

The X-ray Surveyor Mission Concept Study Plan

Douglas A. Swartz (MSFC/USRA)

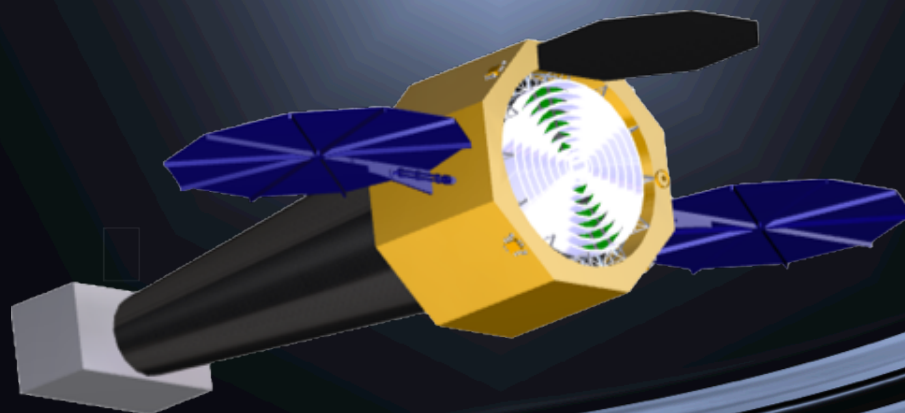
On behalf of the MSFC/SAO X-ray Surveyor Study Office

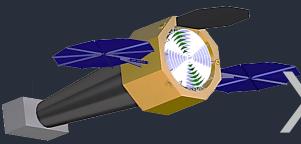
Jessica A. Gaskin – Study Scientist

Martin Weisskopf – Senior Scientist

Alexey Vikhlinin – Lead Scientist, SAO

Harvey Tananbaum – Senior Astrophysicist, SAO





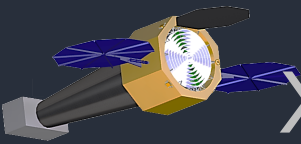
X-ray Surveyor Mission Update

◆ Recent Events (2015)

- ◆ 01/04/2015 white paper from HQ
- ◆ 10/08/2015 PAG reports following community discussion
- ◆ 11/20/2015 MSFC submits Study Plan for X-ray surveyor to HQ

◆ Immediate Schedule (2016)

- ◆ January: Announcement of study lead Centers & call for STDTs
- ◆ March: STDT appointments completed, study teams defined
- ◆ April/May STDT comments on study requirements & deliverables due
- ◆ June/July Document initial Technology Gaps
- ◆ Aug/Sep Deliver detailed study plan to achieve the required Concept Maturity Level for the Decadal Survey



X-ray Surveyor Mission Overview

- ◆ Strawman Mission (Spring 2015)
 - ◆ *“At least an order of magnitude improvement (at similar cost)”*
- ◆ Builds on Chandra heritage; evolved from Smart-X (Con-X, IXO)
 - ◆ Chandra-like spacecraft requirements; Chandra-like costs
 - ◆ Lightweight, 0.5” angular resolution, high throughput ($\sim 3 \text{ m}^2$ EA) optics
 - ◆ $R=5000$ (0.2-2 keV) transmission gratings
 - ◆ 1”, 5’x5’ FOV, <5eV resolution, 0.2-10 keV microcalorimeter
 - ◆ Sub-arcsecond, 22’x22’, 0.2-8 keV CMOS imager

Gaskin, J. et al. 2015, SPIE 96010J

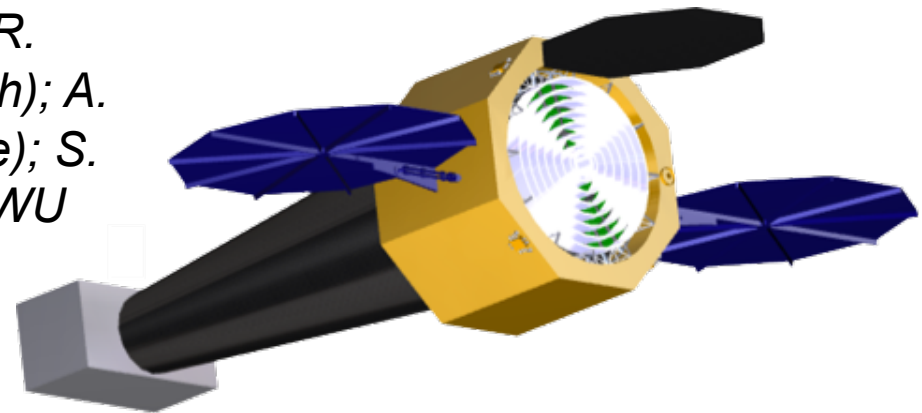


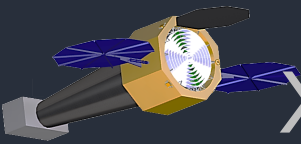
X-ray Surveyor Strawman Mission

- ◆ Developed through MSFC's Advanced Concepts Office
- ◆ Informal mission concept definition team:

