



NASA HQ Update on IXO

IXO Facility Science Team Meeting
GSFC, 20 August 2008

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Recent History of IXO

- Stern and Southwood at NASA/ESA bilateral informally agree that Con-X and XEUS must find a path forward to a single, merged mission (Paris, Sept 2007).
- Southwood letter to Stern (Jan 2008) invites NASA to participate in XEUS study as a starting point leading to possible interagency partnership.
- Morse/Favata letter (May 2008):
 - Con-X is highest priority large-class mission following JWST (2000 Decadal), to be revisited in 2010 Decadal.
 - XEUS selected as one of three CV L-class competing missions (Outer Planets, XEUS, LISA) with downselection in 2009 and 2011.
 - Limited resources in both agencies and considerable overlap in science goals argue for finding a joint mission approach.
 - Agreement for a joint mission study (not the mission itself).
 - **Formation of coordination group (CG) composed of ESA, NASA, and JAXA representatives.**
 - First task of CG is to determine the existence of possible joint mission scenarios.
 - Once found, study the joint mission scenario to the level required by the selection process milestones of the agencies involved.
 - No consideration to be given by the CG of which agency might lead the merged mission.



IXO Coordination Group

- IXO-CG initially charged to find a joint mission scenario for further joint study by the agencies (ESA, NASA, JAXA).
- IXO-CG now charged with definition of science requirements for the IXO concept, scientific supervision of **study activities**, reporting to Agencies.
- IXO-CG jointly chaired by the ESA and NASA study scientists.
- ESA, NASA, JAXA each appoint a HQ representative, study manager, study scientist, and additional scientists (10 total).
- No agency commitment as yet to proceed with development of the IXO mission, just with the study.



Meetings of the IXO CG

- First IXO CG meeting at ESTEC (May 2008):
 - Review of Con-X and XEUS science goals and mission designs.
 - Discussion of science and design differences.
 - Tasks established for the second IXO CG meeting:
 - Preparation of joint science case
 - Technical issues and impact on science:
 - Decision on joint mission name: “International X-ray Observatory”
- Second IXO CG meeting in Boston (June 2008):
 - Discussions of task results
 - Agreement reached for joint study of IXO.
- Third IXO CG meeting to be held at MPE, Garching (Sept 2008)
 - Study progress



Agreed elements for the IXO study

1. An extensible optical bench, exploring focal lengths in the approximate range between 20 and 25 meters. The focal length will be traded off with other performance-defining characteristics (e.g., mirror area, field of view) during the study.
2. The studied concept will be compatible with both slumped glass and silicon-pore optics technologies for the X-ray mirror. Both optical technology developments are planned to continue to the necessary level of technology readiness. Appropriate selection points for the actual flight technology will be defined jointly at a later time. The studies will explore possible ways to maximize the collecting areas at energies above approximately 6 keV for a given focal length.
3. The instruments to be studied for the IXO concept will include an X-ray wide field imaging spectrometer, a high spectral resolution, non-dispersive X-ray spectrometer, an X-ray grating spectrometer, plus allocation for further payload elements with modest resource demands. The various payload elements will be traded off in terms of resource requirements and system impact versus scientific impact.
4. The IXO concept must be compatible with both an Ariane V and Atlas V 551 launch vehicle.



IXO Science and Technical Working Groups

- Restructuring of FST: Subject to ESA/NASA/JAXA agreement, the FST will be replaced by Working Groups that report to the IXO Coordination Group.
- Working group areas:
 - Science WG
 - Instrumentation WG
 - Telescope WG
 - Other WG's?
 - Substructures TBD
- Decadal:
 - WG inputs to CG
 - CG prepares documents for Decadal Committee/Panels



The Astronomy & Astrophysics Decadal Survey

- National Research Council
 - Commission on Physical Sciences, Mathematics, and Applications
 - Board of Physics and Astronomy
 - Space Studies Board
 - Committee on Astronomy and Astrophysics (joint subcommittee)
- BPA, SSB, with CAA assistance conduct the Decadal Survey Process
 - Astronomy and Astrophysics Survey Committee
 - Panel on High Energy Astrophysics from Space
 - Panel on Optical and Infrared Astronomy from the Ground
 - Panel on Particle, Nuclear, and Gravitational-Wave Astrophysics
 - Radio and Submillimeter-Wave Astronomy
 - Panel on Solar Astronomy
 - Panel on Theory, Computation, and Data Exploration
 - Panel on Ultraviolet, Optical, and Infrared Astronomy from Space

2001
Survey
science
panels





Decadal Time Line

(from NAS website)

Stage 1: Defining the Study (agencies' statement of task)

Stage 2: Committee Selection and Approval (range of expertise, no conflicts)

Stage 3: Committee Meetings, Information Gathering, Deliberations, and Drafting of the Report

Stage 4: Report Review (independent review by anonymous experts)

May 2008



~Winter 2009/10



~Summer 2010



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are needed to see this picture.



