National Aeronautics and
Space Administration

INSPIRE - ENGAGE - EDUCATE - EMPLOY

The Next Generation of Explorers

NASA Advisory Council STEM Engagement Committee

Aimee Kennedy, Chair

NASA's Office of STEM Engagement Update

Mike Kincaid

Associate Administrator for STEM Engagement

Dec. 4, 2018

NASA Advisory Council
STEM Engagement Committee Inaugural Meeting

Current Team:

Aimee Kennedy
Senior Vice President, Education STEM & Philanthropy
Battelle Memorial Institute

Michael Lach
Director, STEM Policy & Strategic Initiatives
University of Chicago

Ray Mellado
Founder & Chairman
Great Minds in STEM

Carl Person
Undergraduate Research Preceptor
Fayetteville State University

New Members:

Cristin Dorgelo
President & CEO
Association of Science-Technology Centers

Daniel Dumbacher
Executive Director
American Institute of Aeronautics & Astronautics

Norman Fortenberry
Executive Director
American Society for Engineering Education

Darryl Williams
Senior Vice President of Science and Education
The Franklin Institute

NASA's Office of STEM Engagement

Committee meeting 12.4.18: visit from Administrator Bridenstine

STEM Engagement Transformation
FY18 Accomplishments

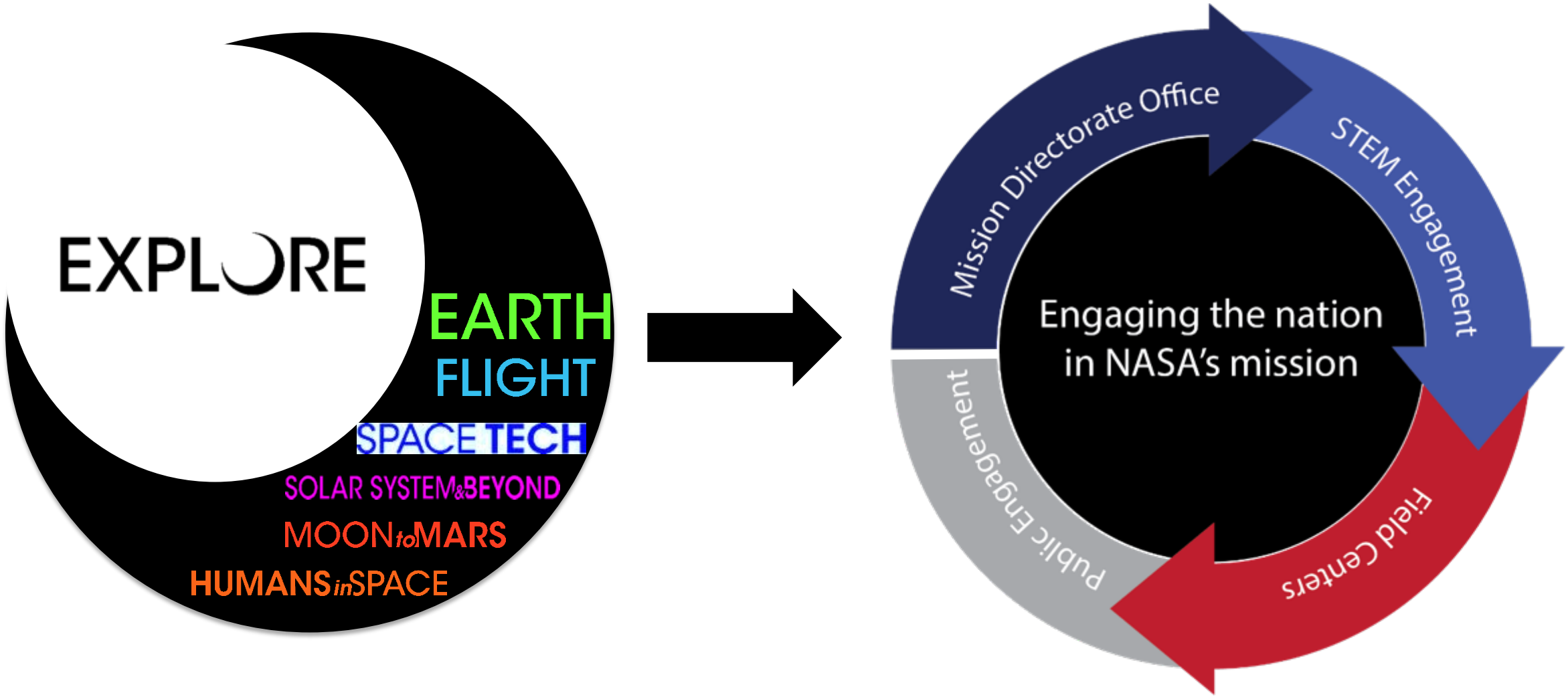
Systemic	Programmatic
✓Chartered and established STEM Engagement Council. (03/30/18) Convened inaugural session of the Council. (04/12/18) ✓Completed development of new STEM Engagement NASA Policy Directive. (02/21/18) Will undergo formal agency process. (Sep-Oct 2018) ✓Established new Office of STEM Engagement. (effective 08/29/18) ✓Completed definition of new performance measurement and assessment approach. (07/15/18) ✓Conducted analysis of existing infrastructure, tools & systems. (03/15/18) ✓Developed NASA Strategy for STEM Engagement. (Council approval 08/22/18) ✓Streamlined and improved agency websites, platforms and social media tools. ✓Developed and deployed a new NASA Internships and Fellowships website for students.	✓Put in place an integrated program management approach for EPSCoR, MUREP and Space Grant, with corresponding staff changes. ✓Overhauled SEAP, incorporating significant changes to approach for awards to informal education institutions (TEAM II) and innovative new mission-driven pilot initiatives. ✓Achieved improvements in interfaces and relationships with Space Grant Consortia and their key stakeholders. ✓Streamlined MUREP with more focused, strategic award initiatives. ✓Incorporated more rigorous, systematic program and fiscal management practices.

