



# INSPIRE - ENGAGE - EDUCATE - EMPLOY

## The Next Generation of Explorers



## NASA ADVISORY COUNCIL STEM ENGAGEMENT COMMITTEE

### Aimee Kennedy, Chair

MIKE KINCAID

# 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



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# STEM ENGAGEMENT TRANSFORMATION

## FY18 ACCOMPLISHMENTS

Systemic	Programmatic
<ul style="list-style-type: none"> <li>✓ Chartered and established STEM Engagement Council. (03/30/18) Convened inaugural session of the Council. (04/12/18)</li> <li>✓ Completed development of new STEM Engagement NASA Policy Directive. (02/21/18) Will undergo formal agency process. (Sep-Oct 2018)</li> <li>✓ Established new Office of STEM Engagement. (effective 08/29/18)</li> <li>✓ Completed definition of new performance measurement and assessment approach. (07/15/18)</li> <li>✓ Conducted analysis of existing infrastructure, tools &amp; systems. (03/15/18)</li> <li>✓ Developed NASA Strategy for STEM Engagement. (Council approval 08/22/18)</li> <li>✓ Streamlined and improved agency websites, platforms and social media tools.</li> <li>✓ Developed and deployed a new NASA Internships and Fellowships website for students.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Put in place an integrated program management approach for EPSCoR, MUREP and Space Grant, with corresponding staff changes.</li> <li>✓ Overhauled SEAP, incorporating significant changes to approach for awards to informal education institutions (TEAM II) and innovative new mission-driven pilot initiatives.</li> <li>✓ Achieved improvements in interfaces and relationships with Space Grant Consortia and their key stakeholders.</li> <li>✓ Streamlined MUREP with more focused, strategic award initiatives.</li> <li>✓ Incorporated more rigorous, systematic program and fiscal management practices.</li> </ul>



# NASA's OFFICE OF STEM ENGAGEMENT

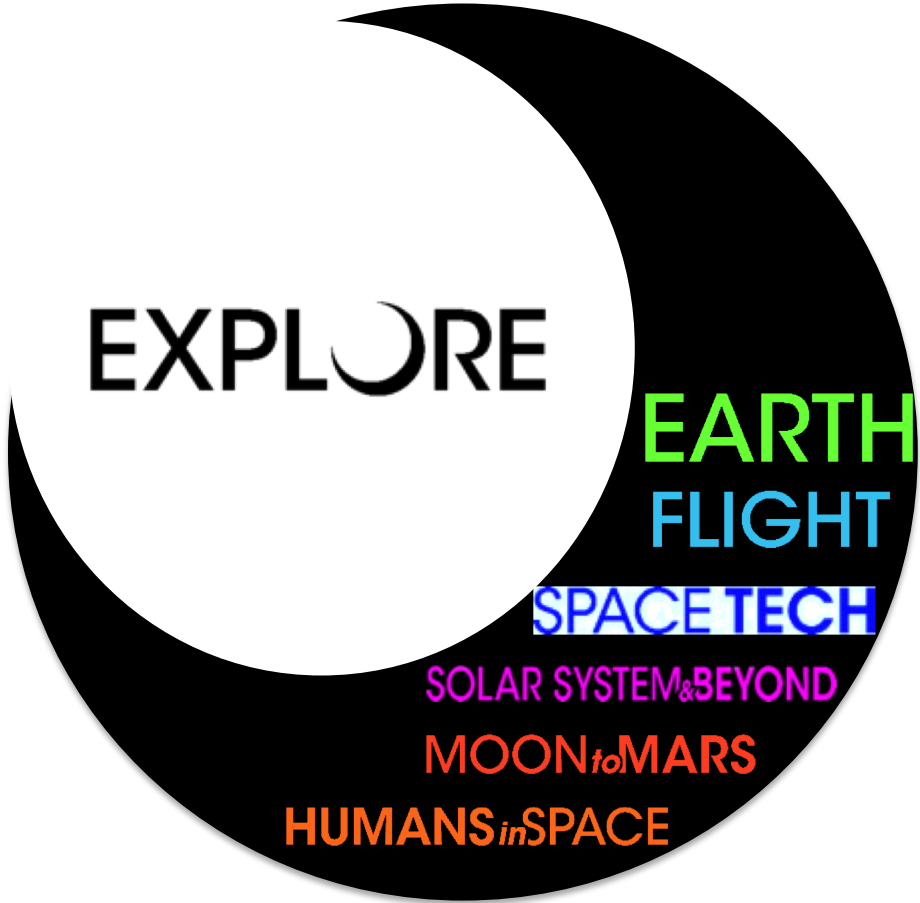
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## Committee meeting 12.4.18

