NASA Update

Astronomy and Astrophysics Advisory Committee | January 25, 2022

Paul Hertz
Director, Astrophysics Division, Science Mission Directorate
@NASAUniverse @NASAExoplanets @NASAWebb

Sandra Cauffman – Deputy Director

Prior to joining the Astrophysics Division as Deputy Director in October 2021, she was Deputy Director of the Earth Science Division from May 2016 to October 2021; during that period, she served as the Acting Director of Earth Science from February 2019 until May 2020.

Before joining NASA HQ, Mrs. Cauffman worked at the Goddard Space Flight Center for 25 years, progressing from ground systems manager through an increasing series of management roles including instrument manager, project manager, deputy program director, and assistant director of flight projects.

Mrs. Cauffman joined NASA in 1991. She has been awarded the NASA Exceptional Achievement Medal and she is a two-time recipient of the NASA Outstanding Leadership Medal. She is a four times recipient of the NASA Acquisition Improvement Award, and numerous GSFC and HQ awards. She is a Senior Fellow on the Council for Excellence in Government. She is an Honorary Member of the National Academy of Sciences, Costa Rica and an Honorary Member of the Colegio Federado de Ingenieros y de Arquitectos in Costa Rica. Her profile has been highlighted by the United Nations Entity for Gender Equality and the Empowerment of Women for being a positive example for women, especially, youth and children. Due to her extensive work in outreach and STEM in Costa Rica and Latin America, the Government of Costa Rica issued a stamp in her honor in 2017. She received a B.S. in Physics, a B.S in Electrical Engineering and a M.S. in Electrical Engineering, all from George Mason University. GMU honored Mrs. Cauffman achievements at their 50th Anniversary in 2018 as one of the 50 “exemplars”, alumni who exemplify the impact of a Mason degree around the world.

Sandra Cauffman – Deputy Director

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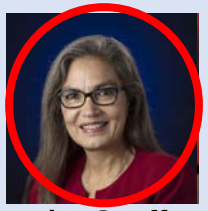
NASA Astrophysics Division

Division Director

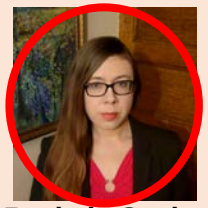
Paul Hertz
Astrophysics Division Director



Sandra Cauffman
Astrophysics Division Deputy Director

ASTROPHYSICS
NASA's Science Mission Directorate

Program Executives



Rachele Cocks
Operating MissionPioneers

E. Lucien Cox
SOFIA, GUSTO, XRISM, ExEP

Ed Griego
Roman CGI, APD Operating Missions

Shahid Habib
PCOS/COR, ARIEL, Athena, Euclid, LISA, UltraSat

Janet Letchworth
Roman

Mark Sistilli
Explorers Program IXPE, SPHEREx, COSI Balloons

Cross Cutting

Eric Smith
Chief Scientist Webb

Jeanne Davis
Assoc Dir for Flight ASM Program Manager

Mario Perez
Chief Technologist SAT, RTF, ISFM, Swift

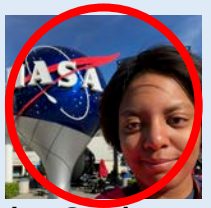
Not Pictured

Lisa Wainio
Information Manager, Public Affairs Liaison

Administrative Support

Kelly Johnson
Administrative Assistant

Maria Harriell
Administrative Assistant



Lina Carrington
Program Support Specialist

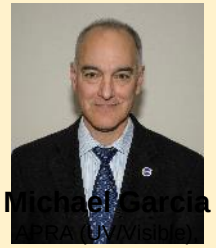
Ingrid Farrell
Program Support Specialist

Program Scientists

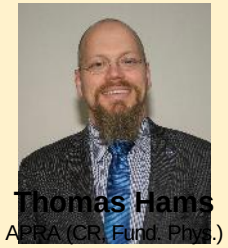
Dominic Benford
Roman
APRA Lead

Terri Brandt
COSI Dep
APRA Dep
Pioneers Dep

Valerie Connaughton
APRA (High Energy)
XRISM, UltraSat
PCOS Program



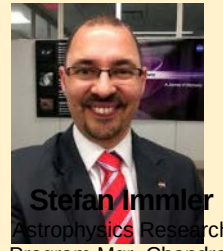
Michael Garcia
APRA (UV/Visible)
SmallSats/Pioneers
Hubble



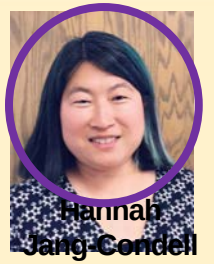
Thomas Hams
APRA (CR, Fund. Phys.)
Rockets/Balloons
GUSTO, LISA

Hashima Hasan
Education/Comms, Citizen Science, Archives, Advisory Committees, NuSTAR, Keck

Douglas Hudgins
ExEP Program
ADAP Lead
TESS, ARIEL



Stefan Immler
Astrophysics Research Program Mgr, Chandra, ART-XC



Hannah Jang-Condell
XRP, TESS
DEIA Lead

Patricia Knezek
Explorers Program
Astrophysics Probe
SOFIA, Hubble Fellows

William Latter
APRA (Lab Astro)
SPHEREx, Fermi

Sangeeta Malhotra
Roman Dep
ATP/TCAN Dep

Roopesh Ojha
Data Lead, Athena, NICER, HEC, AI/ML

Kartik Sheth
On detail to OSTP

Linda Sparke
2021 MIDEX/MO, Archives, COSI

Eric Tollestrup
APRA (IR/Submm)
Euclid, IXPE, COR Program

Sanaz Vahidinia
ATP/TCAN Lead

Not Pictured

Future

Key

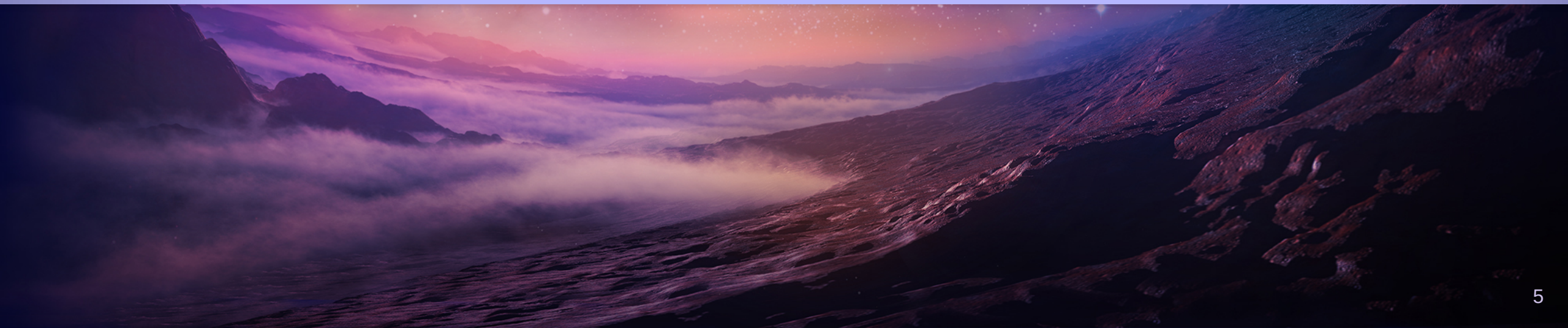
New to Astrophysics Division

Key

New NASA Civil Servant

Astrophysics Program Abbreviations: ASM – Astrophysics Strategic Missions; COR – Cosmic Origins; ExEP – Exoplanet Exploration Program; PCOS - Physics of the Cosmos

Launches Galore



Suborbital Launches

Fall 2021 Balloon Campaign (Ft Sumner, NM)
7 balloon launches plus 34 student payloads

First balloon campaign since Winter 2019 (Antarctica)

Planning for CY22 balloon campaigns includes:

- Spring 2022 (New Zealand)
- Spring 2022 (Sweden)
- Fall 2022 (Ft Sumner NM)
- Winter 2022 (Antarctica)

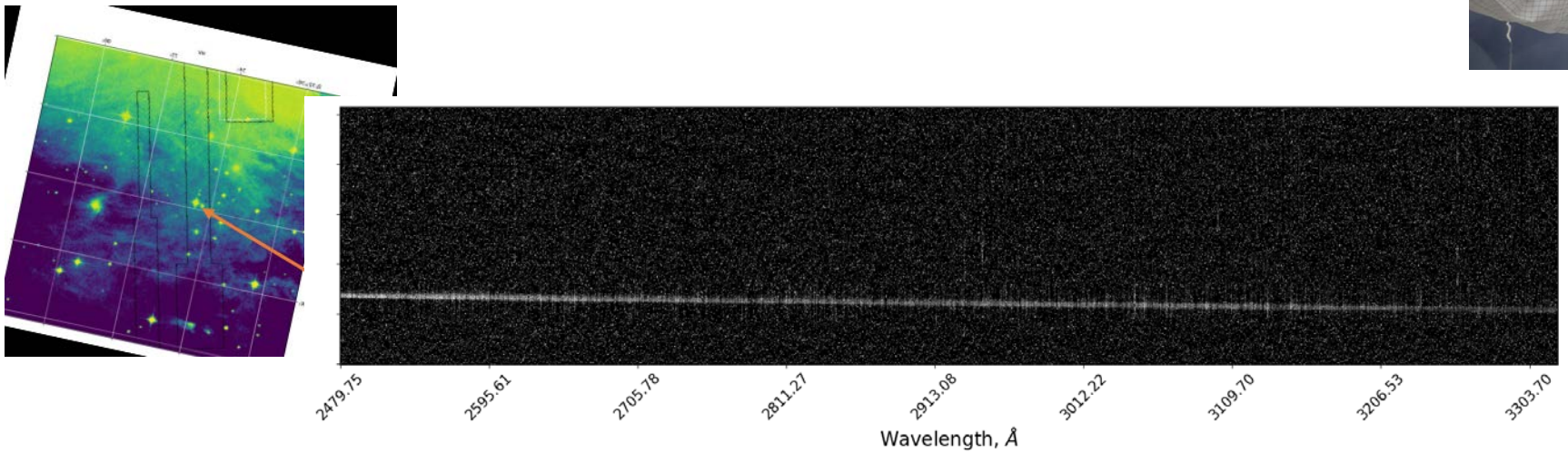
SISTINE, PI K. France (U. Colorado) [Nov 8, White Sands NM]
DXL, PI M. Galeazzi (U. Miami) [Jan 9, Wallops Island VA]

Additional sounding rocket launches planned in CY22

- tREXS, PI R. McEntaffer (Penn State U.) May from White Sands
- XQC, PI D. McCammon (U. Wisconsin) June from Australia
- SISTINE, PI K. France (U. Colorado) July from Australia
- DEUCE, PI B. Fleming (U. Colorado) July from Australia
- Micro-X, PI E. Figueroa (Northwestern U.) August from White Sands

Colorado Ultraviolet Transit Experiment (CUTE)

- CUTE is a 6U cubesat with an NUV (255 – 330nm) telescope and spectrograph to study transiting planets around bright stars
- Launched Sep 27, 2021, as a secondary payload on the LANDSAT-9 mission. Spacecraft tracked and communications established within 2 days in coordination with amateur satellite community
- Spacecraft commissioning complete mid-Nov 2021, science payload commissioning to be complete by late-Jan 2022. Science operations to execute Feb 1 – Oct 31, 2022



Calibration spectrum from CUTE

(K. France/University of Colorado)

Next astrophysics cubesat launches: BurstCube (PI J. Perkins) and SPRITE (PI B. Fleming) in 2023

Imaging X-ray Polarimetry Explorer (IXPE)

Launch Dec 9

Boom deploy Dec 15

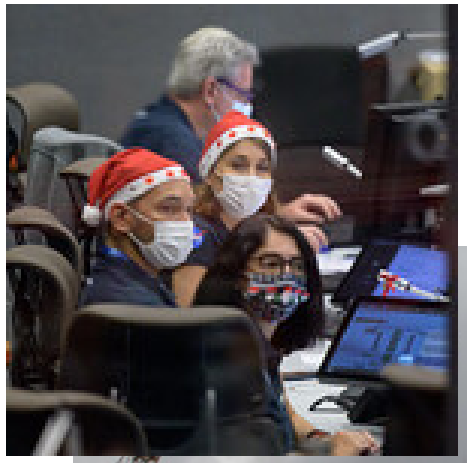
Science start Jan 10

James Webb Space Telescope Update

Update by Eric Smith
AAAC Meeting
Jan 26 @ 1:20 pm ET

Webb Town Hall
Virtual
Jan 28 @ 12:00 pm ET
https://www.stsci.edu/contents/events/jwst/2022/january/jwst-town-hall

Webb Space Telescope Update



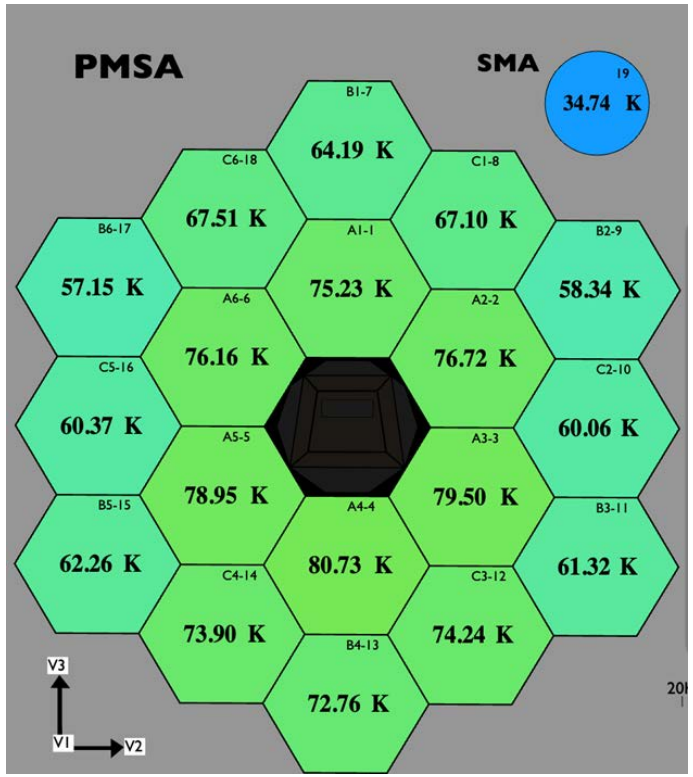
The precision of ESA/Arianespace's launch means Webb life-limiting fuel supply will last significantly more than 10 years

Textbook major deployment phase went as planned (14 days)
Finishing on Jan 8

Astronomical Christmas Gift on Dec 25

Webb Deployments Progress

All major deployments completed on schedule and performance is nominal



Current Primary Mirror Segment Temperatures (24-Jan-2022, L+30d)

Optical Telescope Element (OTE) Details
Regions 1 & 2

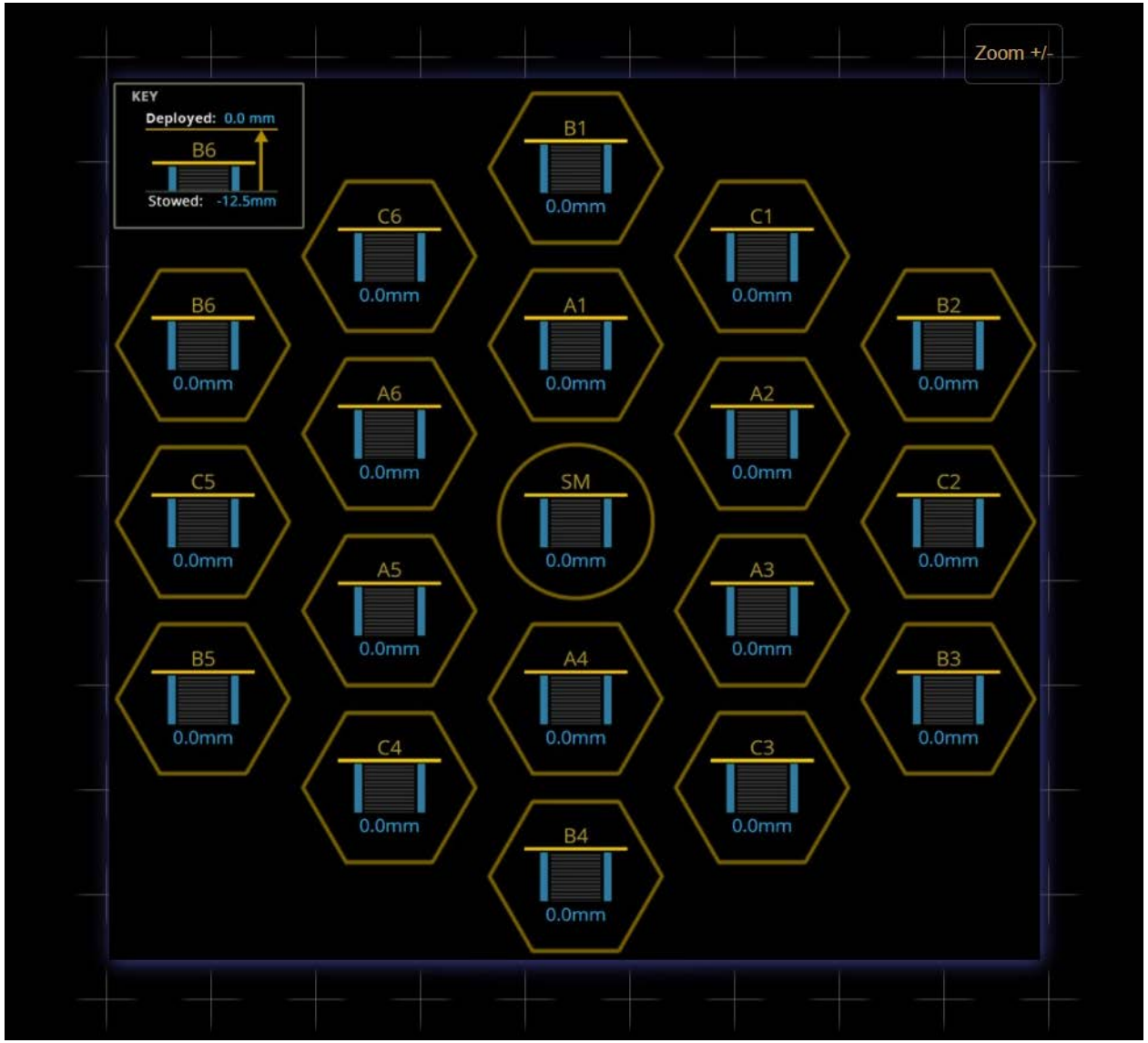
OTE Group	Max Temp. (K)	Limit Violation(s)
Backplane/BSF	86.15	None
PMSAs/SMA	81.06	None
AOS & SMA Struc.	217.69	None

Integrated Science Instrument Module (ISIM) Details
Region 1

ISIM Group	Max Temp. (K)	Limit Violation(s)
IEC & HR	281.72	None
ADIR	78.27	None
Instruments	168.64	None
ISIM Structures	130.44	None
ISIM Enclosure	122.15	None

Webb Deployments Progress

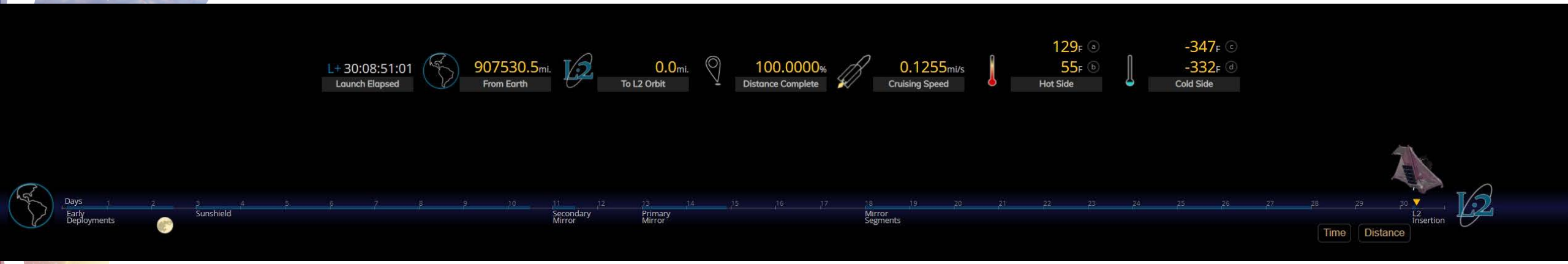
All major deployments completed on schedule and performance is nominal

