

# 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
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**Length**

Total IUS/Chandra	57.0'
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