NASA's Office of STEM Engagement

Committee meeting 12.4.18

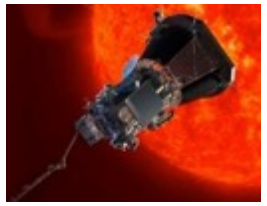
- Two Recommendations
- One Finding
- One Observation

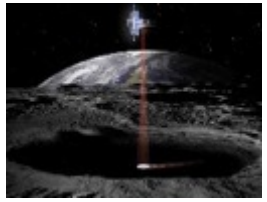
MISSION-DRIVEN STRATEGIC ENGAGEMENT



New Architecture Enabling Student Opportunities & Contributions

NASA Mission Directorate Drivers & Requirements


Focus Areas

Evidence-based strategies

Rigorous planning

Integrated operational model

Create unique opportunities for students to contribute to NASA's work.

Build a diverse future STEM workforce by engaging students in authentic learning experiences.

Strengthening public understanding by enabling powerful connections to NASA's mission and work.

Strategic, balanced portfolio

NASA-unique learning experiences

Student contributions to NASA's work in action

Scalability to magnify NASA's reach and impact

Beneficiaries of NASA's STEM Engagement Portfolio

K-Elementary School

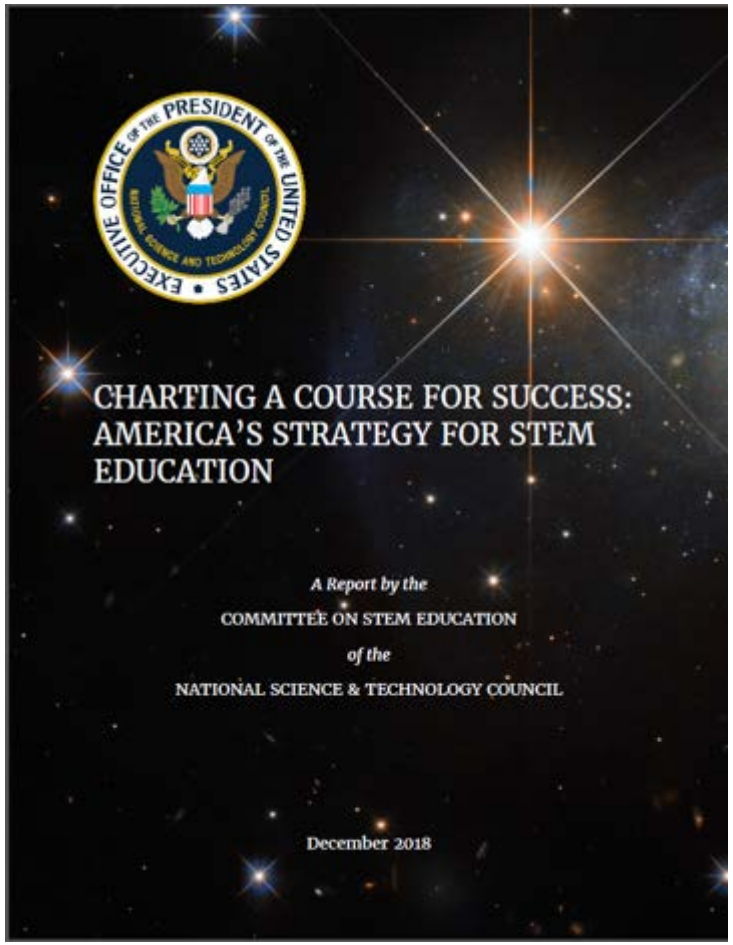
Middle School

High School

Undergraduate

Graduate

FEDERAL STEM EDUCATION 5-YEAR STRATEGIC PLAN



Purpose:

Coordinate federal STEM education strategy and investment, and serve as a 'North Star' to guide state and local STEM education initiatives

Opportunity for Agency Input:

- FC-STEM Agency Meetings: August, September and October
- Co-STEM Meeting: Thursday, November 15th
- FC-STEM Meeting: Friday, November 16th
- Agencies/OMB Review: November 2018
- Roll-out of Strategic Plan: December 4

RECOMMENDATION #1

Short Title of Recommendation: Federal STEM Plan

Recommendation: We recommend that NASA fully engage in its responsibilities outlined in the Federal STEM plan.