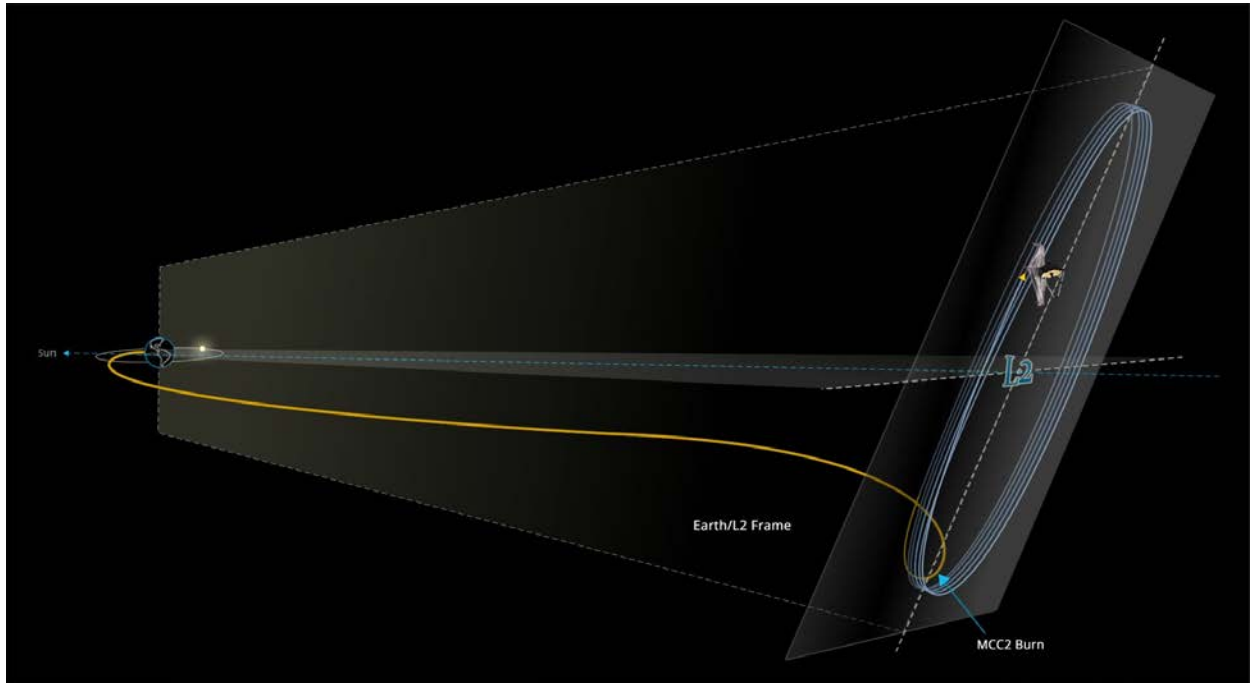


Current Primary Mirror Segment Positions (24-Jan-2022, L+30d)

Completed

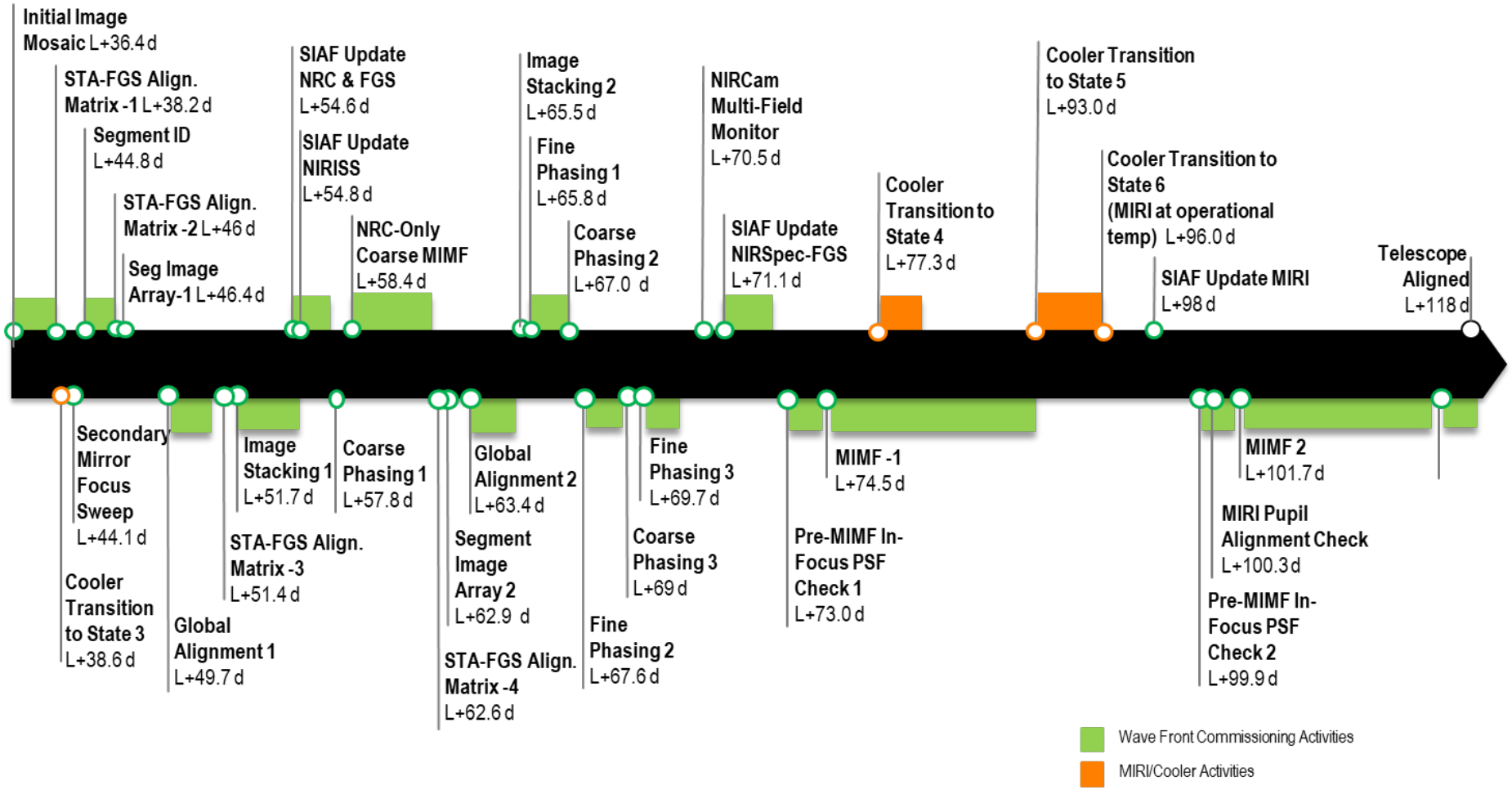
Webb arrived at L2 on Jan 24





Webb Commissioning Tasks To Go

- Telescope commissioning is the next major series of activities (see below)
- Instrument commissioning follows (L+118 to L+180)

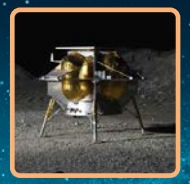


2022 SCIENCE LAUNCHES & MILESTONES

BIO EXP-1
ARTEMIS 1

LUNAH-MAP
ARTEMIS 1


ARTEMIS 1


PEREGRINE-1


FIRST LIGHT

SOFIE
SPX 25

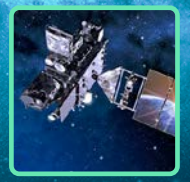

JPSS-2


EARTH FLYBY

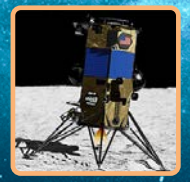

IMPACT


EMIT

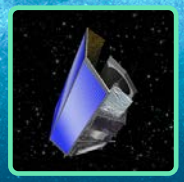

GUSTO

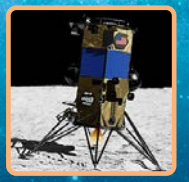

GOES-T


TROPICS (3)


1ST NOVA-C


PSYCHE


EUCLID

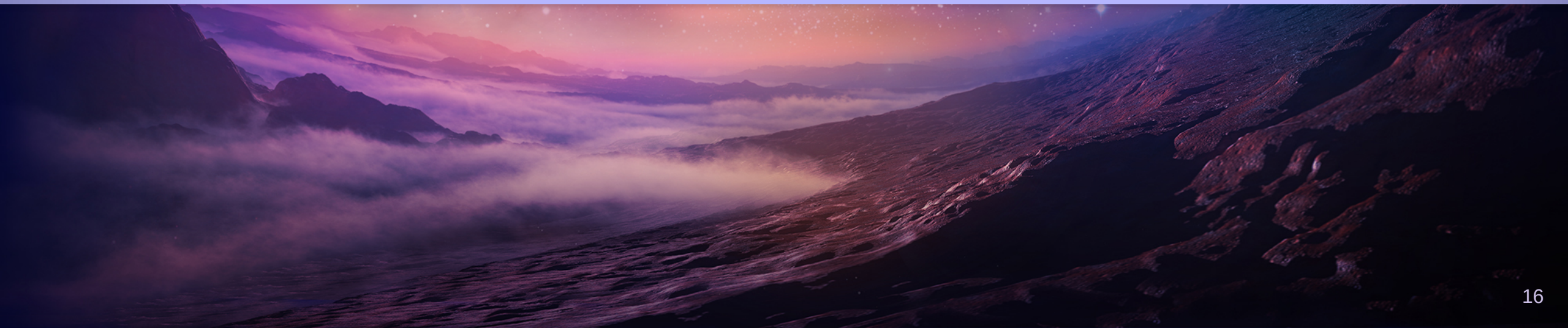

2ND NOVA-C


JANUS


MOMA-MS

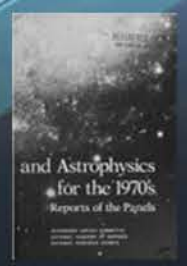
LAUNCH
DELIVERY
MILESTONE

2020 Decadal Survey

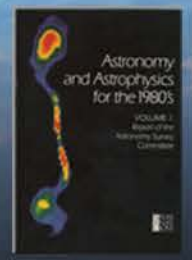


Astrophysics

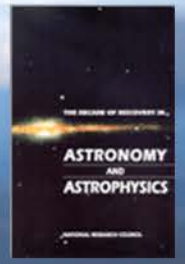
Decadal Survey Missions



1972
Decadal Survey
Hubble



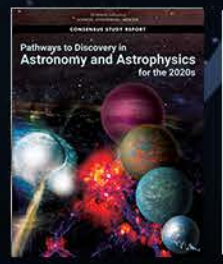
1982
Decadal Survey
Chandra



1991
Decadal Survey
Spitzer

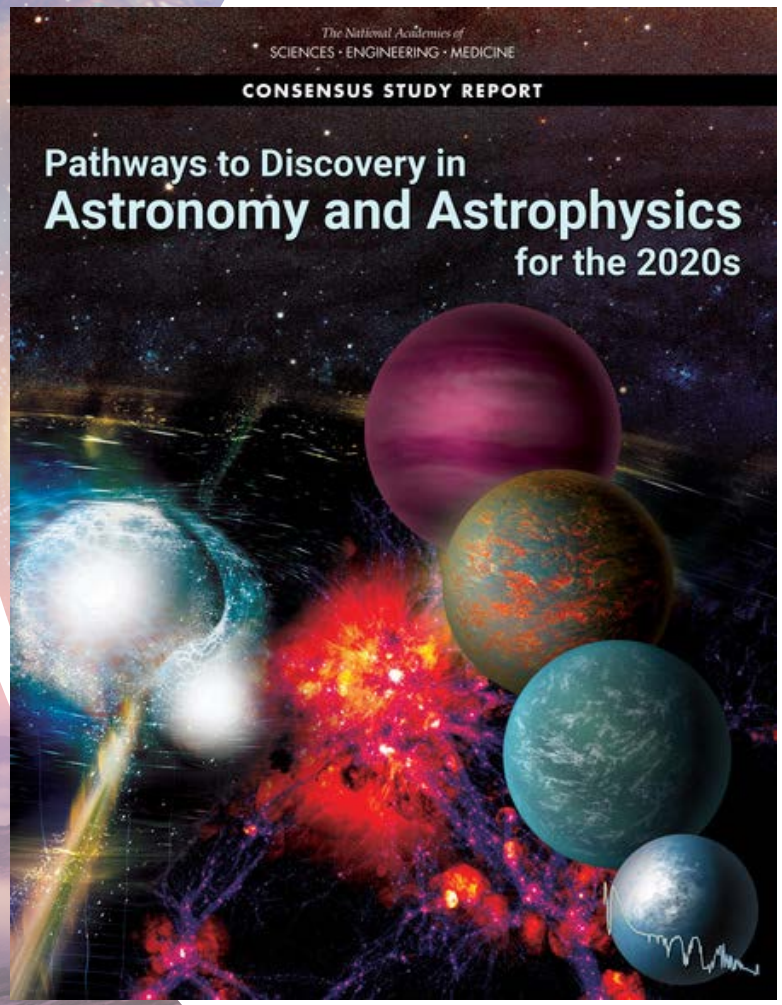
2001
Decadal Survey
Webb

2010
Decadal Survey
Roman



2021
Decadal Survey

NASA and the 2020 Decadal Survey



Thanks to the 2020 Decadal Survey Steering Committee and Panels for an inspiring and ambitious Decadal Survey

Carpe Posterum

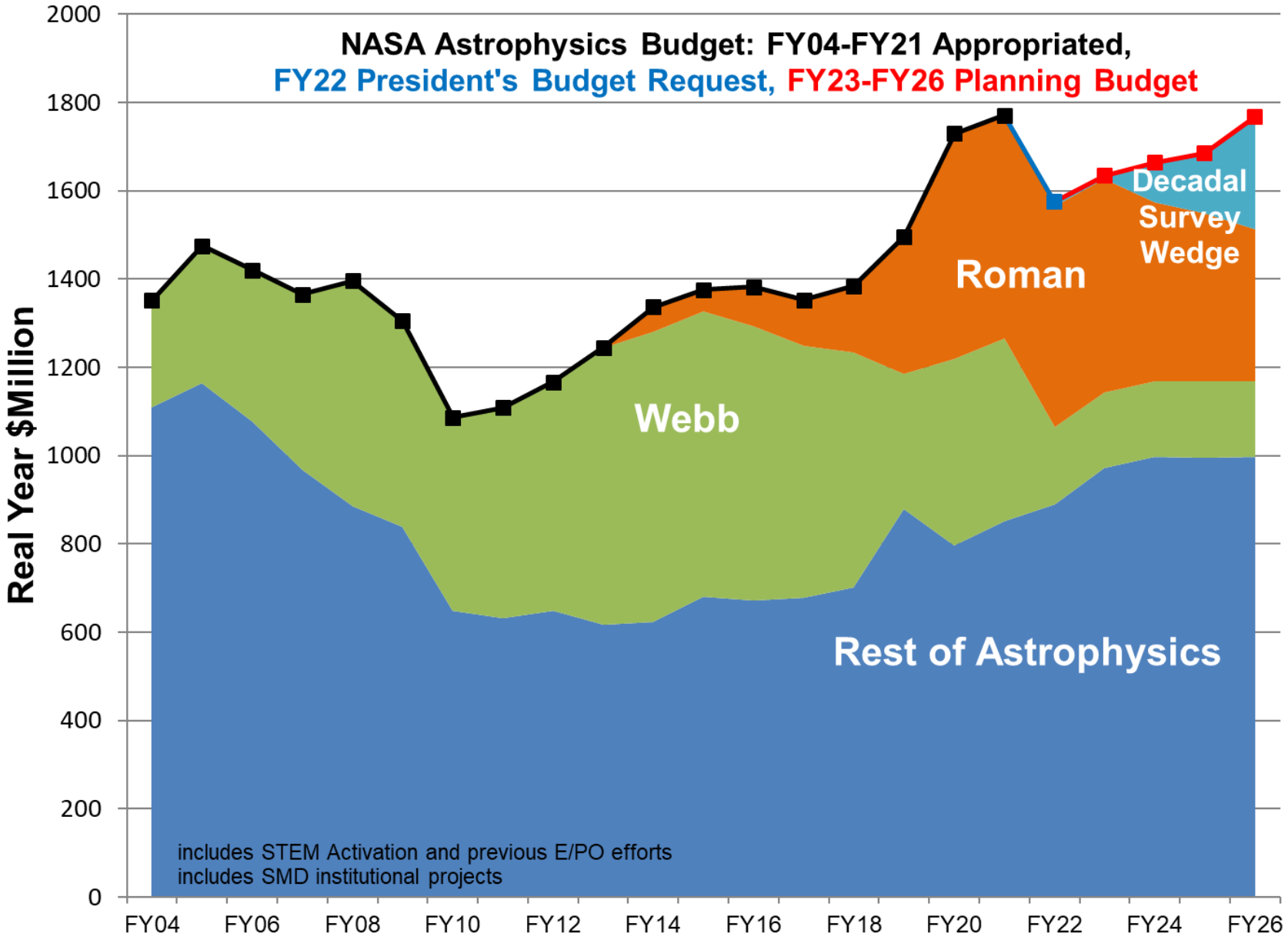
NASA has been working in advance of the Decadal Survey

- Reducing risks of large missions via technology development, precursor science and through studying lessons learned from prior large missions
- Developing options for recommendations in IDEA, R&A, suborbital, Explorers, and Probes that maintain a balanced portfolio
- Staying focused on Webb and Roman mission success
- Developing options for large mission risk reduction activities – an “all of NASA” activity involving Government, industry, and academia
- Holding wedges in out year planning budgets for new initiatives

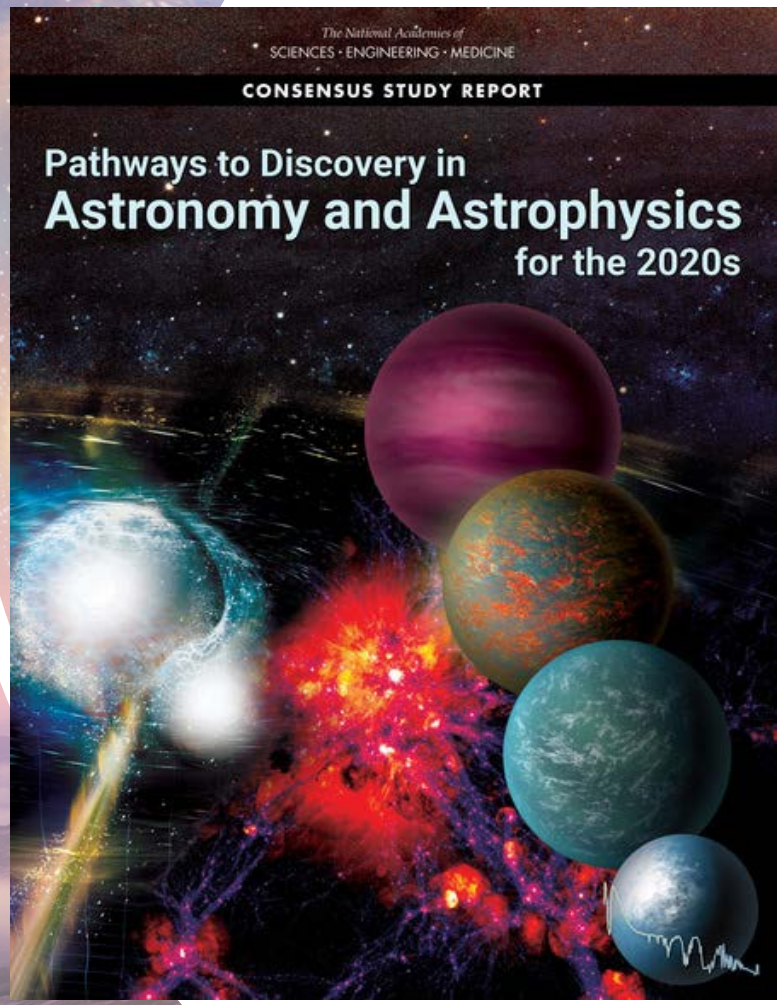
We are bound by the budgets that we have

- First budget that is fully informed by the Decadal Survey will be the FY24 budget proposal submitted to Congress in Feb 2023

Astrophysics Budget – FY22 Request



NASA and the 2020 Decadal Survey

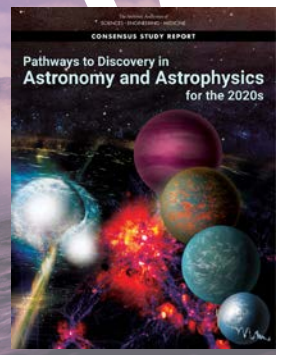


- An inspiring and ambitious plan for the next decade and beyond
  - Foundations of the Profession: Addressing inclusion, diversity, training, and the profession
  - Research Foundation: Improvements to research and analysis and data centers
  - Sustaining the Operating Portfolio: End SOFIA operations by 2023
  - Technological Foundation: Improvements to technology development programs and the balloon program
  - New Medium Initiative: Time Domain Astrophysics and Multi-Messenger Program
  - New Medium Initiative: Astrophysics Probes
  - New Large Initiative: Great Observatories Science, Mission and Technology Maturation Program for IR/O/UV, FIR, and X-ray Next Generation Great Observatories
  - New Large Initiative: Next Generation Great Observatories, starting with an IR/O/UV Large Mission optimized for exoplanets and astrophysics

Foundations of the Profession

Actions already being taken by NASA that are responsive to recommendations of the 2020 Decadal Survey include

