

NASA Sustainable Aviation Workforce Discussion

David Berger
STEM Engagement Embed to Aeronautics
08/17/2023

NASA STEM ENGAGEMENT



VISION

We immerse students in NASA's work, enhance STEM literacy, and inspire the next generation to explore.

MISSION

We engage students in NASA's mission

Strategic Goals



Create **unique opportunities** for a diverse set of students to contribute to NASA's work in exploration and discovery.



Build a **diverse future STEM workforce** by engaging students in authentic learning **experiences** with NASA's people, content and facilities.



Attract **diverse groups of students to STEM** through learning opportunities that **spark interest** and **provide connections** to NASA's mission and work.

STEM ENGAGEMENT ARCHITECTURE

ENABLING STUDENT OPPORTUNITIES & CONTRIBUTIONS

NASA MISSION DIRECTORATE
DRIVERS & REQUIREMENTS

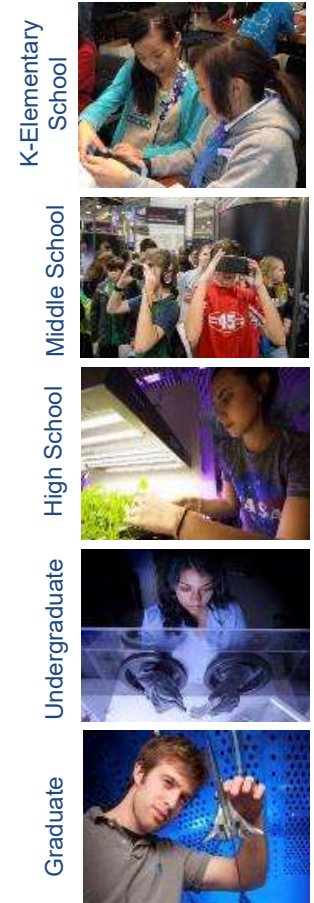


STRATEGIC GOALS

- Create unique opportunities for students to contribute to NASA's work.
- Build a diverse future STEM workforce by engaging students in authentic learning experiences.
- Strengthen understanding by enabling powerful connections to NASA's mission and work.



SCALABILITY TO MAGNIFY NASA'S REACH AND IMPACT

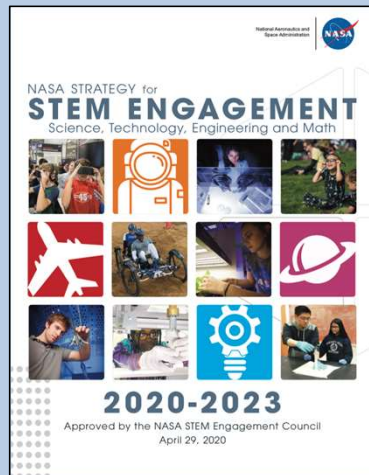


BENEFICIARIES OF NASA'S
STEM ENGAGEMENT PORTFOLIO

NASA STEM ENGAGEMENT STRATEGY AND DIRECTION



NASA Strategic Objective 4.3
Build the next generation of explorers.
Engage students to build a diverse future STEM workforce.



NASA STEM Engagement Goals:

1. Create unique opportunities for a diverse set of students to contribute to NASA's work in exploration and discovery.
2. Build a diverse future STEM workforce by engaging students in authentic learning experiences with NASA's people, content, and facilities.
3. Attract diverse groups of students to STEM through learning opportunities that spark interest and provide connections to NASA's mission and work.

Focus Areas:

- **Broaden student participation** to increase diversity, equity, and inclusion in STEM through NASA opportunities and activities.
- **Build strategic partnerships and networks**, expanding NASA's STEM ecosystem to magnify reach and impact.
- **Expand NASA contributions in engaging K-12 students** in STEM pathways.

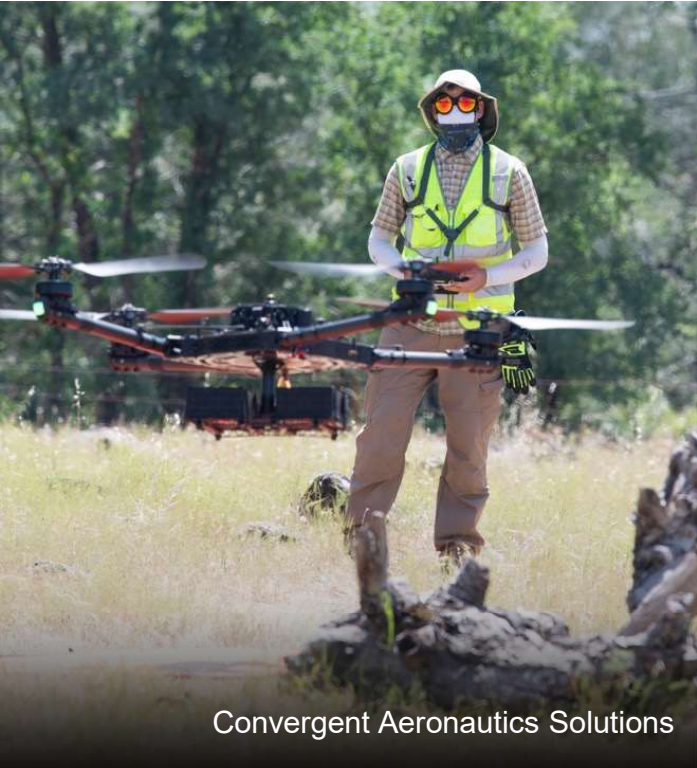
EFFORTS TO BROADEN STUDENT PARTICIPATION



Where Are We Headed?