- Two Recommendations
- One Finding
- One Observation



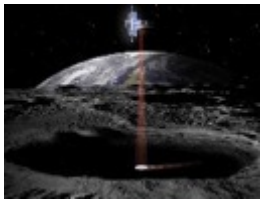
# MISSION-DRIVEN STRATEGIC ENGAGEMENT



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# 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

K-Elementary School



Middle School



High School



Undergraduate

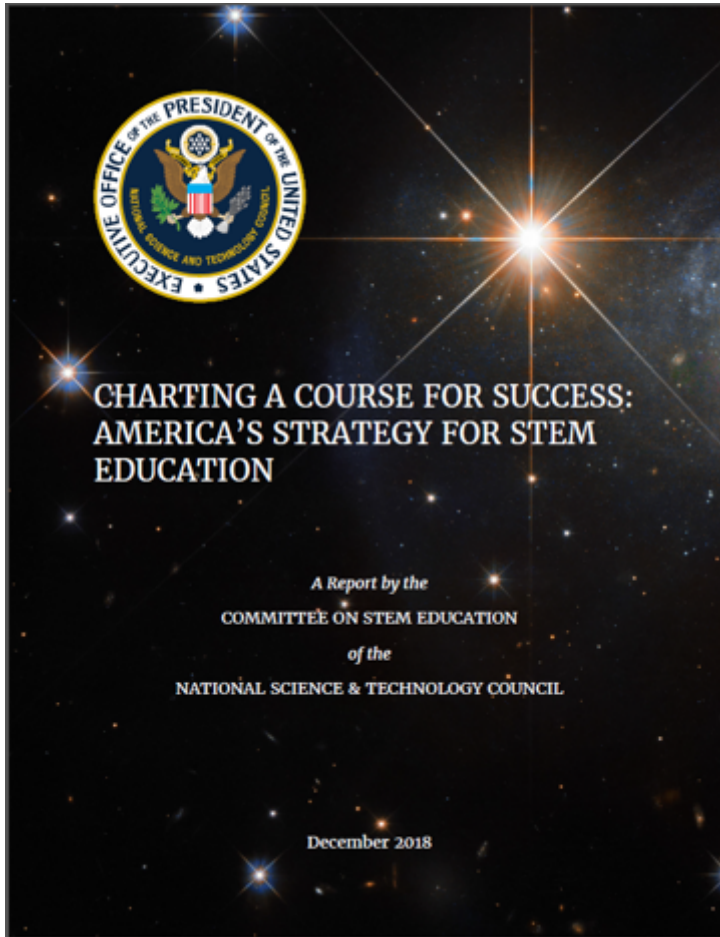


Graduate



## BENEFICIARIES OF NASA'S STEM ENGAGEMENT PORTFOLIO

# 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 15<sup>th</sup>
- \* FC-STEM Meeting: Friday, November 16<sup>th</sup>
- \* 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 50<sup>th</sup>

## **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



**Space STEM Forum**

Home  
Program Information  
Small Steps to Giant Leaps  
Events and Exhibits  
STEM Engagement  
NASA Home  
Museum Alliance

**Space STEM Forum Launches Collaboration**  
Leading organizations met in the fall of 2018 to initiate plans for collaborative STEM engagement activities in celebration of the 50th anniversary of the Apollo 11 lunar landing, and the future of NASA exploration. Stay tuned to this site!