- Investment in Bridge Program starting in 2022
- Astrophysics mission design summer school, to help train new PIs, in 2023
- Increased stipends for NASA Postdoctoral Program and NASA FINESST Graduate Student Program
- Expansion of the ROSES Inclusion Plan pilot in ROSES-22 with eventual incorporation into selection decisions
- Including diversity and inclusion of teams in evaluation of AO proposals starting in 2022
- Continuation of NASA Hubble Fellowship Program (NHFP), while encouraging development of scientific leaders who advance diversity and inclusive excellence, in accordance with external NHFP Review in 2022 [Community webinar planned for February]
- Keeping the option of virtual panels to reduce carbon footprint and increase accessibility
- Seeking access to demographic data and indicators pertaining to outcomes of proposal competitions
- Partnerships with NASA's Office of STEM Engagement to increase support of HBCUs, TCUs, and other MSIs
- NASA and NSF are beginning discussions on the state of the profession



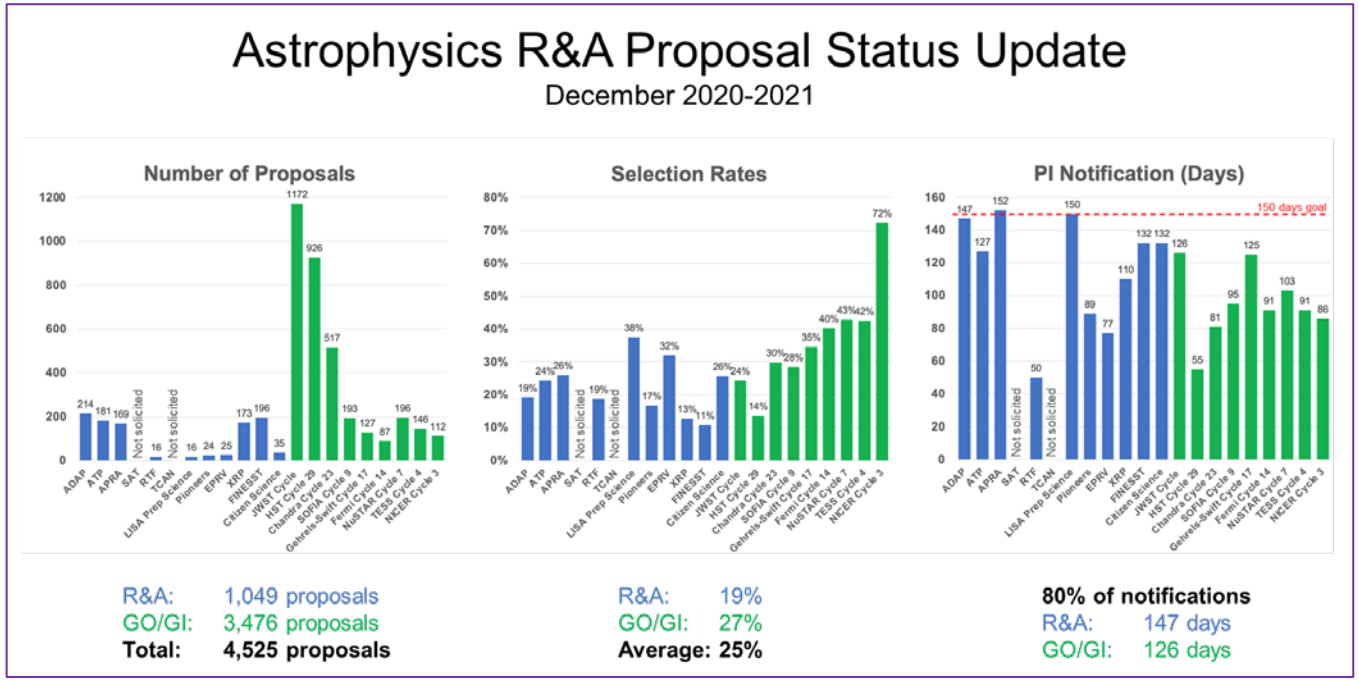
Actions are being developed to address remaining Foundations of Profession recommendations

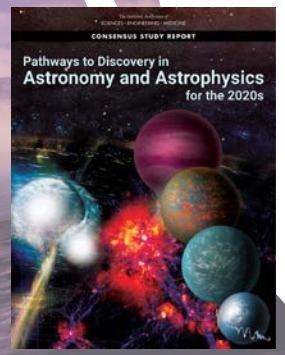
Research Foundation

Actions already being taken by NASA now that are responsive to recommendations of the 2020 Decadal Survey include

- NASA will continue to release data on proposal success rates at all AAS Town Halls and Astrophysics Advisory Committee meetings

- NASA will discuss options of returning to an annual solicitation in the Astrophysics Theory Program (ATP) with the Astrophysics Advisory Committee, recognizing the concerns about selection rates





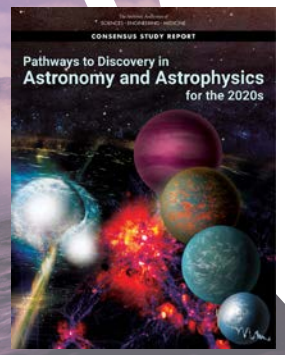
- There will be no ATP call in ROSES-22, as all of the potential new start funding was awarded through the ROSES-21 ATP

- NASA and NSF have begun discussions on coordinating data archives

Sustaining the Operating Portfolio

Recommendation: NASA should end SOFIA operations by 2023, consistent with NASA's current plan.

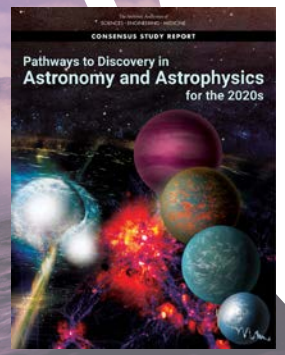
Response: SOFIA has been withdrawn from the Senior Review. NASA is developing a full response to this recommendation.



Technological Foundation

Actions are being developed to address Technological Foundation recommendations of the 2020 Decadal Survey

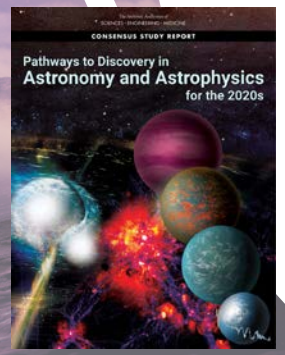
- SAT recommendation: NASA has already modified the SAT call in ROSES-21 (and ROSES-22) to include technologies for identified future Great Observatories and identified future Probe missions (see ROSES-21, Amendment 37)
- Balloon Program recommendation: NASA will conduct an external review of the balloon program, possibly as a task force of the Astrophysics Advisory Committee (APAC)
- Explorers recommendation: NASA will maintain the established cadence of 4 AOs per decade, alternating between MIDEX and SMEX and including Missions of Opportunity, and Explorers will remain open to all areas of science
  - 2011 MIDEX AO: TESS and NICER
  - 2014 SMEX AO: IXPE and GUSTO
  - 2016 MIDEX AO: SPHEREx and ARIEL
  - 2019 SMEX AO: COSI
  - 2021 MIDEX AO: Received 20 MIDEX+MO proposals on December 9
  - 2024 SMEX AO: planned AO
  - 2026 MIDEX AO: planned AO



Time Domain & Multi-Messenger Program

Actions are being developed to address Time Domain Astrophysics and Multi Messenger (TDAMM) recommendations of the 2020 Decadal Survey; NASA's current thinking is

- A panchromatic, multi-messenger initiative enabled by current and upcoming ground- and space-based facilities will require coordination and broad community involvement
- In addition to new flight missions, the initiative must involve multi-mission, interagency, and international coordination in the areas of data archives, data standards, transient alerts, and community research opportunities
- Existing and future (in development) NASA missions will continue to make valuable contributions to TDAMM, and upcoming NASA missions and partnerships promise to do likewise
- This will be an initiative with extensive international cooperation, shaped using broad community input
- NASA has invited its international partners and NSF to participate in the necessary cooperation



Community Groups in response to Astro 2020

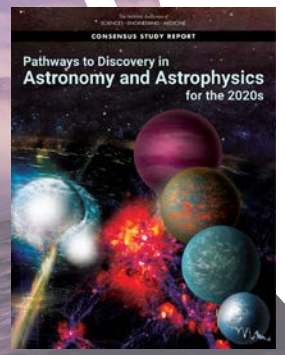
Who	Purpose	Possible Group	Status
NASA, NSF, DOE	“Implement a cross-agency committee … for regularly collecting, evaluating, and publicly reporting demographic data and indicators …” [Pathways 3-29]		Need to discuss with OCS and OSTP
NASA, NSF, (DOE)	“Explore mechanisms to improve coordination among U.S. archive centers …” [Pathways 4-20]	APD-AST-HEP Working Group	Agreement to do a working group
NASA, NSF	“Convene a broad panel of … experts in laboratory astrophysics …” [Pathways 4-28]	AAAC Task Force	Under discussion with NSF
NASA, (NSF)	“Undertake an external review of the balloon program …” [Pathways 6-8]	APAC Task Force	Under discussion at NASA
NASA, (NSF)	“Provide tactical advice … on impending needs and priority capabilities for time domain and multi-messenger follow-up …” [Pathways 7-19]	Workshop Aug 2022	
NASA	“Conduct a non-advocate review of Roman science program …” [Pathways 7-35]	CAA	Letter of request submitted to NASEM

Astrophysics Probes

The 2020 Decadal Survey recommends competed probe missions; NASA is implementing this recommendation immediately

NASA will release an AO for a PI-led Astrophysics Probe

- Proposals will be limited to the recommended priority areas:
  - A far infrared imaging or spectroscopy mission
  - An X-ray probe to complement ESA's Athena Observatory
- A Community Announcement laying out the primary parameters of the upcoming Astrophysics Probe AO is released on Jan 11, 2022
- Some important parameters:
  - PI-lead mission, $1B (FY23) PI-Managed Mission Cost Cap (PIMMC)
  - International contributions are welcome
  - PIMMC does not include contributions, access to space, GO/GI programs



Release of draft AO:	June 2022 (target)
Release of final AO:	January 2023 (target)
Proposals due:	NET 90 days after AO release

Astrophysics Mission Classes

DECADAL SURVEY

>$1B $1B

>$2B
LARGE CLASS
Great Observatory or Flagship

~$1.5B
MEDIUM CLASS
Probe
PICC $1B*

EXPLORER AO

$450M $225M

~$450M
SMALL CLASS
Medium Explorer (MIDEX)
PICC $300M*

~$225M
SMALL CLASS
Small Explorer (SMEX)
PICC $145M*

SALMON AO

$80M $40M

$80M
SMALL CLASS
Standard Mission of Opportunity
**

$40M
SMALL CLASS
SmallSat Mission of Opportunity
**

ROSES

$20M $5M

$20M
SMALL CLASS
Pioneers SmallSat
** §

$20M
SUBORBITAL
Pioneers Balloon

$5M
SMALL CLASS
APRA CubeSat

$10M
SUBORBITAL
APRA Balloon

$20-40M
SMALL CLASS
PRISM Lunar Surface
§

$5M
SUBORBITAL
APRA Sounding Rocket

Updated December 11, 2021

* PI Cost Cap ** Includes ISS-attached Experiments § Includes lunar landed payloads

Future Great Observatories

Large observatories are a critical component of NASA's astrophysics portfolio

- The Decadal Survey recommends a compelling, feasible, timely portfolio of future great observatories that is part of a balanced Astrophysics program

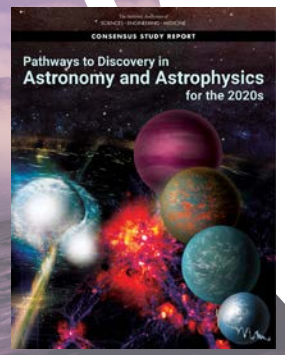
Today NASA's priority is ensuring mission success for Webb and Roman

- Webb has been launched and has begun its 6-month commissioning phase
- Roman successfully passed its Critical Design Review (CDR) and has been replanned to account for COVID impacts; the new launch commitment date is mid-2027 (7 month delay due to COVID)

Now is not the time to start a Future Great Observatory; now is the time to prepare

NASA will take a deliberate, multi-stage planning and strategy approach to the next large observatory mission

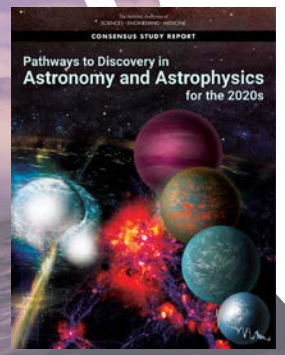
- Stage 1 – Focus on enabling science and technology; begin Stage 1 now
- Stage 2 – Begin the Decadal Survey recommended "Great Observatories Maturation Program"; conduct Analysis of Alternatives (AoA) and science / technology / architecture trades; begin Stage 2 in a few years (driven by planning and budget availability)
- Stage 3 – Pre-formulation and decision to start the next Great Observatory; begin after Stage 2 complete (Decadal Survey estimates 6 years for Stage 2 and Stage 3)



Future Great Observatories

Stage 1: Identify and start enabling science and technology investments that are responsive to Decadal Survey science priorities for the future Great Observatories

- Lessons learned by prior missions and flagships are important to identify and implement in our future portfolio (see NASA's Large Mission Study)
- Stage 1 consists of activities, not an organization, program, or project
- Stage 1 is led by NASA Headquarters Astrophysics Division and supported by existing NASA Astrophysics organizational structures (i.e., existing Astrophysics program offices))
- Stage 1 will include broad, inclusive community involvement



Future Great Observatories

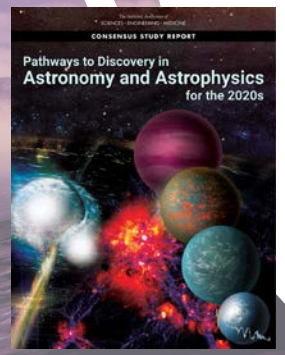
Stage 1: Precursor Science Program

Definitions:

- Precursor Science: Informs mission architecture/trades. Need Date: now.
- Preparatory Science: Informs data/interpretation. Need Date: by/after launch.

Future Great Observatory mission costs can be controlled by having well defined science goals. To this end, NASA will invest in science investigations that inform mission architectures and trades with a goal to reduce design and development risk where possible.

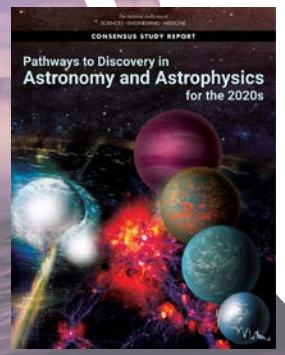
- All Future Great Observatory missions will follow the same path for precursor science implementation. This is not just a rehashing of the large mission concept studies science cases.
- Planning a series of workshops to have more discussion in April and July 2022.
  - Precursor science for all Future Great Observatories will be discussed
  - Please plan to attend!
- Precursor Science will be conducted by the community and funded through a new ROSES program element starting with ROSES-22



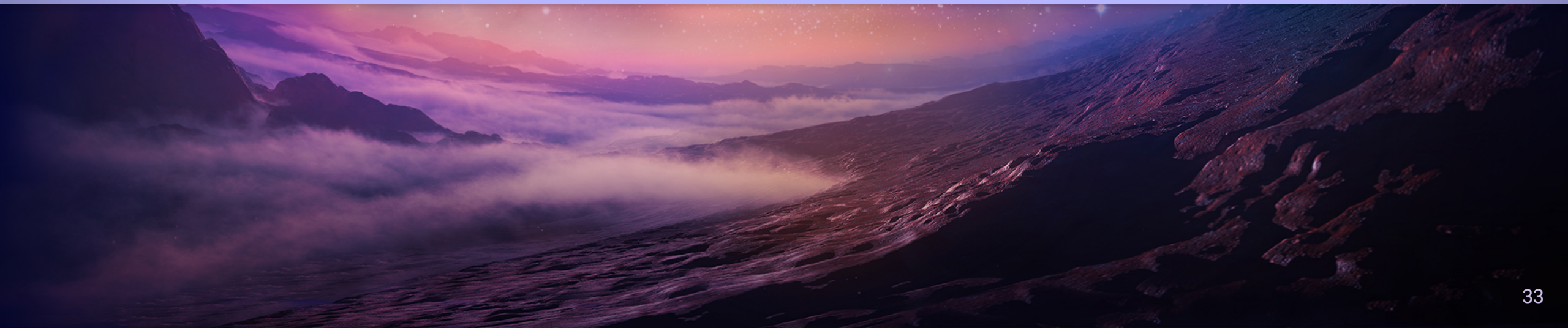
Future Great Observatories

Stage 1: Technology Development

- The Decadal Survey explicitly linked technology and mission concept maturation to controlling costs and enabling Future Great Observatories
- NASA is funding many technology development activities that address the Decadal Survey recommendations, funding will continue for many (but not all) activities
- NASA is updating the Astrophysics Technology Gap List
- Our existing technology ecosystem (e.g., solicitations, technology management, processes) will serve us well in this decade
  - Competed technology development activities (e.g., SAT, Strategic Astrophysics Technology) will continue
  - Directed technology development activities (e.g., NASA Center development of enabling technology for all three New Great Observatories) will continue
  - Participation by industry (e.g., System-Level Telescope Design - Technology Maturation Phase II) will continue
- Strategic technology investments going forward will be focused on strategic Decadal Survey recommendations
  - APRA remains open to all technology investment proposals
- Future activities will need community feedback from all stakeholders



Program Updates



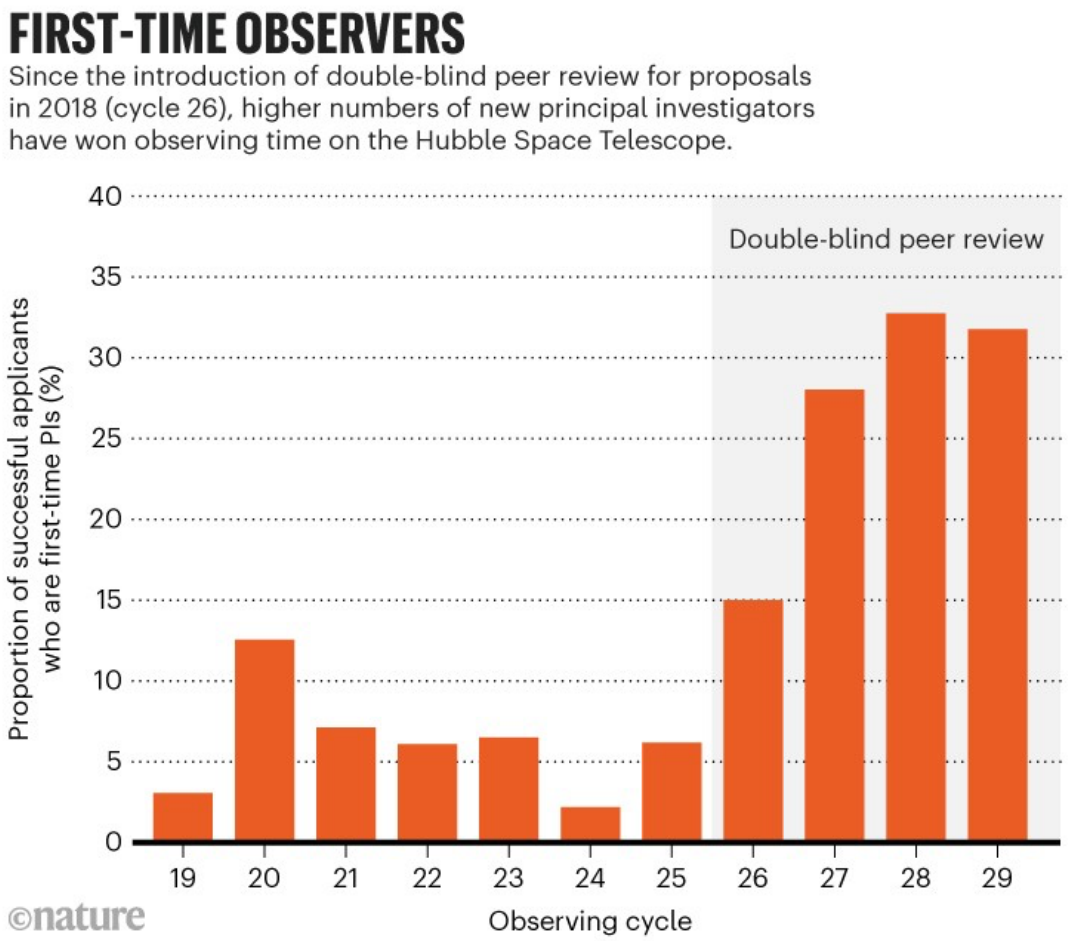
Importance of Inclusion, Diversity, Equity, Accessibility (IDEA)

“The panel [on the State of the Profession and Societal Impacts] asserts that fundamentally, the pursuit of science, and scientific excellence, is inseparable from the humans who animate it.”

