

*IXO Facility Science Team Meeting
August 20 - 22, 2008 / NASA/GSFC*

Project Update

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Highlights Since Last FST Meeting (Feb. 2008)

- **Mission Configuration Studies with single telescope for IXO**
 - Conducted trade of mirror size, mass, and focal length
 - Investigated mission options for deployable metering structure
 - Defined strawman parameters and payload for July Mission Design Lab study
 - XMS study in Instrument Design Lab (week of May 19)
 - Initiated Flight Mirror Assembly concept study
 - Developed error budget and plans for 5 arcsec angular resolution
 - Conducted MDL study (week of July 28) for observatory concept definition
- **Technology Development**
 - **Mirror**
 - Mirror segment fabrication and metrology consistent with 15 arcsec requirement; improving toward 5 arcsec
 - Good progress on alignment of segments into housing
 - **Microcalorimeter**
 - Demonstrated spectral resolution for inner array pixels in 8 x 8 arrays; multiplexing of 32 pixels
 - Initiated development of read-out for larger (32 x 32) arrays

IXO Mission Study

- **Mission Design Lab (MDL) study was conducted at GSFC during week of July 28, 2008**
- **Effort to define concept includes extensive “pre-work”, including definition of strawman payload and accommodation parameters, observatory requirements, parameters, and overall lay-out.**
- **This particular study was limited to:**
 - 20 m focal length
 - 3.3 m diameter flight mirror assembly (slumped glass mirror technology)
 - Instrument complement consisting of X-ray Microcalorimeter Spectrometer, Wide Field Imager (WFI), Hard X-ray Imager (HXI), X-ray Grating Spectrometer
 - Atlas V 551 launch vehicle
- **Overall, from studies performed to date, mission concept appears viable with positive margins**
 - Provides “proof-of-concept” for extensible bench mission configuration
- **Work on this configuration is continuing**

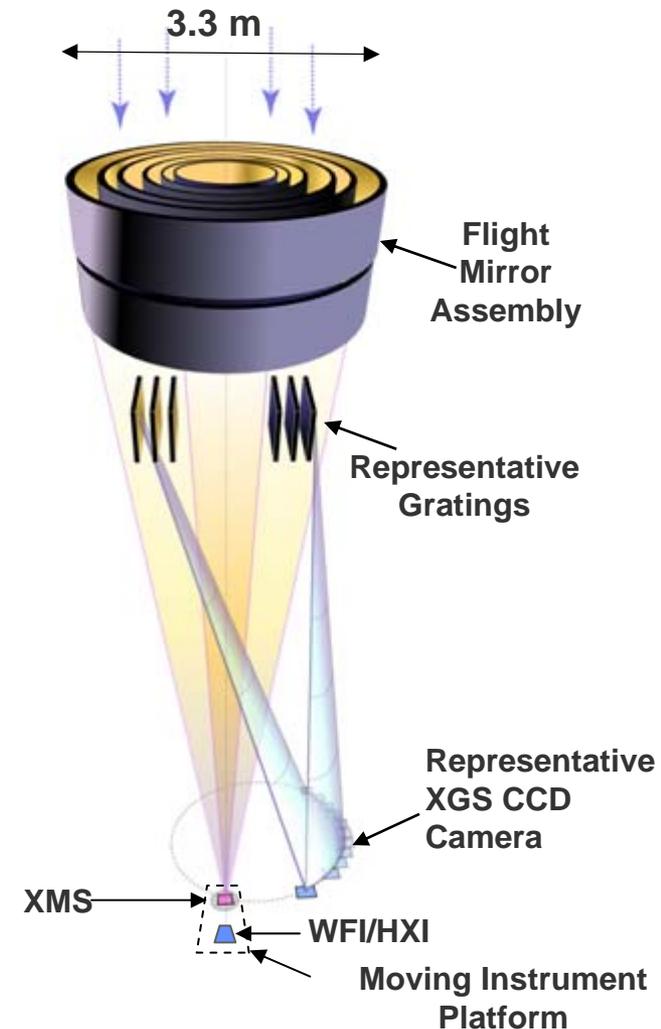
Strawman Payload Summary

Single Flight Mirror Assembly (FMA)

