Marshall Space Flight Center Fact Sheet

Quick Facts:
The Chandra X-ray Observatory

NASA's newest space telescope, the Chandra X-ray Observatory, will allow scientists from around the world to obtain unprecedented X-ray images and spectra of violent, high-temperature events and objects to help us better understand the structure and evolution of our universe.

It will also serve as a unique tool to study detailed physics in a unique laboratory -- the universe itself – one that cannot be replicated here on Earth.

Managed by NASA's Marshall Space Flight Center in Huntsville, Ala., Chandra is a sophisticated, state-of-the-art instrument that represents a tremendous technological advance in X-ray astronomy.

Did you know?

- The Chandra X-ray Observatory is the world's most powerful X-ray telescope. It has eight-times greater resolution and will be able to detect sources more than 20-times fainter than any previous X-ray telescope.
- The Chandra X-ray Observatory, with its Inertial Upper Stage and support equipment, is the largest and heaviest payload ever launched by the Space Shuttle.
- The Chandra X-ray Observatory's operating orbit takes it 200-times higher than the Hubble Space Telescope. During each orbit of the Earth, Chandra travels one-third of the way to the Moon.
- The Chandra X-ray Observatory's resolving power is – 0.5 arc-seconds -- equal to the ability to read the letters of a stop sign at a distance of 12 miles. Put another way, Chandra's resolving power is equivalent to the ability to read a 1-centimeter newspaper headline at the distance of a half-mile.
- If the State of Colorado were as smooth as the surface of the Chandra X-ray Observatory mirrors, Pike's Peak would be less than an inch tall.
- Another of NASA's incredible time machines, the Chandra X-ray Observatory will be able to study some quasars as they were 10 billion years ago.
- The Chandra X-ray Observatory will observe X-rays from clouds of gas so vast that it takes light more than five-million years to go from one side to the other.
- Although nothing can escape the incredible gravity of a black hole, not even light, the Chandra X-ray Observatory will be able to study particles up to the last millisecond before they are sucked inside.
- It took almost four centuries to advance from Galileo's first telescope to NASA's Hubble Space Telescope — an increase in observing power of about a half-billion times. NASA's Chandra X-ray Observatory is about one-billion times more powerful than the first X-ray telescope, and we have made that leap in slightly more than three decades.

Chandra Mission at a Glance:

Chandra X-ray Observatory Mission Duration

Chandra science mission	Approx. 5 yrs
Orbital Activation & Checkout period	Approx. 2 mos

Orbital Data

Inclination	28.5 degrees
Altitude at apogee	86,487 sm
Altitude at perigee	5,999 sm
Orbital period	64 hrs
Observing time per orbital period	Up to 55 hrs

Dimensions

Length – (Sun shade open)	45.3’
Length – (Sun shade closed	38.7’
Width – (Solar arrays deployed)	64.0’
Width – (Solar arrays stowed)	14.0’

Weights

Dry	10,560 lbs
Propellant	2,153 lbs
Pressurant	10 lbs
Total at launch	12,930 lbs

Integral Propulsion System

Liquid Apogee Engines	4 engines (Only 2 used at a time)
Fuel	Hydrazine
Oxidizer	Nitrogen tetroxide
Thrust per engine	105 lbs

Electrical Power

Solar Arrays	2 arrays 3 panels each
Power generated	2,350 watts
Electrical power storage	3 batteries 40-amp-hour nickel hydrogen

Communications

Antennas	2 low-gain antennas
Communication links	Shuttle Payload Interrogator Deep Space Network
Command link	2 kbs per second
Data downlink	32 kbs to 1024 kbs

On-board Data Capture

Method	Solid-state recorder
Capacity	1.8 gbs 16.8 hrs

High Resolution Mirror Assembly

Configuration	4 sets of nested, grazing incidence paraboloid/hyperboloid mirror pairs
Mirror Weight	2,093 lbs
Focal length	33 ft
Outer diameter	4 ft
Length	33.5 in
Material	Zerodur
Coating	600 angstroms of iridium

Attitude Control & Pointing

Reaction wheels	6
Inertial reference units	2
Aspect camera	1.40 deg x 1.40 deg fov

Science Instruments

Charged Coupled Imaging Spectrometer (ACIS)
High Resolution Camera (HRC)
High Energy Transmission Grating (HETG)
Low Energy Transmission Grating (LETG)

The Inertial Upper Stage

Dimensions

Length	17.0’
Diameter	9.25’

Weights

Stage 1 – Dry	2,566 lbs
Stage 1 – Propellant	19,621 lbs
Stage 1 - Total	22,187 lbs
Stage 2 – Dry	2,379 lbs
Stage 2 – Propellant	6,016 lbs
Stage 2 - Total	8,395 lbs
Total Inertial Upper Stage – At launch	30,582 lbs

Performance

Thrust – Stage 1	46,198 lbs, average
Burn Duration – Stage 1	125 seconds
Thrust – Stage 2	16,350 lbs, average
Burn Duration – Stage 2	117 seconds

Support Equipment

Weights

Airborne Support Equipment	5,365 lbs
Other	1,285 lbs
Total Support Equipment	6,650 lbs

Total Payload

Weight

Total Chandra/IUS/Support equipment at liftoff	50,162 lbs

Length

Total IUS/Chandra	57.0’