NAC Science Committee

Marc Weiser, Acting Chair

January 18, 2023

NAC Science Committee Members

- Dr. Ellen Williams, Chair, University of Maryland
- Dr. Noël Bakhtian, Berkeley National Laboratory
- Dr. Vinton Cerf, Google
- Dr. Serina Diniega, Jet Propulsion Laboratory; Acting Chair, Planetary Science Advisory Cmte (PAC)
- Dr. Linda M. Godwin, University of Missouri
- Dr. Willie E. May, Morgan State University
- Dr. Therese Moretto-Jorgensen, Ames Space Flight Center; Chair, Heliophysics Advisory Cmte (HPAC)
- Dr. Sara Tucker, Ball Aerospace & Technologies Corp.; Chair, Earth Science Advisory Cmte (ESAC)
- Mr. Marc Weiser, RPM Ventures
- Dr. Charles “Chick” E. Woodward, University of Minnesota; Chair, Astrophysics Advisory Cmte (APAC)
- Incoming Chair of new Biological and Physical Sciences Advisory Committee (BPAC) joining soon

SMD Updates & Highlights

Thomas Zurbuchen

Associate Administrator for the Science Mission Directorate, 2016-2023

- Longest continuous service as AA for Science in NASA history

~31.9%

TOTAL BUDGET INCREASE

FY17: 5.76B

FY22: 7.6B

33

MISSIONS LAUNCHED