**PROGRAM INFORMATION**  
Get to know the Space STEM Forum, and how to use its resources to enhance student understanding and engagement.

**SMALL STEPS TO GIANT LEAPS**  
Look forward to the future of space exploration through these educational initiatives.

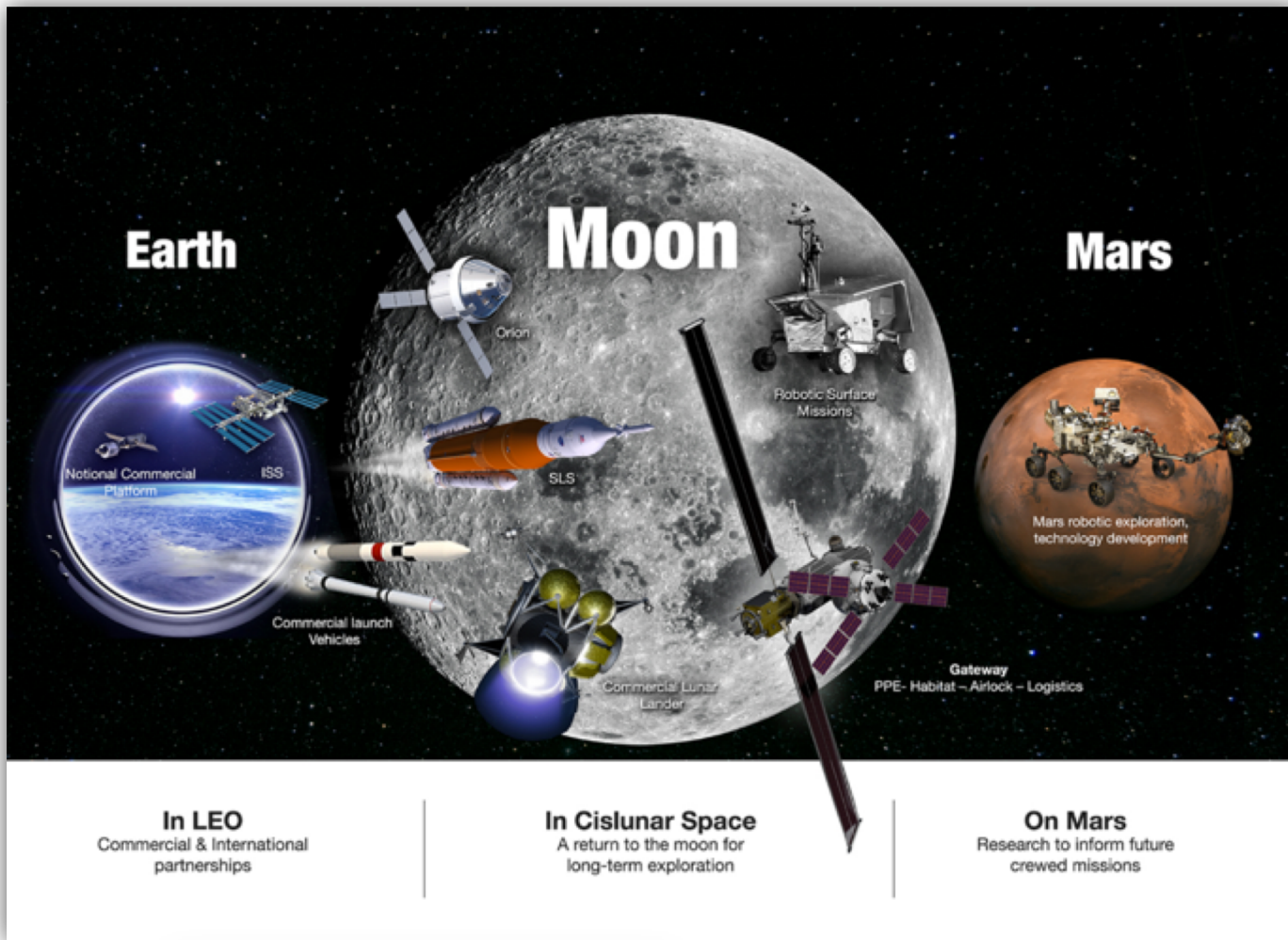
**MAP OF EVENTS AND EXHIBITS**  
Nationwide opportunities to learn about Moon missions - past, present and future!

