

# The X-ray Surveyor Mission Concept Study Plan

Douglas A. Swartz (MSFC/USRA)

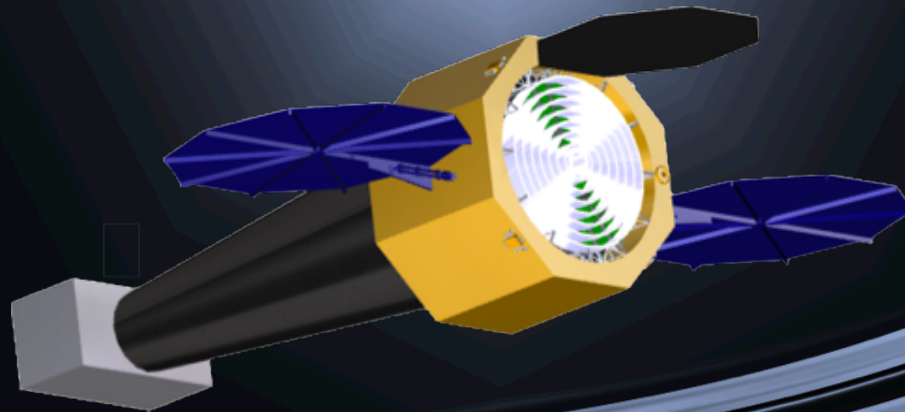
On behalf of the MSFC/SAO X-ray Surveyor Study Office

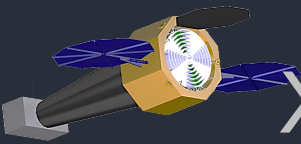
Jessica A. Gaskin – Study Scientist, MSFC

Martin Weisskopf – Senior Scientist, MSFC

Alexey Vikhlinin – Lead Scientist, SAO

Harvey Tananbaum – Senior Astrophysicist, SAO





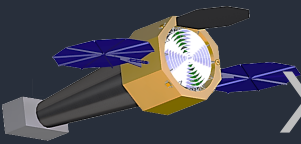
# X-ray Surveyor Mission Update

## ◆ 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

*“Orders of magnitude improvement at similar cost”*

## ◆ Strawman Mission (Spring 2015)

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,  $<5\text{eV}$  resolution, 0.2-10 keV microcalorimeter
- ◆ Sub-arcsecond, 22’x22’, 0.2-8 keV CMOS imager