M. Weisskopf, J. Gaskin, B. Ramsey, S. O'Dell (MSFC); A. Vikhlinin, H. Tananbaum, P. Reid, D. Schwartz, R. Kraft (SAO); D. Burrows, A. Falcone, L. Townsley (PSU); M. Bautz, R. Heilmann (MIT); S. Bandler, A. Ptak, R. Petre, C. Kilbourne (GSFC); R. McEntaffer (Iowa); F. Harrison (Caltech); A. Kravtsov (Chicago); P. Natarajan (Yale); S. Heinz (Wisconsin); C. Kouveliotou (GWU)

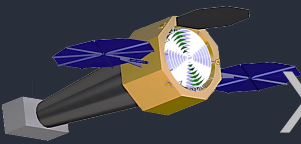
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X-ray Vision Workshop

- ◆ An X-ray Surveyor Science Workshop
 - ◆ 6-8 October, 2015 Washington, DC
 - ◆ Over 80 participants for talks & community discussion
 - ◆ http://cxc.harvard.edu/cdo/xray_surveyor/
- ◆ Outline broad Science Case through Community Engagement
 - ◆ Neutron Stars and Birth and Evolution of Black Holes
 - ◆ Plasma Physics: Cluster gas microphysics, SNRs & PWNe,
 - ◆ Cycles of Baryons: Stellar & AGN Feedback, Galaxy halos & Cosmic Web
 - ◆ Physics of New Worlds: Exoplanets, Dusty ISM & Protostars
 - ◆ Brainstorming Breakout Session to “stimulate further out-of-the-box thinking and to search for emerging themes among the varied science presented”



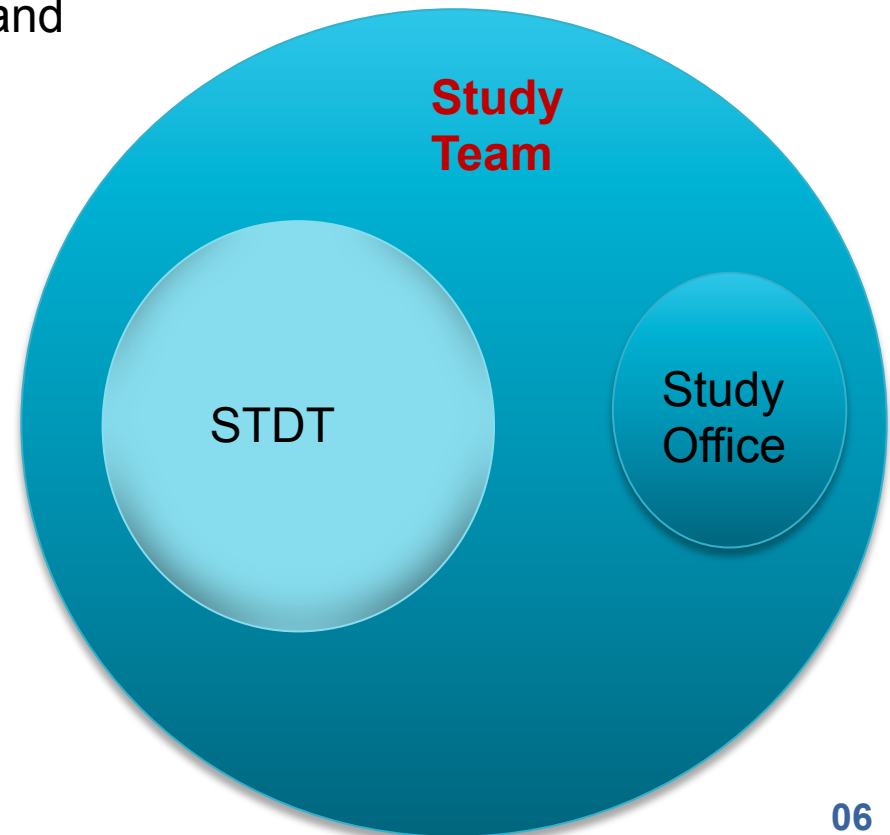
X-ray Surveyor Study Team

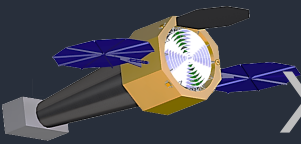
◆ Science & Technology Definition Team (STDT)

- ◆ Deliver a compelling and executable concept to the 2020 Decadal Survey Committee so that science can be adequately prioritized by the Committee
- ◆ Composed of Community, NASA, and Center Study Scientists

◆ Final report includes:

- ◆ Science case
- ◆ Notional mission & trade analysis
- ◆ Design Reference Mission
- ◆ Technology assessment
- ◆ Cost assessment
- ◆ Top-level schedule & risks





