National Aeronautics and Space Administration

NASA Aeronautics Research

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NASA STEM Engagement Embed to Aeronautics
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4/25/2023
www.nasa.gov

NASA Aeronautics is One of Five Mission Directorates

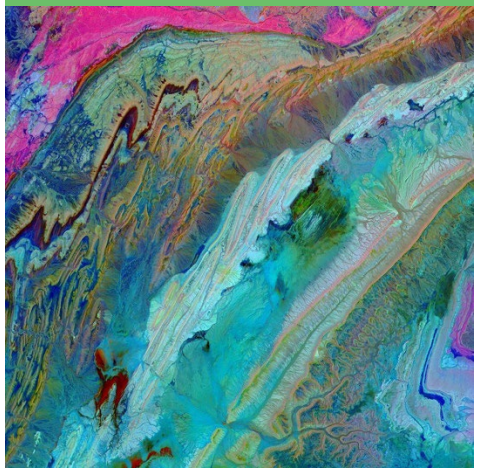
Aeronautics

NASA explores technologies that reduce aircraft noise and fuel use, get you gate-to-gate safely and on time, and transform aviation into an economic engine at all altitudes.

Space Technology

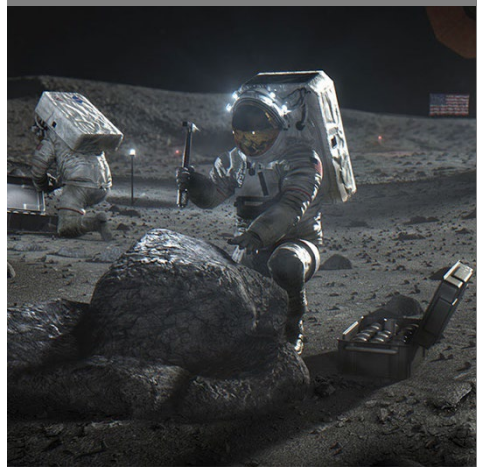
NASA technologies developed for spaceflight benefit our everyday life. The Artemis program proves and matures what those technologies can do and reduces risk for exploration of Mars and beyond.

Science

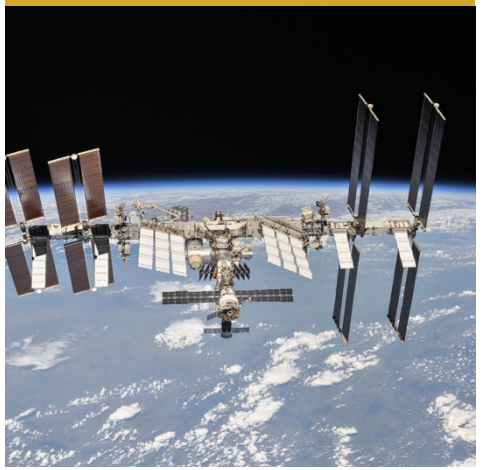


NASA and the nation's science community use space observatories conduct scientific studies of the Earth from space to visit and return samples from other bodies in the solar system, and to peer out into our galaxy and beyond.