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

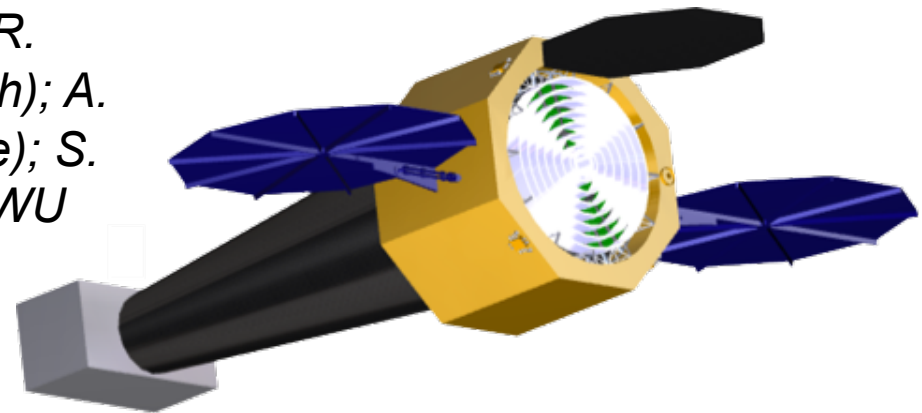


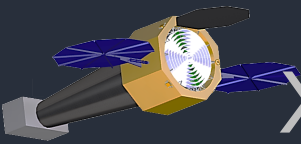
# X-ray Surveyor Strawman Mission

- ◆ 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)*

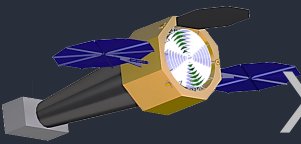
**Gaskin, J. et al. 2015, SPIE 96010J**





# 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/](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”



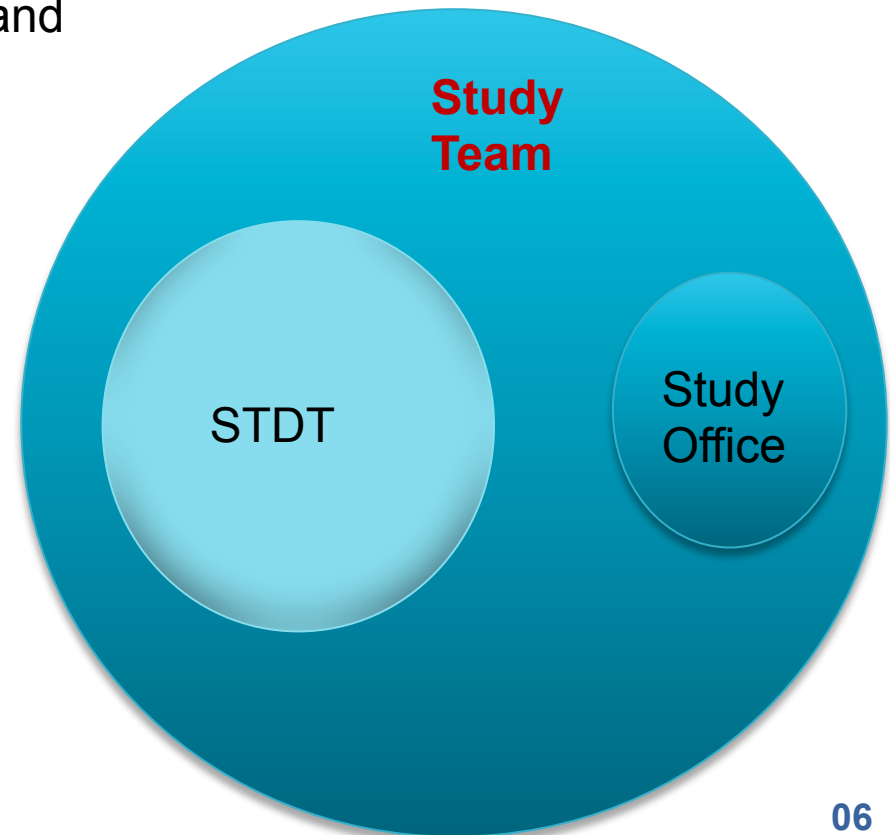
# X-ray Surveyor Study Team

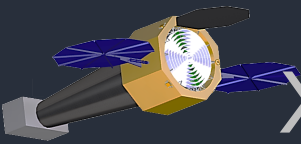
## ◆ Science & Technology Definition Team (STDT)

- ◆ 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





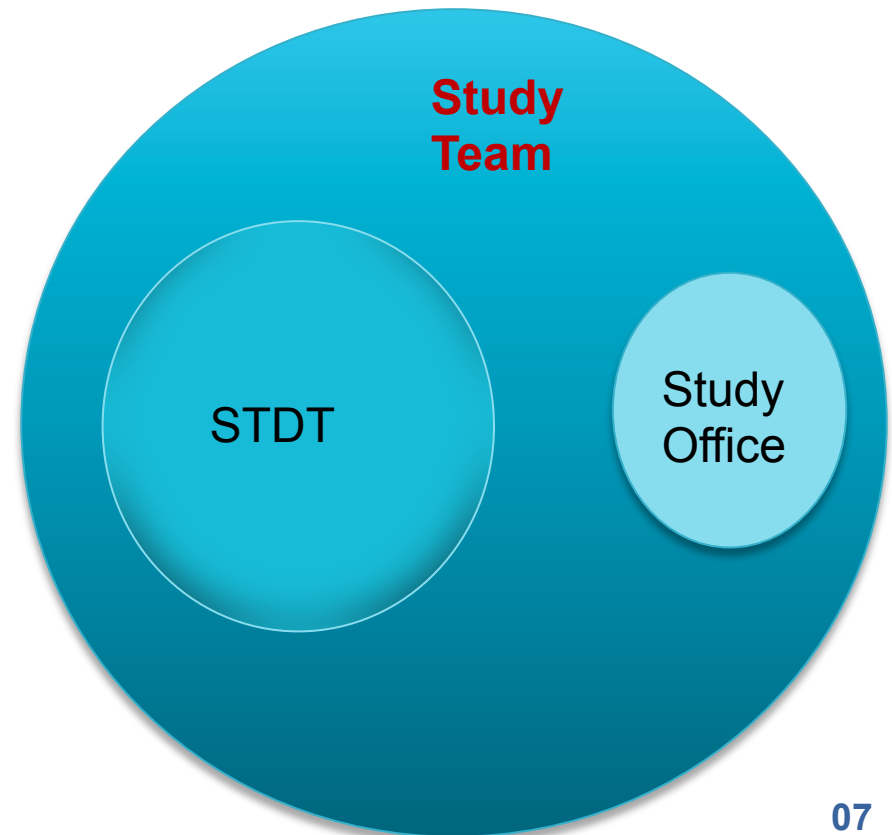
# X-ray Surveyor Study Team

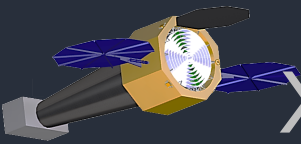
## ◆ Science & Technology Definition Team (STDT)

- ◆ Deliver a compelling and executable concept to the Decadal Survey Committee so that science can be adequately prioritized by the Committee

## ◆ Study Office

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



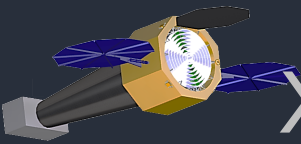


# X-ray Surveyor Study Plan

## ◆ General Study Office Responsibilities:

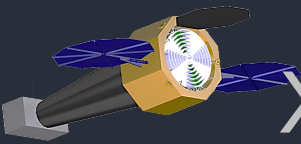
- ◆ Support the STDT
  - Engineering studies
  - RFIs and RFPs; facilitate PAG/SIG infrastructure utilization
- ◆ Promote close relation between the Study and the (PCOS) technology cycle (APRA & SAT) to ensure resources are committed to closing Technology Gaps
- ◆ Engage Industry
- ◆ Inform the Community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





# X-ray Surveyor Study Plan

- ◆ Perform STDT-directed design trades and analyses:
  - ◆ 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 including:
  - ◆ 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.*

*We look forward to working with you to define the next great X-ray Astrophysics Observatory*