108

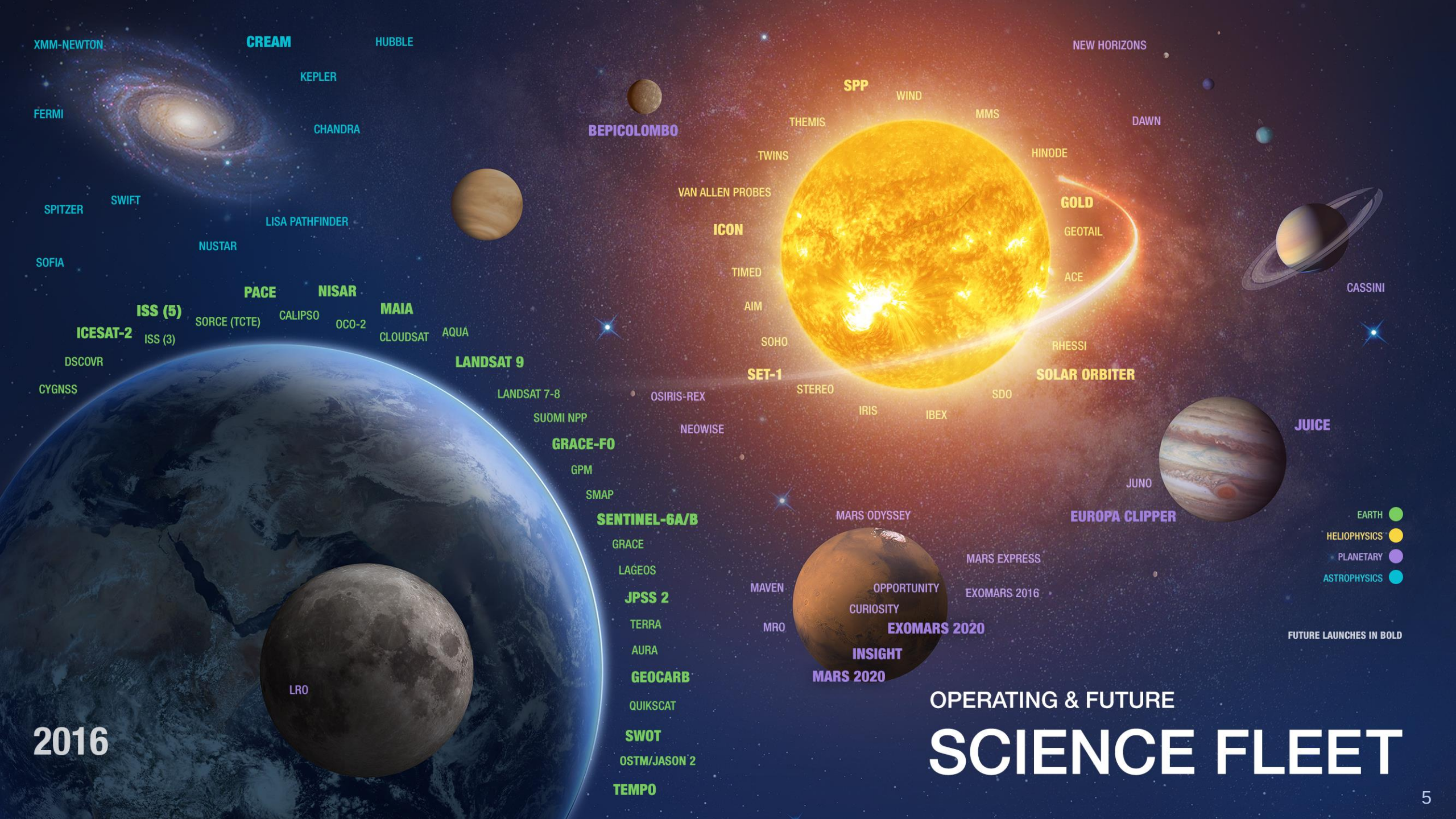
HIRES

47

MISSIONS SELECTED

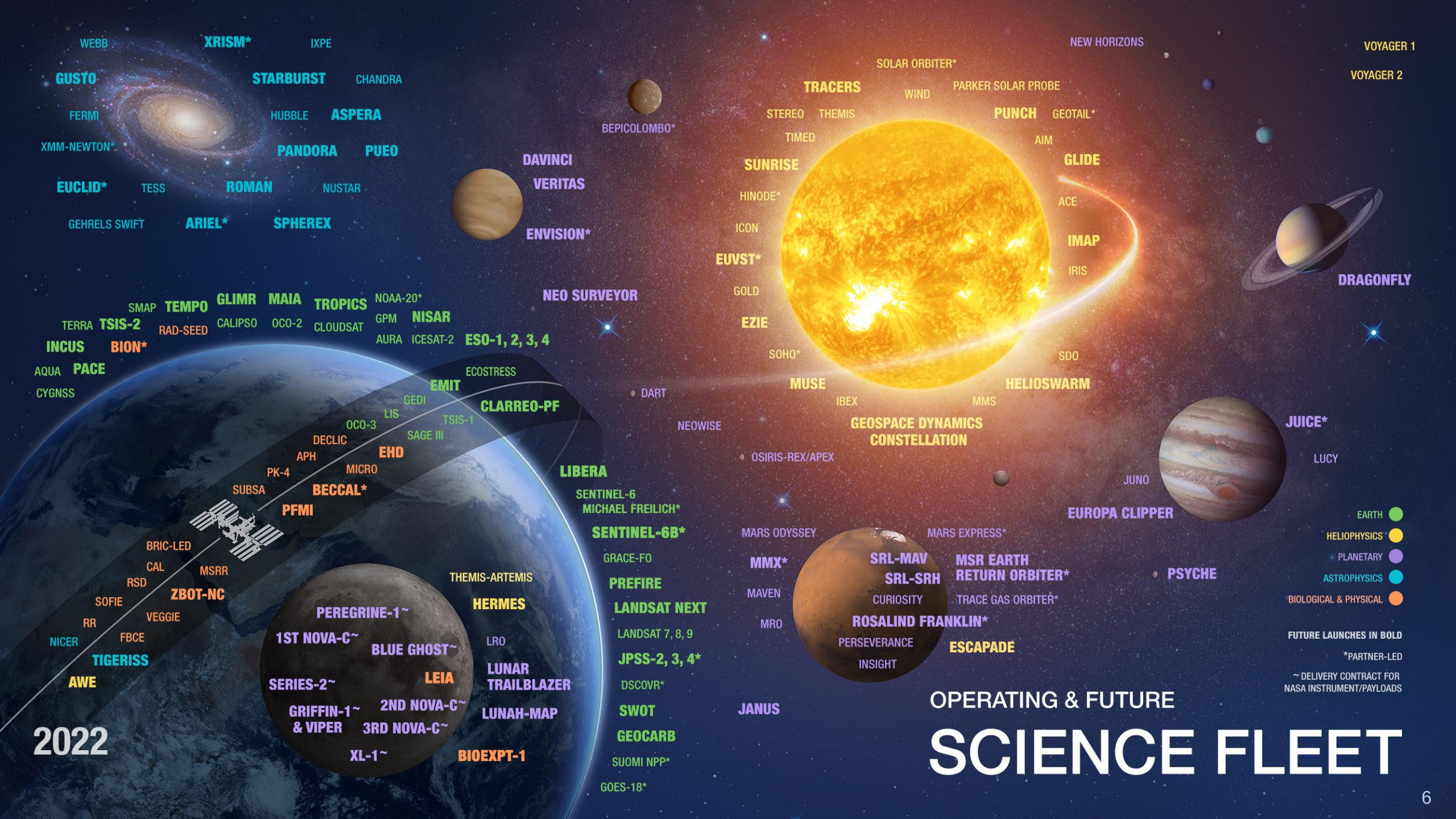
7

CLPS SELECTED



OPERATING & FUTURE

SCIENCE FLEET



OPERATING & FUTURE

SCIENCE FLEET

NASA Science Leadership Accomplishments During Zurbuchen Tenure

Organizational Leadership

- Built SMD Leadership team to perform at highest standard
- Prioritized and committed to creating the best teams we can, which requires a diverse and inclusive workforce
- Committed to innovation as a guiding value to achieve global leadership in science
- Integrated Biological and Physical Sciences division into SMD

Prioritized a culture of Innovation, high risk-high impact science, and partnerships

- Established novel partnerships with commercial entities, enabling new science and better science value (CLPS, Commercial data buys, service models, small launch, etc.)
- Strengthened partnerships with established and emerging space agencies by implementing a strategic vision for international collaboration that advances science
- Increased emphasis on High-Risk / High-Impact Science within the R&A Program and technology demonstrations
- Infused SmallSat capabilities into science missions

NASA Science Leadership Accomplishments During Zurbuchen Tenure

Global leadership in robotic science

- Launched 18+ novel Earth Science missions, focused on ice, sea level, CO^2, etc.
- Parker Solar Probe, Heliophysics Observatory
- Perseverance and Ingenuity, successful start of Mars Sample Return
- James Webb Space Telescope in operation, Roman on track
- Planetary defense, including DART and NEO-Surveyor

Opportunities to build upon for the next AA

- Continue to collaborate with human exploration and space tech towards an integrated Artemis program driving both exploration and science
- Further expand support and missions for the Earth Systems Observatory developing the next generation of integrated capability further driving US leadership on the earth on and its climate
- Maintain leadership in robotic exploration through programs like DRAGONFLY, PHSYCE, VERITAS (Venus), DIVINCI (Venus) and future missions, like the Habitable Worlds Observatory with similarly august goals.

