FUSE

PROJECT HIGHLIGHTS

Announcement of Opportunity	
NASA Headquarters Office	Space Science Code S
Enterprise	Space Science
Project	FUSE
Project Lead Center	GSFC
Management Approach	Out-of-House
Mission Life (months)	36
Additional Data Analysis (months)	TBD
Launch Date	24 Jun 1999

MISSION OBJECTIVES

FUSE is a "Principal Investigator-class" mission to explore the Universe using techniques of high-resolution spectroscopy in the farultraviolet spectral region. The purpose of the FUSE mission is to understand better how galaxies evolve and how the gas within galaxies changes with time. The FUSE instrument will study the ultraviolet bands of light, searching for relics of the Big Bang that scientists believe created the universe some 12 billion years ago, by collecting information that's impossible to detect with any current telescope. FUSE is part of NASA's Origins Program under the auspices of NASA's Office of Space Science.

FOREIGN PARTICIPATION

CNES (France) Gratings

CSA (Canada) Fine Error Sensor, Instrument Main Computer

SPACECRAFT DESCRIPTION

The original FUSE spacecraft was planned to be mission unique. To save cost, a commercial available explorer satellite frame was adapted for FUSE by incorporating existing hardware in the satellite design regardless of weight, provided the existing component was cheaper. As a result, the FUSE spacecraft is a modified version of the Explorer platform used to support the Extreme Ultraviolet Explorer (EUVE) mission. The spacecraft also includes heritage from the Rossi X-ray Timing Explorer (XTE) and Tropical Rainfall Measurement Mission (TRMM) in the attitude control and RF communications subsystems. The final spacecraft design, developed and built by Orbital Sciences Corporation, consists of the following subsystems: mechanical; command and data handling; attitude control; power and RF communications.

PAYLOAD DESCRIPTION

The FUSE payload consists of one instrument that is designed to look at light in the far ultraviolet portion of the electromagnetic spectrum (approximately 90 to 120 nanometers), which is unobservable with other telescopes. FUSE observes these wavelengths with much greater sensitivity and resolving power than previous instruments used to study light in this wavelength range. The instrument is described more in the succeeding subsection.

INSTRUMENT DESCRIPTIONS AND SCIENCE LEADERS

Data Point Number 952: The Far Ultraviolet Spectroscopic Explorer instrument (FUSE) [protoflight] (FUSE) consists of four spectroscopic channels which share two detector systems. Collimated light is collected by four off-axis parabolic telescopes with 2245 mm focal lengths. Two telescopes are coated with aluminum/lithium fluoride (AI/LiF) and two are coated with silicon carbide (SIC) to optimize the effective areas above and below 1050 Angstroms. The light from each telescope is focused onto one of four entrance apertures and is then diffracted by a large, holographic ruled, spherical grating. The diffracted light then focuses onto a double delay line microchannel plate (MCP) detector. The MCPs are coated with potassium bromide (KBr) to optimize the detection quantum efficiency. The overall instrument length is four meters and is assembled onto a two-piece, graphite epoxy structure. The lower half of the structure contains the parabolic telescopes and the instrument electronics. The upper half of the structure is the far ultraviolet spectrograph which houses entrance slits, gratings, baffles and detectors. FUSE is a Principal Investigator (PI) class astronomy mission and is the first time a university has been given almost complete control of a major project. The instrument cost includes 15.1 million dollars (in FY2K $) of foreign involvement. Warren Moos (JHU) is the instrument PI.

GROUND SYSTEM DESCRIPTION

The FUSE Satellite Control Center will be located in the Bloomberg Center for Physics and Astronomy on the Johns Hopkins University Homewood Campus. From there engineers and scientists will communicate with the satellite and receive data from completed operations**.** The communications with FUSE will be made through a single ground station antenna located at the University of Puerto Rico in Mayaguez. The satellite's orbit brings it over the ground station for less than 10 minutes at a time (on average) for about 6 obits in a row, followed by about 8 orbits without contact. Hence, the satellite must operate autonomously (or without direct contact from the ground) most of the time, moving from target to target, identifying star fields, centering each target in the spectrograph apertures, and performing the observations. Data are stored in computer memory on the satellite until contact with the ground station is established, and then the data are transmitted down to earth. The data are stored temporarily at the ground station, and then transferred back to the Satellite Control Center at JHU, where they are checked to verify they are complete and then sent on for processing into a form that the scientists can measure and use for their investigations.

CONTRACT AND SUBCONTRACT HISTORY

Contractor/Subcontractor	Project Element
Johns Hopkins University	Phase B Definition
Johns Hopkins University	Phase C/D Design
Johns Hopkins University	Outreach Initiative

LAUNCH AND MISSION ORBIT DATA

Launch Vehicle/Upper Stage	Delta II-7320-10	Inclination (deg)	25
Launch Site	Eastern Test Range	Period (min)	100
Mission Orbit Type	Low Earth Orbit	Perigee (km)	758
		Apogee (km)	774