Major Reasons for the Recommendation: As a result of their work, NASA has a unique opportunity to inspire the country, and to broaden participation in the future STEM workforce. The agency has extensive involvement in leadership of the plan. Administrator Bridenstine co-chairs CO-STEM, and Associate Administrator Kincaid co-chairs FC-STEM. As a federal agency, NASA is required to participate in the STEM plan, and NASA agreed to be a contributor for three of the nine objectives in the Plan.

Consequences of No Action on the Recommendation:
Not only would NASA be out of compliance, but more importantly, the opportunity to inspire and catalyze the country around the exciting work of the Agency would be wasted.

FEDERAL STEM EDUCATION 5-YEAR STRATEGIC PLAN

GOALS FOR AMERICAN STEM EDUCATION

★ Build Strong Foundations for STEM Literacy ★

★ Increase Diversity, Equity, and Inclusion in STEM ★

★ Prepare the STEM Workforce for the Future ★

Pathways	Objectives	DOC	DoD	DOE	DHS	DOI	DOL	DOS	DOT	ED	EPA	HHS	NASA	NSF	SI	USDA
Develop and Enrich Strategic Partnerships	Foster STEM Ecosystems that Unite Communities	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	Increase Work-Based Learning and Training through Educator-Employer Partnerships	•	•	•	•	•	•			•	•	•	•	•	•	•
	Blend Successful Practices from Across the Learning Landscape	•	•	•	•		•	•		•	•			•	•	•
Engage Students where Disciplines Converge	Advance Innovation and Entrepreneurship Education	•	•	•				•		•	•	•		•		•
	Make Mathematics a Magnet	•	•							•				•		•
	Encourage Transdisciplinary Learning	•	•	•	•	•		•		•	•	•	•	•	•	•
Build Computational Literacy	Promote Digital Literacy and Cyber Safety	•	•		•			•		•		•		•		•
	Make Computational Thinking An Integral Element of All Education	•	•	•	•	•				•		•		•	•	•
	Expand Digital Platforms for Teaching and Learning	•		•	•			•		•				•	•	•