- *Pathways to Discovery in Astronomy and Astrophysics for the 2020s*

NASA is committed to integrating inclusion, diversity, equity, and accessibility (IDEA) into all activities (missions, programs, reviews, internal matters, etc.)

SMD Inclusion, Diversity, Equity, Accessibility (IDEA) Initiatives



- University – Center – Minority Serving Institutions (MSI) bridge programs and learning workshops
- Implementing IDEA requirements in Announcement of Opportunities
- Enhanced student programs to improve access to underserved populations (Student Airborne Research Program, Rock On, data science internships)
- NASA SMD requested the National Academies examine the space mission proposal system in a study titled "Increasing Diversity and Inclusion in the Leadership of Competed Space Missions"

ATP Inclusion Plan Pilot Program

All ROSES-21 Astrophysics Theory Program (ATP) proposals required to include an inclusion plan.

- The inclusion plans were evaluated for adequacy and completeness. In addition to the 20 science panels (which evaluated all 182 proposals), there were 4 inclusion panels.
- Inclusion panels made up of astronomers active in DEI and DEI experts over a range of related fields

Feedback was provided to the proposers as part of the panel review summaries.

- The feedback was not folded into the adjectival ratings or selection recommendations
- Inclusion panels produced a lessons learned document on how to refine the solicitation and evaluation to best incorporate our inclusion goals as a selection criterion in future reviews

Recommendations from DEI expert panels:

- Inclusion can be effectively incorporated into our review process
- Specialized panels of DEI experts should review inclusion plans
- DEI should be a criterion in evaluation of proposals

The inclusion plan pilot has already been expanded to ROSES-21 PRISM and will be expanded to other programs in ROSES-22

- ROSES-22: Inclusion plan evaluation not used for selection; selected PIs must have an acceptable inclusion plan
- ROSES-23: Proposals with unacceptable inclusion plans will not be selected

Including inclusion plans in selection decisions is responsive to the Decadal Survey

2022 Astrophysics Research Program Elements

ROSES-22

Supporting Research and Technology

- Astrophysics Research & Analysis (APRA) *
- Strategic Astrophysics Technology (SAT) *
- Theoretical and Computational Astrophysics Networks (TCAN) *
- Roman Technology Fellowships (RTF)
- Precursor Science Investigations for Astro2020 DS */** New

Data Analysis

- Astrophysics Data Analysis (ADAP) **
- GO/GI programs for Fermi, Swift, NuSTAR, TESS, NICER **

Mission Science and Instrumentation

- Astrophysics Pioneers (suborbital science investigations) *
- Suborbital payloads solicited through APRA *
- LISA Preparatory Science *
- Roman Research and Opportunities (moved from ROSES-2021) New
- XRISM Guest Scientist (XGS, moved from ROSES-2021) ** New

Cross Divisional

- Exoplanets Research Program (XRP) **
- Topical Workshops, Symposia and Conferences (TWSC)
- Citizen Science Seed Funding Program
- Graduate Student Research Awards (FINESST)

Solicited Separately

- GO/GI/Archive/Theory programs for Hubble, Chandra, SOFIA, Webb **
- NASA Hubble Fellowship Program (NHFP)
- NASA Postdoctoral Program (NPP)
- Support for XMM-Newton U.S. PIs selected by ESA

Not solicited in ROSES-22

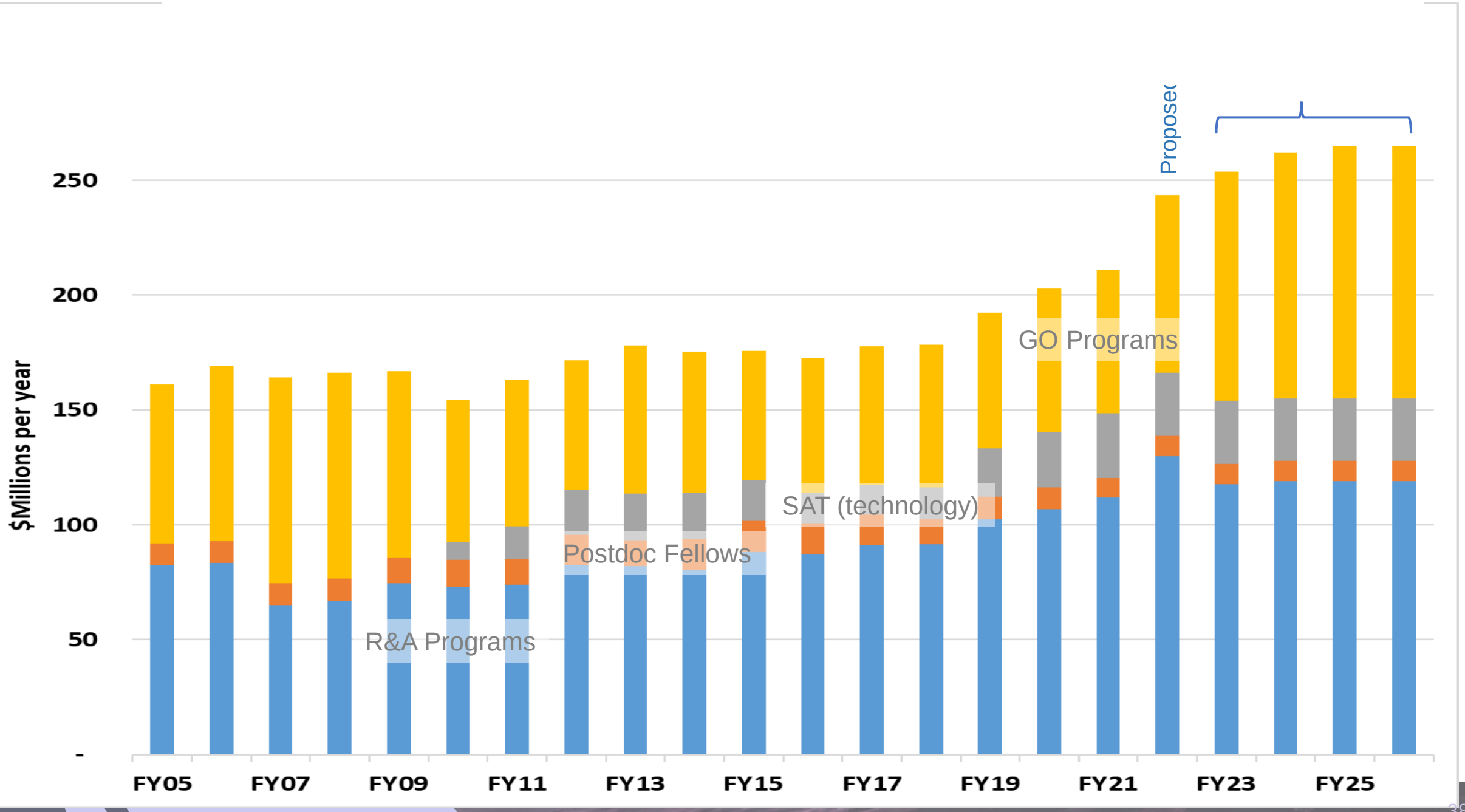
- Astrophysics Theory Program (ATP), every other year
- Astrophysics Explorers U.S. PIs (APEX USPI) is no longer solicited separately, now part of Astrophysics Research & Analysis (R&A)

Notice:

ROSES-22 will be released around February 14

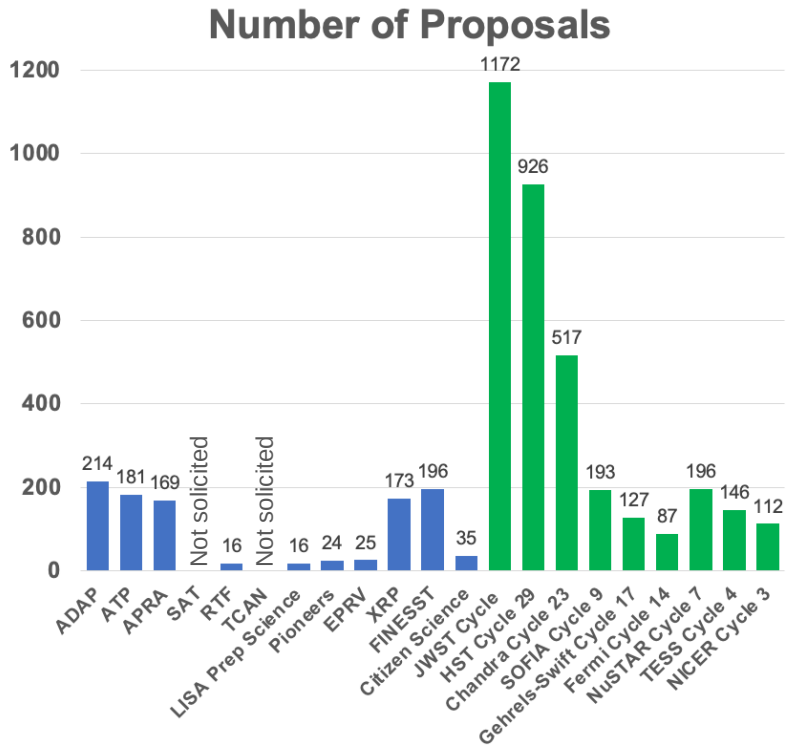
* Proposals will require an inclusion plan for creating and sustaining a positive and inclusive working environment. Stay tuned for future announcement

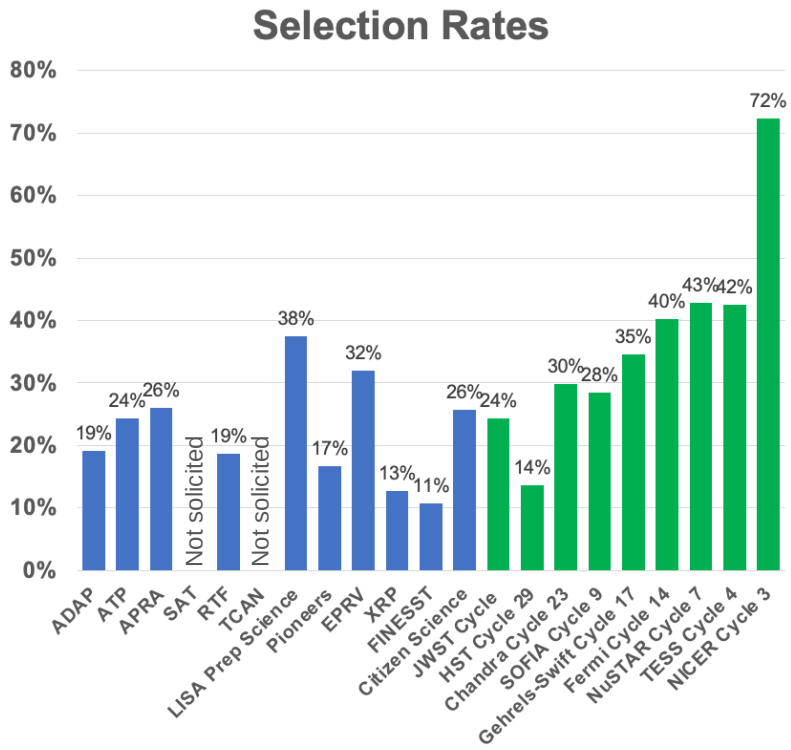
** Proposals evaluated using dual-anonymous peer reviews

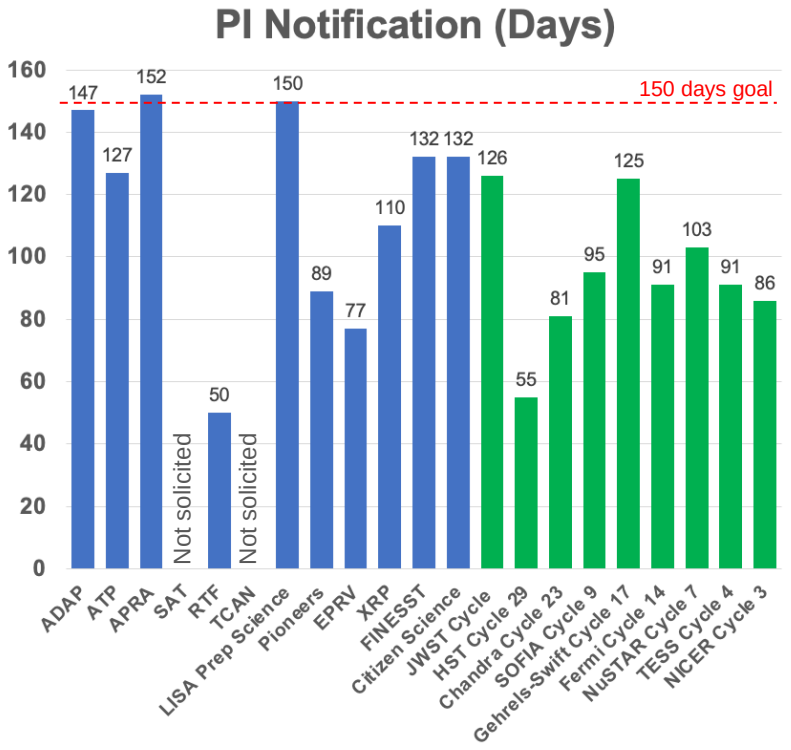

$Millions per year
250
200
150
100
50
-
FY05
FY07
FY09
FY11
FY13
FY15
FY17
FY19
FY21
FY23
FY25
R&A Programs
Postdoc Fellows
SAT (technology)
GO Programs
Proposed

Astrophysics R&A Proposal Status Update

December 2020-2021





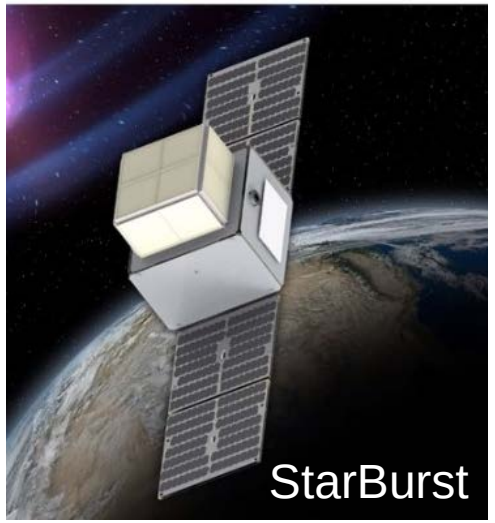


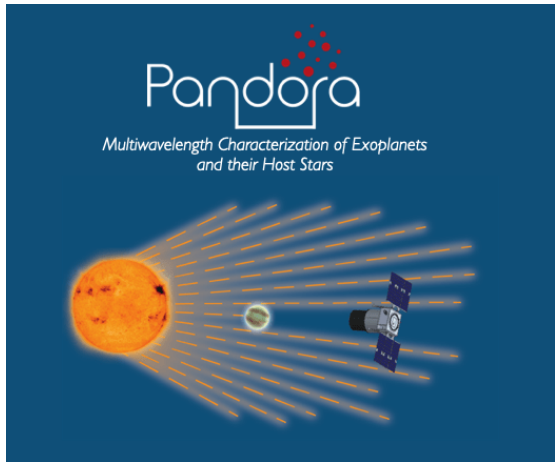
R&A: 1,049 proposals
GO/GI: 3,476 proposals
Total: 4,525 proposals

R&A: 19%
GO/GI: 27%
Average: 25%

80% of notifications
R&A: 147 days
GO/GI: 126 days

Astrophysics Pioneers – Cycle 1 Selections





NANCY GRACE ROMAN SPACE TELESCOPE

Completed the Mission Critical Design Review on September 27, 2021.

Project continues to make progress in spite of COVID inefficiencies and supply chain impacts; cost and schedule commitments have been adjusted to accommodate.

NASA launch commitment date is May 2027.

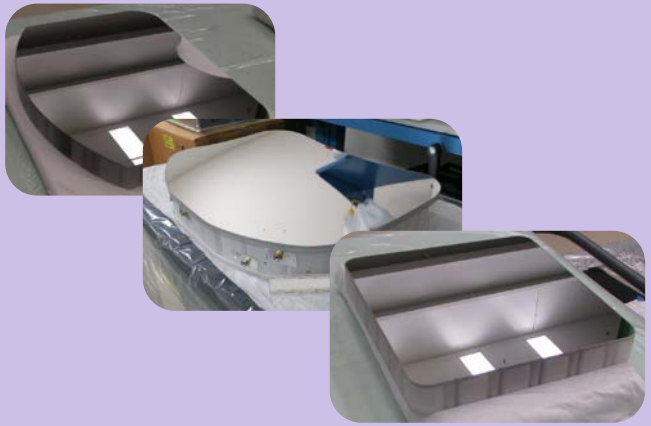
Significant flight hardware in testing or in fabrication. Full complement of flight detectors for Wide Field Instrument are already in hand. Most Coronagraph Instrument critical flight components expected to complete by spring 2022. Anticipate completing telescope in late 2022.

Opportunities for participation in Roman Space Telescope research and support are offered in ROSES-2021; draft solicitation out soon.

https://roman.gsfc.nasa.gov/

NANCY GRACE ROMAN SPACE TELESCOPE

Optical Telescope Assembly Hardware



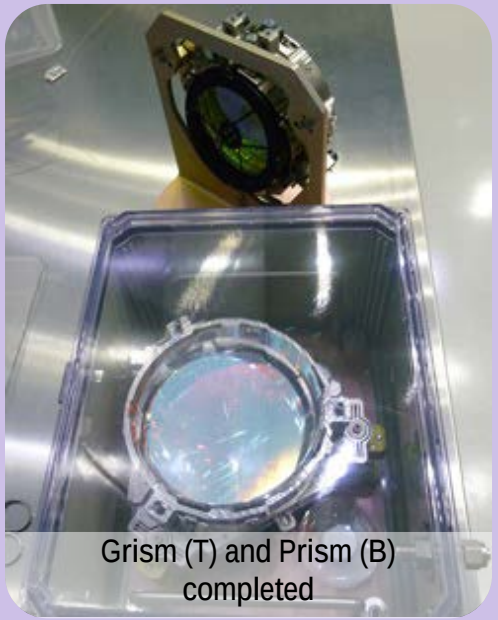
Telescope optics for Wide Field Instrument

Primary Mirror (PM)

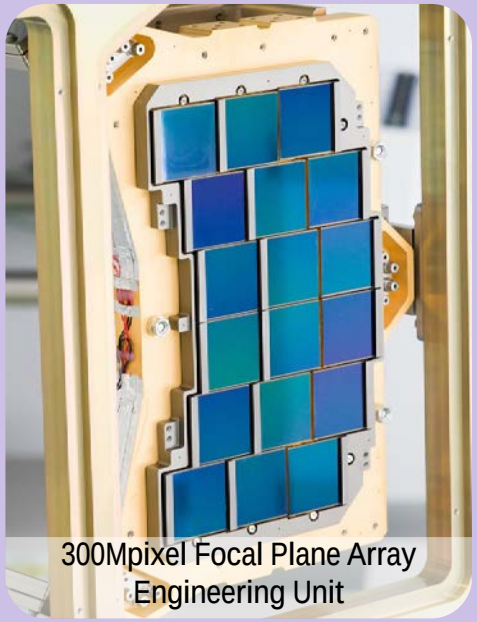
Secondary Mirror (SM)