Decadal Cost Estimation

- 2001 Decadal Cost Estimates (US cost, FY00 \$):
 - JWST at \$1000M
 - Con-X at \$800M
 - LISA at \$250M
 - TPF at \$200M
 - GLAST at \$300M
 - To address unexpected cost growth, “trip wires” likely to be introduced with “decision rules:” reprioritization, termination?
 - How will budgetary limits affect the prioritization process?
 - Will Con-X in the Decadal and XEUS in the Cosmic Visions downselection fare better if merged with subsequent cost reduction to each agency?
- Large underestimation of cost resulted in unrealizable mission program.



*From the talk by Anneila Sargent (Chair, Board of Physics and Astronomy)
at the Austin, TX AAS meeting on the 2010 Astronomy & Astrophysics
Decadal Survey*

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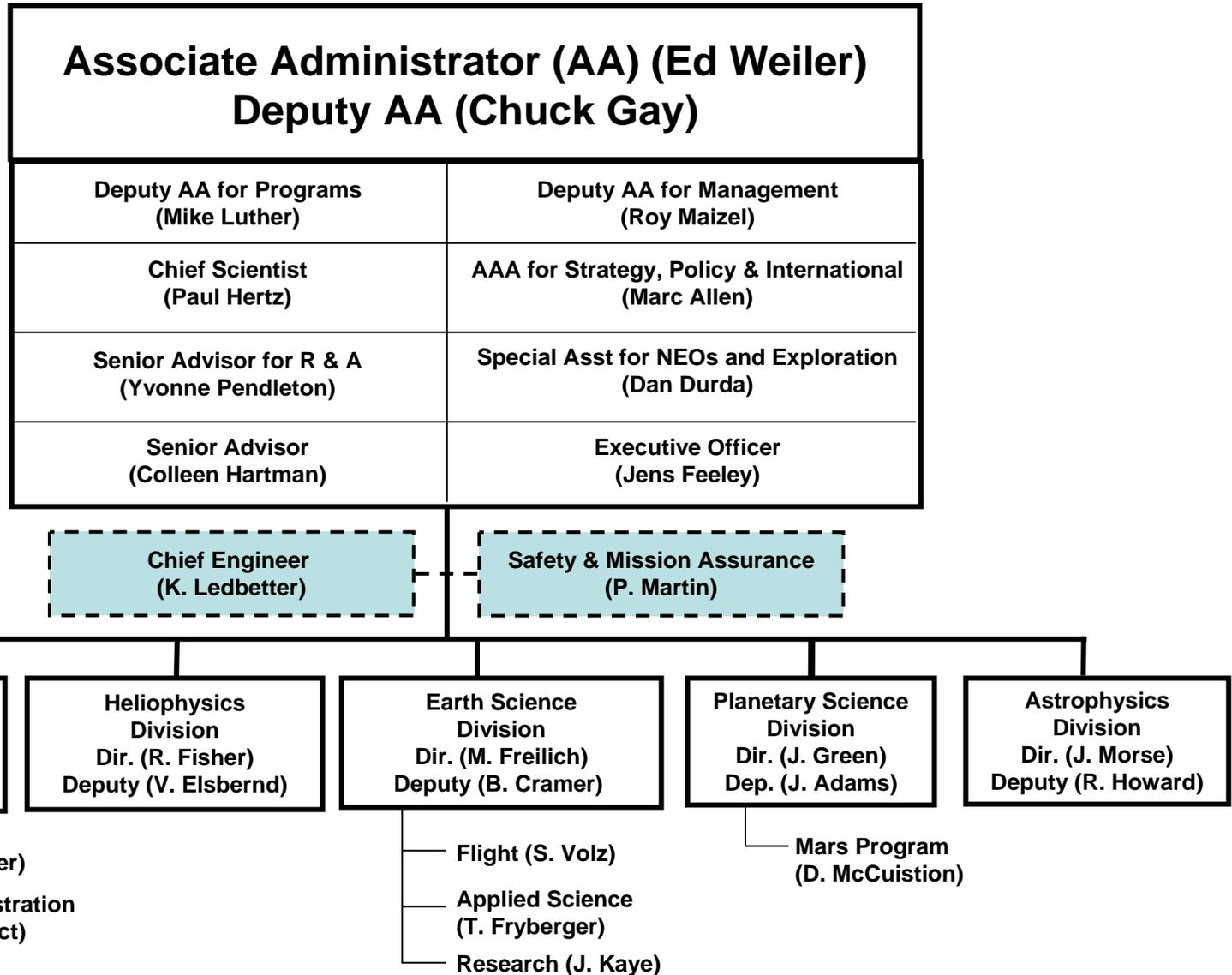
A&A Decadal Update