NASA:

- Foster STEM Ecosystems that Unite Communities
- Increase Work-Based Learning and Training through Educator-Employer Partnerships
- Encourage Transdisciplinary Learning

FINDING #1

Finding:
The Office of STEM Engagement is taking steps to identify and amplify NASA's unique achievements.

Major Reasons for the Finding:

- SpaceSTEM forum
- Website redesign
- Aligning with and co-funding STEM activities with STMD
- Consolidation of program management of MUREP, EpsCor, and Space Grant for the express purpose of increasing knowledge sharing across the programs.
- Integration of STEM engagement activities across the three programs above—and NextGen STEM

Space STEM Forum:

NASA HQ – September 19, 2018

Theme:

Small Steps to Giant Leaps, Looking Forward to the Future of Space Exploration

Purpose:

Identify opportunities to collaborate and leverage individual STEM engagement activities and efforts with industry and professional organizations commemorating Apollo's 50th

Abstracts:

Approximately 28 abstracts were selected, 17 involving national efforts and 11 involving resources and capabilities

Website:

Collaborative work website and public website has been created to facilitate implementation of outcomes https://spacestem.nasa.gov/

SPACE STEM FORUM

INSPIRE - ENGAGE - EDUCATE - EMPLOY
The Next Generation of Explorers

SPACE STEM FORUM-THEMATIC CONCEPT

Exciting events of July 16-24, 1969 are viewed, re-enacted and celebrated 50 years later, including when man first stepped foot on the moon on July 20.

Exhibits and activities for students “looking forward” highlight plans allowing the return humans to the moon, establish a lunar gateway and have humans land on Mars for the first time.