- Grazing incidence, highly nested mirrors
- 20 m focal length

Four instruments

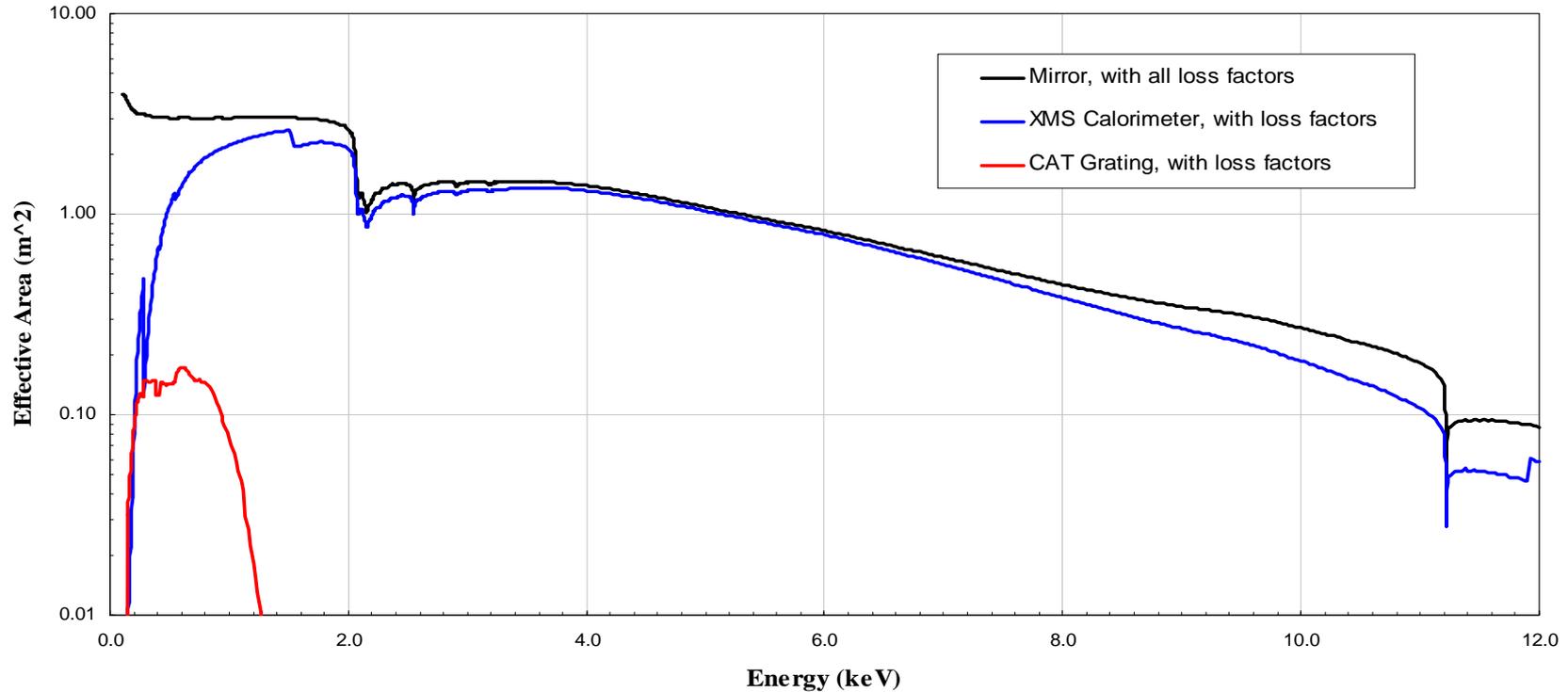
- **X-ray Microcalorimeter Spectrometer (XMS)**
 - Covers 0.6 to 10 keV with high spectral resolution
- **Wide Field Imager (WFI)**
 - Covers 0.1 to 15 keV with large FOV
- **Hard X-ray Image (HXI)* extends the WFI bandpass to 40 keV**
 - Assumed detector head within WFI envelope
- **X-ray Grating Spectrometer (XGS)**
 - Dispersive from 0.3 to 1 keV
 - Two grating arrays mount to aft of FMA
 - CCD camera for readout on fixed instrument platform



Note:

* Response by the FMA for this particular design (without multilayers) does not meet desired level for high energies.

