



Introduction to NASA

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Ben Kallen

Lewis-Burke Associates LLC

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About Lewis-Burke

- Thirty policy experts with range of expertise/backgrounds allow multi-layered issue teams with deep expertise in agencies and scientific/higher education areas
- Support federal relations activities to develop and implement federal strategies to pursue, shape, and create new sources of funding to increase and diversify research portfolio
- Able to engage on multiple levels:
 - Individual faculty (including early career faculty)
 - Teams of faculty
 - Associate Deans for Research
 - Deans and Center Directors
 - University leadership and campus-wide priorities/activities

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National Aeronautics and Space Administration (NASA) Overview

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Agenda

- Overview
- Research Priorities and Opportunities
- Tips for Engagement

National Aeronautics and Space Administration (NASA)

- **Mission:** Drive advances in science, technology, aeronautics, and space exploration to enhance knowledge, education, innovation, economic vitality, and stewardship of Earth
- Five core directorates through which universities can engage:
 - Science
 - Space Technology
 - Aeronautics
 - Human Exploration
 - STEM Engagement
- Major crosscutting priorities for Administrator Jim Bridenstine include human-crewed missions to the Moon (Artemis program) and expanding/leveraging unique and untapped capabilities of external stakeholders

NASA Field Centers



- NASA comprises 10 field centers which carry out the bulk of the agency's mission development activities and operations
- Each specializes in a different mission space (e.g., GRC's strengths are in propulsion, comms., energy generation/storage, and materials)
- Collaborating with NASA centers can open new opportunities for universities and strengthen proposals
 - Direct connections to HQ
 - Technical expertise
 - Access to facilities
 - Teaming opportunities



Science Mission Directorate (SMD)

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SMD Overview

- **Mission:** SMD seeks to answer fundamental questions about the Earth, the Sun, planets, and cosmos through space-based observation of natural phenomena
- SMD contains four divisions, each focused on a different discipline:
 - Earth Science
 - Planetary Science
 - Astrophysics
 - Heliophysics
- SMD investments are guided by the National Academies' decadal surveys, which leverage input from the scientific community to develop specific scientific objectives and mission concepts for each SMD Division
- **Budget:** Currently funded at \$6.9 billion
 - Trump Administration placing emphasis on using SMD missions as pathfinders for future human exploration endeavors (e.g. robotic missions to the Moon and/or Mars laying the groundwork for eventual human-crewed missions)
 - Increased emphasis on competitively solicited, PI-led, cost-capped missions

SMD Programs

- **Research Grants** – SMD solicits proposals for individual research grants (\$100K - \$1M), multi-institutional centers (\$2-3M), and fellowships through the annual Research Opportunities in Space and Earth Science (ROSES) solicitation, which is released every February
 - Observation and data analysis
 - Mission-focused technology development
 - Modeling and simulation
- **Competed Missions:** Each Division has its own line of missions which are overseen by NASA but designed and run by the PI; missions are competed via solicitations and are cost-capped
- **Decadal Surveys** – Inform SMD priorities and mission frameworks, developed by National Academies Space Studies Board
 - Earth Science and Applications from Space (ESAS), 2017; mid-term review likely in 2022
 - Solar and Space Physics, 2013; undergoing mid-term review now
 - Visions and Voyages for Planetary Science, 2011
 - New Worlds, New Horizons, 2010; Astro2020 under way now
- **Advisory Committees** – Each Division has a dedicated Advisory Committee comprised of members of the research community who are charged with informing SMD research programs

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Sample of SMD Emerging Priorities

Lunar Science

- SMD implementing the Lunar Discovery and Exploration Program (LDEP) as part of Artemis
- LDEP request is \$300M in FY 2020, all activities housed within the Planetary Science Division
- Major elements include:
 - Commercial contracts for lunar lander services
 - Lunar science instrumentation development
 - Smallsats for science and exploration investigations

Space Weather

- SMD Heliophysics Division seen as lead organization for fundamental research relevant to space weather
- Major elements include:
 - Space weather instrumentation
 - Computational aspects of space weather
 - Research-to-operations (R2O) and operations-to-research (O2R)