Exploration Systems Development



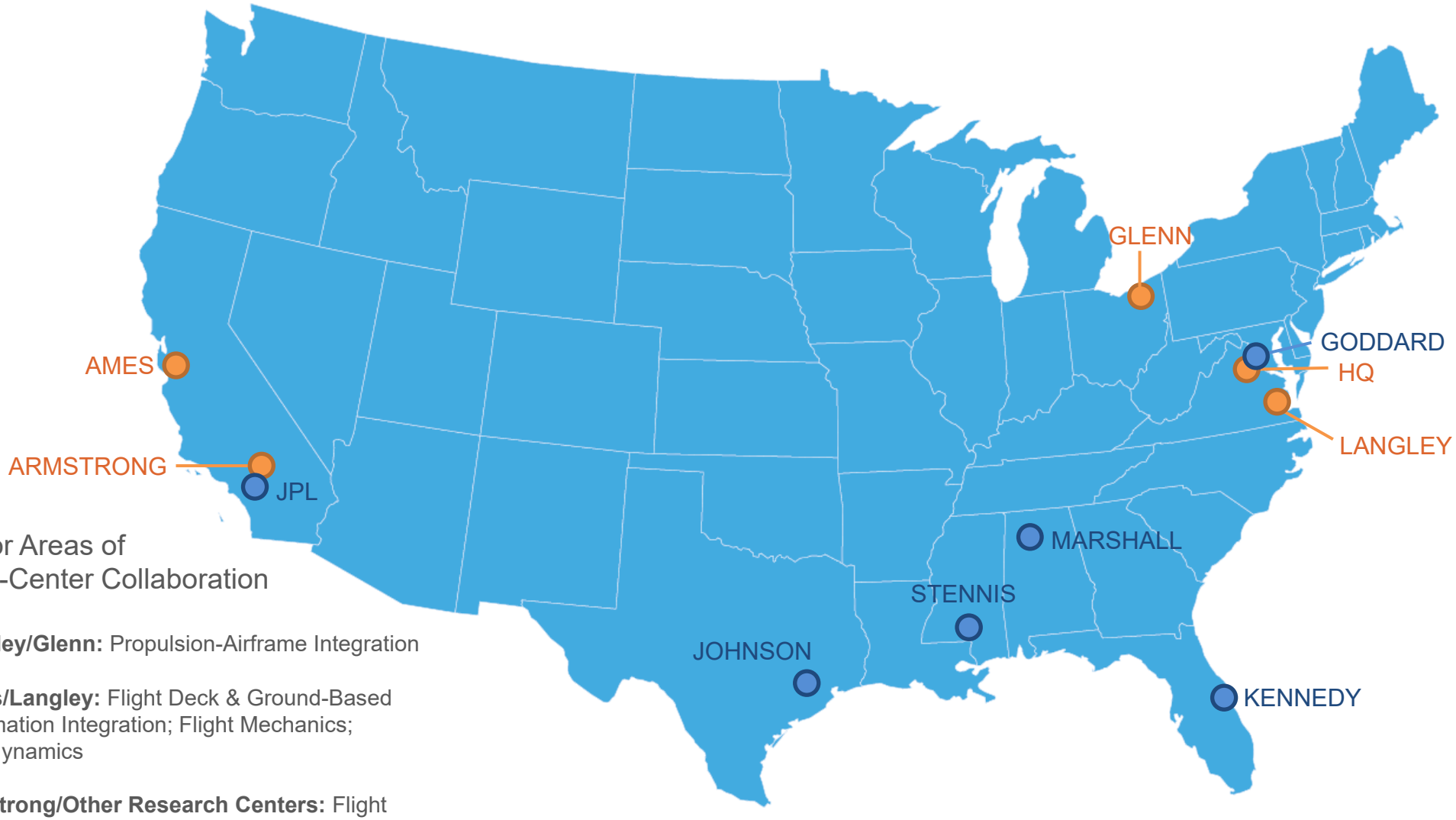
NASA's Artemis program is defining and creating the steps path from Earth back to the Moon and on to Mars, including the Orion capsule, the Space Launch System, Exploration Ground Systems, the Gateway, and Human Landing System.



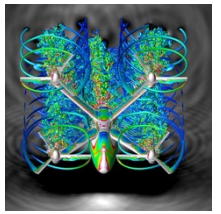
NASA's work in beyond low-Earth orbit includes commercial launch services to the International Space Station, exploration systems, space transportation systems, and broad scientific research on orbit.

Where Does NASA Aeronautics Research Happen?

Aeronautics research takes place at four of NASA's centers.



AMES



ATM Research and Technology & Integration

ARMSTRONG

Flight Research

GLENN

Propulsion Research and Technology

LANGLEY

Vehicle Research and Technology

Major Areas of Inter-Center Collaboration

Langley/Glenn: Propulsion-Airframe Integration

Ames/Langley: Flight Deck & Ground-Based Automation Integration; Flight Mechanics; Aerodynamics

Armstrong/Other Research Centers: Flight Experiment Integration

Aviation is Vital to our Nation's Economy

Pre-COVID

- $78 billion positive trade balance; the largest positive trade balance of any U.S. manufacturing sector
- $1.8 trillion total U.S. economic activity
- 10.9 million direct/indirect jobs
- 21.3 billion tons of freight transported by U.S. airlines in 2019

NASA Aeronautics – Vision for Aviation in the 21st Century

ARMD continues to evolve and execute the Aeronautics Strategy *https://www.nasa.gov/aeroresearch/strategy*

