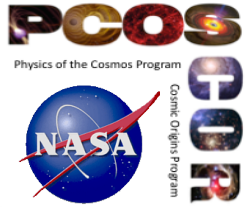

Cosmic Origins Program: Technology Prioritization

Susan Neff
Chief Scientist, Cosmic Origins Program Office

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COR Program Technology Manager

Why Should You Care?

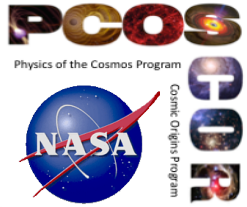
- **Priorities help determine funding for technology development.**
- **Technology priorities reviewed/revised yearly.**
- **We want/need community input.**
- **The time for that input is now / very soon.**

COR Technology Investments – All are Peer-reviewed

• Early Development	APRA	TRL 1-5
• Strategic Development	SAT	TRL 3-5
• Flight Testing	Suborbital Program, SOFIA	TRL 5-9
• Mission Specific	Phase A/B	TRL 5-9

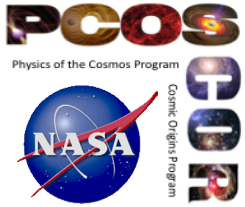
TRL: Technology Readiness Level

COR Strategic Technology Prioritization: Objectives and Purposes



- **Objectives**
  - Identify technology gaps most relevant to COR Program's objectives
    (described in Astrophysics Implementation Plan)
  - Rank technology gaps to show investment priorities
- **Purposes**
  - Engage the scientific community in technology development process
  - Inform the SAT solicitation of greatest mid-TRL technology needs for COR.
  - Inform other technology development planning at NASA.
    - (e.g., SBIR program, other STMD activities).
  - Focus efforts of technology developers.
  - Help align selection of technology awards with COR science objectives.
    →This process supplements, does not replace existing SAT peer review process
  - Improve relevance of COR Program technology investments
  - Leverage technology investments of external organizations by defining capability gaps and identifying NASA as a potential customer

COR Strategic Technology Investment Process

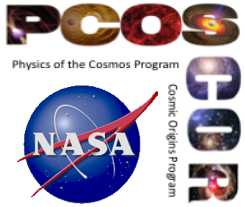


• Prioritize the science	Decadal Survey
• Identify technology gaps	Community input
• Prioritize the gaps	COR Program Technology Management Board
• Solicit & evaluate proposals Strategic Astrophysics Technology (SAT) program	NASA HQ
• Select and fund proposals	NASA HQ

Identify Technology Gaps (June)

- COR Program solicits the Astronomy community for inputs
  - Individuals submit suggestions using form at http://cor.gsfc.nasa.gov/technology/
  - The COPAG is asked to identify inputs possibly missed by the community (by late June).
  - COPAG is welcome to provide recommendations on priorities (late June).

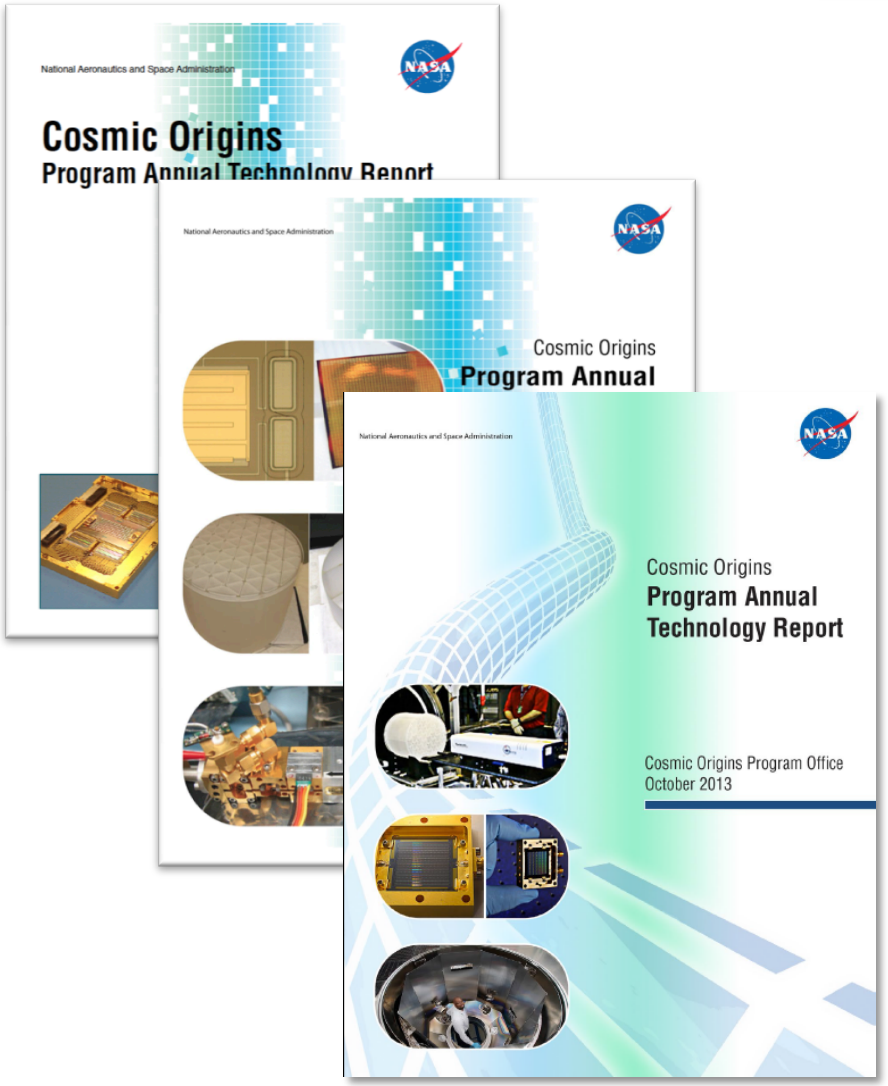
Prioritize Technology Gaps (July-Aug)