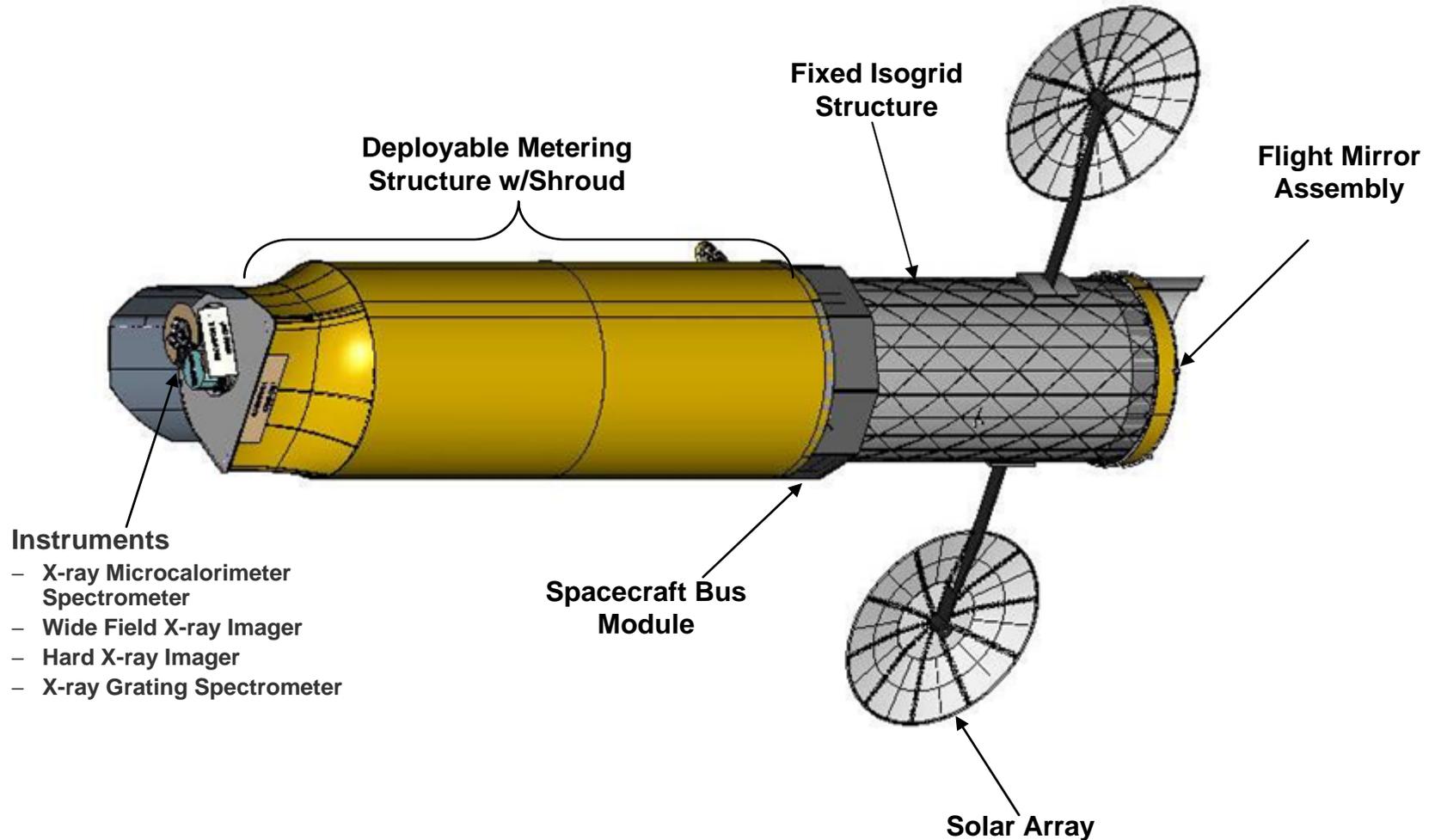
Mission Effective Area



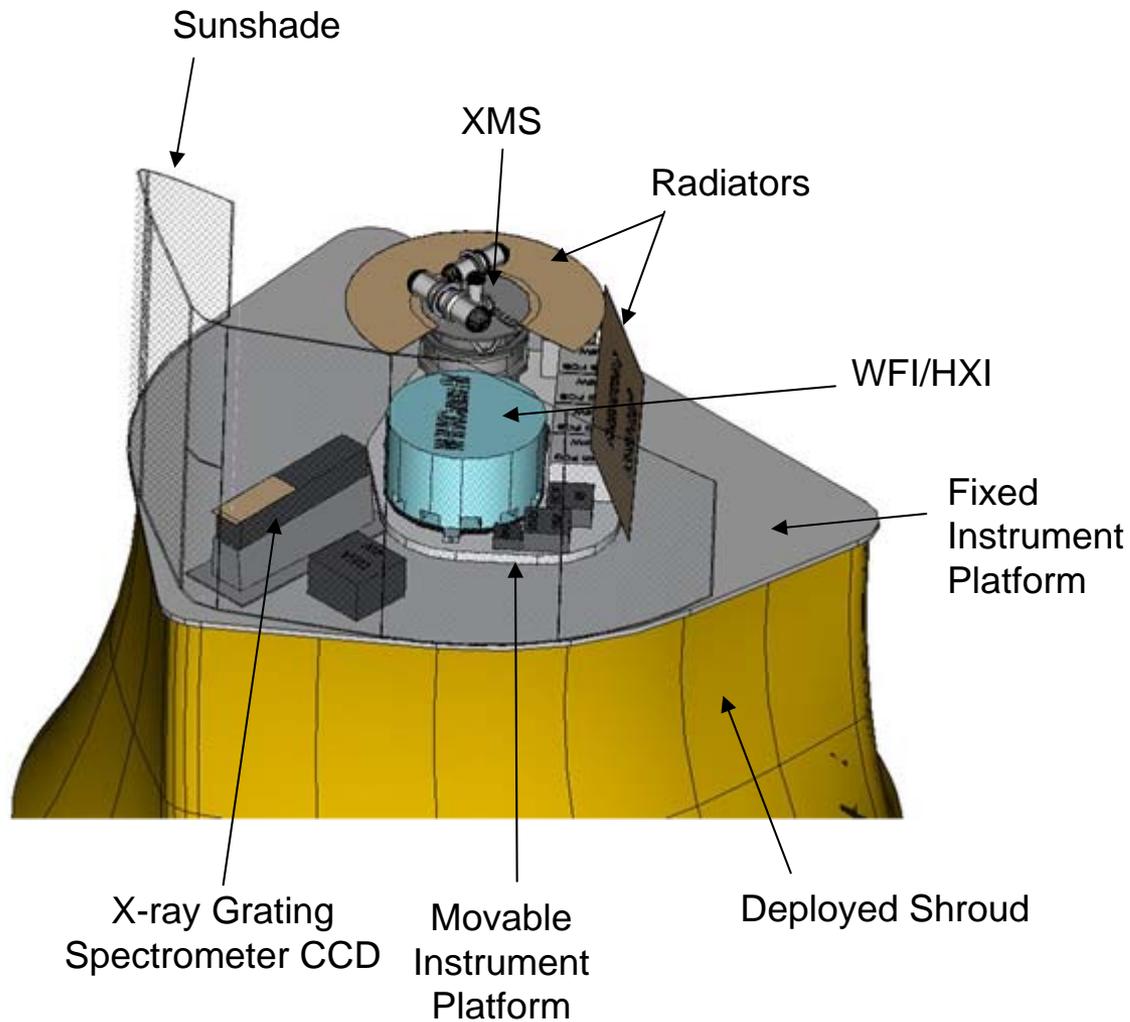
▪ Flight Mirror Assembly

- 3.3 m overall outer diameter (3.2 m largest diameter on optical surface)
- 20 m focal length