6 Strategic Thrusts

- Safe, Efficient Growth in Global Operations
- Safe, Quiet, and Affordable Vertical Lift Air Vehicles
- Innovation in Commercial Supersonic Aircraft
- In-Time System-Wide Safety Assurance
- Ultra-Efficient Subsonic Transports
- Assured Autonomy for Aviation Transformation

U.S. leadership for a new era of flight

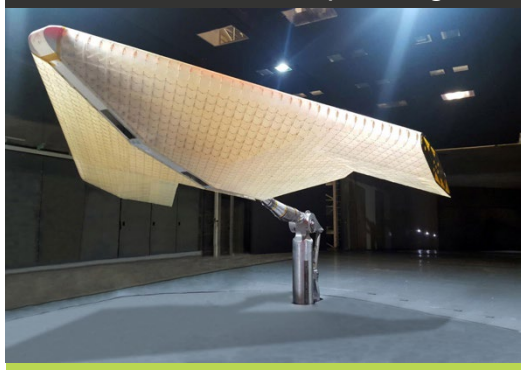
ARMD PROGRAMS

Airspace Operations and Safety Program

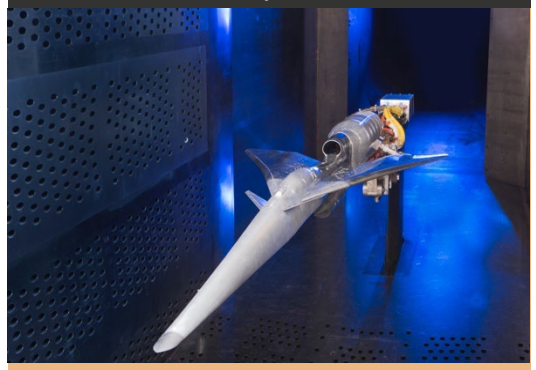
Advanced Air Vehicles Program

Integrated Aviation Systems Program

Transformative Aeronautics Concepts Program



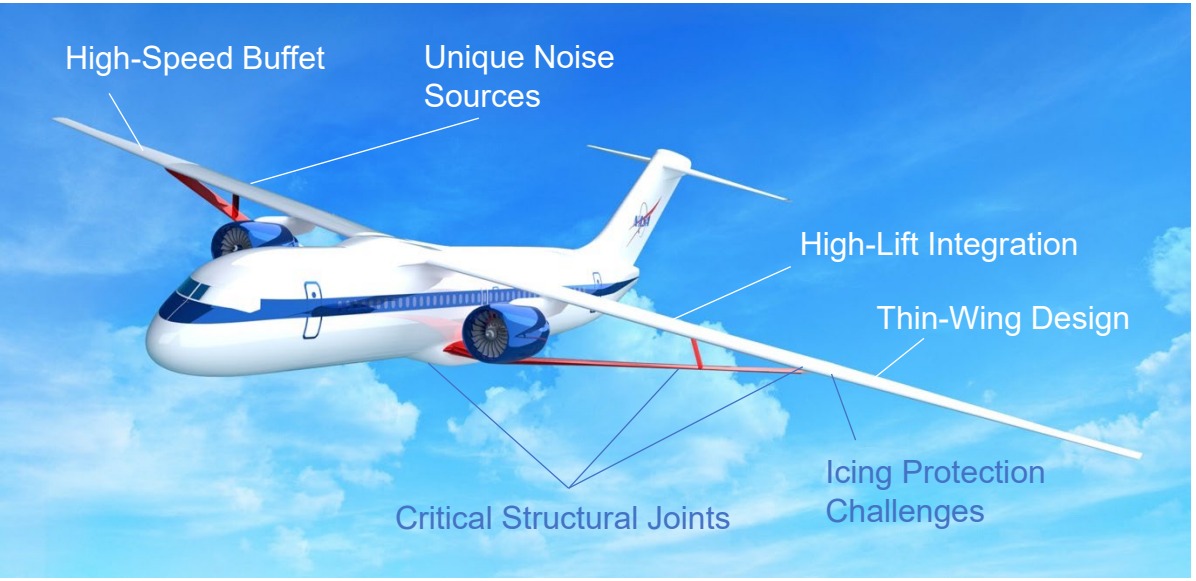
Aerosciences Evaluation and Test Capabilities Portfolio