- Reexamining existing efforts
- Reevaluating **target goals** and developing a **formalized feedback process**
- Integrating DEIA requirements language in solicitations and contract awards
- FY 22 **performance assessment** and **evaluation studies**
- **Expanding partnerships** with other federal agencies (NSF, DoD, ED, NOAA)
- Strategically **leveraging partners, networks and influencers** to expand reach to underrepresented/underserved students

ARMD's Agile Innovation Ecosystem



NASA Leadership for the Aviation Community –
Exploration, Invention, and Innovation

NASA Aeronautics STEM Goals (K-12, Post-secondary)



Engage, Inform, Inspire



K-12 Learning Resources



NASA Aero Interns

Aero Challenges



University Leadership Initiative

University Student Research Competition

- Engage external communities to build relationships that can support STEM opportunities linked to NASA Aero research milestones
- Create timely and engaging activities connected with NASA Aero milestones that help youth discover and experience real-life applications of STEM skills
- Identify and execute opportunities to expand the applicant/award pool for NASA solicitations
- Offer youth (e.g., interns, grantees who've engaged with NASA Aero in a significant way) the option to stay connected to the NASA Aero family

University Leadership Initiative (ULI) Engaging the University Community

6 rounds of solicitations
\$178M of awards

Seeking and awarding proposals
addressing all strategic thrusts
and special topics

- 23 teams awarded to date
- 80 universities including 11 Historically Black Colleges and Universities / 16 other Minority Serving Institutions
- 507 proposals submitted
- 377 different proposing Principal Investigators
- 4,023 total team members
- 20–50 students per team

In ULI, the universities take the lead, build their own teams, and set their own research paths.



Net-Zero Aviation Emissions Innovation

Foster radical aviation technology advancement – new energy sources, aircraft architectures – necessary for large aircraft with extremely low or zero emissions

Low Technology Readiness Level concepts can be further conceptualized, researched, developed, ground and flight-tested and advanced for late 2030s / early 2040s

Recent University Leadership Initiative awards included teams working on net-zero emissions topics

Research currently underway at low Technology Readiness Levels



NASA Distributed Propulsion Concept

- Turbo-Electric with superconducting electric drivetrain
- Over 70% reduction in energy use



University of Illinois, Urbana-Champaign (NASA ULI) All-electric Concept

- Hydrogen fuel cell, superconducting electric drivetrain
- Zero carbon emissions

Tennessee Technological University

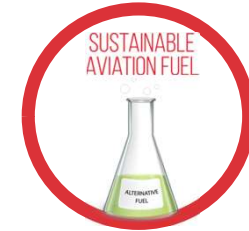
- Electrified aircraft
- Ammonia-based integrated propulsion, power, and thermal management system

Sustainable Flight National Partnership (SFNP) Workforce Development

Goal: Identify and retain top talent for Team USA's pursuit of ***Aviation Sustainability*** and goal of net-zero carbon emissions by **2050**

Who?

- "Sustainability" Intern Ambassadors – undergraduates
- "Sustainability" Scholars – graduate students
- "Sustainability" Fellows - mid-career professionals



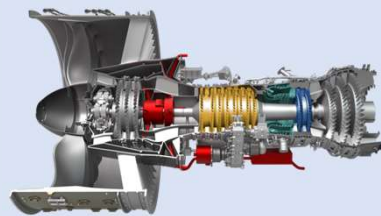
Where? NASA's Aeronautics Research Centers: Ames, Armstrong, Glenn, and Langley

When? Summer 2023 Pilot, 15 ambassador and scholar interns

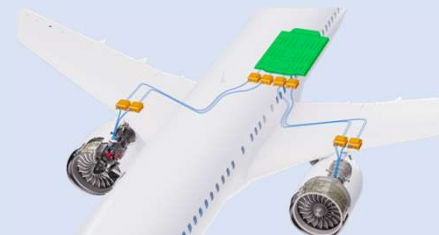
Subsonic Transport Technologies in development with NASA and partners



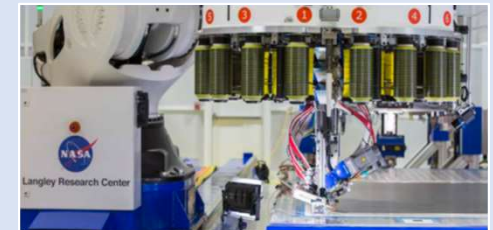
Transonic Truss-Braced Wing
5-10% fuel burn benefit



Small Core Gas Turbine
5-10% fuel burn benefit



Electrified Aircraft Propulsion ~5%
fuel burn and maintenance benefit



High-Rate Composite Manufacturing
4-6x manufacturing rate increase

Investment in innovation and workforce today paves the way to a net-zero carbon and beyond aviation future.

Space Workforce 2030

- **Space Workforce 2030** is a collective effort that demonstrates the power of collaboration industry efforts
- Long-term commitment to improving diversity in our workforce and holding ourselves accountable for measurable results
- Pledge:
 - <https://swf2030.org/read-the-pledge/>



Looking Forward

- Increased focus on Skilled Technical Workforce (STW), traditionally NASA has focused on science and engineering workforce
- Dual priorities of both NASA's near-term workforce needs and national demand
- Amplify impact through increased use of partnerships
- In order to meet future needs we must broaden participation. Not only traditional DEIA areas, but also expand engagement and institutional capacity in more diverse set of institutions, academic disciplines, regions throughout the country