- The contract between NAS and the agencies (NASA, NSF, DOE) has been fully paid for, enabling start of Decadal process.
- The agencies have no control whatsoever of the Decadal process once the contract is initiated.
- Selection of Decadal Survey Committee Chair: an appointment memo has been prepared, waiting for NAS President's (Ralph Cicerone) approval.
- No Decadal Committee members are selected until the Chair has been established.
- Panel categories and panel members TBD by the Committee
- Plan to have first Committee meeting by the end of CY 2008.
- Current estimate of *earliest* date for mission and community input: Feb-Mar 2009.
- Input phase expected to take several months.



Backup

SMD Organization



Blue dashed boxes denote individuals who report to other organizations, but support SMD

Draft: May 28, 2008

NASA and SMD President's Budget Request FY09-FY13

	* FY2007	* FY2008	FY2009	FY2010	FY2011	FY2012	FY2013
<u>Total NASA</u>	<u>\$16,231.0</u>	<u>\$17,300.5</u>	<u>\$17,610.7</u>	<u>\$18,022.9</u>	<u>\$18,457.0</u>	<u>\$18,901.6</u>	<u>\$19,355.4</u>
<u>Science</u>	<u>\$4,609.9</u>	<u>\$4,706.2</u>	<u>\$4,441.5</u>	<u>\$4,482.0</u>	<u>\$4,534.9</u>	<u>\$4,643.4</u>	<u>\$4,761.6</u>
Earth Science	\$1,198.5	\$1,280.3	\$1,367.5	\$1,350.7	\$1,250.9	\$1,264.4	\$1,290.3
Planetary Science	\$1,215.6	\$1,247.5	\$1,334.2	\$1,410.1	\$1,537.5	\$1,570.0	\$1,608.7
Astrophysics	\$1,365.0	\$1,337.5	\$1,164.5	\$1,122.4	\$1,057.1	\$1,067.7	\$1,116.0
Heliophysics	\$583.7	\$590.9	\$575.3	\$598.9	\$689.4	\$741.2	\$746.6
DSN/ Ground Network	\$247.2	\$250.0					
Aeronautics Research	\$593.8	\$511.7	\$446.5	\$447.5	\$452.4	\$456.7	\$467.7
Education	\$114.1	\$137.9	\$112.1	\$122.7	\$120.4	\$120.4	\$120.4
<u>Exploration Systems</u>	<u>\$2,837.6</u>	<u>\$3,143.0</u>	<u>\$3,500.5</u>	<u>\$3,737.7</u>	<u>\$7,048.2</u>	<u>\$7,116.8</u>	<u>\$7,666.8</u>
Constellation Systems	\$2,114.7	\$2,471.9	\$3,048.2	\$3,252.8	\$6,479.5	\$6,521.3	\$7,080.5
Advanced Capabilities	\$722.9	\$671.1	\$452.3	\$484.9	\$568.7	\$595.5	\$586.3
<u>Space Operations</u>	<u>\$5,093.5</u>	<u>\$5,526.2</u>	<u>\$5,774.7</u>	<u>\$5,872.7</u>	<u>\$2,900.1</u>	<u>\$3,089.9</u>	<u>\$2,788.5</u>
Space Shuttle	\$3,295.3	\$3,266.7	\$2,981.7	\$2,983.6	\$95.7		
International Space Station	\$1,469.0	\$1,813.2	\$2,060.2	\$2,277.0	\$2,176.4	\$2,448.2	\$2,143.1
Space and Flight Support (SFS)	\$329.2	\$446.3	\$732.8	\$612.1	\$628.0	\$641.7	\$645.4
<u>Cross-Agency Support</u>	<u>\$2,949.9</u>	<u>\$3,242.9</u>	<u>\$3,299.9</u>	<u>\$3,323.9</u>	<u>\$3,363.7</u>	<u>\$3,436.1</u>	<u>\$3,511.2</u>
Agency Management and Operations	\$971.2	\$830.2	\$945.6	\$945.5	\$939.8	\$950.5	\$961.3
Institutional Investments	\$223.8	\$319.7	\$308.7	\$331.7	\$335.9	\$330.4	\$338.3
Congressionally Directed Items		\$80.0					
Center Management and Operations	\$1,754.9	\$2,013.0	\$2,045.6	\$2,046.7	\$2,088.0	\$2,155.2	\$2,211.6
Inspector General	\$32.2	\$32.6	\$35.5	\$36.4	\$37.3	\$38.3	\$39.2