Telescope optics for Coronagraph Instrument

Wide Field Instrument Hardware

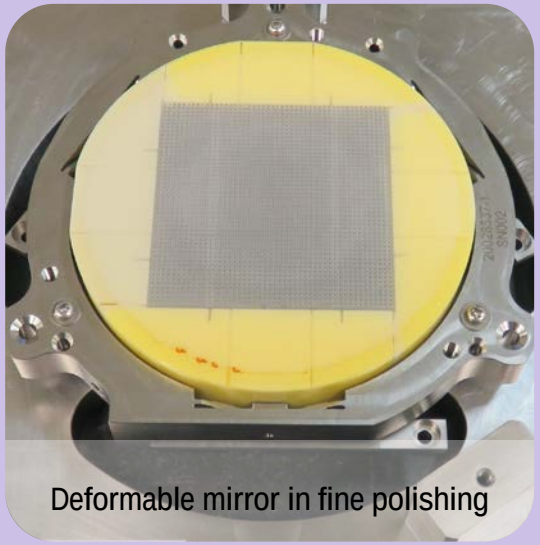


Grism (T) and Prism (B) completed

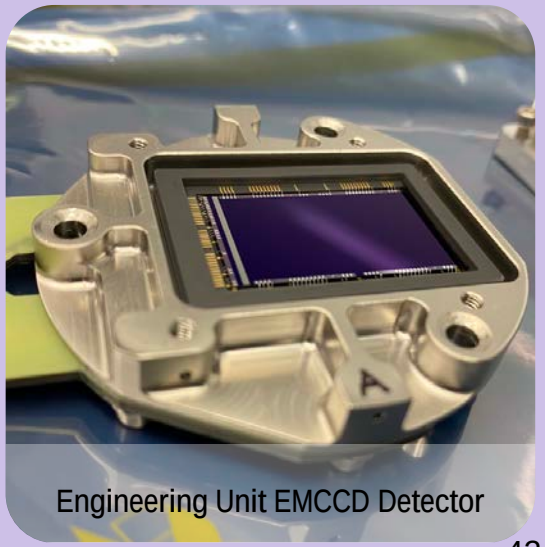


300Mpixel Focal Plane Array Engineering Unit

Coronagraph Instrument Technology Demonstration Hardware



Deformable mirror in fine polishing



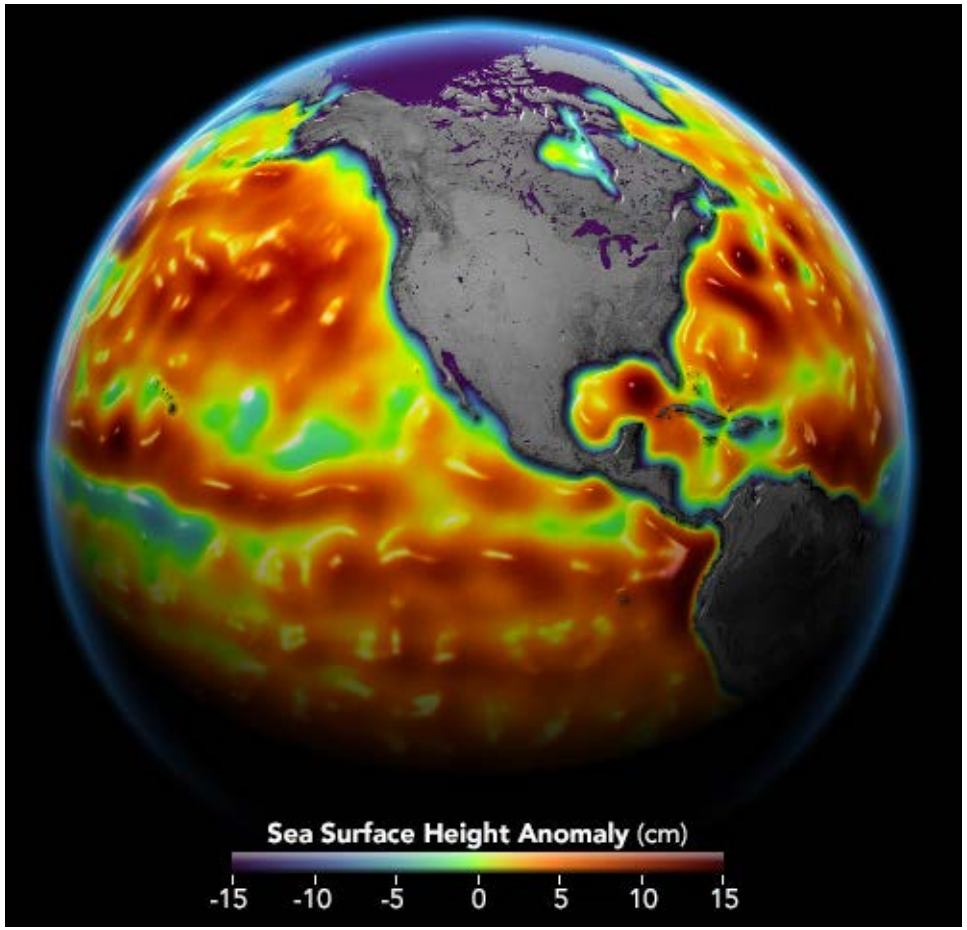
Engineering Unit EMCCD Detector

Roman Proposal Opportunities

- Nancy Grace Roman Space Telescope Research and Support Opportunities will be solicited as part of ROSES-2022 (deferred from ROSES-2021).
- Includes opportunities for Coronagraph community participation, Wide Field Instrument preparatory science, and key project infrastructure teams.
    - Coronagraph Community Participation Program: Investigators to work with the coronagraph instrument team to plan and execute tech demo observations
    - Wide Field Science: Investigators to work on science preparation activities related to mission performance verification and/or science operations preparation
    - Project Infrastructure Teams: Science teams to support scientific investigations using the data from the core community surveys

Roman Space Telescope Town Hall
Deferred to Jan/Feb
Details TBA

Open-Source Science Accomplishments



- Initiated the common SMD data catalog project to enable cross-divisional data search and discovery
- Expanded access to free and open journals by modifying the Astrophysics Data System (ADS) journal database to include Planetary Science and Heliophysics
- Updated SMD's data information policy (SPD-41) to support open science by requiring missions to release scientific data, publications and software openly

SPD-41: Scientific Information Policy Town Hall rescheduled to Jan 26, 3-4 pm EST
http://www.spaceref.com/news/viewsr.html?pid=55588
Questions can be sent to HQ-SMD-SPD41@mail.nasa.gov

SPD-41: Highlights and *Proposed Additions*

Publications	Data	Software

NASA Hubble Fellowship Program Review

The NASA Hubble Fellowship Program (NHFP) supports outstanding postdoctoral scientists pursuing independent research that contributes to NASA Astrophysics

- Merged the previously separate Einstein, Hubble, and Sagan Fellows programs in 2017

In the summer of 2021, NASA conducted the first programmatic review of its Hubble Fellowship Program since the original Hubble Fellowship Program was created over 30 years ago

Review focused on two main areas:

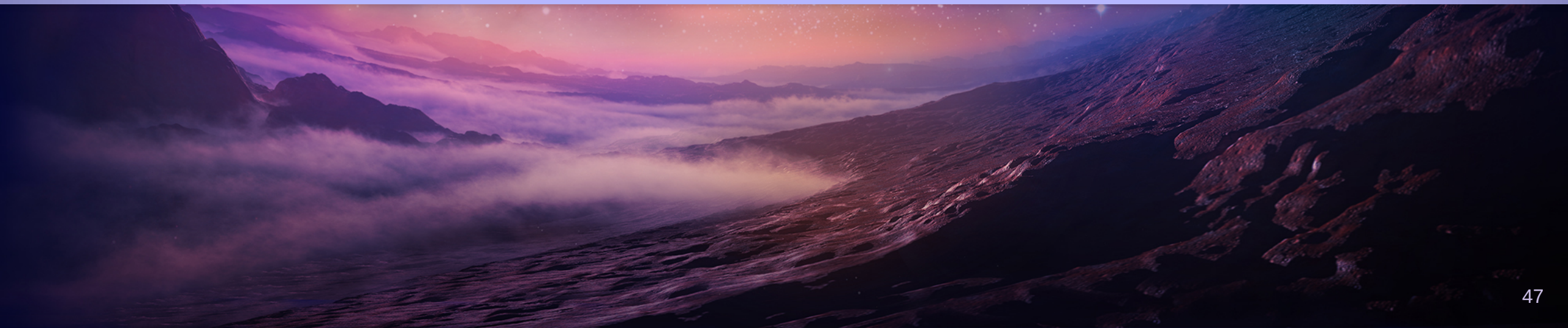
1. Success of the NHFP under its current structure
2. Diversity, equity, and inclusion of the program

Panel convened comprised of a diverse group of astrophysicists and experts in diversity, equity, inclusion, and accessibility

- Co-chaired by Rita Sambruna, Deputy Director of the Astrophysics Division at GSFC, and Nicolle Zellner, Program Scientist in NASA HQ's Planetary Science Division
- The panel's report is available at https://science.nasa.gov/astrophysics/documents

External Review of NASA Hubble Fellowship Program
Webinar in February

Mission Updates (time permitting)



Astrophysics Missions in Development

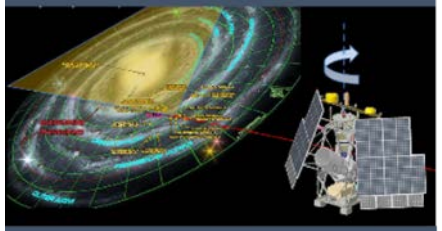
IXPE 2021
NASA Mission

Imaging X-ray Polarimetry Explorer

Webb 2021
NASA Mission

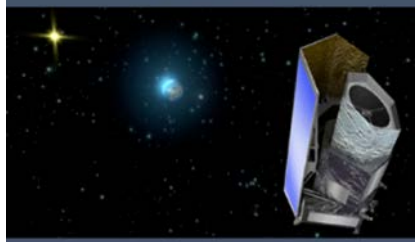
James Webb Space Telescope

GUSTO 2022
NASA Mission



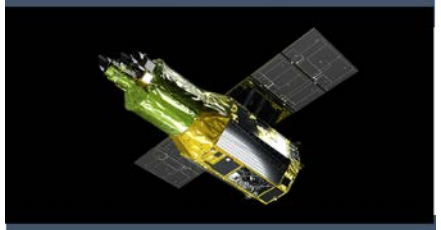
Galactic/ Extragalactic ULDB Spectroscopic Terahertz Observatory

Euclid 2023
ESA-led Mission



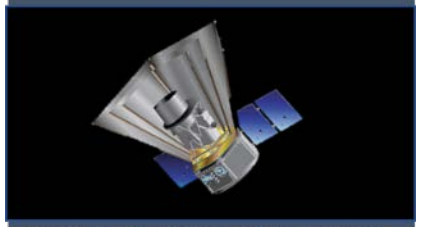
NASA is supplying the NISP Sensor Chip System (SCS)

XRISM 2023
JAXA-led Mission



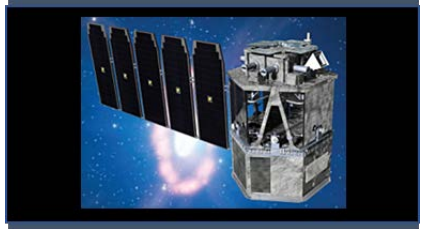
NASA is supplying the SXS Detectors, ADRs, and SXTs

SPHEREx 2025
NASA Mission



Spectro-Photometer for the History of the Universe, Epoch of Reionization, and Ices Explorer

COSI 2025
NASA Mission

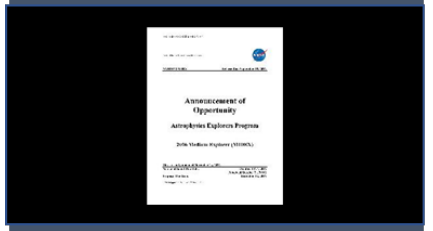


Compton Spectrometer and Imager

Roman 2027
NASA Mission

Nancy Grace Roman Space Telescope

MIDEX/MO 2028
NASA Missions



Medium-class Explorer Explorer Mission of Opportunity

ARIEL 2029
ESA-led Mission

NASA is supplying the CASE fine guidance instrument

Launch dates are current project working dates through XRISM; Agency Baseline Commitment launch date could be later

Does not include Pioneers or CubeSats

Euclid

ESA and NASA partnership

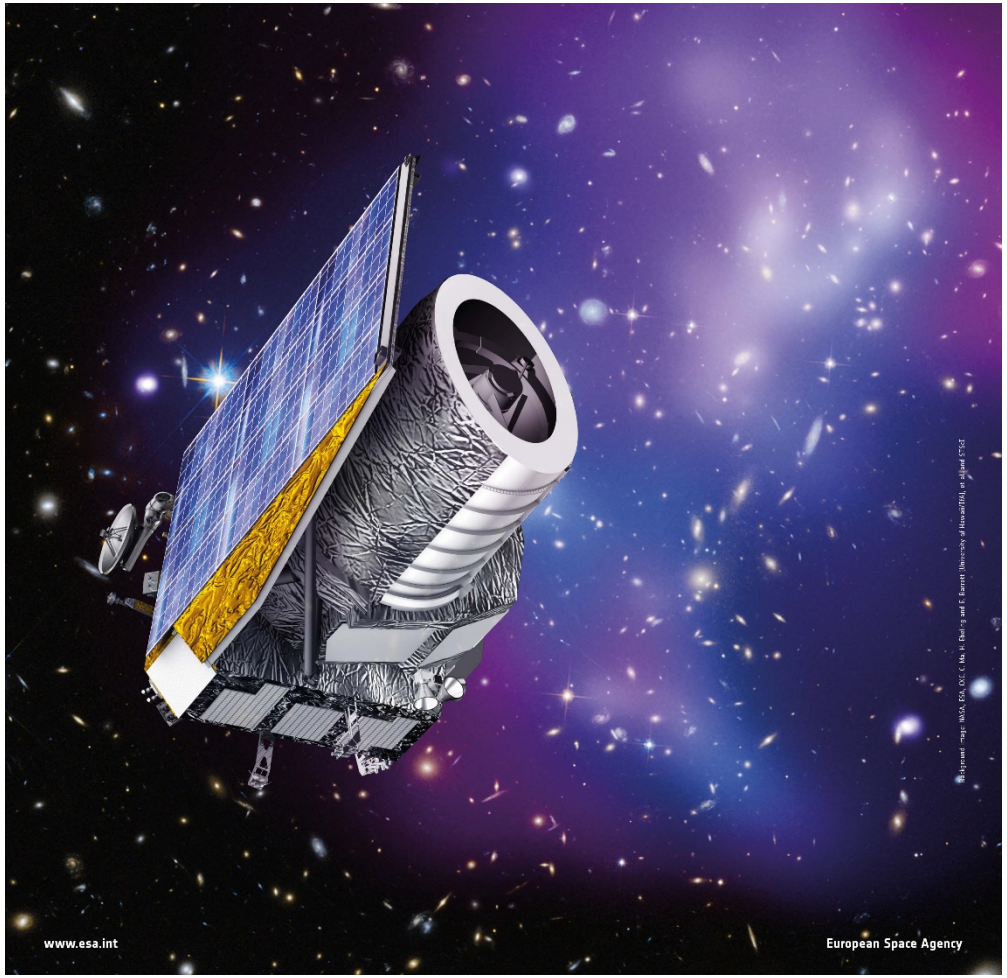
- Euclid will study the nature of Dark Energy, Dark Matter and General Theory of Relativity

NASA delivered Sensor Chip System includes 16 Flight and 4 Spare Sensor Chip Systems for the Near Infrared Spectrometer Photometer instrument

Euclid NASA Science Center at IPAC and over 70 US Science Team members

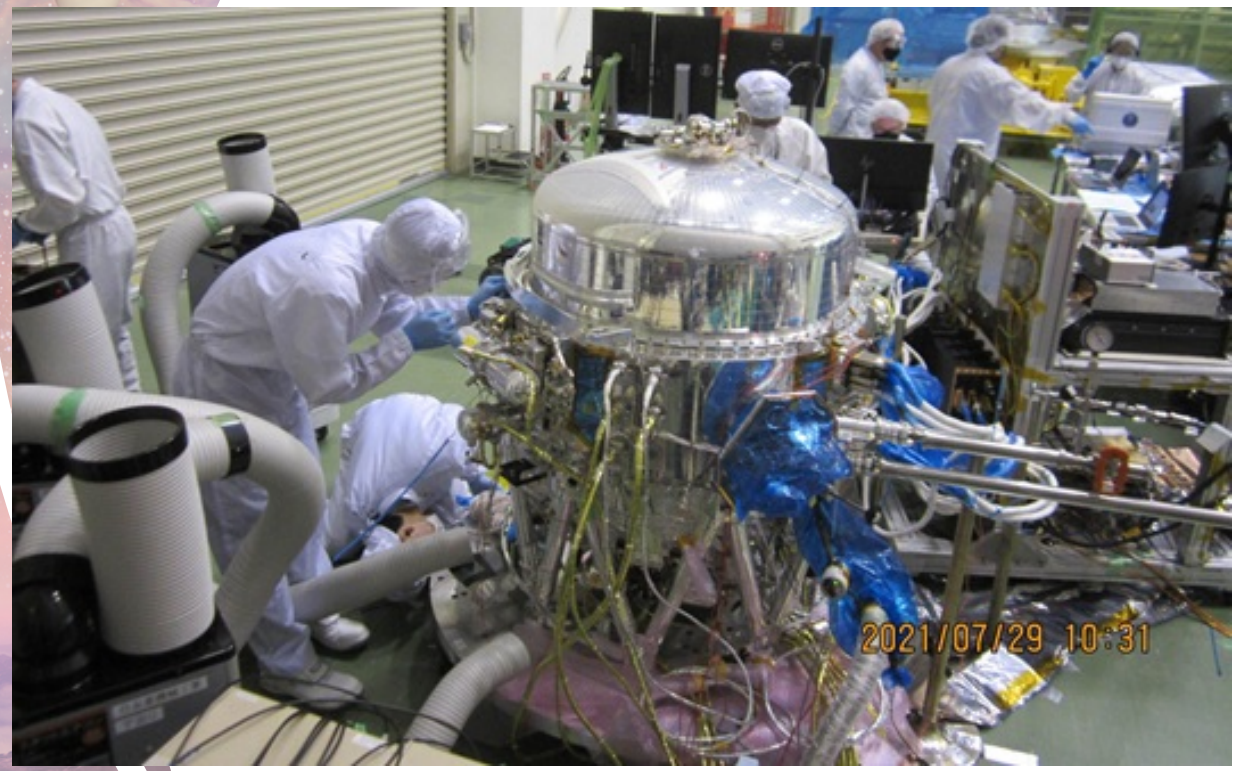
STATUS:

- Payloads are with Thales-Alenia in Italy for spacecraft integration
- IPAC science ground segment software deliveries on track
- Launch in 2023



XRISM

X-ray Imaging and Spectroscopy Mission

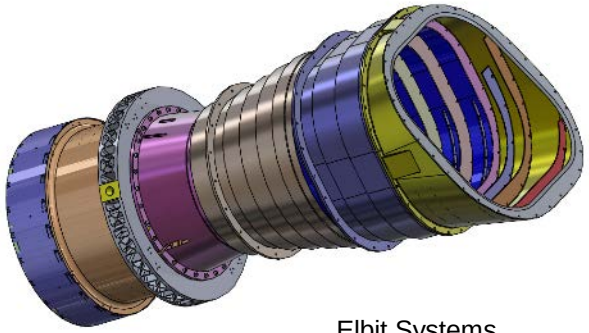


- After 1.5 years of tough travel to Japan during pandemic, the NASA and JAXA teams have verified that a helium leak in the JAXA dewar has been fixed
- Integration and Test continues with in-person and remote NASA support, launch early 2023
  - In-person NASA support suspended due to Japan's restriction of all travel to Japan
- X-ray Mirror Assemblies complete and under calibration at GSFC – delivery to Japan in March 2022
- XRISM Guest Scientist program for broader US participation in Performance Verification phase solicited through ROSES-22
- PV phase targets: https://heasarc.gsfc.nasa.gov/docs/xrism/timelines/pvtargets.html

ULTRASAT

- ULTRASAT: a wide-field (>200 sq deg) UV survey & transient detection mission by the Israel Space Agency & Weizmann Institute of Science
  - NASA providing commercial launch ~late 2024/early 2025 for a 3-yr prime mission in geosynchronous orbit
  - Data public at IPAC following 12-mo exclusive data use period
- Science: Main focus on gravitational wave sources, supernovae, variable and flare stars, and time domain astronomy. Public alerts within 20-min of trigger.
- Status
  - Israel Space Agency ULTRASAT mission CDR completed in early 2022
  - NASA-ISA MOU in NASA concurrence process
  - US Participating Scientist program solicited through ROSES-22

ULTRASAT Concept
Source: Israel Aerospace Industries (IAI)



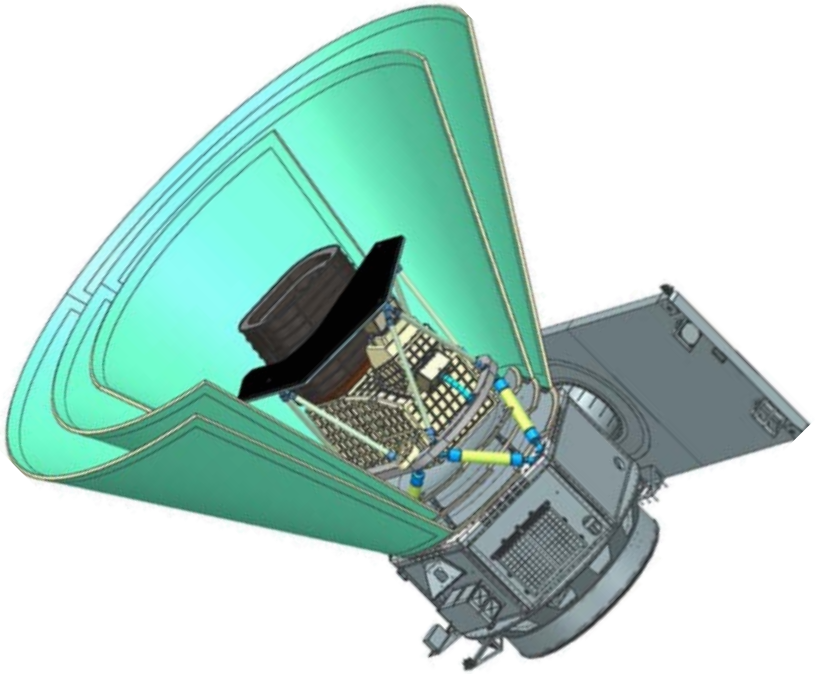
Elbit Systems

SPHEREx

Spectro-Photometer for the History of the Universe, Epoch of Re-ionization,and Ices Explorer Mission

NASA's first all-sky near-infrared (0.75 microns – 5 microns) spectral survey. Science goals include:

- Probe the origin of the Universe by improving constraints on inflationary non-Gaussianity through a large- volume galaxy redshift survey.
- Investigate the origin of water and biogenic molecules from interstellar ices in the early phases of planetary system formation.
- Chart the origin and history of galaxy formation, from light produced by the first galaxies that ended the cosmic dark ages to the present day.
- Provide a rich public spectral archive for diverse investigations ranging from X-ray astronomy to exoplanet characterization.



