SLPSRA Program Overview and Directions

Human Exploration & Operations Mission Directorate
Division Director, Space Life and Physical Sciences:

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National Academy of Sciences
7 February 2017

Research for Human Exploration
Outline

• SLPSRA organizational overview

• SLPSRA and the decadal
  – Past
  – Present
  – Future directions

• Midterm task discussion
National Aeronautics and Space Administration

Administrator
Deputy Administrator
Associate Administrator

Chief of Staff
Deputy Associate Administrator
Associate Deputy Administrator
Associate Administrator for Strategy and Plans

Chief Scientist
Chief Technologist

Chief Engineer
Chief, Safety and Mission Assurance
Chief Health and Medical Officer

General Counsel

Mission Support Directorate
Aeronautics Research Mission Directorate
Human Exploration and Operations Mission Directorate

Ames Research Center
Armstrong Flight Research Center
Glenn Research Center
Goddard Space Flight Center
Jet Propulsion Laboratory
NASA Management Office**
Stennis Space Center
Johnson Space Center
Kennedy Space Center
Langley Research Center
Marshall Space Flight Center

Human Capital Management
Strategic Infrastructure
Headquarters Operations
NASA Shared Services Center
Procurement
Protective Services

Note: Administrator may delegate direct reports to Deputy Administrator at his/her discretion.
* Center functional office directors report to Agency functional AA or Chief. Deputy and below report to Center leadership.
** NMO oversees the Jet Propulsion Laboratory and other Federally Funded Research and Development Center work

Report/Structure

www.nasa.gov

November 2015
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A SLPSRA Chronology

1993  Office of Space Science and Applications is reorganized, and the Life Sciences Division and Microgravity Science and Applications Division are incorporated into the Office of Life and Microgravity Sciences and Applications

1998  ISS assembly begins

2000  Office of Life and Microgravity Sciences and Applications becomes an Enterprise: Office of Biological and Physical Research

2001  ISS Management and Cost Evaluation Task Force recommends that in order to maximize research within proposed budgets, research priorities be established and implemented

2002  Research Maximization and Prioritization (ReMaP) Exercise

2003  Columbia accident on STS-107 reentry causes reconsideration of human spaceflight plans

2004  Vision for Space Exploration lays out an ambitious plan to return to the moon, paid for in part by terminating the Shuttle and ISS programs; NASA reorganizes and the Office of Biological and Physical Research is absorbed into the Exploration Systems Mission Directorate as the Advanced Capabilities Division.
A SLPSRA Chronology

2005  NASA Authorization directs NASA to maintain basic research capability, and to support non-exploration research

2008  NASA Appropriation directs NASA to work with the National Research Council to develop recommendations for research in the life and physical sciences

2010  NASA Authorization directs NASA to establish a non-profit entity to manage non-NASA use of the ISS National Laboratory

2011  Last Space Shuttle flight

2011  ISS Assembly complete

2011  The Advanced Capabilities Division becomes the Space Life and Physical Sciences Research and Applications Division in the newly formed Human Exploration and Operations Mission Directorate

2011  Recapturing a Future for Space Exploration: Life and Physical Sciences Research for a New Era is published

2012  First permanent director selected for SLPSRA
Achieving the goals of the Exploration Initiative will require a greater understanding of life and physical sciences phenomena in microgravity as well as in the partial gravity environments of the Moon and Mars.

Therefore, the Administrator is directed to enter into an arrangement with the National Research Council to conduct a “decadal survey” of life and physical sciences research in microgravity and partial gravity to establish priorities for research for the 2010-2020 decade.

Further, within amounts provided, NASA is directed to increase the amount for non-exploration microgravity life and physical sciences research by $13,500,000. These funds are for non- multi-user support and services activities.
Current NASA Strategic Plan

• Our Vision
  We reach for new heights and reveal the unknown for the benefit of humankind.

• Our Mission
  Drive advances in science, technology, aeronautics, and space exploration to enhance knowledge, education, innovation, economic vitality, and stewardship of Earth.
By empowering the NASA community to...

**Objective 1.1:** Expand human presence into the solar system and to the surface of Mars to advance exploration, science, innovation, benefits to humanity, and international collaboration.

**Objective 1.2:** Conduct research on the International Space Station (ISS) to enable future space exploration, facilitate a commercial space economy, and advance the fundamental biological and physical sciences for the benefit of humanity.

**Objective 1.3:** Facilitate and utilize U.S. commercial capabilities to deliver cargo and crew to space.

**Objective 1.4:** Understand the Sun and its interactions with Earth and the solar system, including space weather.

**Objective 1.5:** Ascertain the content, origin, and evolution of the solar system and the potential for life elsewhere.

**Objective 1.6:** Discover how the universe works, explore how it began and evolved, and search for life on planets around other stars.

**Objective 1.7:** Transform NASA missions and advance the Nation’s capabilities by maturing crosscutting and innovative space technologies.

By engaging our workforce and partners to...

**Objective 2.1:** Enable a revolutionary transformation for safe and sustainable U.S. and global aviation by advancing aeronautics research.

**Objective 2.2:** Advance knowledge of Earth as a system to meet the challenges of environmental change, and to improve life on our planet.

**Objective 2.3:** Optimize Agency technology investments, foster open innovation, and facilitate technology infusion, ensuring the greatest national benefit.

**Objective 2.4:** Advance the Nation’s STEM education and workforce pipeline by working collaboratively with other agencies to engage students, teachers, and faculty in NASA’s missions and unique assets.

By working together to...

**Objective 3.1:** Attract and advance a highly skilled, competent, and diverse workforce, cultivate an innovative work environment, and provide the facilities, tools, and services needed to conduct NASA’s missions.