Four Transformations for Sustainability, Greater Mobility, and Economic Growth

Transonic Truss-Braced Wing Technology Maturation

Increase confidence in technology to be robustly integrated in the aircraft system



Scope

- Mature and reduce risk of Transonic Truss-Braced Wing (TTBW) technology, focused on:
  - Buffet boundary prediction
  - Stall characteristics
  - High-lift system integration
  - Acoustic assessment
  - Icing impact
  - Thin wing structural design
  - Unique structural joints

Benefit

- Achieve 5-10% reduction in fuel burn through reduced drag

Approach

- Concept studies through scale model testing
- Perform high-fidelity prediction, testing and validation to increase confidence in fuel burn benefit

Design/analysis studies and wind-tunnel tests are underway.
Completed high-speed buffet wind-tunnel test in FY22.

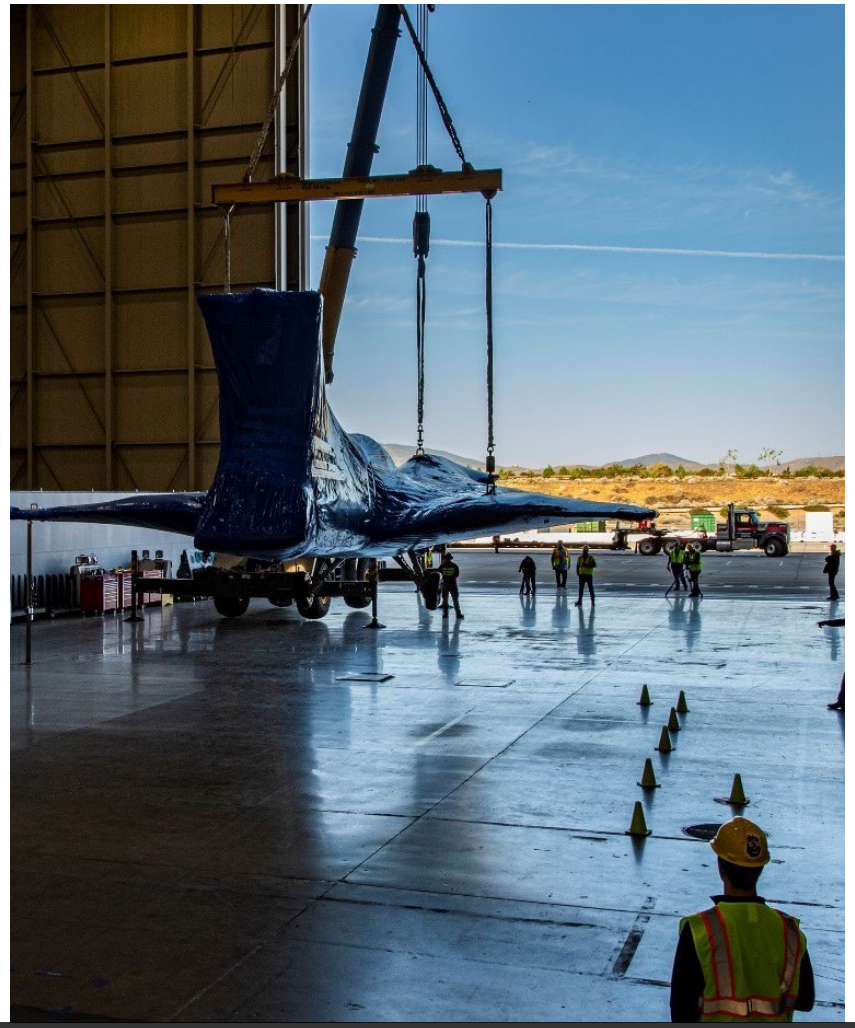
High-Speed Commercial Flight

Sustainable transformation of the speed of air travel

Addressing the unique barriers to sustainable, environmentally responsible high-speed flight