**STEM ENGAGEMENT**  
Explore STEM engagement and education materials for learners of all ages.



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# 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.



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# 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

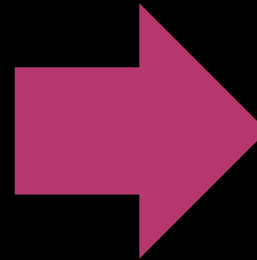
Orlando Science Center  
Saint Louis Science Center  
Space Foundation  
U. S. Space and Rocket Center  
ScienCenter

## Schedule

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

# UPCOMING OSTEM WEBSITE UPDATES

The current website layout features a top navigation bar with links for Topics, Missions, Galleries, NASA TV, Follow NASA, Downloads, About, and NASA Audiences. Below this is a hero banner with the NASA Education logo and the tagline "INSPIRE ENGAGE EDUCATE EMPLOY The Next Generation of Explorers". A left sidebar contains navigation options like "Follow", "NASA Education", "For Educators", "For Students", and "NASA Kids' Club". The main content area is divided into several sections: "About NASA's Education Program" with an image of an astronaut, "APOLLO 50th" anniversary banner, "NASA Education Programs and Projects" with a list of opportunities, "NASA Education Calendar", "NASA Internships and Fellowships", and a "Tweets by @NASAedu" section. A "#TeacherOnBoard" banner is also present.



The updated website layout features a top navigation bar similar to the current version. Below is a hero banner with the NASA Education logo and tagline. A prominent search bar is titled "Search Educational Resources and Opportunities" with filters for "Educators" and "Students". Below the search bar is a "#TeacherOnBoard" banner with a detailed description of the initiative. The main content area is titled "Explore NASA Education Websites" and is organized into three horizontal rows: "For Educators" (with categories for Grades K-4, 5-8, 9-12, and Higher Education), "For Students" (with categories for Grades K-4, 5-8, 9-12, and Higher Education), and "About STEM Engagement" (with categories for Partnerships & Collaboration, Leadership, Locations, and Latest News Releases).



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Provides users direct access to the search tool. The collection of educational resources will include opportunities (timely events).  
**New** keyword autocomplete functionality (suggested results).

### Search Educational Resources and Opportunities

By topics for: **Educators** ▼ or **Students** ▼

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

### #TeacherOnBoard

#### A Year of Education on Station

This year, NASA is celebrating a Year of Education on the Station as astronauts and former teachers **Jane Aizawa** and **Ricky Arnold** make the International Space Station their home. While on board, they share their love of STEM and their passion for teaching.

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

### Explore NASA Education Websites

#### For Educators

- Grades K-4
- Grades 5-8
- Grades 9-12
- Higher Education

#### For Students

- Grades K-4
- Grades 5-8
- Grades 9-12
- Higher Education

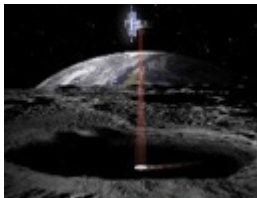
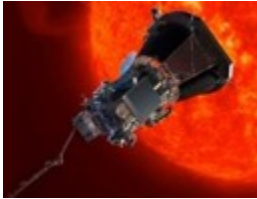
#### About STEM Engagement