SPACE STEM FORUM-PARTNERS AND WORK SCHEDULE

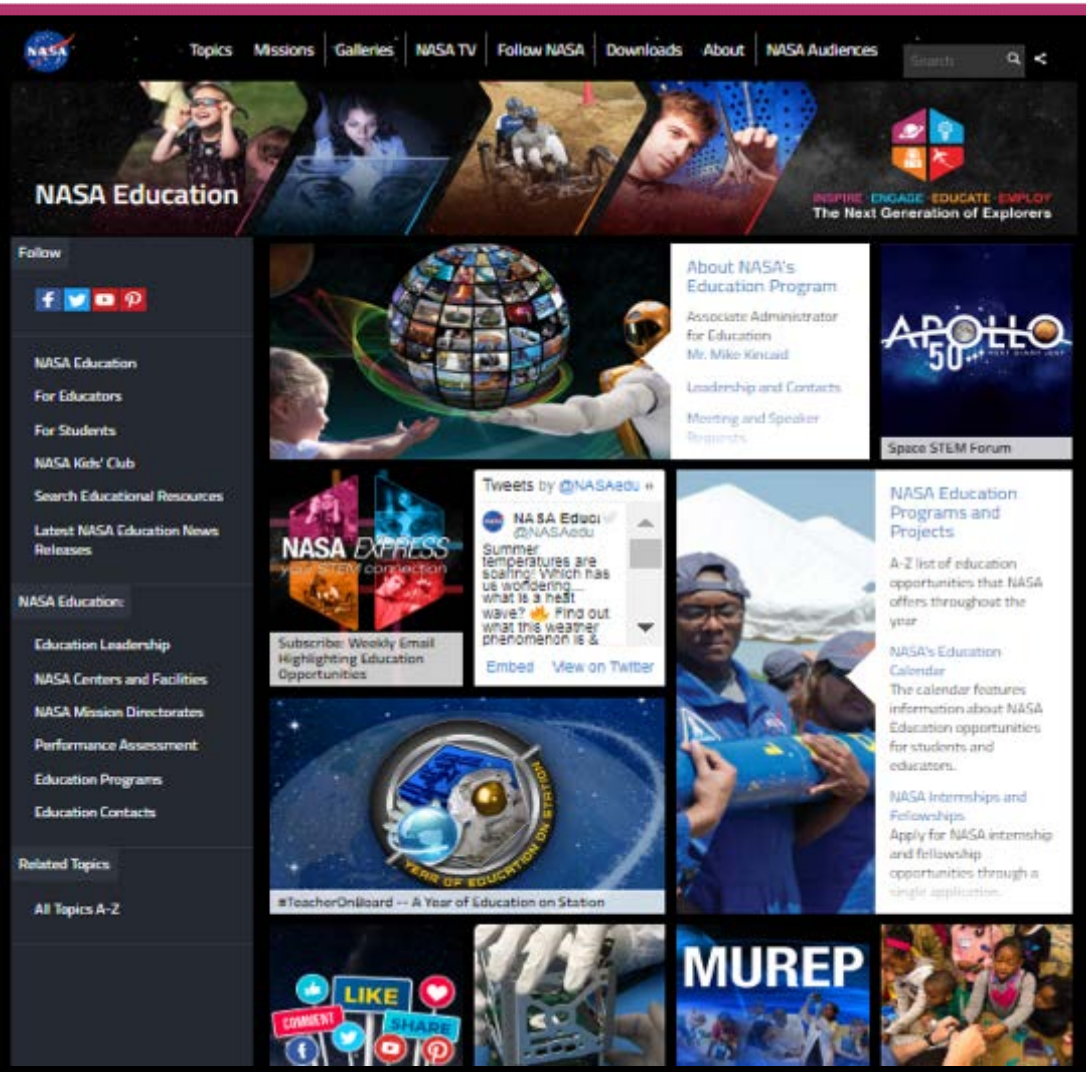
Organizations

ASTC
Arizona State University
Challenger Center
Children's Museum of Indianapolis
Columbia Memorial Science Center
Conrad Foundation
Cosmosphere
Discovery Center, Bridgeport
Lunar and Planetary Institute
Museum of Flight, Seattle
Museum of Science, Boston
National Air and Space Museum
National Park Service
Orlando Science Center
Saint Louis Science Center
Space Foundation
U. S. Space and Rocket Center
ScienCenter

Schedule

Bi-weekly meetings through December
Monthly/as needed in New Year
Plan to roll out initiative in winter 2019

UPCOMING OSTEM WEBSITE UPDATES



Provides users direct access to the search tool. The collection of educational resources will include opportunities (timely events).

New keyword autocomplete functionality (suggested results).

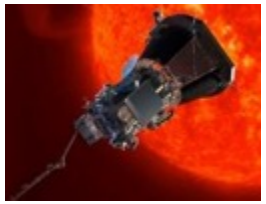
Drop down menu introduces a broad range of topics or categories based on audience.

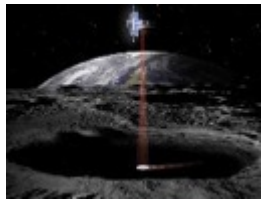
Slider to highlight key events and/or activities. Can be self-guided or auto-rotate.

Slider/scroll (arrows) to highlight major content areas/groupings. Will need to determine maximum number to show for each (4+)

Mission-Driven Programs Enabling STEM Engagement

NASA's Thematic Areas


SPACE GRANT
- National network of 52 Consortia with 850 Affiliate members
- Stimulates cooperative programs among universities, industry, federal/state/local governments
- Encourages interdisciplinary education and research programs
- Incorporates State priorities, needs, and goals

EPSCoR
- 27 eligible jurisdictions (States and Territories)
- Contributes to development of research infrastructure and capabilities
- Fosters partnerships between NASA research entities, industry, and academic institutions
- Incorporates state priorities, needs, and goals

MUREP
- Limited to Minority-Serving Institutions
- Increases retention of underserved and underrepresented groups in STEM
- Enhances infrastructure at MSI institutions
- Portfolio with 7 funded elements