REDWIRE → OAKMAN AEROSPACE | DSS Deployable Space Systems | techshot

VOYAGER → THE LAUNCH COMPANY | VLS VALLEY TECH SYSTEMS | SPACE MICRO

ROCKETLAB → ASI | PLANETARY SYSTEMS CORPORATION

planet. → VanderSat

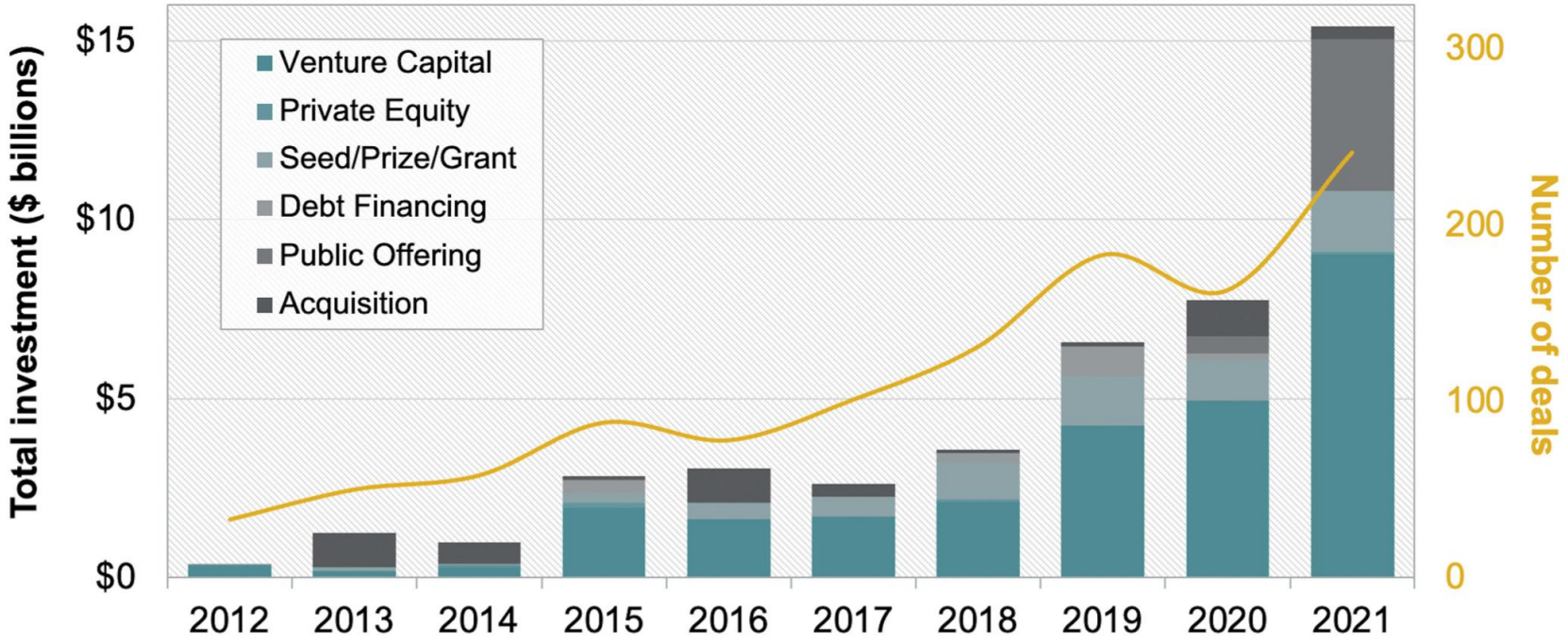
ASTRA → Apollo Fusion

spire → exactEarth

SPACEX → SWARM

BRYCE TECH

Investment in Start-Up Space Companies
2012 to 2021, by Investment Type



*Acquisition activity in 2021

DART

Double Asteroid Redirection Test

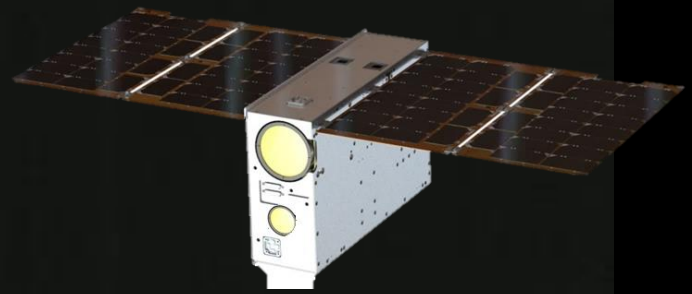
Pre-impact orbital period:
11 hours, 55 minutes

Post-impact orbital period:
11 hours, 23 minutes

Earth-based
observations

Distance [km]: 777

Credit: ASI/NASA



LICIACube

NAC Science Committee Hybrid Meeting

November 15-16

- SMD Update – Committee Report in Progress
- Discipline Advisory Committee Reports
- Beyond ISS for Biological and Physical Sciences
  Discussion: Next steps following Decadal Survey
- Cross-cutting Lessons from SMD's Independent Review Boards
  Discussion: Impacts across the SMD portfolio
- Double Asteroid Redirection Test (DART)
  Discussion: Value of risk and innovation in SMD projects
- SMD Bridge Program
  Discussion: Vast benefits of diversity in science

Findings and Recommendations

Science Committee Resolution of Thanks to Thomas Zurbuchen

The NASA Advisory Council Science Committee wishes to express its highest gratitude to Thomas Zurbuchen for his extraordinarily successful and productive six-year term as Associate Administrator of NASA's Science Mission Directorate. He is the longest serving AA in this position and brought to the job insight, energy, commitment and passion. In the midst of a global pandemic, missions such as the James Webb Space Telescope, the Double Asteroid Redirection Test, the start of Mars Sample Return with the Perseverance rover, the Ingenuity Mars helicopter, the Parker Solar Probe, amongst several others, were brought to fruition with dramatically successful results.