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Space Technology Mission Directorate (STMD)

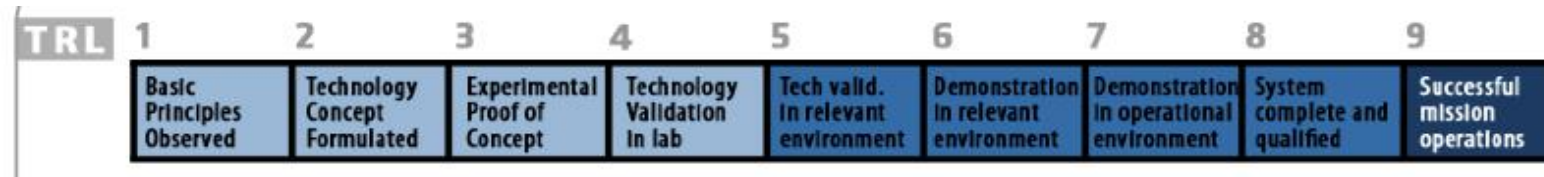
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STMD Overview

- **Mission:** Rapid maturation of crosscutting, broadly applicable technologies through partnerships with industry and academia
- Focus is on high-impact, high-risk, transformative technologies at different phases of the Technology Readiness Level (TRL) spectrum; less focused on mission-specific needs



- STMD's wide-ranging research portfolio makes it very accessible to universities—particularly engineering schools
 - Directorate is relatively new (2013), active engagement with universities
 - Capabilities-driven programs allow university participation across a broad range of tech R&D areas
- STMD investments guided by the [2020 NASA Technology Taxonomy](#), 17 different technology types (TXs)
- **Budget:** STMD currently funded at \$927M
 - Trump Administration has proposed wholesale restructuring of space tech programs to reflect renewed focus on lunar exploration; Congress has not authorized

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STMD Programs

- **NASA Innovative Advanced Concepts (NIAC)** - \$100K-\$500K per award
 - “Blue sky” ideas for new concepts or radical approaches, advance from TRL-1 to TRL-3
- **Space Technology Research Grants (STRG)** - \$74K-\$250K per award
 - Early Career Faculty (ECF) and Early Stage Innovation (ESI) encourage universities to help advance tech from TRL-1 to TRL-3
 - Graduate Student Support: NASA Space Technology Graduate Research Opportunities (NSTGRO)
- **Space Technology Research Institutes (STRI)** - \$15M per award over five-year period
 - STRIs are university-led, multi-institutional teams focused on developing technologies for addressing specific technical challenges chosen by NASA (e.g. in-space manufacturing, computational materials design, human habitation systems, etc.)
- **Game Changing Development (GCD)** - \$550K-\$2M per award
 - GCD moves technologies from TRL-3 to TRL-5/6, higher chance of competing against industry
- **Small Spacecraft Technology Program (SSTP)** - \$100K annually per award
 - Leverages university partnerships to advance Smallsat/CubeSat capabilities relevant to other NASA missions from TRL-3 to TRL-7
- **Flight Opportunities** - \$300K-\$500K
 - Offers flights to test new space technologies in relevant environments

All STMD funding opportunities except NSTGRO are released as appendices to the annual Space Technology Research, Development, Demonstration, and Infusion (SpaceTech-REDDI) solicitation, which is released every October

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Aeronautics Research Mission Directorate (ARMD)

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ARMD Overview

- **Mission:** ARMD fosters development of cutting-edge aircraft technology and conducts and supports research on integration of new technologies into the National Air System (NAS)
- Since 2015, structured along [strategic vision](#) aimed at providing flexibility required to respond to evolving air transportation system
 - **Thrust 1:** Assured Autonomy for Aviation Transformation
 - **Thrust 2:** Innovation in Commercial Supersonic Aircraft
 - **Thrust 3:** Ultra-efficient Commercial Vehicles
 - **Thrust 4:** Transition to Low-carbon Propulsion
 - **Thrust 5:** Real-time System Safety Assurance
 - **Thrust 6:** Safe, Efficient Growth in Global Operations
- **Budget:** Currently funded at \$725M, with specific priorities including integration of unmanned aerial systems (UAS) into NAS, fundamental hypersonics, and advanced materials

