

# Astrophysics Projects Division



**Physics of the Cosmos Program**



**Cosmic Origins Program**

## **Program Status**

**Physics of the Cosmos Program (PCOS)**

**Cosmic Origins Program (COR)**

**M. Ahmed**

Briefing to the PhysPAG

January 8, 2012

AAS Meeting, Austin Texas

# Table Of Contents

---

- **Program Status Update**
  - Program Implementation & SRB Findings
  - Personnel Updates
- **Technology Development Status**
  - Funding Philosophy
  - Funding Process FY-13 and beyond
  - Targeted Technologies in FY-12
  - Competed Technologies in FY-12
- **Mission Concept Studies, The RFI Process**
- **HST De-orbit Study**

# Program Acceptance Review: SRB Findings

---

- **Program Acceptance review process completed August 2011**
  - SRB chaired by Dr. Michael Bicay, Director of Science, NASA Ames Research Center
  - Agency approved the PCOS & COR programs to proceed into Implementation phase
- **Key findings from the review:**
  - Strengths
    - Science objectives of both Programs aligned well with 2010 NASA Strategic Plan
    - Program Offices are well-organized by functional responsibilities, and are adequately staffed with capable managers
    - Technology & Risk Management Plans are sound
  - Concerns
    - Lack of viable 10-year roadmap for PCOS, with executable flight missions
    - Health of the scientific community because of the above
    - Impact of HST de-orbit mission on Astrophysics science budget

# Personnel Update

---

- **Anne Hornschemeier Cardiff is the PCOS program chief scientist**
  - Taking over from Jean Cottom
  
- **Dominic Branford is the COR program chief scientist**
  - Taking over from Malcolm Niedner
  
- **Mark Clampin is the program chief technologist for PCOS & COR**
  - A new position, recommended by the SRB
  - Key focus on possible collaborations with other programs within NASA, other agencies within US and abroad

# Methodology for Technology Management

---

- **Technology investments through merit-based review processes**
- **Decisions are informed by an ongoing discussion with our community through our Program Analysis Groups (PAGs) and through extensive outreach program**
  - The community identifies technology needs each summer by working with the PAG or through individual input using the program web site.
  - The Program Technology Management Board (TMB) prioritizes these needs based on a published set of criteria that includes assessments of urgency, relevance to defined missions and science objectives, and the broader programmatic context
  - These priorities are published each year in the Program Annual Technology Report, along with the status of technologies that were funded the previous year
  - The program references these priorities and this report over the following year as the calls for technology proposals are drafted
- **This process improves the transparency and relevance of technology investments, provides the community a voice in the process, ensures open competition for funding, and leverages the technology investments of external organizations by defining a need and a customer**

# Technology Prioritization for FY-13 and Beyond

---

- **Starting in FY-13, all technology funds will be awarded through the SAT process, until specific mission concepts are selected to proceed**
- **A prioritization process has been put in place that will**
  - Inform the call for SAT proposals
  - Inform technology developers of the program needs
  - Guide the selection of technology awards to be aligned with program goals
- **Community inputs for technology needs solicited through**
  - Program Analysis Groups
  - Chief scientists for the programs
  - Program scientists at NASA headquarters
- **The TMB prioritizes the inputs based on established criteria**
- **Program priorities are published in the Program Annual Technology Report (PATR)**
- **All documents for FY-13 allocations have been released**
  - PCOS PATR was released on November 29, 2011
  - COR PATR was released on November 14, 2011
  - SAT call for proposals for FY-13 funding was released on December 22, 2011

# Technology Buckets

---

- **Targeted Technologies – Directed**
  - Tied to a specific mission concept
  - Documented in a Technology Development Plan
  - Vetted through the TMB
- **Strategic Astrophysics Technologies (SAT) – Competed-ROSES**
  - Program priorities established and documented in the Program Annual Technology Report (PATR)
  - SAT call for proposals is informed by the priorities in PATR
  - Selection of the proposed technologies is based on the program priorities
- **Unique Infrastructure – Directed/Competed**
  - Capability that serves the community
  - Examples include optical test beds and detector development and characterization labs at NASA Centers or academic institutions

# Targeted Technologies in FY-12

---

- **IXO & LISA were discontinued as “projects” late in FY-11**
  - Both projects were executing their Technology Development Plans using the project funding allocations
- **The call for SAT proposals did not include IXO & LISA technologies**
  - Call went out before the decision to discontinue the projects
- **Special Technology Management Board (TMB) was convened to prioritize continued investments in IXO/LISA technologies in FY-12**
- **Criteria included**
  - A clear connection to a possible contribution to the ESA L-1 missions or be a key enabling technology for a possible US-led mission, or both
  - A clearly defined end product in FY-12
  - Reasonableness of the proposed budget
- **Awards were announced in September 2011**