- Partnerships & Collaboration
- Leadership
- Locations
- Latest News Releases

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

Graduate Middle School K-Elementary School High School Undergraduate



## STEM ENGAGEMENT BENEFICIARIES

# 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

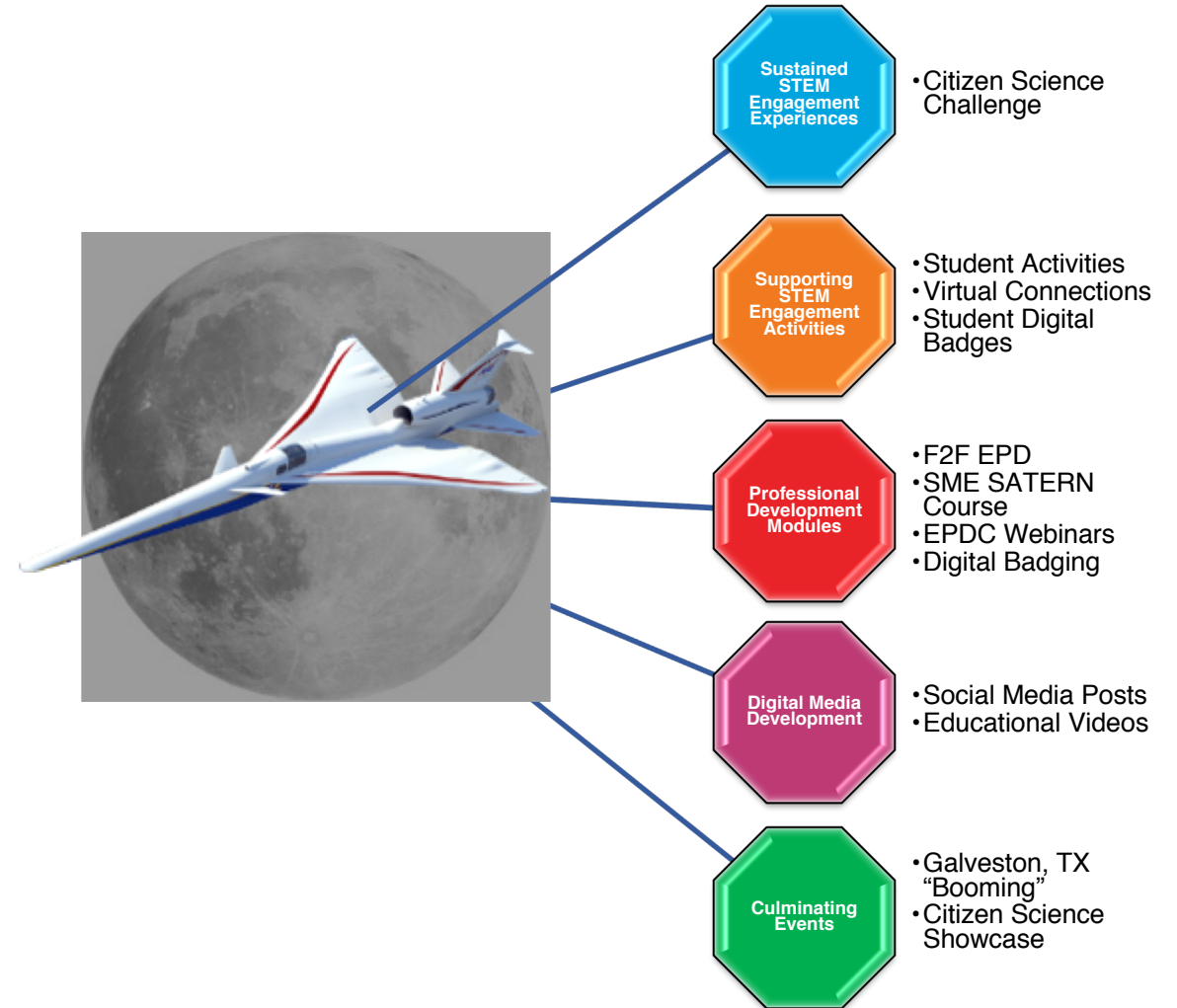


# NEXTGEN STEM PILOT ACTIVITY 1

## Small Steps to Giant Leaps:

A focus on the Future of NASA  
Aeronautics Innovation  
*Quiet Supersonic Flight– X-59*  
*QueSST*