- Technology Management Board (TMB) evaluates identified technology gaps. Membership includes:
  - Program leaders at NASA HQ.
  - Senior Staff at the Program Office.
  - Subject matter expert(s) as required.
- TMB prioritizes the technology gaps using:
  - Scientific priorities (Decadal Survey).
  - Benefits to COR program / Astrophysics Division, if gaps are closed.
  - Timeliness: When is the technology needed?
- Criteria are published yearly in the Program Annual Technology Report (PATR).
- TMB may recommend investment considerations to HQ.

Publicize the Priorities (Oct):

Program Annual Technology Report (PATR)



The PATR summarizes the COR Program's technology development activities for the prior year, including:

- Overview of the Program and its technology development activities.
- Status of the Program's strategic and targeted technology development for the prior year.
- Description of new SAT award selections.
- Summary of technology gaps submitted and evaluated.
- Prioritized list of technology gaps for the coming year to inform the SAT proposal calls and selection decision.

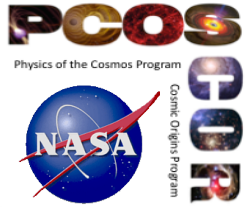
The COR PATR can be downloaded from http://cor.gsfc.nasa.gov

How You Can Participate

- Submit your suggestions for technology capability gaps **by June 30, 2014.**
  - Send suggestions to the COPAG EC, by submitting your suggestions by June 16 **or** by sending to Thai.Pham@nasa.gov
  - Use the online form at: http://cor.gsfc.nasa.gov/technology/ (page bottom)
- Propose to the SAT – due date late March each year.
- Serve as a peer reviewer for the SAT or APRA programs.
  - Contact Mario Perez (SAT) or Mike Garcia (APRA) at HQ
- Provide feedback on the technology prioritization process to Thai.Pham@nasa.gov

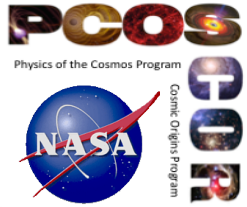
THANK YOU!

Requested Technology Capability Gaps Inputs



1. Name of desired technology capability
2. Description of desired capability
3. Brief assessment of relevant state-of-the-art technologies (including Technology Readiness Level (TRL))
4. Quantitative performance goals
5. Scientific, engineering or programmatic benefits of filling the gap.
6. Potential applications and relevant mission(s).
7. Time to anticipated need (TRL 5/6)

→Inputs received through the COR website before June 16, 2014, will be forwarded to the COPAG for inclusion in their consolidated list.