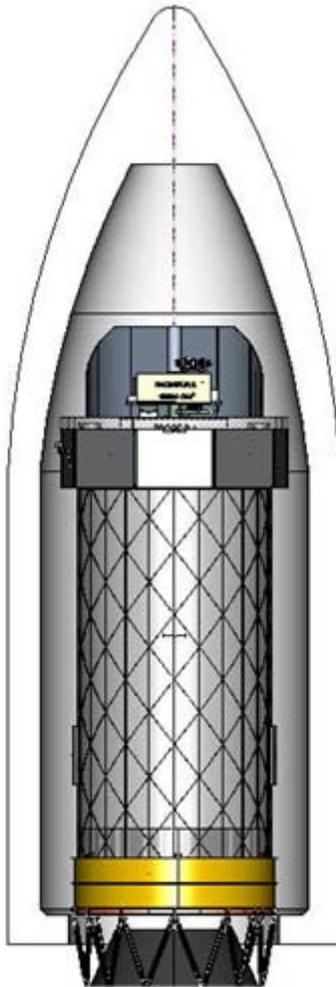
Single Mirror IXO Configuration



Instrument Module



Launch Configuration and Mass Summary



Atlas V 551
Medium Composite Fairing

Payload	Estimate (kg)	Cont.	Allocation (kg)
Flight Mirror Assembly	1775	30%	2308
XMS	258	30%	336
WFI	80	30%	104
XGS	62	30%	81
HXI	24	30%	31
Misc. Payload Accom	51	30%	66
Payload Total	2250	30%	2924
Bus	Estimate (kg)	Cont.	Allocation (kg)
Avionics	66	30%	86
Communications	36	30%	47
Attitude Control	72	30%	94
Structure and Mechanisms	1188	30%	1545
Power	108	30%	141
Propulsion (dry)	48	30%	63
Thermal	239	30%	311
Harness	274	30%	357
Bus Total	2033	30%	2643
Observatory	Estimate (kg)	Cont.	Allocation (kg)
Observatory On Orbit Dry Mass	4282	30%	5567
Separation System LV Side	227	6%	241
Propellant Mass (10 yrs)			308
Observatory Wet Launch Mass			6116
Margins			
Atlas V 551 Throw Mass (C3=-0.5)			6425
Project Manager's Margin			309