**Objective 3.2:** Ensure the availability and continued advancement of strategic, technical, and programmatic capabilities to sustain NASA’s Mission.

**Objective 3.3:** Provide secure, effective, and affordable information technologies and services that enable NASA’s Mission.

**Objective 3.4:** Ensure effective management of NASA programs and operations to complete the mission safely and successfully.
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• Vision
  – We lead the space life and physical sciences research community to enable space exploration and benefit life on Earth

• Mission
  – Enable exploration to expand the frontiers of knowledge, capability, and opportunity in space
  – Pioneer scientific discovery in and beyond Low Earth Orbit to drive advances in science, technology, and space exploration to enhance knowledge, education, innovation, and economic vitality
Implementation: Partnerships

• Enrich content
  – Needed to Enable Exploration (Pull)
    • E.g., Advanced Exploration Systems, Space Technology Mission Directorate
  – Needed to Pioneer Scientific Discovery (Adopters)
    • E.g., CASIS, NIH, NIST, NSF, other government agencies; international partners; industry

• Facilitate execution
  – Access new platforms
  – Leverage SLPSRA resources
SUBJECT: Letter of Intent between the National Aeronautics and Space Administration and the National Institutes of Health

Dava J. Newman, Ph.D.
Deputy Administrator
National Aeronautics and Space Administration

Date

Francis S. Collins, M.D., Ph.D.
Director
National Institutes of Health

Date
Implementation: Open Science

- Tailor formulation of investigations
  - Traditional PI-led
  - Team-led
    - Co-Principal Investigator Teams
    - Science Definition Teams

- Disseminate results through databases
  - Timely data deposition
    - With space flight metadata
    - With unique analysis tools
  - Platforms
    - GeneLab
    - Physical Science Informatics
    - Life Sciences Data Archive
    - Lifetime Surveillance of Astronaut Health
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Enabling Exploration

Examples:
- Fluid Physics
- Combustion
- Human Research
- Microbiology
- Plant Science
SLPSRA in LEO and below

- Space Stations
  - International Space Station
  - International partner space station(s)
  - Commercial space station(s)

- Free Fliers
  - Other government agencies
  - Commercial
  - International partners

- Sub-orbital
  - Crewed flights
  - Sounding rockets
  - Balloons
  - Parabolic aircraft

- Ground research

Enabling Exploration

Pioneering Scientific Discovery

- Other government agencies
- Commercial
- International partners
Historical Context

• Chapter 1: Exploration (1961-1974)
  – Mercury
  – Gemini
  – Apollo
  – Skylab
  – Apollo-Soyuz Test Project

• Chapter 2: Low Earth Orbit (1981-2024(8))
  – Space Shuttle
  – International Space Station

• Chapter 3: Exploration Resumed (2018-?)
  – International Space Station
  – Commercial vehicles in LEO?
  – Commercial stations in LEO?
  – EM-1, EM-2, Cis-lunar
  – Phobos, Demo, Mars surface
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The National Academies of Sciences, Engineering and Medicine shall convene an ad hoc committee to review the progress of NASA’s Space Life and Physical Sciences Research and Application program in addressing the strategies, goals, and priorities outlined in the 2011 NRC decadal survey report, Recapturing a Future for Space Exploration, Life and Physical Sciences Research for a New Era.

1. The committee’s assessment will describe:
   a. NASA’s approach to and progress on realizing the strategies, goals, and priorities outlined in the 2011 decadal survey and other relevant Academies reports;
   b. Existing and emerging challenges to and opportunities for the implementation of decadal strategies, goals and priorities, including:
      • Plans for the International Space Station and the long-term future for research infrastructure in Low Earth Orbit (LEO)—including the provision of privately-owned and operated infrastructure;
      • Resource and program constraints,
      • The opportunities and challenges of a multi-sponsor (NASA, Center for the Advancement of Science in Space, other government agencies, commercial) science procurement approach using Reference Experiments and Open Databases; and
      • Developments in the research community and its engagement with NASA, CASIS, and other research sponsors.
c. While considering current and forecasted resources, actions that could be taken to optimize the science value of the program in the context of enabling the expansion of human exploration into deep space. In this regard:

- The committee will identify and rank from among the “highest priority recommendations” in the decadal survey a set of targeted research priorities which are critical for NASA to conduct in order to enable the expansion of human exploration into deep space.

- To the greatest extent possible, the committee will also identify the platform environment where the priority research should take place in order to be successful—such as: Earth analogs, LEO (on ISS through 2024), LEO (on other platforms), beyond Earth orbit (such as, a cis-lunar habitat).

- In identifying and ranking its targeted research priorities, the committee will consider the full set of “highest priority recommendations” in the decadal survey in conjunction with relevant exploration technology development priorities identified in the NRC report NASA Space Technology Roadmaps and Priorities: Restoring NASA's Technological Edge and Paving the Way for a New Era in Space. The committee will also consider NASA’s deep space exploration goals and priorities as presented by the agency.

- Using the remaining “highest priority recommendations,” from the decadal survey, the committee will identify where possible those that are aligned with ongoing activities in other government agencies and, where feasible, the commercial/private sector.

2. The committee will provide guidance about implementation of the recommended portfolio for the remaining years of the current decadal survey, recognizing likely resource and program constraints.
Conclusion

• SLPSRA has deployed its resources to address research and technology development identified in the Decadal Survey

• The current focus in SLPSRA is on a subset of the Decadal Survey
  – Enable exploration for customers
  – Pioneer scientific discovery for adopters

• Implementation of SLPSRA research and technology development emphasizes
  – Partnerships
  – Open Science in formulation and dissemination

• Future plans must be robust with respect to
  – changes in the post-ISS stepping stones towards Mars
  – the potential availability of a wide range of platforms
Thank You