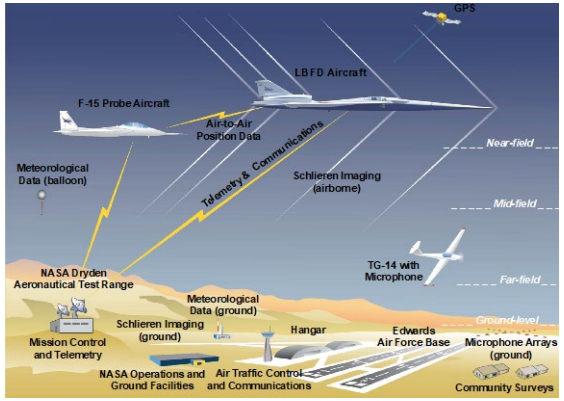
The Quesst Mission generates key data to support development of en route certification standards based on acceptable sound levels

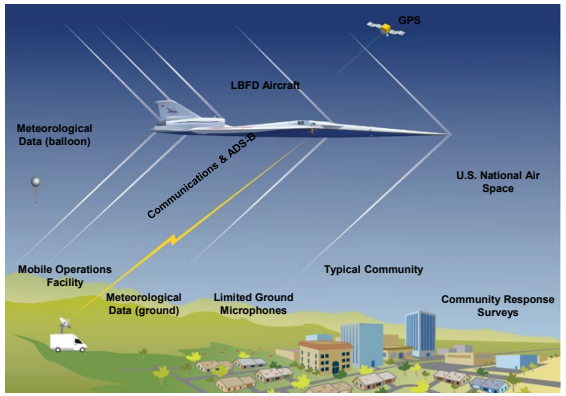
X-59 Construction and Testing



X-59 Nearing Completion
Achieve First Flight in 2023

Quesst Mission Overview





QUESST

Phase 1 – Aircraft Development

In progress (FY18-23)

- Design, fabricate a quiet supersonic research aircraft
- Prove performance in test range flights
- Prove safety for flights in normal airspace

Phase 2 – Acoustic Validation

Preparation in progress (FY18-23), Execution FY23-24

- Prove the acoustic characteristics match design targets
- Detailed in-flight and ground measurements in test range

Phase 3 – Community Response Testing

Preparation in progress (FY19-23), Execution FY24-27

- Conduct community tests
  - Select communities
  - Outreach and engagement (including STEM)
  - Obtain necessary approval
  - Plan surveys and recruit participants
  - Collect ground measurements