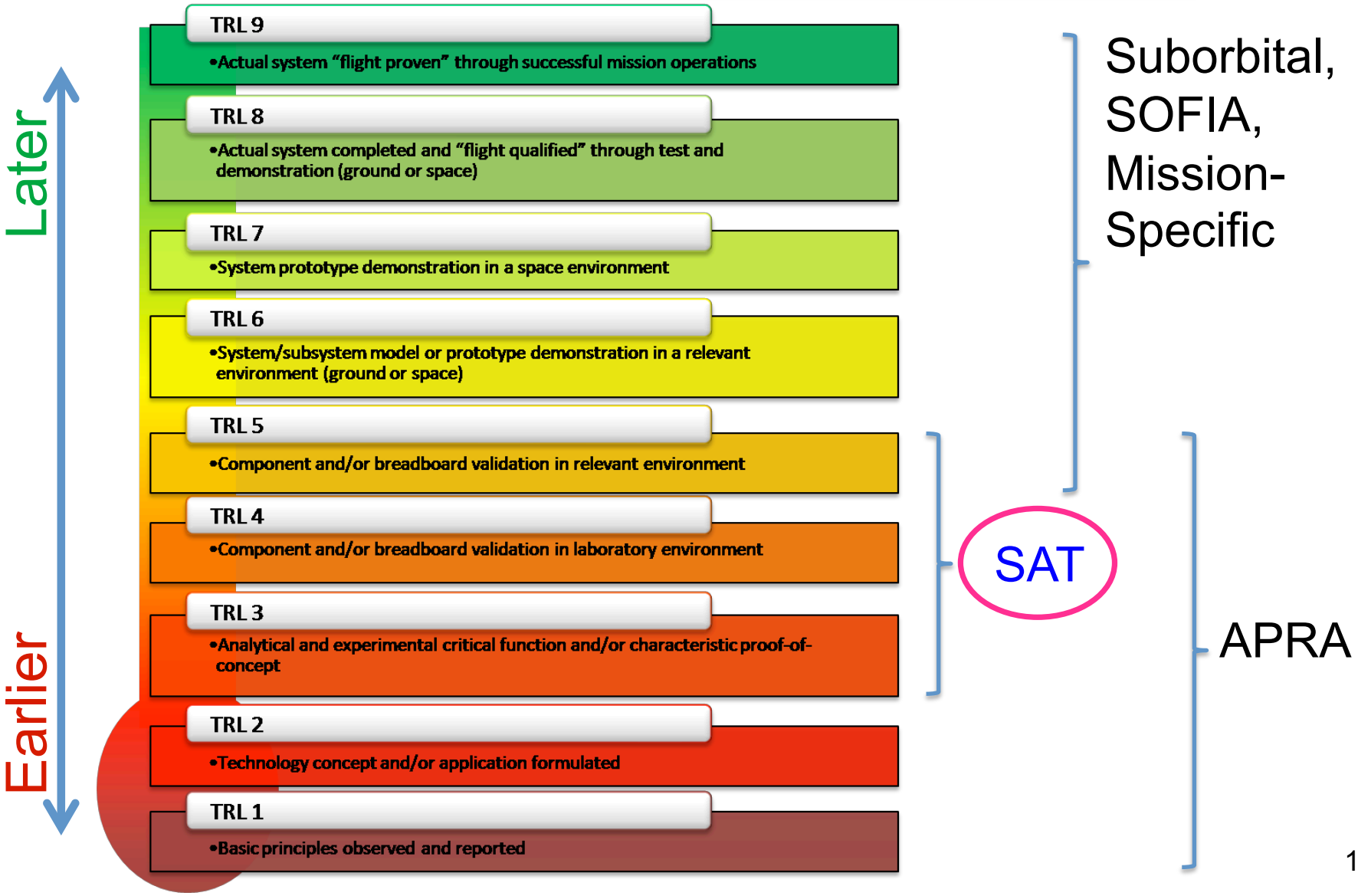
Cosmic Origins Program: Technology Prioritization

Backup Charts

Susan Neff
Chief Scientist, Cosmic Origins Program Office

Technology Readiness Levels (TRL)

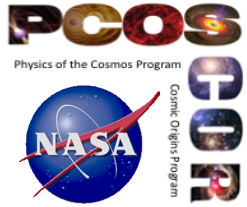
from NASA Procedural Req (NPR) 7123.1B Appendix E



“Ideal” Technology Capability Gaps List

- Contains only technology capability gaps consistent with Program objectives (as given in the Astrophysics Implementation Plan and other current programmatic directives)
- Includes inputs from a broad and diverse community
- Identifies capability gaps (not specific implementation approaches).
- Is developed through an open and impartial process
- Has no perception of COR Program endorsement for any specific person, concept, or organization.
- Is concise, non-redundant, and well-defined
- Contains no proprietary or ITAR-sensitive information

Suggestions for Helpful Submissions



- Focus on technology gaps associated with missions prioritized in the Astrophysics Implementation Plan
- Submit entries directly applicable to COR Program objectives.
  (Don't include non-COR-specific technologies, such as launch vehicles, rovers, avionics, spacecraft systems, etc.)
- Include well-defined technology needs currently at TRL 3-5.
- Don't include technologies already at TRL 6 or higher.
- Submit generic technology needs, not specific implementations
  (e.g. named mission concepts).