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

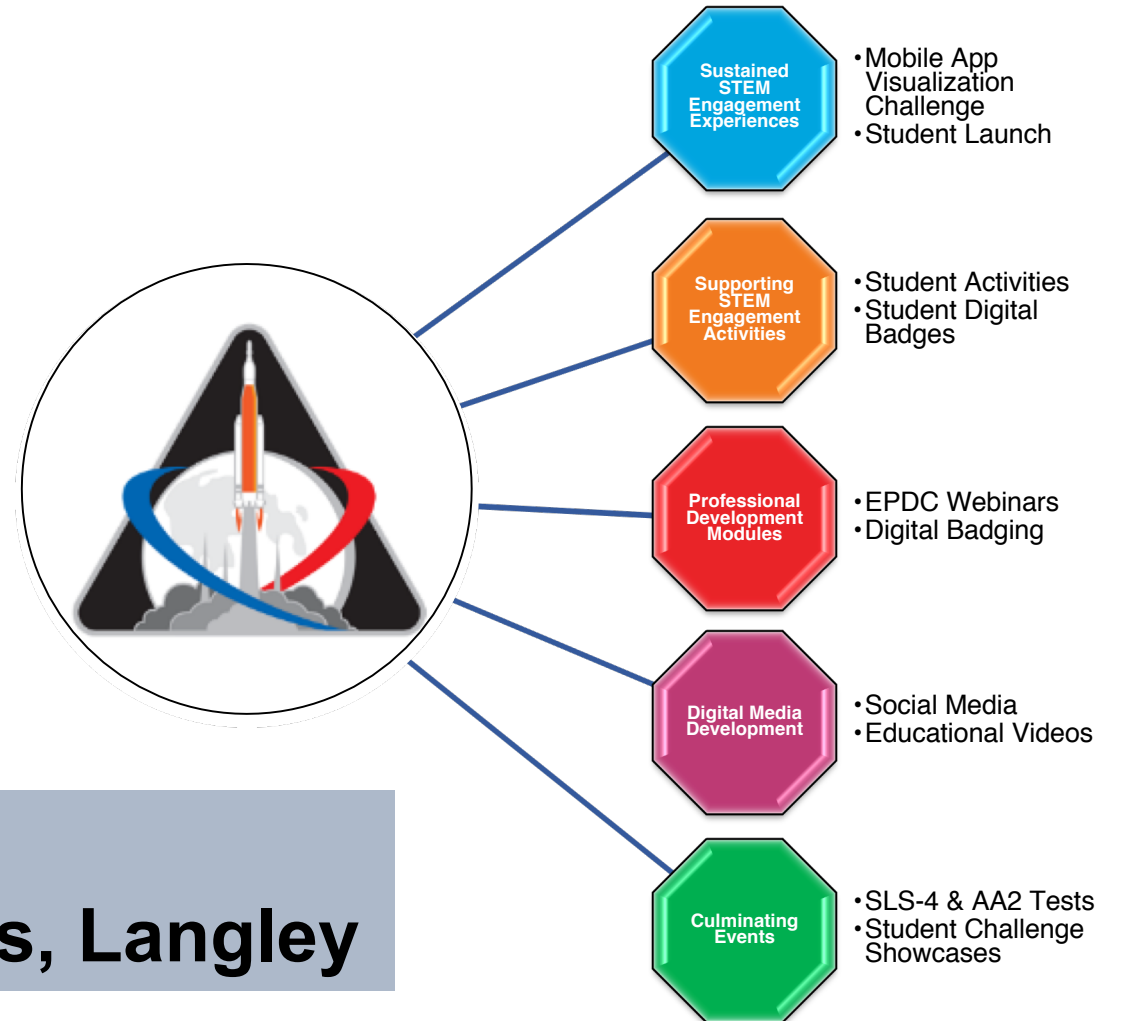
Culminating Events

- 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**



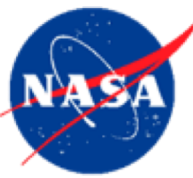
# RECOMMENDATION #2

**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.



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**NASA ADVISORY COUNCIL STEM ENGAGEMENT COMMITTEE**



# OBSERVATION

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**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.

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# Questions, Feedback and Input from Council Members



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# THANK YOU!