Systematic Approach Leading to Community Testing

Quesst Community Response Testing: Space Grant Opportunity

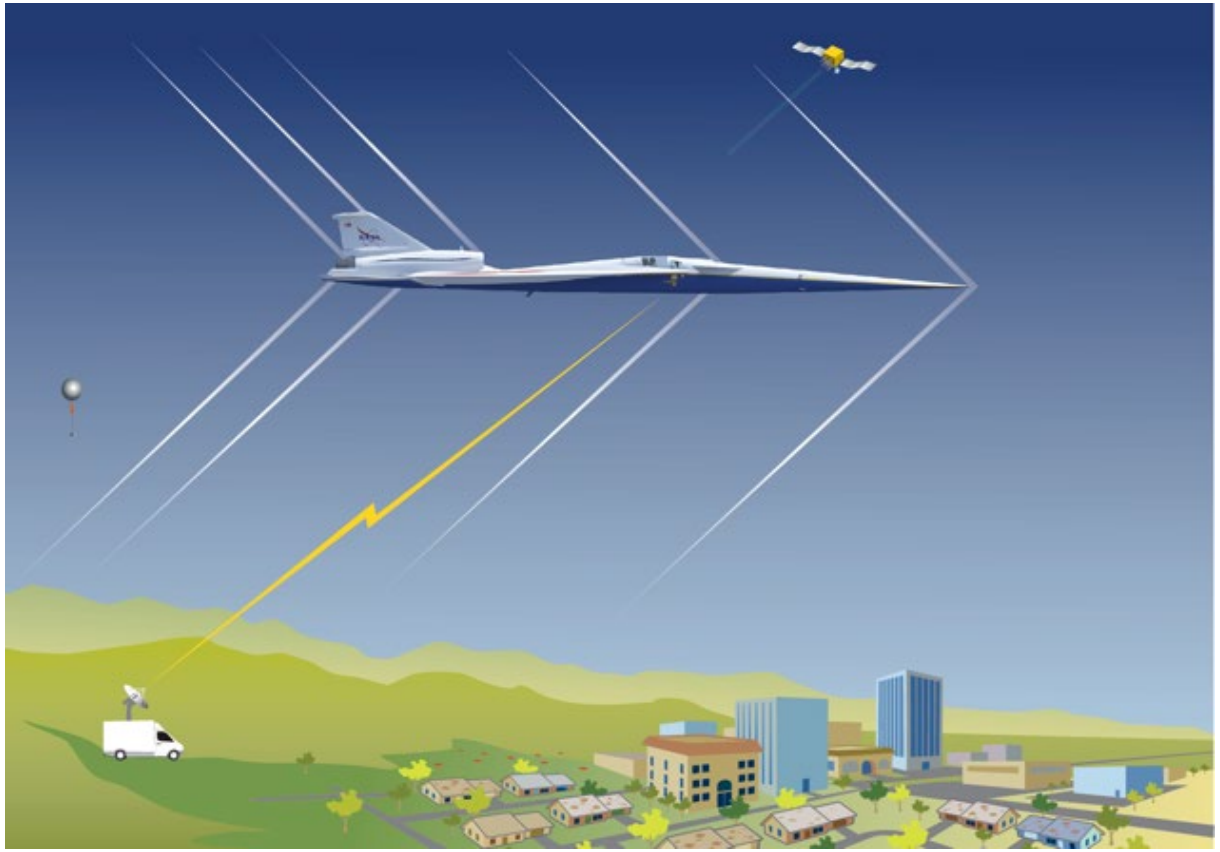
QUESST

Audience:

- K-20 Students
- Educators
- Post-Secondary students and faculty
    - Includes skilled technical workforce
- Community

Objectives

- Understand how to educate communities without introducing perception bias
- Increase knowledge about NASA Aeronautics in their community
- Introduction to Quesst and X-59
- Workforce development
- Better equip educators about science of sound and build foundational knowledge in students
- Citizen science and augmented data collection
- Follow-up community engagement post test