Critical Design Review (CDR) completed January 2022

Systems Integration Review (SIR) planned for June 2023

Current Agency launch readiness date is April 2025

Status

- Prototype telescope mirror in cryogenic testing. Fabrication of flight telescope mirror to start late this CY.
- Development of flight detectors is ongoing at Teledyne.
- V-Grooves payload thermal subsystem is in detailed design at JPL.
- Photon shield payload thermal subsystem is in vendor procurement process.

Compton Spectrometer and Imager (COSI)

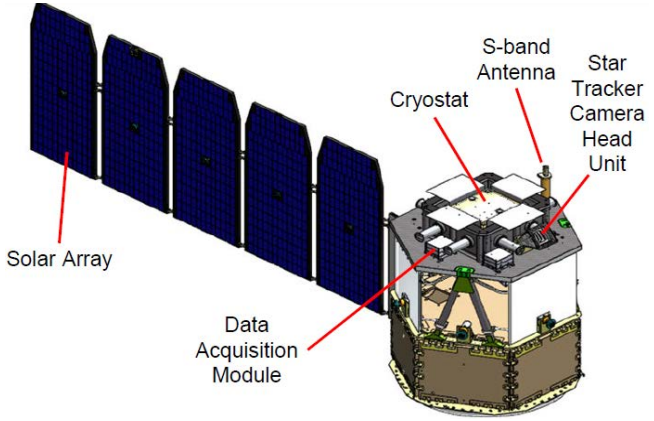
PI: John Tomsick, University of California, Berkeley

COSI is Compton imaging spectrometer with cryogenic Ge detectors for 0.1-5 MeV gamma-rays. It has an energy resolution of 0.4% FWHM @ 1.8 MeV, an angular resolution of 2.0º FWHM @ 1.8 MeV and would cover 100% of the sky every day; COSI builds on heritage from successful balloon campaigns and operates at a Near-equatorial orbit at 550km altitude

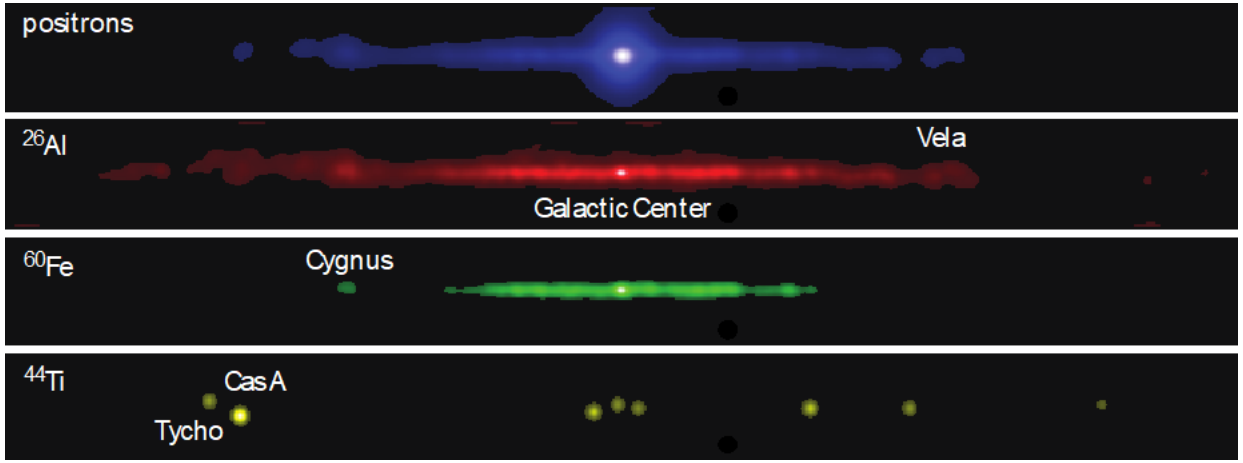
COSI will provide an understanding of the positron excess; map ^{26}Al (half-life 60yr) to study element formation; make the first map of ^{60}Fe (half-life 2.6Myr, only source is core-collapsed SN) to trace past core collapse supernovae; and discover new young supernovae in ^{44}Ti (half-life 0.7Myr).

In addition, COSI will gain insight into extreme environments with polarization, such as accreting black holes (AGN and Galactic) and -ray bursts (GRBs). COSI can also localize the -ray counterparts to GW events (short GRBs) and detect high-energy neutrino counterparts.

Launch Readiness Date: December 2025



Simulated Radioactive Milky Way



ARIEL

Atmospheric Remote-sensing Infrared Exoplanet Large survey

ESA and NASA partnership

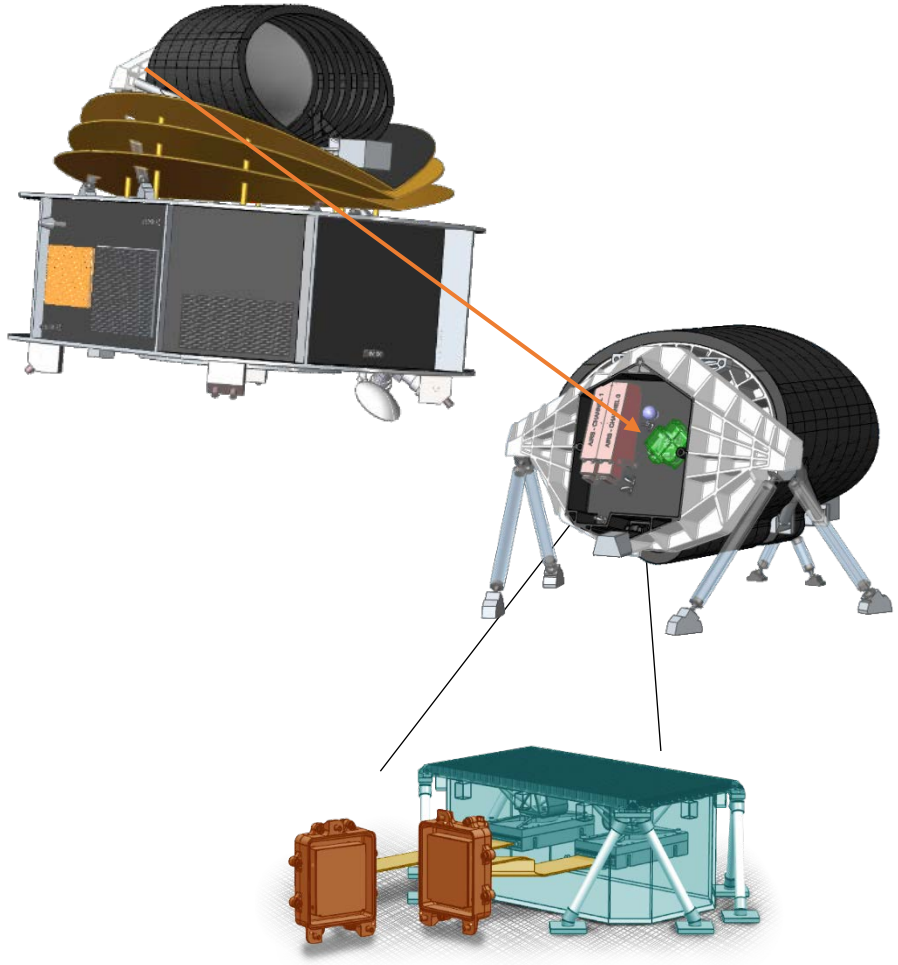
- Observe ~1000 planets
- Survey and characterize exoplanet atmospheres

NASA contribution (CASE) includes detectors and cold front-end electronics, packaging, thermal management, and cryoflex cables for ARIEL Fine Guidance System

Provides US participation in science team, mission survey design, and scientific discoveries

STATUS:

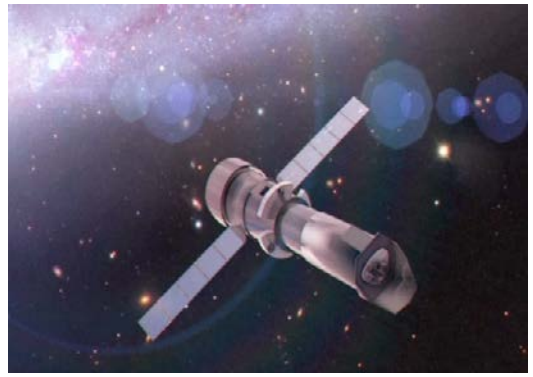
- MOU draft is under review
- Spring 2022 – NASA CASE PDR
- Summer 2022 – NASA CASE KDP-C
- Fall 2023 – NASA CASE CDR
- Hardware deliveries late 2024 to 2025
- Launch ~2029



CASE
Contribution to ARIEL Spectroscopy of Exoplanets

ATHENA

Advanced Telescope for High Energy Astrophysics



ESA and NASA partnership

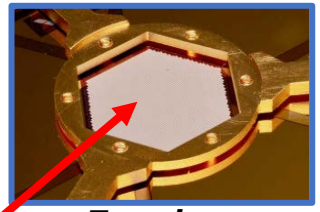
ATHENA will map hot gas structures and determining their physical properties, search for supermassive black holes in the Hot and Energetic Universe

NASA contributions:

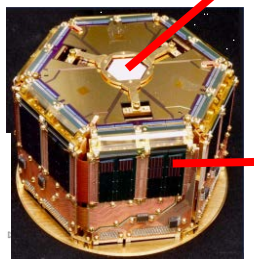
- X-IFU Focal Plane Array (GSFC, NIST-Boulder, LLNL, Stanford, UMBC, UC-Boulder)
- Use of NASA Testing Facilities MSFC XRCF facility for mirror calibration
- Vibration Isolation System
- WFI VERITAS ASIC Design for detector readout and WFI Background Analysis Model
- US Athena Science Center
- Science Grant Program for US Co-Is and Guest Observers

x 120

Vibration Isolation System



Focal Plane Array



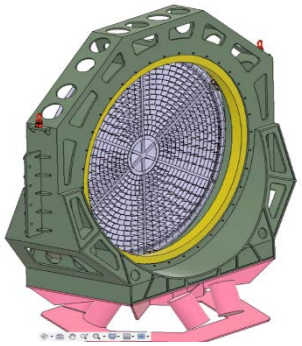
Readout

Sensor Assembly

X-IFU Focal Plane Array

STATUS:

- NASA transitioned from ATHENA study phase to ATHENA project on September 30, 2021. GSFC is the implementing Center
- Mission adoption review currently scheduled for Nov 2022 - Feb 2023
- Mirror unlikely to meet 5'' resolution requirement, ESA conducting independent review of science case at 10'' resolution
- Launch ~ 2034



XRCF Mirror Assembly

LISA

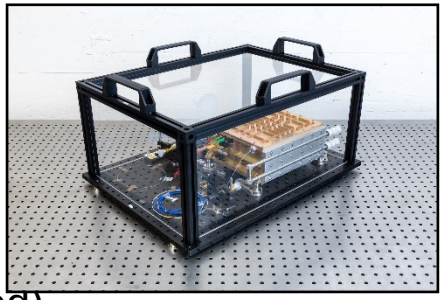
Laser Interferometer Space Antenna

ESA and NASA partnership

- LISA will observe the universe in the millihertz gravitational wave band, detecting tens of thousands of sources ranging from white dwarf binaries in the Milky Way to massive black hole mergers at high redshift.

NASA contributions

- Interferometric Telescopes (GSFC, L3 Harris)
- Laser Systems (GSFC)
- Charge Management System (U. Florida, Fibertek)
- TBD contributions to data analysis & science (concept study initiated)
- Contributions to European-led mission and instrument systems engineering



TRL4 laser brassboard

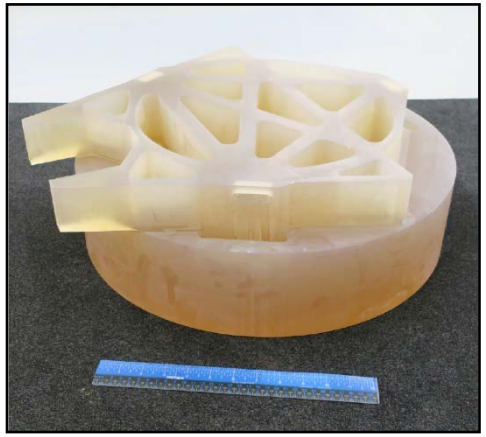
TRL5 Charge Management Unit

STATUS

- NASA in pre-Phase A Study managed by Physics of the Cosmos Program Office at GSFC. Systems engineering & science support from JPL & MSFC.
- ESA completed Mission Formulation Review on Dec 3, 2021 and transitions to ESA's phase B1.

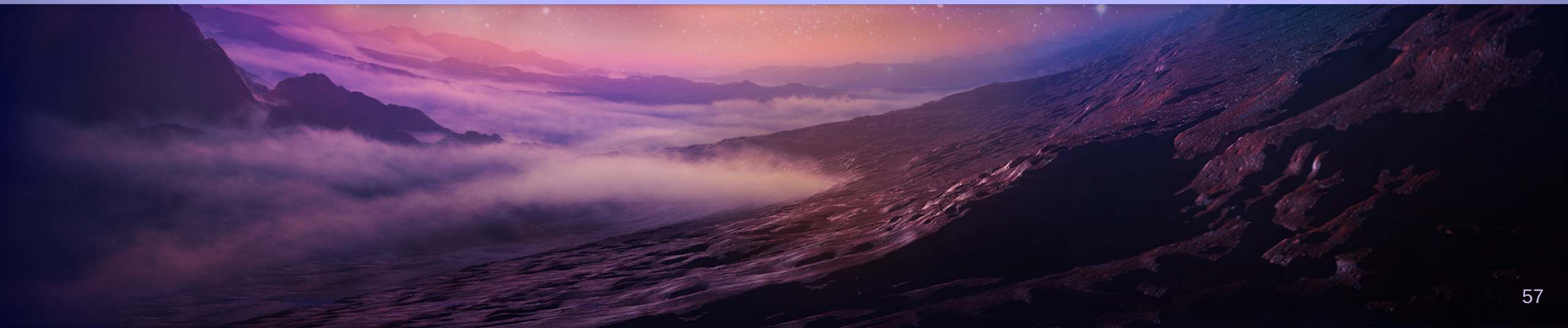
All dates approximate

- September 2023 –
- February 2024 –
-
- 2035 – ESA Launch



Primary mirror blank for EDU telescope

Big Finish



What's next for Astrophysics?

Paul Hertz will be stepping down this year after more than 10 years as Director of Astrophysics (the best job at NASA)

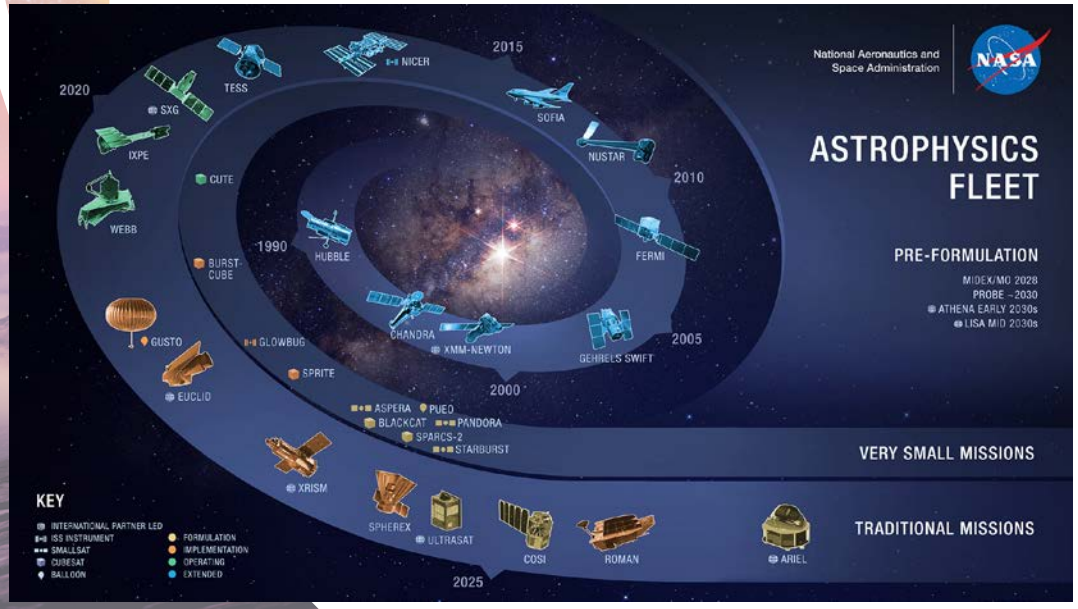
- Once the new Director of Astrophysics is in place, Hertz will move to the SMD Front Office as Senior Advisor to the SMD Associate Administrator

Who will lead NASA astrophysics in the upcoming era of increasing inclusion and diversity, growing R&A, Webb science, Roman development, exoplanet characterization, time domain and multi-messenger astrophysics, dark energy and dark matter, first Astrophysics Probe, more Explorers / Pioneers / cubesats, future great observatories, and realizing Decadal Survey priorities?

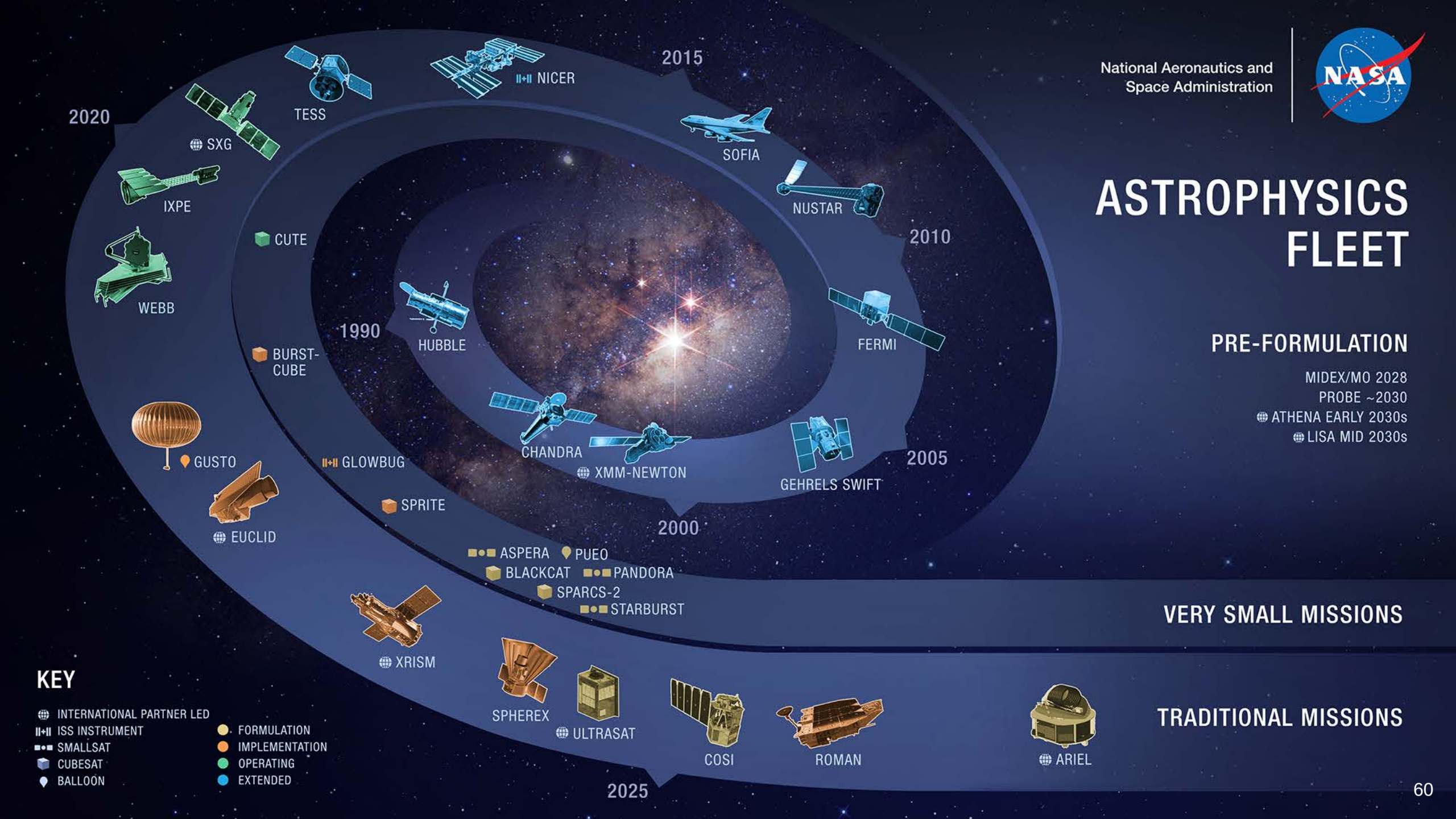
The search for the next NASA Director of Astrophysics has begun