Next Gen STEM
- Informal education and K-12 STEM engagement initiatives aligned to mission priorities
- Richer, more comprehensive STEM engagement opportunities
- NASA's museum alliance

Aligned program management

STEM Engagement Beneficiaries

K-Elementary School

Middle School

High School

Undergraduate

Graduate


NEXTGEN STEM CHANGES INITIATED IN FY2018

- ✓ Revamped approach for Informal Solicitation
  - ✓ Focus on two **Agency themes**
  - ✓ Required involvement of affiliate networks of partners to expand reach

- ✓ Initiated proof-of-concept pilot activities
  - ✓ Focus on two themes above plus an additional **Agency theme**
  - ✓ Aligned to evidence-based education strategies
  - ✓ Work assigned based on Center skills and capabilities

- ✓ Sunsetting SEAP activities no longer in alignment with new approach to STEM Engagement
  - ✓ Insuring systematic process to capture performance, key accomplishments, and findings

THEMES

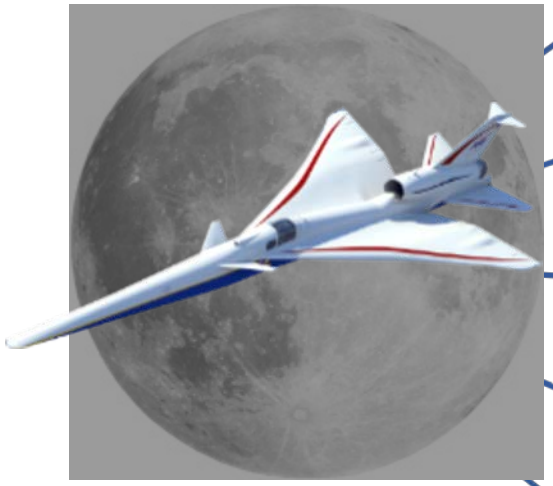
- Small Steps to Giant Leaps: Looking to the Future of NASA Aeronautics Innovation
- Moon to Mars: Human Exploration Beyond Low Earth Orbit
- Development of Commercial Crew Program Capabilities

NextGen STEM Pilot Activity 1

Small Steps to Giant Leaps:

A focus on the Future of NASA Aeronautics Innovation

Quiet Supersonic Flight– X-59 QueSST



- **Sustained STEM Engagement Experiences**
  - Citizen Science Challenge
- **Supporting STEM Engagement Activities**
  - Student Activities
  - Virtual Connections
  - Student Digital Badges
- **Professional Development Modules**
  - F2F EPD
  - SME SATERN Course
  - EPDC Webinars
  - Digital Badging
- **Digital Media Development**
  - Social Media Posts
  - Educational Videos
- **Culminating Events**
  - Galveston, TX "Booming"
  - Citizen Science Showcase

Lead Center: Armstrong

Teaming Centers: Glenn, Langley

NextGen STEM Pilot Activity 2

Developing Commercial Crew Program Capabilities

A Focus on Human Spaceflight to Space Station with our Commercial Partners

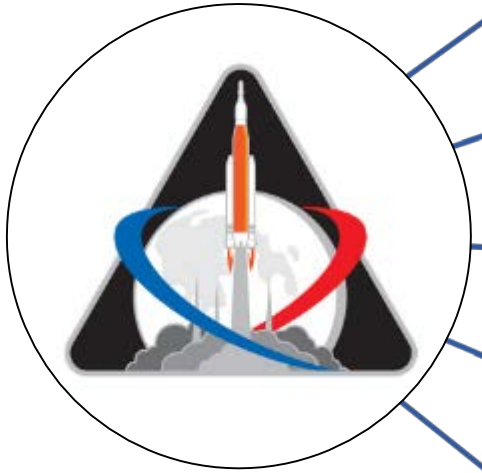
Lead Center: Kennedy
Teaming Centers: Johnson, Langley