5 % margin

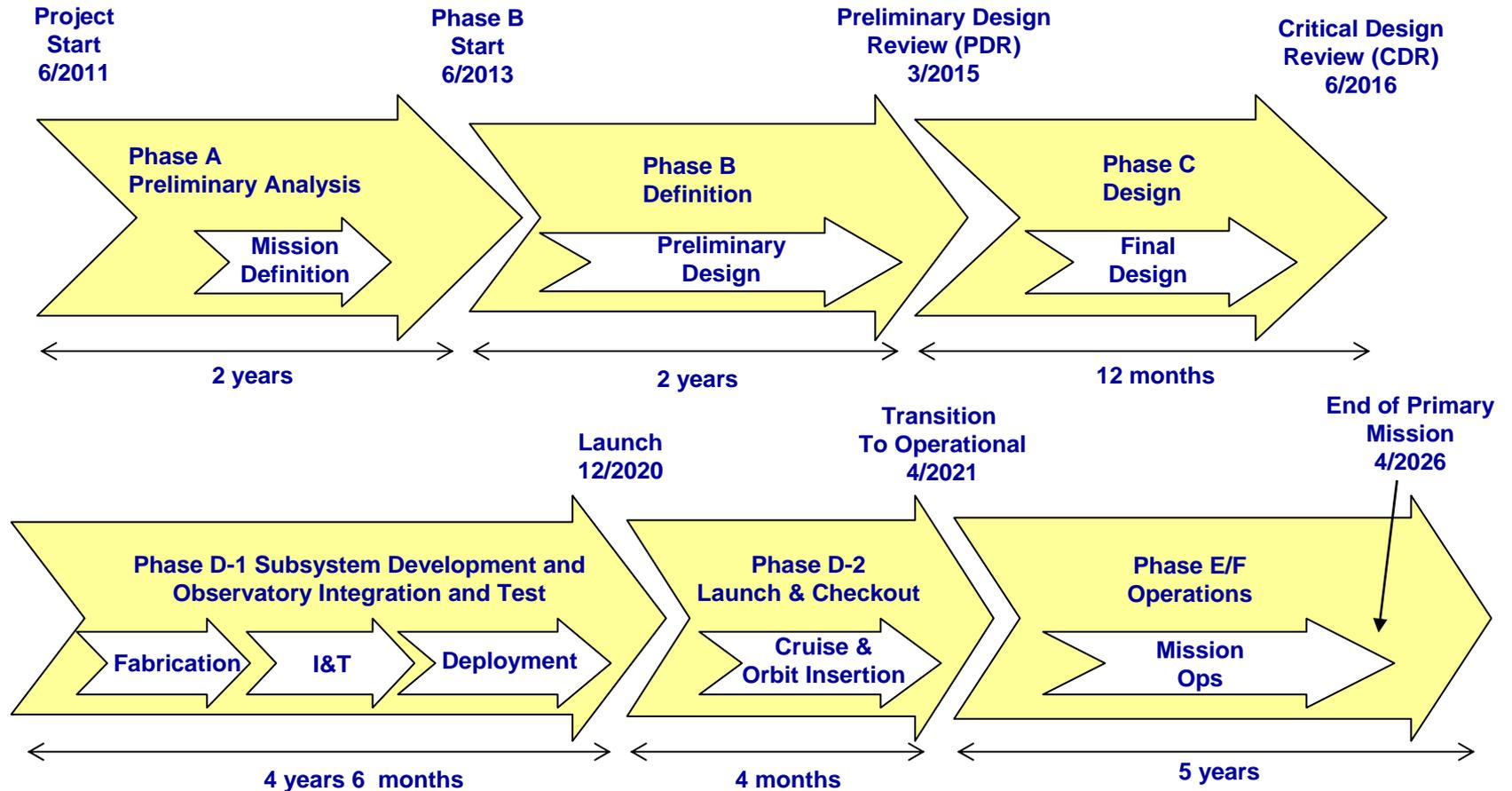
Preparations for Decadal Review

- **Input required for Decadal likely to be similar to what was required for recent National Research Council (NRC) Beyond Einstein Program Assessment Committee (BEPAC) review, which required the following information:**
 - **Science**
 - **Mission science objectives and flowdown to measurement requirements and performance requirements**
 - **Science reach compared other existing/planned missions**
 - **Instrumentation**
 - **Approach and rationale for selection**
 - **Performance requirements**
 - **Technical maturity and schedule/plans to achieve Technology Readiness Level (TRL) 6**
 - **Flight operations modes, complexity and software**
 - **Data and data analysis plans**

Preparations for Decadal Review (cont.)

- Observatory
 - Spacecraft characteristics, requirements, drawings/diagrams
 - Launch options
 - Key trades performed and planned
 - Spacecraft technologies TRL status, open issues
 - S/C subsystem characteristics and requirements
 - Flight heritage of S/C systems
 - Accommodations of instrumentation
- Mission operations and ground system
- Risks and mitigation plans (top 3 for each instrumentation, spacecraft bus, overall mission)
- Mission descope options and associated performance and cost impacts
- Schedules for instrumentation, spacecraft, overall mission
- Organizational structure and responsibilities
- Cost Estimate and profile
 - 70% confidence
 - Basis of estimate and validation
- **NRC will independently determine 70% confidence cost estimate**

Project Lifecycle



Nominal Plan to prepare for Decadal

- Target for initial submittals to Decadal as early as February 2009
- Finalize Science measurement requirements and performance requirements
 - Facility Science Team meeting (Aug 2008), IXO Workshop and Coordination Group Meeting (Sept 2008)
- Mission and Instrument Concept Update
 - XMS Instrument Design Lab (IDL) study — May 2008 ✓Complete
 - Observatory Mission Design Lab — Jul 2008 ✓Complete
 - SXT Flight Mirror Assembly (FMA) — Jul thru Oct 2008
 - Mission study in ESA CDF — Oct/Nov 2008
 - Conduct supporting technical analyses, refinement, etc. — Sept thru Dec 2008
 - Update/complete all information for decadal (risk assessment operations, etc.) — Dec 2008/Jan 2009
- Schedule
 - Update FMA Schedule (mission development critical path) — Oct thru Dec 2008
 - Update instrument, S/C, and overall mission schedules — Oct 2008 thru Jan 2009
- Costs
 - Generate 70% confidence cost estimates — Aug 2008 thru Jan 2009
- Technology Demo's
 - Define plans/schedule to achieve required mission performance — Oct thru Dec 2008
 - Complete demonstrations – December 2008 thru June 2009