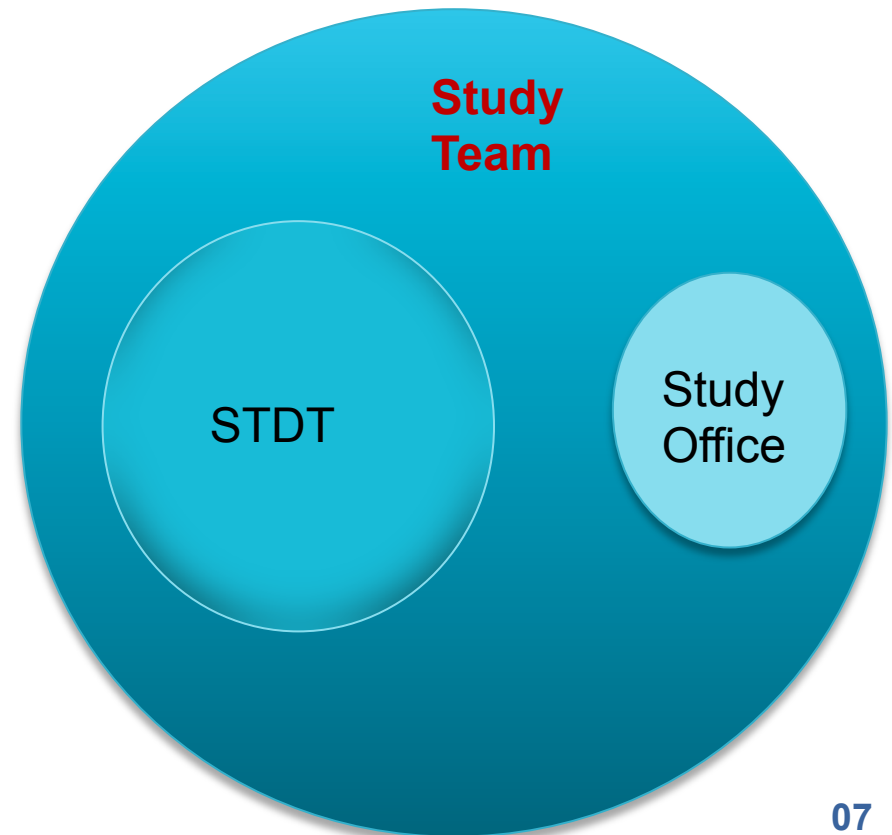
X-ray Surveyor Study Team

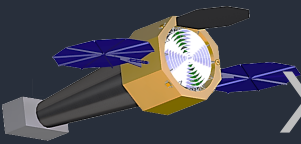
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◆ Study Office

- ◆ Perform STDT-directed design trade and analysis
 - Provide design products
 - Assess & recommend trade options
 - Develop implementable DRM
- ◆ Applies MSFC & SAO capabilities and resources

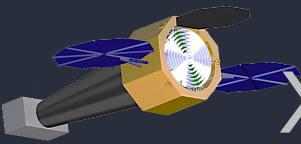




X-ray Surveyor Study Plan

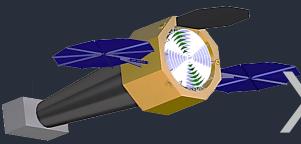
◆ General Study Office Responsibilities:

- ◆ Support the STDT
 - Engineering studies
 - RFIs and RFPs; facilitate PAG infrastructure (SAG/SIG) utilization
- ◆ Promote close relation between the Study and the (PCOS) technology cycle (APRA & SAT) to ensure resources are committed to closing Technology Gaps
- ◆ Engage Industry
- ◆ Inform the Community
 - Organize workshops, STDT meeting logistics
 - Provide website; simulation tools, information archive



X-ray Surveyor Study Plan

- ◆ Perform STDT-directed design trade and analysis:
 - ◆ Provide design products
 - ◆ Assess & recommend trade options
 - ◆ Develop implementable DRM
- ◆ Employ MSFC's engineering services to provide high-fidelity studies analyzing end-to-end mission systems:
 - ◆ Avionics, power systems, propulsion,
 - ◆ Structural design & analysis,
 - ◆ Thermal analysis, space environment,
 - ◆ Communications, command & data handling
- ◆ Cost Assessments



X-ray Surveyor Study Plan

- ◆ Apply MSFC/SAO capabilities and resources
 - ◆ Incorporate Chandra heritage; mainly Chandra-like spacecraft requirements (with some straight-forward extensions)
 - ◆ World-class calibration facilities
 - ◆ Optics Engineering Design Support Tasks:
 - Energy-dependent angular resolution, effective area, vignetting trades
 - Stray-light baffles, pre- & post-collimators and thermal control and gradients
 - Mirror support & module mount design structural, thermal, and optical optimization
 - Mirror alignment & module assembly workflow; production mechanization
 - Metrology volume and accuracy assessments; calibration plans & requirements
 - ◆ Promote competitive exploration of multiple approaches to sub-arcsecond mirror element design; Study Team will help inform future funding prioritization



X-ray Surveyor Study Team

The MSFC and SAO Study Team is tremendously enthusiastic about the importance and potential of X-ray Surveyor and we pledge to do everything we possibly can to ensure its success