* FY07-08 are consistent with IBPD, and exclude latest Operating Plans. Subsequent charts INCLUDE Operating Plans.

Astrophysics Program Content (FY09 Pres. Budget)

	* FY07	* FY08	FY09	FY10	FY11	FY12	FY13
FY09 President's Budget *	1,356.8	1,363.5	1,162.5	1,122.4	1,057.1	1,067.7	1,116.0
Physics of the Cosmos	196.5	157.2	157.0	219.8	249.0	271.1	326.0
GLAST	84.4	41.9	23.2	23.3	24.1	24.9	24.9
JDEM		3.7	8.5	63.0	83.0	109.0	125.0
LISA	6.5	5.7	5.7	15.9	18.7	26.7	35.0
Constellation-X	8.3	8.1	8.3	12.0	16.8	15.9	42.0
Chandra	58.6	62.9	65.0	67.8	68.5	50.2	48.9
XMM	8.6	7.4	7.0	7.4	7.6	8.5	8.5
Herschel/Planck & Other	48.4	27.6	76.1	56.6	54.5	59.9	64.7
Exoplanet Exploration	184.6	159.5	48.1	67.7	68.4	96.4	126.2
SIM	30.4	24.3					
Kepler	121.8	79.5	25.2	14.9	13.9	12.6	8.8
Keck Operations	2.8	2.8	2.9	3.0	3.1	3.2	
TPF/EXEP Tech	8.0	7.5	6.7	6.3	6.4	7.5	8.7
Future Exoplanet Missions	1.0	23.8	6.6	41.7	44.0	72.0	107.5
Other	20.6	21.6	6.7	1.8	1.0	1.0	1.2
Cosmic Origins	788.9	816.9	674.4	571.1	515.4	485.6	458.5
James Webb Space Telescope	398.6	447.4	371.9	311.1	265.1	236.1	194.9
Hubble Space Telescope	277.5	230.2	154.9	125.6	114.7	94.8	93.9
SOFIA	38.9	64.0	72.8	72.8	57.0	58.8	60.6
Spitzer	73.8	75.4	71.7	15.9	10.3	3.2	3.3
Astrophysics Future Missions			3.0	45.8	68.3	92.7	105.8
Astrophysics Explorer	88.0	117.2	130.6	93.3	43.3	11.7	6.4
WISE	52.9	72.7	65.2	13.0	5.2	1.6	
NuSTAR		16.7	41.5	57.8	31.0	6.8	6.4
Operating Explorers (Swift, Suzaku, RXTE, GALEX, WMAP)	35.1	27.8	23.9	22.5	7.1	3.2	
Astrophysics Research	98.8	112.6	152.3	170.4	181.0	203.0	198.9
Research and Analysis	52.2	56.6	61.4	65.4	69.3	72.6	77.5
Balloons	22.2	24.0	24.6	26.7	28.8	32.4	33.2
ADCAR	9.0	12.6	12.8	13.4	17.7	33.5	24.3
Other	24.5	19.4	53.5	65.1	65.2	64.4	63.8

* FY07 and FY08 reflect latest proposed Operating Plan, in FY09 structure

IXO Concept Studied in MDL