- For the job advertisement, see https://www.usajobs.gov/job/628265700 or search for announcement number HQ-22-ES-11334214 on https://USAJOBS.gov
- This is a Senior Executive Service (SES) position, which requires a resume and a substantial narrative job application addressing executive core qualifications and mandatory technical qualifications
- The application period closes on March 21, 2022

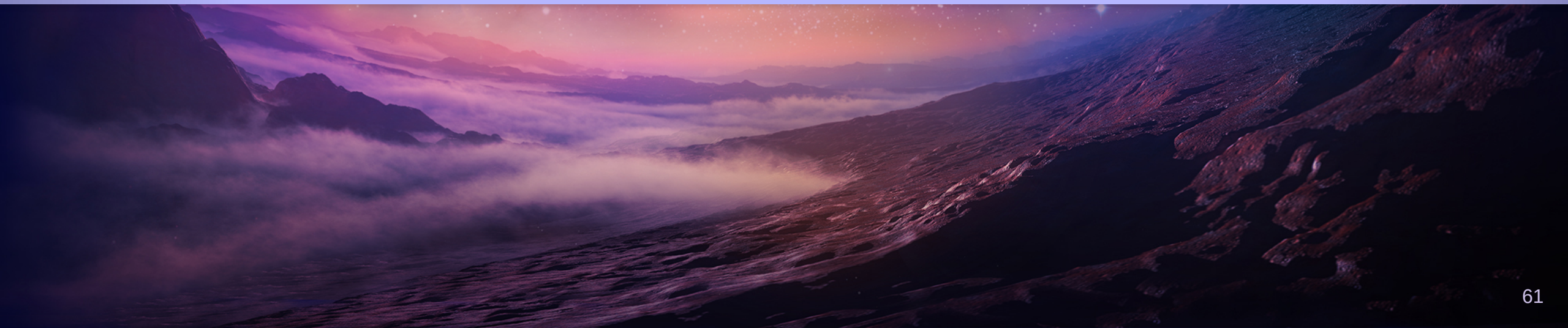
Astrophysics is Looking Up



- Webb has launched, Roman has completed CDR
- Explorers are being competed and selected regularly
- Smaller missions (e.g., Pioneers, CubeSats, suborbital) are being competed and selected annually
- International partnerships are strong
- R&A budgets are up, suborbital capabilities are expanding
- Technology investments are being made for future missions
- NASA is prioritizing an inclusive and diverse astrophysics community, and is initiating changes to address systemic failures that limit participation by all
- An exciting Decadal Survey has been received
- The FY22 budget request supports all this PLUS contains a funding wedge for Decadal Survey priorities

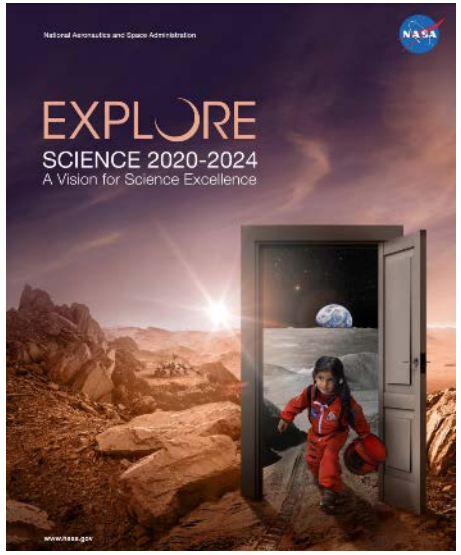

National Aeronautics and Space Administration
NASA
ASTROPHYSICS FLEET
2015
2020
2010
1990
2005
2000
2025
NICER
TESS
SXG
SOFIA
IXPE
NUSTAR
CUTE
WEBB
HUBBLE
FERMI
BURST-CUBE
CHANDRA
XMM-NEWTON
GEHRELS SWIFT
GUSTO
GLOWBUG
SPRITE
EUCLID
ASPERA
PUEO
BLACKCAT
PANDORA
SPARCS-2
STARBURST
XRISM
SPHEREX
ULTRASAT
COSI
ROMAN
ARIEL
PRE-FORMULATION
MIDEX/MO 2028
PROBE ~2030
ATHENA EARLY 2030s
LISA MID 2030s
VERY SMALL MISSIONS
TRADITIONAL MISSIONS
KEY
INTERNATIONAL PARTNER LED
ISS INSTRUMENT
SMALLSAT
CUBESAT
BALLOON
FORMULATION
IMPLEMENTATION
OPERATING
EXTENDED

BACKUP



Improving Inclusion at NASA

Inclusion – NASA is committed to a culture of diversity, inclusion, and equity, where all employees feel welcome, respected, and engaged. To achieve the greatest mission success, NASA embraces hiring, developing, and growing a diverse and inclusive workforce in a positive and safe work environment where individuals can be authentic. This value will enable NASA to attract the best talent, grow the capabilities of the entire workforce, and empower everyone to fully contribute.



Strategy 4.1: Increase the diversity of thought and backgrounds represented across the entire SMD portfolio through a more inclusive and accessible environment.

ROSES: SMD's goals are to develop a workforce and scientific community that reflects the diversity of the country and to instill a culture of inclusion across its entire portfolio.

Building Excellent NASA Teams Requires Inclusion and Diversity

At NASA, we recognize that excellence is only achieved with inclusive and diverse teams. We are creating a multi-pronged approach.

- Standing up a long-term internal activity focused on sustained engagement, systemic, and lasting changes.
- Modifying requirements for AOs to align with NASA's core value of Inclusion; draft modifications released for community comment.
- Piloting inclusion plans as an evaluation criterion for R&A programs.
- Requesting funding (starting in FY22) to establish Bridge Programs supporting MSIs and HBCUs.
- Increasing Science Activation program to support diversity and inclusion initiatives.
- Hosting incubator workshops and implementing actions from those workshops focused on short-term changes to how we are operating and how we grow our leaders.
- National Academies study of barriers to inclusion in mission leadership.
- Adopted a Code of Conduct to improve the inclusion and process of our panels and teams.
- Proposal Processes: Recognizing we have influence through our calls for proposals and what we reward in our selections. Piloting dual-anonymous peer review and seeking to expand that. Actively looking into how we can be a model for inclusivity.

Establishing New AO Requirements

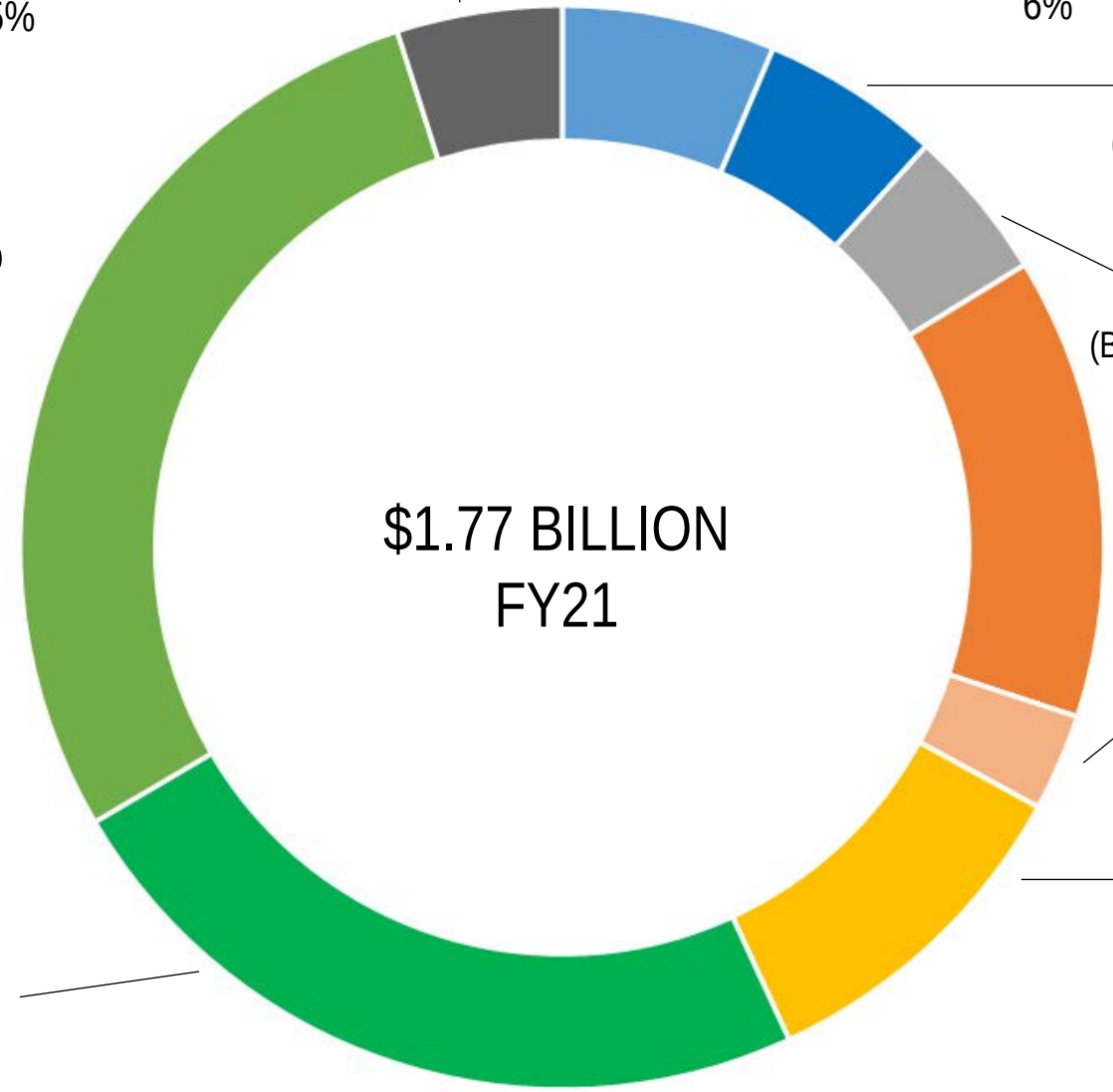
NASA expects that inclusion, diversity, equity, and accessibility (IDEA) will be reflected in the composition of all Announcement of Opportunity (AO) proposal teams. NASA also expects that all AO mission projects will clearly define the principles by which team members can operate in an inclusive and equitable environment.

To meet NASA's expectations regarding the reflection of IDEA values in the composition of proposed mission teams, SMD plans to add language to future Announcements of Opportunity (AO) and amend the currently open Stand-Alone Mission of Opportunity Notice (SALMON-3). Proposers will be required to describe in their proposal how the processes used 1) to assemble the proposed team and 2) to execute the proposed project aligned with SMD's IDEA values, including the NASA Policy Statement on Diversity and Inclusion at https://www.nasa.gov/offices/odeo/policy-and-publications.

The full text of SMD's IDEA RFI, including the proposed new AO language and response instructions can be found at short URL: https://go.nasa.gov/3xSsOP1. RFI responses were due on November 3, 2021 and are currently being reviewed.

Establishing IDEA requirements for AO proposals is responsive to the Decadal Survey

Astrophysics Budget – FY21 Op Plan



MANAGEMENT
INCL. STEM ACTIVATION
5%

RESEARCH
(ADAP, APRA, ATP, ETC.)
6%

TECHNOLOGY
(SR&T, ATHENA, LISA, ETC.)
5%

INFRASTRUCTURE
(BALLOON PROGRAM, ARCHIVES, ETC.)
5%

OP. MISSIONS
(INCL. GO PROGRAMS)
17%

EXPLORERS
DEVELOPMENT
10%

WEBB
DEVELOPMENT
23%

ROMAN
DEVELOPMENT
29%

Quick Summary

Community support: 19%
Operating missions: 14%
Building missions: 62%
Science Activation: 3%

Astrophysics FY22 Budget Request

Requests $1,575.5 M for NASA Astrophysics (including Webb) in FY 2022 (submitted May 2021)

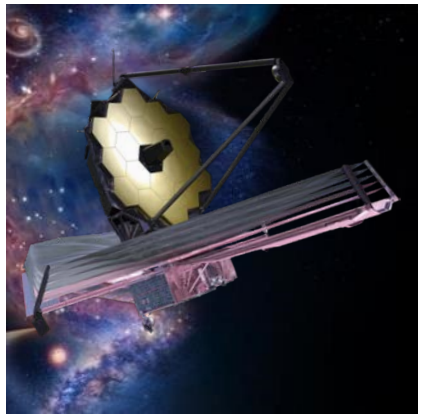
What's Changed compared to runout of previous budget request

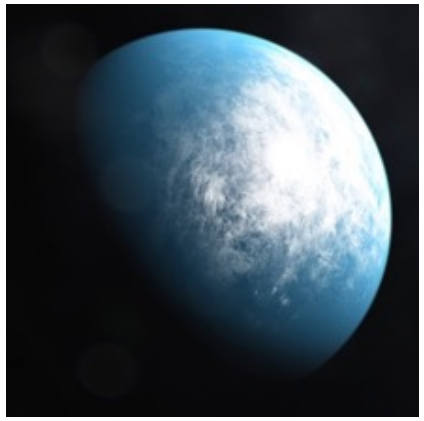
- Funds continued development of the Nancy Grace Roman Space Telescope and estimated COVID impacts
- Plans for an Astrophysics Probe-class mission, an increase in R&A, and other initiatives pending receipt of the Decadal Survey
- Four Astrophysics Pioneers conducting mission concept studies
- Enhanced facilities and open science initiatives within research program (e.g., laboratory equipment upgrades, extreme precision radial velocity program, formulation for integrating data archives with cloud computing)
- Science activation increases to support diversity and inclusion initiatives

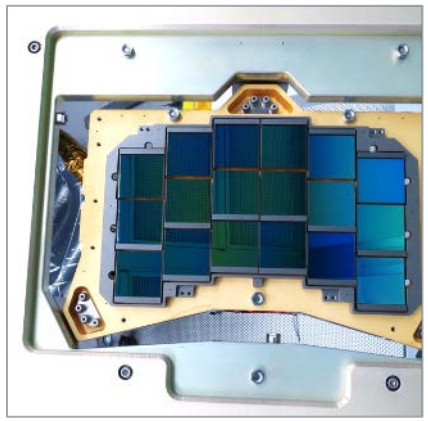
What's the Same compared to runout of previous budget request

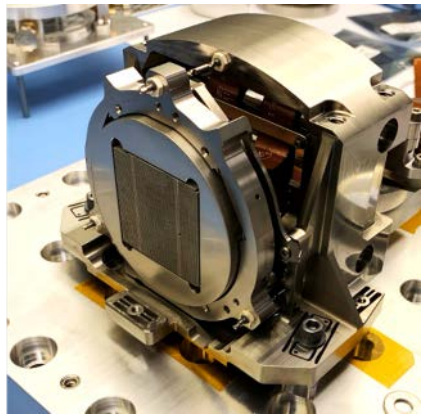
- Webb on track to launch in 2021
- Proposes termination of SOFIA due to its high cost and lower scientific productivity than other missions
- Hubble, Chandra, and other operating missions continue
- Supports development of IXPE, GUSTO, SPHEREx, and contributions to XRISM, Euclid, ARIEL
- Maintains Astrophysics Explorers cadence including both SMEX downselect and MIDEX AO in 2021
- CubeSat initiative and balloon campaigns within healthy research program

Planned Milestones FY21-22









Complete integration and launch Webb in 2021

Complete integration and test for IXPE and launch in 2021

Achieve Roman Space Telescope critical design review in 2021

Maintain decadal cadence of four AOs per decade for Astrophysics Explorers and Missions of Opportunity with a SMEX downselect and a MIDEX AO in 2021

Receive Astrophysics Decadal Survey in 2021

- Achieve SPHEREx critical design review in 2022
- Conduct Senior Review of Operating Missions in 2022
- Begin Webb science operations in 2022
- Generate world-class science from operating missions including Hubble Space Telescope and Chandra X-ray Observatory
- Maintain healthy research program including suborbital-class missions, technology development, data analysis, theoretical and computational investigations, and laboratory astrophysics
- Plan formulation or solicitation for a Probe mission in 2022
- Support mission concept studies and technology investments to implement Astrophysics Decadal Survey priorities starting in 2022

COVID-19 Impacts – Missions

Many missions are expected to stay within their cost commitments (known as the ABC or Agency Baseline Commitment, which includes HQ held reserves above project budget)

- ABC is set at Confirmation Review

Some missions have experienced challenges that affect cost and schedule commitments

- In astrophysics, this includes Webb, Roman, and IXPE
- Missions that have been Confirmed since COVID began (e.g., SPHEREx), or will be Confirmed in the future (e.g., future Explorers) have assumed impacts from COVID included within their cost and schedule commitments

To date, challenges to Flagships (Webb, Roman) have been accommodated with no impact to Explorers or R&A

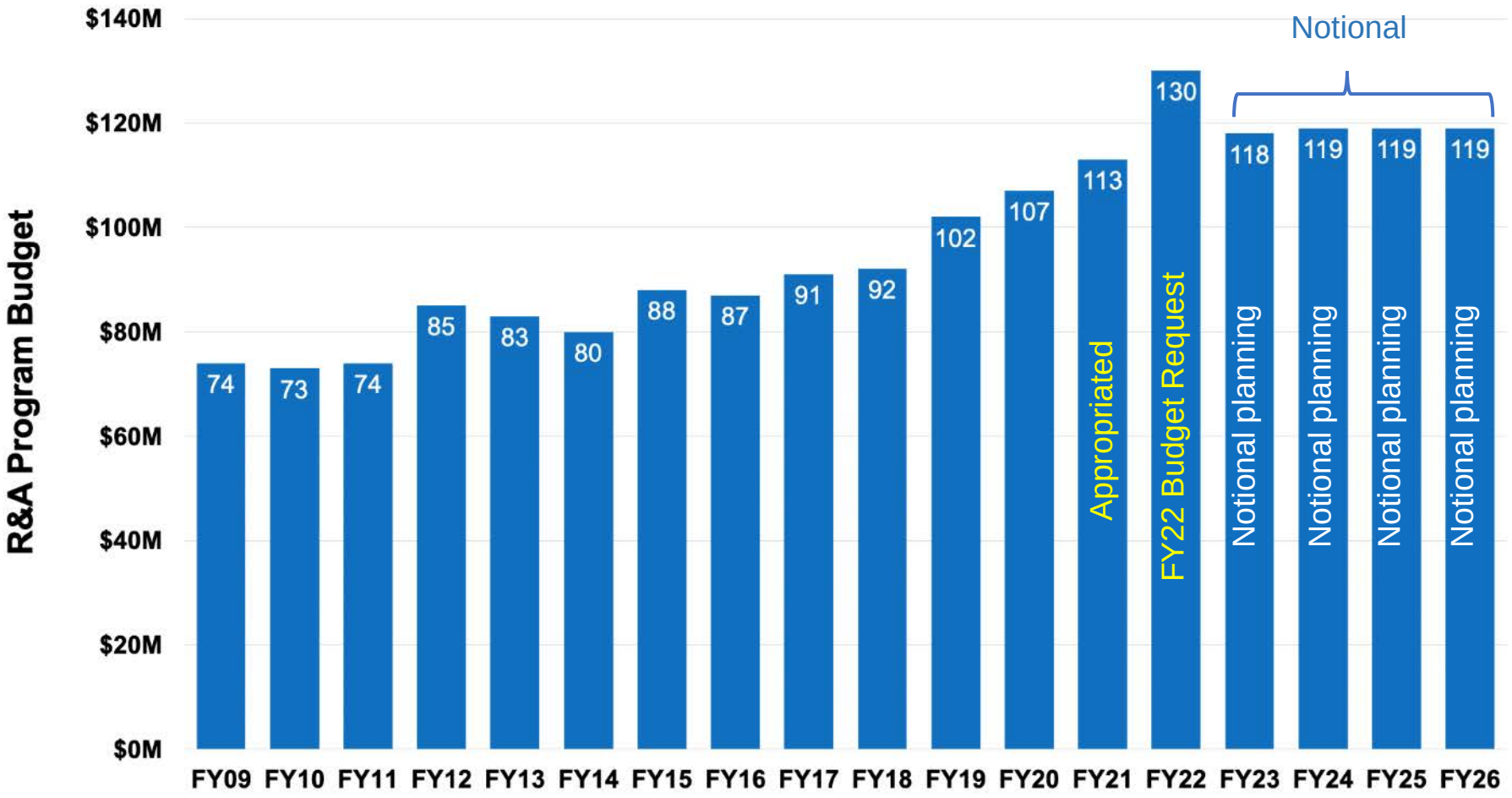
- Challenges to Explorers are accommodated within the Explorers Program

Mission impacts to commitments due to COVID (only missions with commitments)			
Webb	Exceeds schedule*	XRISM	Does not exceed
IXPE	Exceeds cost and schedule*	SPHEREx	Included in commitment
GUSTO	Does not exceed	Roman	Exceeds cost and schedule*
Euclid	Does not exceed	* Replan has been completed and approved	

Recent R&A Initiatives

- **Exoplanet Research Program Consolidation**: all exoplanet investigations are now under XRP
- **Laboratory Astrophysics**: starting in ROSES-20, capital equipment purchases are eligible under APRA
- **FINESST**: doubled funding allocation to achieve selection rates >10% for graduate student program. Starting in ROSES-22, student stipend will increase from $45k to $50k/year for up to three years each
- **Citizen Science**: cross-divisional SMD solicitation for Citizen Science Seed Funding
- **Data Management Plan**: now part of the intrinsic merit evaluation of proposals
- **Open Source, Tools, Frameworks, and Libraries** support through cross-divisional SMD solicitation
- **Dual-Anonymous Peer Review (DAPR):** most Astrophysics and cross-divisional research programs are evaluated using the dual-anonymous peer review process to mitigate biases. All Astrophysics GO/GI programs have permanently converted the peer reviews to DAPR
- **Code of Conduct** and **Bias training** are provided for all reviewers before the start of peer reviews
- **Inclusion, Diversity, Equity, and Accessibility**: established IDEA taskforce for Astrophysics, working closely with and implementing recommendations of SMD's IDEA and Anti-Racism Action Group task forces
- **Inclusion Plan:** implemented as a pilot program for 2021 Astrophysics Theory Program (ATP) to increase the diversities of the proposing teams

R&A Research Funding



Sustained growth in R&A research funding since the 2010 Decadal Survey

Since the last Decadal Survey:
+38% R&A funding growth

Notional Planning:
+60% over 17 years.