Beyond the strikingly successful series of missions executed during his tenure, Zurbuchen brought to NASA and SMD a deep commitment to diversity, equity, inclusion and growth of internal leadership. His quotes: "DEI is not the icing on the cake; it's the cake!" and "The entire nation should feel it is welcomed to work at NASA" offer evidence of his passionate belief in the value of inclusion and accessibility. His management style serves as a model for strong, pragmatic, empathetic and collaborative leadership.

Zurbuchen brought to his work and to NASA a deep appreciation of service to science and to the country and articulated this idea in powerful and evocative terms. His sense of balance in management practice drew our appreciation. His lived experience as a leader illustrates his feeling that working at NASA has been a privilege. The NAC Science Committee offers to Thomas Zurbuchen its great appreciation for his service, successes, and its warmest wishes for similar results in the next phase of an already stellar career.

DART

The Science Committee finds that:

- DART is an exemplary example of a high-risk, high-reward mission, which included multiple technology demonstrations. The risk was in science and technology, with costs kept to a minimum. This project was a good investment of NASA resources.
- The decision to add the Italian Space Agency LICIACube to the DART mission added international cooperation and enhanced public interest.

The Science Committee recommends that:

- NASA should maintain an intentional balance of this type of high-risk, high-reward missions in its portfolio.

Science Mission Directorate

The Science Committee finds that:

- Following AA Zurbuchen's initiative, maintaining continuity in focus is critical to success in SMD's IDEA program and NASA's overall DEIA goals.
- SMD's Modality Strategic Principles provide a good basis for integrating Science and Human Exploration.

The Science Committee recommends that:

- SMD and NASA should continue to develop clear communication of the benefits, goals and metrics aligned with IDEA and DEIA principles, and their intrinsic importance to NASA's mission
- Including integration of human space flight in science planning (e.g. Decadal Surveys) should be mandatory to provide effective Scientific focus in human space flight

Beyond ISS for BPS

The Science Committee finds that:

- BPS has recently been moved to SMD and is positioned to plan strategically for a quick and effective response to the upcoming Decadal Survey.
- **The Science Committee recommends that:**
- SMD should support BPS in planning for increased turn-around time on science missions, including developing modular science packages.
- SMD should support BPS in further integrating IDEA principles in planning.

IRBs

The Science Committee finds that:

- The IRB assessments for Psyche and GDC were effective strategic interventions, and inclusion of the SRB chairs on the IRB was a useful approach that should be continued as a future good practice.
- The Psyche PI and team have worked well under challenging circumstances caused by workforce limitations.
- The Hybrid-work environment under COVID exacerbated workforce issues but was not the base cause for Psyche launch delay.
- Workforce issues identified in the Psyche mission are not believed to be unique to JPL and are likely to create similar challenges in other Centers if not addressed.
- The GDC is a strategic Heliophysics Division Living With a Star constellation mission with strong support in the heliophysics community. It suffered from a constrained approach due to overly strict adherence to policies and procedures. The IRB report lays out critical recommendations and NASA's response to the IRB report and immediate actions taken are appreciated and will be crucial for a successful implementation.

IRBs (continued)

The Science Committee recommends that:

- NASA should evaluate recruitment and retention of workforce in the Centers, and develop effective interventions, particularly for mid-career employees. Considerations should include:
  - Financial compensation, intellectual freedom, engagement in decision making
  - Inclusivity and accessibility
  - Effectiveness of personnel assessments in identifying value to mission.
- NASA should evaluate whether centers have lost too much autonomy, particularly regarding ability to manage workforce issues
- NASA should ensure that mission science is fully incorporated in planning from the earliest stage of each project.
- The project scientist should be assigned early in the project lifecycle.
- NASA/SMD should ensure that the timing of SRB inputs is well matched to project stages. Too much time between meetings can result in a loss of focus on issues already identified, or failure to identify emerging issues.
- Execution of the SRB process should minimize additional extraneous time burden or bureaucracy.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