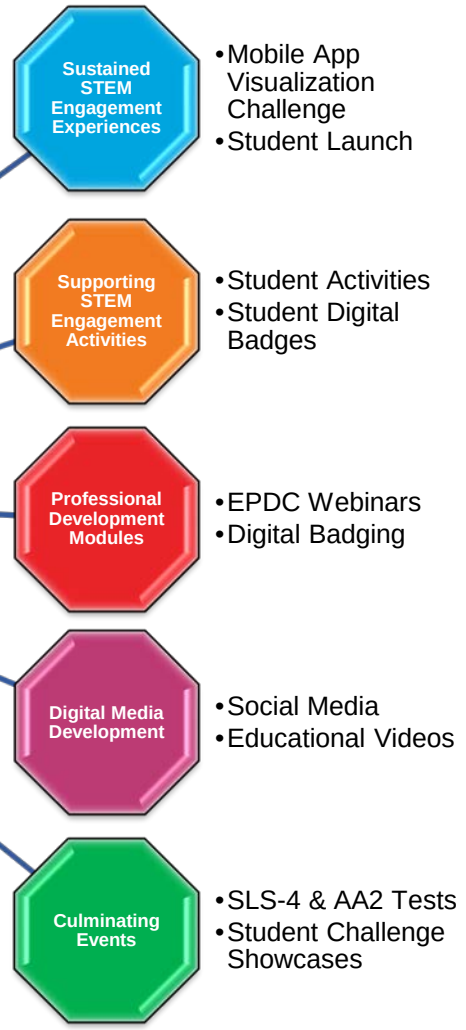
- **Sustained STEM Engagement Experiences**
  - Engineering Design Challenges
  - Coding Opportunity
- **Supporting STEM Engagement Activities**
  - New and refreshed STEM content for K-12
  - Incorporates reading and writing
  - Student Digital Badges
- **Professional Development Modules**
  - Teachers guides
  - Virtual and experiential opportunities
  - EPDC Webinars
  - Digital Badging
- **Digital Media Development**
  - CCP App
  - New VR content
  - Virtual field trips with access to NASA and partner facilities
- **Culminating Events**
  - 2019 Crew Launches

NextGen STEM Pilot Activity 3

Moon to Mars:

A Focus on Transportation Systems for Moon to Mars Missions





Lead Center: Johnson
Teaming Centers: Marshall, Stennis, Langley

RECOMMENDATION #2

Short Title of Recommendation: Spark that leads to Engagement

Recommendation: The Office of STEM Engagement should create a deep and comprehensive document that describes what we know about spark, STEM engagement, and motivation, and use it to create the foundational evidence for the Office.

Major Reasons for the Recommendation: NASA is uniquely positioned to inspire and motivate the country with their work. As good stewards of a limited budget, NASA strives to maximize its investments. If NASA could better understand spark, STEM engagement, and motivation, it could be more effective—basing investment decisions on evidence of what works. The Committee feels there is sufficient ambiguity in the field about spark, STEM engagement, and motivation that the Agency should invest in a deeper review of the evidence-based strategies and practices that promote spark, STEM engagement, and motivation.

Consequences of No Action on the Recommendation: Lack of action on this recommendation relegates NASA to using secondary indicators of effectiveness, and could lead to less effective investment decisions. NASA will have limited impact, will be at risk of duplication of ineffective activities.

National Aeronautics and
Space Administration

INSPIRE - ENGAGE - EDUCATE - EMPLOY

The Next Generation of Explorers

NASA Advisory Council STEM Engagement Committee

OBSERVATION

Observation: The budget and statute that governs the Office of STEM Engagement appears to limit their ability to nationally scale their programs and outreach. The majority of the budget allocated to the Office of STEM Engagement is partitioned to specific categories of institutions and programs. The committee plans to learn more about the current efforts of Office to achieve national scale, and recognizes that understanding evidence-based practices for sparking STEM engagement and motivation is a critical first step in the discussion around scale.

Questions, Feedback and Input from Council Members

National Aeronautics and
Space Administration

INSPIRE - ENGAGE - EDUCATE - EMPLOY

The Next Generation of Explorers

THANK YOU!