ARMD Programs

- Research investments are guided by the Flight Vehicle Systems and Air Traffic Management TXs
- Research supported through four research programs, though the most accessible is the **Transformative Aeronautics Concepts Program (TACP)**, which supports multidisciplinary research to develop groundbreaking aeronautical concepts
 - **University Leadership Initiative (ULI)** – Supports universities or university-led teams conducting research to overcome specific technical challenges while contributing to workforce development; technical challenges are associated with the six strategic thrusts
 - Currently solicited once every two years, but ARMD would like to accelerate to annual
- All ARMD funding opportunities are released as appendices to the annual Research Opportunities in Aeronautics (ROA) solicitation, which is usually released in the spring

Urban Air Mobility (UAM) Initiative

- UAM is ARMD's initiative to develop an urban-based air transportation system that safely and efficiently integrates everything from autonomous delivery drones to passenger air taxis into the urban airspace
- Interest driven by:
 - Growing complexity of smart infrastructure
 - Advances in autonomy and vertical takeoff and landing (VTOL)
 - Increasing popularity of on-demand ride services
- Initial activities associated with UAM limited to partnerships with industry (Uber), but now permeating early-stage research agenda
 - Recent ULI solicitation included topics in materials and structures for next-gen aerospace systems with relevance to UAM.



Additional Opportunities

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Human Research Program (HRP)

- **Mission:** Housed within the Human Exploration and Operations Mission Directorate (HEOMD), HRP supports research to mitigate risks to astronaut health, safety, and performance
- Five main elements: Space Radiation; Human Health Countermeasures; Exploration Medical Capability; Human Factors and Behavioral Performance; and Research Operations and Integration
- Foundational documents that proposers should review:
 - [Program Requirements Document](#) - High-level requirements in three cross-cutting categories: human system standards; human health and performance risks; and provisions of enabling capabilities
 - [Integrated Research Plan](#) – Series of roadmaps that establish research priorities in 34 specific topic areas; identifies gaps
- HRP proposals solicited through the Human Exploration Research Opportunities (HERO) NRA, which is released in July
 - Includes individual funding opportunities for specific HRP research topics
 - Awards range between \$100K and \$1M depending on the comprehensiveness of the proposed research objectives
- **Budget:** Currently funded at \$140M
- Most of HRP research is housed in or directed from Johnson Spaceflight Center in Houston

STEM Engagement

- **Mission:** NASA's Office of STEM Engagement provides educational experiences for K-12 and college students through hands-on programming such as space launch activities
- National Space Grant College and Fellowship Program (Space Grant) is the primary mechanisms within STEM Engagement for universities
 - Fellowships and scholarships for students in STEM programs, as well as curriculum enhancement and faculty development
 - Each state (plus DC and Puerto Rico) operates a Space Grant Consortium, with each administering its own funding programs for students and faculty
 - [Ohio Space Grant Consortium \(OSGC\)](#) is HQ'd at Ohio Northern University and includes 24 universities/colleges, NASA-GRC, and AFRL among other outreach partners
 - OSGC has specific goals that interested proposers should keep in mind when developing applications
 - NASA considering rebalancing funding within Space Grant to more closely align funding with needs of the other mission directorates
- **Budget:** STEM Engagement funded at \$110M currently, including \$44M for Space Grant



Engagement with NASA

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Serve on Proposal Review Panels

- NASA uses peer review panels to assess the merit of proposals
- These are conducted through in-person meetings as well as mail-in reviews
- Participation in panels allow researchers to:
 - Demonstrate interest in the research topic and/or program
 - Meet directly with NASA program managers and officials
 - Showcase ability to meet deadlines and honor commitments
 - Gain first-hand intel on what makes for a successful proposal and what does not
- More information can be found at the following websites:
 - [Science Mission Directorate](#)
 - [NSPIRES registration page](#)