Suggestions for Writing Technology "Needs" as "Capability Gaps"

COR 2013 Priority	Previous Technology "Needs"		Comment	Suggested Rewording To Indicate Technology Capability Gaps		Comment
1	High QE, large format UV detectors		Good as submitted. Does not pre-suppose any specific implementation approach or technology and boiled down to the essential capability need - high efficiency with good resolution. Rewording not required.	Rewording not required		QE, format size, operational wavelength band and any other specific metric are to be added to the "Quantitative Goals and Objectives" section of the input.
	High Reflectivity UV coatings		Reworded slightly not to preclude any materials that may not need coatings	High reflectivity UV materials		Reflectivity, uniformity, bandpasses, etc. should be included in the "Quantitative Goals and Objectives" section of the input.
	Large, low-cost, light-weight precision monolithic mirrors for ultra-stable large aperture UV/Optical/Near-IR telescopes		Could use a little adjustment to focus on the capability gap. Could imagine that a mirror with the needed performance need not be monolithic, and that active techniques could in principle give the same benefits as having ultra- stable structures	Large, low-cost, light-weight precision mirrors for ultra-stable aperture UV/Optical/Near-IR telescopes		Mirror size with specific wavefront quality requirements and other required metrics should be included in the "Quantitative Goals and Objectives" section of the input.
	Deployable light-weight precision mirror systems for future Very Large Aperture UV/Optical/Near-IR Telescopes		"Deployable" is an implementation approach, suggest combining with the large mirror gap described above.	Included in large mirror gap described above		Mirror size range with specific wavefront quality requirements and other required metrics should be included in the "Quantitative Goals and Objectives" section of the input.
	Photon counting large-format UV detectors		Fine as written	Rewording not required		QE, noise, format size, operational wavelength band, etc. should be specified in the "Quantitative Goals and Objectives" section of the input.
	High efficiency UV multi-object spectrometers		Fine as written	Rewording not required		Format size, QE, resolution and other required specifications should be included in the "Quantitative Goals and Objectives" section of the input.
PCOS 2013 Priority	**Previous Technology "Needs"**		**Comment**	**Suggested Rewording To Indicate Technology Capability Gaps**		**Comment**
1	Large format Mercury Cadmium Telluride CMOS IR detectors, 4K x 4K pixels	Dark Energy	Should not matter what technology is used for the focal plane. It is the resolution, noise performance, and sensitivity in the IR band that is required.	Large format, high resolution, low noise near infrared imaging system	Dark Energy	Technical specifications such as number of pixels, bandpass, dark current, read noise, QE, etc. should be specified in the "Quantitative Goals and Objectives" section of the input.
	Telescope design with stringent length and alignment stability with low straylight	Gravitational Wave	Pretty good although it does pre-suppose a mission architecture. A more general description is suggested.	Ultra-stable telescope with low straylight	Gravitational Wave	Specific requirements for length and alignment stability for the needed wavefront quality and straylight should be included in the "Quantitative Goals and Objectives" section of the input.
	Large format high-resolution X-ray microcalorimeter	X-ray	Fine and does not pre-suppose a certain implementation approach. A broader way to express the gap is suggested.	Detector for high resolution imaging spectroscopy of X-rays	X-ray	Array and pixel size, eV resolution, etc. should be included in the "Quantitative Goals and Objectives" section of the input.
	High resolution phasemeter	Gravitational Wave	Fine as written	Rewording not required	Gravitational Wave	Specific measurement sensitivity and any other requirements should be noted in the "Quantitative Goals and Objectives" section of the input.
	Segmented replicating mirrors	X-ray	Using segmented mirrors is an implementation approach. Suggestion is more general.	Large, lightweight mirror system for collection of X-rays	X-ray	Metric describing required size, weight and any other specifications should be included in the "Quantitative Goals and Objectives" section of the input.