For the last 12 months (August 2020 – August 2021), the selection rates were 23% for R&A programs and 46% for smaller mission's general observer (GO)/guest investigator (GI) programs*, with a total average selection rate of 35% for all our ROSES programs

* Does not include Hubble, Chandra, SOFIA

SPD-41: Scientific Information Policy

SMD Policy Directive-41 is the **first SMD-wide policy on data, software and information**.

Consolidation of existing policies and laws applicable to SMD.

Applies to all SMD-funded activities related to producing scientific information. *The policy excludes restricted information such as ITAR, export control, CUI.*

A new Request for Information (RFI) solicits feedback on SPD-41, including support needed for successful implementation and proposed additions: go.nasa.gov/RFISPD41. **Responses are due Feb 11, 2022.**

Townhall on the SPD-41 RFI scheduled for Jan 26, 2022 at 3 pm EST.

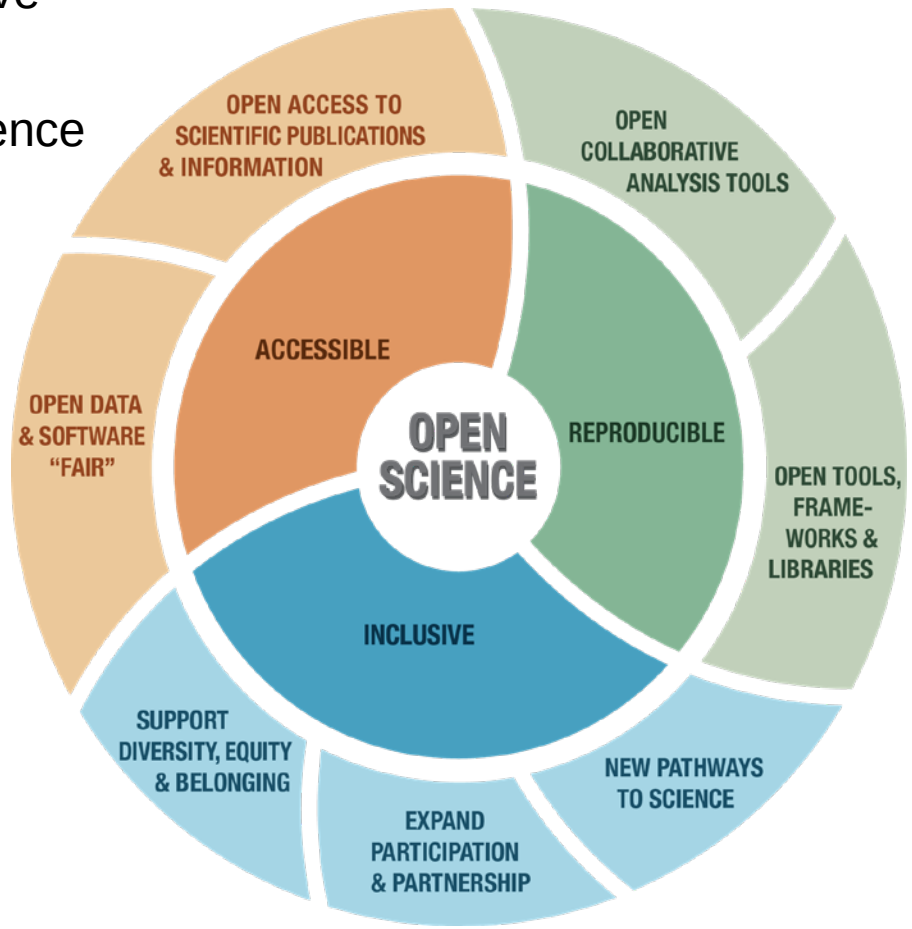
NASA’s Open-Source Science Initiative

NASA is making a long-term commitment to support building an inclusive open science community over the next decade. This initiative is a comprehensive program of activities to enable and support moving science toward openness.

TRANSFORM TO OPEN SCIENCE (TOPS)

NASA’s TOPS initiative is a 5-year effort focused on accelerating scientific discovery and inclusivity through open science. Focus areas include:

- **Capacity building:** teaching and learning resources to enable open science
- **Partner and community engagement:** collaborating with communities to enable a culture of open science
- **Incentives:** certificates and awards programs, prizes and challenges



Citizen Science

Citizen Science is a form of open collaboration in which individuals participate voluntarily in the scientific process – Citizen Science is a science investigation that relies on volunteers

Proposers to any ROSES program element may incorporate citizen science and crowdsourcing methodologies into proposals, where such methodologies advance the proposed investigation

Citizen Science Seed Funding Program (CSSFP) for prototyping of citizen science projects was offered for the first time in ROSES-20. Four proposals in Astrophysics were funded.

Disk Detective V2:Identifying Unusual Circumstellar Disks Via Citizen Science – C. Canizares (MIT)

'Backyard Worlds: Cool Neighbors'-Discovering Extreme Brown Dwarfs through Citizen Science- A. Meisner (NOAO)

Redshift Wrangler: Citizen Science Analysis of Extragalactic Spectroscopy – J. Kartaltepe (RIT)

Leveraging a Zooniverse Discovery to Diagnose a Dominant Mode of Star Formation and Provide a CURE for Introductory Astronomy Students – K. Devine (College of Idaho)

Proposals for CSSFP in ROSES-21 are due on January 21, 2022

https://science.nasa.gov/learners

Science Activation

As a part of NASA's Science Activation (SciAct) program, Astrophysics provides exciting opportunities for students, educators and the public across the spectrum to engage in activities that enrich their knowledge of the Universe

- *Universe of Learning* provides numerous resources and experiences
- *Reaching for the Stars* has created badges to engage Girl Scouts
- *NASA's Airborne Astronomy Program* has created curriculum for schools and trained educators on NASA's flying Stratospheric Observatory for Infrared Astronomy (SOFIA)
- *NASA's Neurodiversity Network* brings astronomy to neurodiverse learners with a focus to the autism spectrum
- *NASA's Community College Network* brings astronomy resources into the classroom in communities across the nation
- *Cosmic Data Stories* engages the learner to use data science and visualization techniques to interrogate data behind cosmic discoveries

To find out how you can participate as a subject matter expert please contact Hashima Hasan (hhasan@nasa.gov) or the PIs of Astrophysics SciAct projects

https://science.nasa.gov/learners

Astrophysics and the Moon

NASA Astrophysics has no strategic missions or strategic activities planned for the lunar surface, Gateway, or cis-lunar space

The Astrophysics Decadal Survey was charged to “Consider ongoing and planned activities and capabilities in other organizational units of NASA, including … planned research platforms in Earth orbit and cis-lunar space.”

- NASA has sponsored a concept study of a radio observatory on the radio-quiet far side of the Moon, plus other related radio astronomy concepts
- The Decadal Survey made no recommendations regarding the use of planned NASA capabilities for the lunar surface, Gateway, or cis-lunar space

All science opportunities for lunar surface, Gateway, and cis-lunar space are open for proposed, competitive, PI-led, peer reviewed astrophysics activities

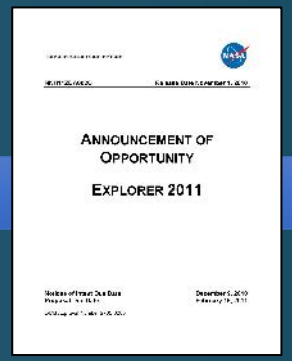
- This includes Payloads and Research Investigations on the Surface of the Moon (PRISM) (open to astrophysics on the lunar surface), Explorers including Missions of Opportunity (open to missions in cis-lunar space), and Pioneers (open to lunar surface and cis-lunar space missions)
- To date, three lunar landed experiments with relevance to astrophysics have been selected: a next generation laser retroreflector for general relativity tests and two technology demonstrations for measuring cosmic radio waves

Astrophysics Explorers Program

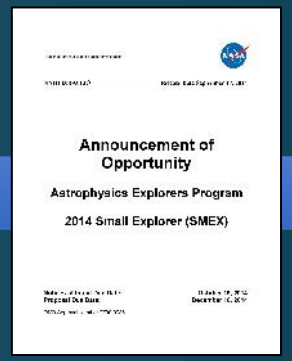
Gehrels
Swift

NuSTAR

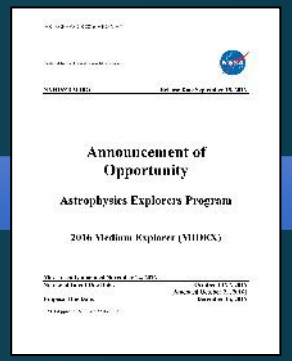
4 AOs per decade



MIDEX
2011

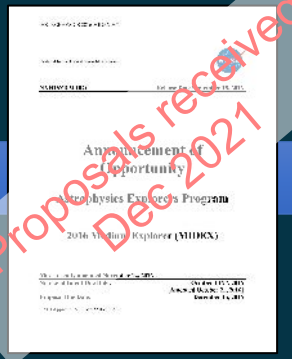


SMEX
2014



MIDEX
2016

SMEX
2019



Proposals received
Dec 2021

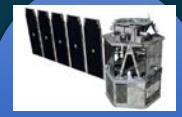
MIDEX
2021

Small and
Mid-Size
Missions

TESS

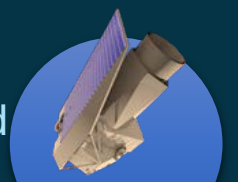
IXPE

SPHEREx



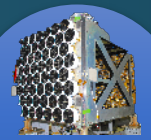
COSI

Directed
2013



Euclid

Missions of
Opportunity



NICER

GUSTO

ARIEL

Directed
2017

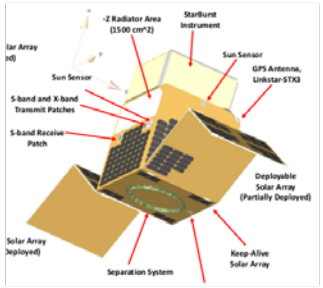
XRISM

Astrophysics Pioneers

- A new class of small missions solicited annually in ROSES. Includes SmallSats, CubeSats >6U, major balloon payloads, modest ISS attached payloads, and lunar surface CLPS payloads; $20M maximum PI cost cap
- Fills in the gap between existing ROSES investigations (<$10M for APRA) and existing Explorers MO investigations (~$35M for SmallSats)

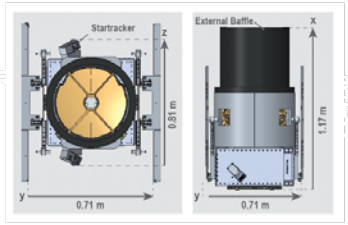
Astrophysics Pioneers – Cycle 1 Selections

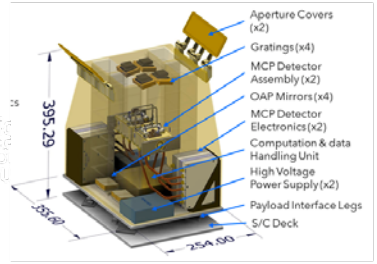
PUEO: A Long-duration Balloon-borne Instrument for Particle Astrophysics at the Highest Energies (PI Abigail Vieregg, U. Chicago) APPROVED for DEVELOPMENT



StarBurst: Gamma-ray ASM, Simultaneous detection of NS/NS mergers with LIGO (PI Daniel Kocevski, NASA MSFC) APPROVED for DEVELOPMENT

Pandora: Multiwavelength Characterization of Exoplanets and their Host Stars (PI Elisa Quintana, NASA GSFC) APPROVED for DEVELOPMENT

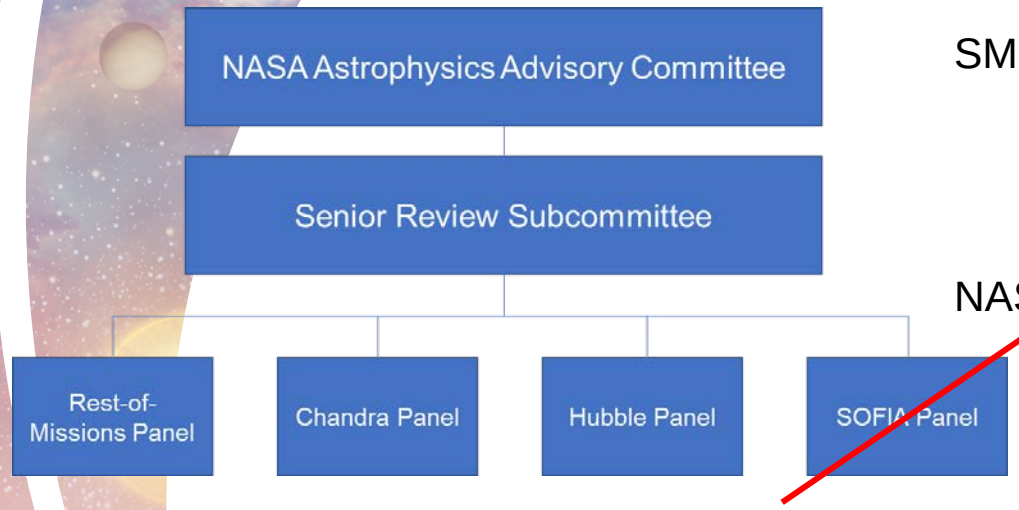




Aspera: IGM Inflow/outflow from galaxies via OVI 10^5K emission line imaging (PI Carlos Vargas, U. Arizona) APPROVED for DEVELOPMENT

- First four selections made January 2020
- Must pass NASA cost assessment of <$20M (rolling reviews, not a competition)
- All four have passed
- Pioneers Cycle 2 (ROSES-21) proposals due March 17, 2022

Astrophysics 2022 Senior Review



Triennial peer-review mandated by Congress of operating missions (last one was 2019) to assist NASA in planning its strategy for extended missions

SMD Missions to be reviewed by Astrophysics Division

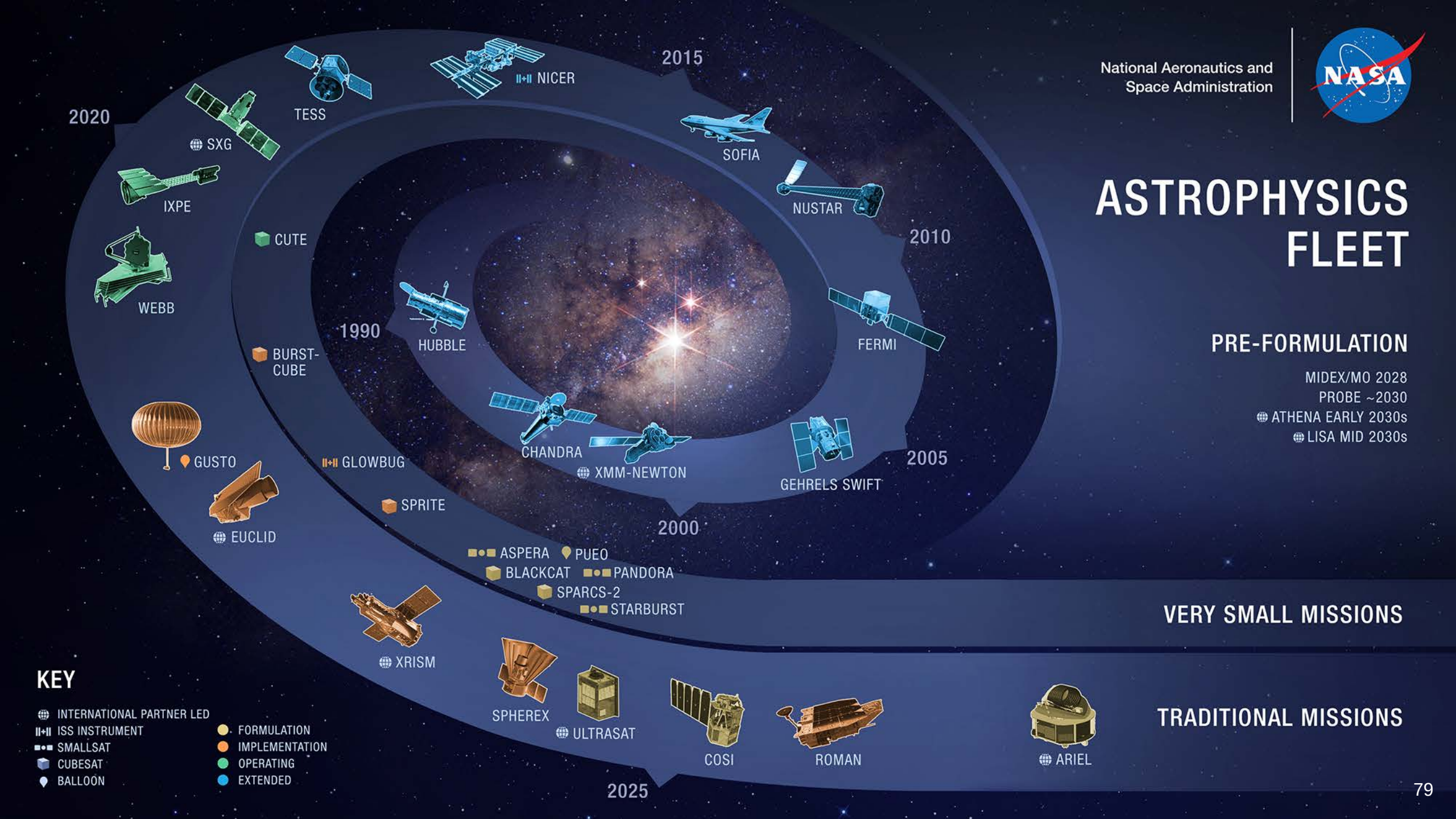
- Hubble, Chandra, SOFIA (separate panels)
- Fermi, New Horizons, NICER, NuSTAR, Swift, TESS, XMM-Newton (one panel)

NASA will use the review information to:

- Prioritize the operating missions and projects;
- Define an implementation approach to achieve astrophysics strategic objectives;
- Provide programmatic direction to the missions and projects concerned for FY23, FY24 and FY25; and issue initial funding guidelines for FY26 and FY27 (to be revisited in the 2025 Senior Review)

Notional Schedule

- Call for proposals: 1-Oct-2021
- Proposal due date: 1-Feb-2022
- Site visits for large missions: March 2022
- Panel reviews merged and delivered to APAC: April 2022
- Special meeting of the APAC for recommendations to NASA: May 2022


National Aeronautics and Space Administration
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WEBB
HUBBLE
FERMI
BURST-CUBE
CHANDRA
XMM-NEWTON
GEHRELS SWIFT
GUSTO
GLOWBUG
SPRITE
EUCLID
ASPERA
PUEO
BLACKCAT
PANDORA
SPARCS-2
STARBURST
XRISM
SPHEREX
ULTRASAT
COSI
ROMAN
ARIEL
PRE-FORMULATION
MIDEX/MO 2028
PROBE ~2030
ATHENA EARLY 2030s
LISA MID 2030s
VERY SMALL MISSIONS
TRADITIONAL MISSIONS
KEY
INTERNATIONAL PARTNER LED
ISS INSTRUMENT
SMALLSAT
CUBESAT
BALLOON
FORMULATION
IMPLEMENTATION
OPERATING
EXTENDED