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STS-93/Columbia

First Female Commander Leads Launch of Most Powerful X-ray Telescope

Astronaut Eileen Collins (Col., USAF) will make history as she becomes the first woman to command a Space Shuttle. She will lead a five-day mission to deploy the heaviest, largest and most powerful X-ray telescope ever launched into space.

The Chandra X-ray Observatory, NASA's latest X-ray telescope, will allow scientists to peer into an invisible and violent realm of the cosmos that contains some of the most intriguing mysteries in astronomy. With its X-ray vision, Chandra will study objects ranging from comets in our solar system to quasars at the edge of the universe.

Chandra's observations should help provide long-sought answers to scientific questions on the presence of "dark matter" in the universe and the source of explosive activities in distant galaxies. Measuring dark matter is of great interest to scientists and others because it could help us determine whether the universe will eventually cave in on itself or expand indefinitely.

With NASA's other "Great Observatories" in space – including the Hubble Space Telescope and the Compton Gamma Ray Observatory — Chandra will enable scientists to study the universe across the spectrum, ranging from infrared, visible and ultraviolet light to X-ray and high-energy gamma rays.

The observatory will fly more than one-third of the way to the Moon. With four pairs of eyes, the cleanest and smoothest mirrors ever made, Chandra's high resolving power is equal to the ability to read the letters on a stop sign from more than 12 miles away. The telescope is 20 to 50 times more sensitive than any other X-ray telescope.

Chandra is 45 feet long and weighs 52,000 pounds with its attached booster, making it the largest and heaviest satellite ever launched on a Space Shuttle. The satellite consists of three major elements: a spacecraft with an inertial upper stage rocket motor, a telescope, and a science instrument module.

The observatory was originally called the Advanced X-ray Astrophysics Facility, or AXAF, but was renamed in honor of the late Indian-American Nobel Laureate Subrahmanyan Chandrasekhar. "Chandra" won the Nobel Prize in 1983 for his theoretical studies of physical processes important to the structure and evolution of stars. His name means "moon" or "luminous" in Sanskrit, an apt name for an orbiting observatory.

Collins will be joined on the flight deck by Pilot Jeffrey S. Ashby (Capt., USN), Mission Specialists Steven A. Hawley, Ph.D., and Catherine G. "Cady" Coleman, Ph.D., (Lt. Col., USAF) and CNES Astronaut Michel Tognini (Col., French Air Force).

The crew will deploy Chandra approximately seven hours after liftoff into a relatively low altitude of 153 miles. Once released from the orbiter's cargo bay, Chandra will use propulsion from an attached Inertial Upper Stage rocket as well as firings from its own on-board rocket motors to reach its working orbit. Once there, it will draw power from its six solar panels. The observatory will be turned on slowly and fine-tuned to become fully functioning

after about nine weeks in orbit. Chandra is expected to remain in orbit collecting information for at least five years.

In contrast to Hubble's circular, low-altitude course, Chandra will travel a highly elliptical path that ranges from 6,200 miles to 86,000 miles above Earth. Circling every 64 hours, the observatory will move well outside the planetary radiation belts that would interfere with its sensitive instruments. Such a route allows Chandra 55 hours of uninterrupted measurements per orbit.

STS-93 is the 95th Space Shuttle mission and 26th flight of Columbia. The Space Shuttle will lift off from Launch Pad 39B. The orbital insertion altitude and inclination will be 153 nautical miles (284 kilometers/176 statute miles)/28.5 degrees to the equator. Landing is scheduled at KSC's Shuttle Landing Facility.

STS-93 will be the shortest scheduled Space Shuttle mission since 1990. Its duration is planned to be about 4 days, 23 hours.

The Crew

Commander Eileen M. Collins (Col., USAF) will be the first woman to command a Space Shuttle flight. A pilot on two previous missions, Collins has spent more than 419 hours in space. During her first flight, Discovery flew within 30 feet of Mir in a dress rehearsal for the first Shuttle/Mir docking. Her second flight was the sixth Shuttle/Mir docking mission, which delivered astronaut Mike Foale to Mir and returned astronaut Jerry Linenger to Earth.

Collins served as an Air Force instruction pilot before joining the astronaut program in 1990. The New York native holds master's degrees in operations research and space systems management.

Pilot Jeffrey S. Ashby (Capt., USN) will be making his first flight. During his career as a Navy pilot, Ashby earned many honors, including a Distinguished Flying Cross and a designation as Navy Attack Aviator of the Year in 1991. His assignments included flights during three operations in Iraq and one in Somalia. NASA selected Ashby to its astronaut program in December of 1994.

Mission Specialist Steven A. Hawley, Ph.D., brings the experience of four previous flights and more than 651 hours in space to his duties as a mission specialist. He has been part of the astronaut program since 1978. Hawley played vital roles as a simulator pilot for software checkout before STS-1 and as a member of the astronaut support crew for the next three missions. He holds a doctorate in astronomy and astrophysics.

Mission Specialist Catherine G. "Cady" Coleman (Lt. Col., USAF), **Ph.D.,** will be making her second spaceflight, having filled the same role on STS-73. She received a doctorate in polymer science and engineering and used that knowledge as a research chemist for the Air Force. As a volunteer test subject in the Air Force's centrifuge program, she set several endurance and tolerance records. Coleman joined the astronaut program in 1992.

Mission Specialist Michel Tognini (Col., French Air Force) will be making his second spaceflight and first Shuttle flight. He represents the Centre National d'Etudes Spatiales, France's national space agency. Tognini made his first space flight on board the Soyuz TM-15, TM-14 in 1992, taking part in a docking with Mir. He prepared for that mission by training at Gagarin Cosmonaut Training Center in Russia. His background includes 4,000 flight hours on 80 types of aircraft.

Additional STS-93 payloads and experiments

Columbia will carry several smaller payloads, including the Southwest Ultraviolet Imaging System. This mid-deck payload allows the measurement of emissions in the UV spectrum that cannot be observed from Earth.

The imaging system includes a 7-inch UV telescope and a UV-sensitive image-intensive Charge-Coupled Device camera that frames at video frame rates. The video-framing freezes out attitude jitter of the Shuttle, eliminating the need for expensive pointing control platforms typically used by astronomy payloads aboard the Shuttle. By processing the video data in a ground-based computer, scientists will be able to obtain sensitive measurements of the Moon, the Earth, other planets and Vulcanoids, which are small bodies orbiting close to the Sun.

The Midcourse Space Experiment will use orbiter thruster firings to calibrate and evaluate UV, infrared and visible sensors on the MSX satellite, which was launched in April 1996. Thruster firings will also be used to create ionospheric disturbances for observation by Shuttle Ionospheric Modification with Pulsed Local Exhaust radar.

The Plant Growth Investigations in Microgravity payload will study the effects of space flight on plants. Genetically engineered plants will be monitored to determine various sources of plant stresses that affect plant growth and gene expression. Another series of plant experiments will be conducted in the Biological Research in a Canister payload.

The temperature-controlled Commercial Generic Bioprocessing Apparatus Isothermal Containment Module will be used to stow and process several experiments, including one using fruit fly larvae. The experiment will examine the effects of microgravity on the development of neural connections between specific motor neurons and their targets in the flies' muscle fibers. Other experiments in the module will study bacteria growth, protein crystal growth and the predator/prey relationship between ladybugs and aphids.