Review Strategic Documents

- [2020 NASA Technology Taxonomy](#)
- Decadal Surveys
 - [Earth Science and Applications from Space](#)
 - [Planetary Science](#)
 - [Astronomy and Astrophysics](#)
 - [Solar and Space Physics](#)
- [Aeronautics Strategic Implementation Plan](#)
- [Human Research Roadmap](#)

Respond to RFIs

- NASA uses Requests for Information (RFIs) to solicit community feedback on planned funding opportunities
- Respond in order to:
 - Demonstrate interest in the research topic and/or program
 - Get your name out there
 - Influence the ultimate scope and focus of future funding solicitations
- Examples:
 - Space Technology Research Institutes
 - DRIVE Science Centers

Glenn Research Center

- Primary Roles

- Aeronautics: ultra-efficient propulsion; alternative power and propulsion, including electric; emissions; propulsion modeling/simulation; hypersonics modeling/simulation
- Human Exploration: in-situ resource utilization; in-space power and propulsion
- Space Technology: power systems and tech, including nuclear and specialized energy storage; electric propulsion; cryogenic; management of STRG program

- Supporting Roles

- Aeronautics: advanced operational concepts; airspace operations; ultra-efficient vehicle systems integration
- Human Exploration: exercise countermeasures; fire/particle monitoring
- Space Technology: chemical propulsion; advanced RF comms

Questions?

ben@lewis-burke.com

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Backup Slides

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Current NASA Funding and Outlook

- NASA has consistently received annual funding increases in recent years – **currently funded at \$21.5 billion**
- Largest increases have been for the **Science Mission Directorate (SMD)**, **Space Technology Mission Directorate (STMD)** and the **Human Exploration and Operations Directorate (HEOMD)**
- NASA enjoys broad bipartisan support, but Congress and the Administration have diverged on funding levels in several key areas
 - **Earth Science:** Administration would significantly cut funding to the Earth Science Division by ending support for several large missions under development
 - **Space Technology:** Administration has sought to restructure space technology portfolio and reorient all programs toward human exploration
 - **STEM Engagement:** Current and previous Administration have repeatedly proposed eliminating the Office of STEM Engagement
- Bipartisan support for these and other areas is expected to be continued.

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Future Funding Outlook

- Trump Administration released its FY 2021 R&D priorities memo, which outlines areas that will be heavily emphasized in the FY 2021 budget request, due to be released in early 2020
- Space-related science and technology areas mentioned include:
 - In-situ resource utilization
 - Cryogenic fuel storage and management
 - In-space manufacturing and assembly
 - Advanced space power and propulsion
 - Infrastructure resilience
 - Earth system predictability
- The Administration views most of these capabilities as critical to achieving its goal of landing humans on the Moon by 2024 and enabling a subsequent mission to Mars
- Infrastructure resilience and Earth system predictability are more relevant to national and economic security concerns, but NASA still has a major role in both

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Competitive SMD Mission Opportunities

- Each Division has its own line of missions which are overseen by NASA but designed and run by the PI; missions are competed via solicitations and are cost-capped
 - Earth Science Venture Class
 - Planetary Science Discovery and New Frontiers
 - Explorer programs in Astrophysics and Heliophysics
- Notional schedule for FY 2020 and 20201 Announcements of Opportunity, contingent on funding:
 - ROSES-2020, February 2020
 - Earth Ventures Mission, Q1 FY 2020 (Oct-Dec 2019)
 - Earth Venture Instrument, Q3 FY 2020
 - Small Innovative Missions for Planetary Exploration (SIMPLEx), Q4 FY 2020
 - ROSES-2021, February FY 2021
 - Astrophysics Explorer, Q3 FY 2021
 - Heliophysics Explorer, Q4 FY 2021
 - Earth Ventures Suborbital, Q4 FY 2021

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