT LEAD CENTER	MANAGEMENT APPROACH	S/C CONTRACTOR	I&T CONTRACTOR
ASTROPHYSICS	SPACE SCIENCE	MSFC	OUT-OF-HOUSE	TRW	TRW

Payload Description

The three High Energy Astronomy Observatory (HEAD 1,2&3) payloads each consist of a unique complement of instruments. The HERO 1 has four x-ray scanning instruments. The HEAD 2 has an x-ray telescope with four focal plane instruments and a fifth instrument which is independent of the telescope to measure properties of x-rays beyond the energy range of the telescope. The HEAO 3 carries two instruments for observing cosmic rays and one for exploring the sources of x-ray and gamma ray line emissions. The three HEAO observatories use a common bus design differing only to the extent required by the unique mission requirements with the electronic components packaged using a standard modular slice to provide a great degree of flexibility in accommodating the various telemetry and command experiment requirements. For example, reaction wheels are included in the HERO 2 to provide a more precise and highly accurate pointing capability. Since such a pointing capability is not required for celestial scanning, the reaction wheels are not used on HEAD 1 and HEAO 3. The HERO 2 spacecraft also carries a secondary solar array which is an application of the basic array design. The HERO 3 spacecraft carries two star trackers, because none are included in the HEAD-3 experiments like in the previous HEAO's.

INSTRUMENT NAME	ACRONYM	PI AFFILIATION	PRINCIPAL INVESTIGATOR	I&T CONTRACTOR
COSMIC RAY EXPERIMENT	A-2	GSFC	E. A. BOLDT	GSFC
HARD X-RAY & LOW-ENERGY GAMMA-RAY EXPERIMENT	A-4	UCSD	L. E. PETERSON	UCSD
LARGE AREA X-RAY SURVEY EXPERIMENT	A-1	NRL	H. FRIEDMAN	NRL
X-RAY SCANNING MODULATION COLLIMATOR EXPERIMENT	A-3	SAO	H. GURSKY	AS&E

Instrument Descriptions
The HEAO 1 Cosrmic X-Ray (A-2) Experiment, Data Point 512, is developed by Goddard Space Flight Center to measure emissions and absorptions of diffuse X-rays in the range of 0.2 to 60 KeV and correlate results with radio and visible light ray emissions. The instrument is also designed to measure intensity and energy distribution of discrete X-rays.
The HEAD 1 Hard X-Ray and Low-Energy Gamma-Ray (A-4) Experiment, Data Point 508, is developed by the University of California at San Diego and built by BASD and Time Zero Labs to measure the spectrum of point and diffuse sources of cosmic X-rays and gamma rays in the 10 KeV to 10 MeV energy range. The instrument consists of a modular array of phoswich scintillator detectors, particle monitors, and a digital processor containing power conditioning and data handling electronics.
The HEAO 1 Large Area X-Ray Survey (A-1) Experiment, Data Point 511, is developed and built by NRL and New Mexico State University to map the celestial sphere for X-ray sources in the energy range of 0.15 to 20 KeV and to determine the energy spectrum, intensity, periodicity of random time structure.
The HERO 1 X-Ray Scanning Modulation Collimator (A-3) Experiment, Data Point 517, is built by American Science and Engineering to determine the position and size of cosmic X-ray sources. The experiment uses two independent modulation collimator banks, each with four sealed proportional counters, to give a precision of 5 to 10 arc-sec over an energy range of 1 to 15 KeV.

Launch
8/12/77 (1) 11/13/78 (2) 9/20/79 (3)