# Targeted Technology Awards in FY-12

Proposed Work	PI	Institution
X-ray Mission Mirrors: Develop glass mirror segment fabrication and mounting techniques toward demonstration of TRL 5	W. Zhang	Goddard Space Flight Center
X-ray Mission Micro-calorimeter: Develop 32 x 32 arrays that incorporate Athena “pitch” and 3 X 16 readout for demonstration of TRL 5	C. Kilbourne	Goddard Space Flight Center
Gravitational Wave Mission Telescope: Establish telescope design that meets pathlength stability and wavefront error requirements for NGO; demonstrate optical and scattered light performance for on-axis telescope.	J. Livas	Goddard Space Flight Center
Gravitational Wave Mission Phasemeter: Design and demonstrate modifications to phasemeter that support relaxation of LISA's requirements on laser noise, orbital parameters, and received optical power; Assemble and test analog signal chain pre-amp board	W. Klipstein	Jet Propulsion Laboratory

# SAT Awards: Physics of the Cosmos FY-12

---

Title	PI	Institution
Development of Fabrication Process for Critical-Angle X-ray Transmission Gratings	M. Schattenburg	Massachusetts Institute of Technology
Antenna-Coupled Superconducting Detectors for Cosmic Microwave Background Polarimetry	J. Bock	Jet Propulsion Laboratory
Directly-Deposited Blocking Filters for Imaging X-ray Detectors: Technology Development for the International X-ray Observatory	M. Bautz	Massachusetts Institute of Technology
Off-plane Grating Arrays for Future Missions	R. McEntaffer	University of Iowa
Development of moderate angular resolution full shell electroplated metal grazing incidence x-ray optics	P. Reid	Smithsonian Astrophysical Observatory

# SAT Awards: Cosmic Origins FY-12

---

Title	PI	Institution
Advanced UVOIR Mirror Technology Development for Very Large Space Telescopes	Phillip Stahl	Marshall Space Flight Center
High performance cross-strip micro- channel plate detector systems for spaceflight experiments	John Vallerga	UC Berkeley
Enhanced MgF2 & LiF Overcoated Al Mirrors for FUV Space Astronomy	Manuel Quijada	Goddard Space Flight Center

# Developing The PCOS Roadmap: The RFI Process

---

## ***Background***

- Science priorities endorsed by the 2010 Decadal Survey cannot be implemented due to budgetary constraints
  - IXO & LISA partnerships with ESA are discontinued
  - Flagship class missions concepts will compete with all other science disciplines

## ***Question***

1. Are there any mission concepts at affordable cost points?
2. If so, what fraction of the “endorsed” science can be achieved with these missions?
3. What is the \$/Science value of these missions?
4. Will the science community, through the Sciences Committee on Astronomy and Astrophysics (CAA), endorse new mission concepts at the \$/Science value

## ***Approach***

- The RFI process to answer questions 1-3 so that the science community can answer question 4

# The RFI Process: Details

---

- ✓ **Request for Information (RFI) - Sept '11**
  - Solicits enabling technologies, instruments, and mission concepts at three cost points that can enable some or all LISA and IXO science objectives endorsed by “NWNH”
    - Explorer Class, **Probe Class**, Flagship Class
- ✓ **Community Science Team (CST) – Oct '11**
  - ✓ Formed through an open solicitation/Dear Colleague letter
  - ✓ To work with the astronomy community and the PCOS Program Office to review all RFI responses and define mission concepts.
- ✓ **Open forum Workshops – Dec '11**
  - ✓ Present a summary of the information received in response to the RFI and potential mission scenarios for further study
- **Develop concepts for mission scenarios at up to three cost points – Jan-May '12**
  - Map the trade space of mission science return versus mission cost
- **Anticipate presenting results to the National Academy of Sciences Committee on Astronomy and Astrophysics (CAA) – June '12**
- **If endorsed by the CAA, facilitate in-depth studies of mission concepts within the cost and \$/Science parameters, in preparation for the DISIAC**

# HST De-orbit Study

---

- **The HST De-orbit mission cost will impact science missions if the cost has to come from the overall COR science budget.**
- **Controlled de-orbit projected to be necessary in 2025**
- **Funding requirements for this activity will compete with other science objectives for the next decade**
- **We need to understand the worst case impact to Astrophysics science and how to minimize the impact**
- **Program Office study is underway to:**
  - Identify the building blocks for the de-orbit mission
  - Define the mission phases
    - Launch to orbit
    - Rendezvous & capture
    - De-orbit/Super sync
  - Understand various options available for each phase of the mission
  - Conduct high-level mission architecture trades of risk and cost
  - Identify potential partners within NASA, industry and other government agencies for various mission elements
  - Identify options for best value solution
  - Determine the worst case budget allocation scenario for future planning

# Summary

---

- **Both PCOS and COR programs are formally in implementation phase**
- **A short term strategy is in place to keep the door open for international partnerships**
  - With ESA for ATHENA or NGO
  - With JAXA for SPICA
- **A long range approach is established to:**
  - Pursue lower-cost mission concepts for X-Ray and Gravitational Wave science
  - Investigate options for HST de-orbit that minimize impact on Astrophysics science budget
- **A merit-based, transparent process is established for technology development that will ensure alignment with program goals**