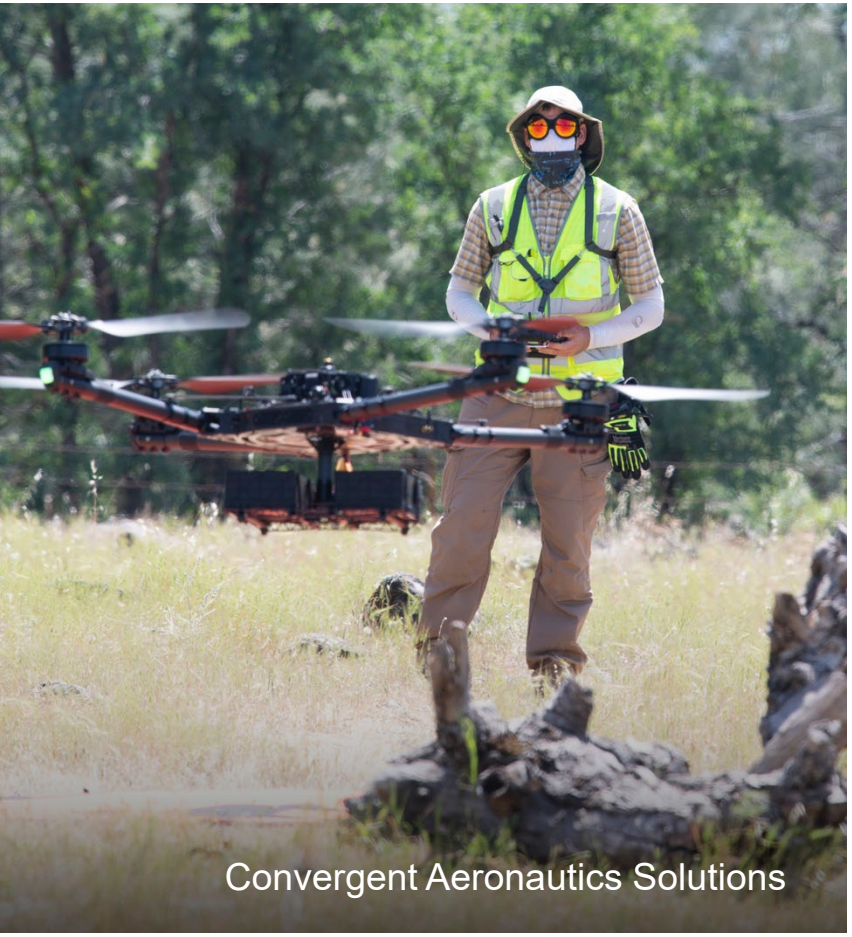


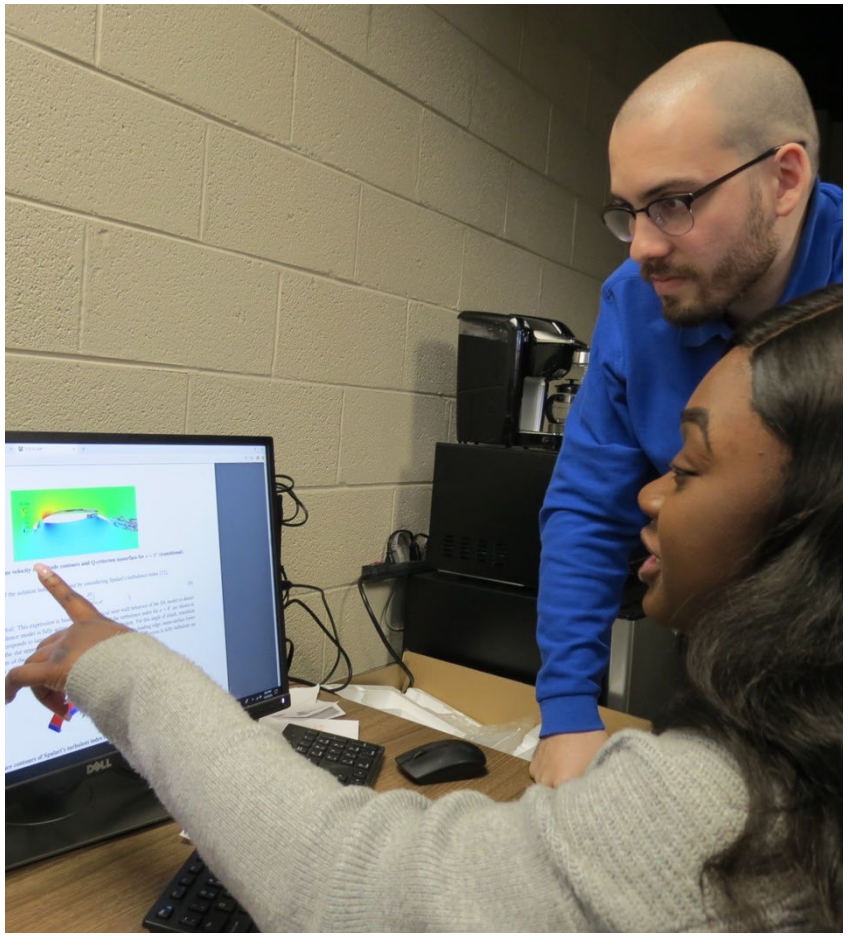
Quesst Community Overflight STEM Engagement (QCOSE) Funding Opportunity Forecast*

- What if? How could Space Grant in the region contribute to Quesst Community Response Testing STEM Objectives?
- Period of Performance 6 month
- Estimated 4 awards up to $30k/award
- Planning and development grant
- Work closely with the NASA Quesst Team
- Ideas will be evaluated by the Quesst Team and the X-59 Independent Review Team
- Estimated release in July

*Pending final approval and funding availability

ARMD's Agile Innovation Ecosystem





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

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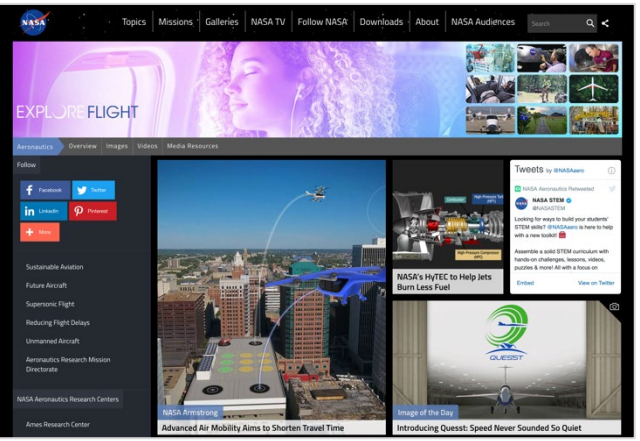
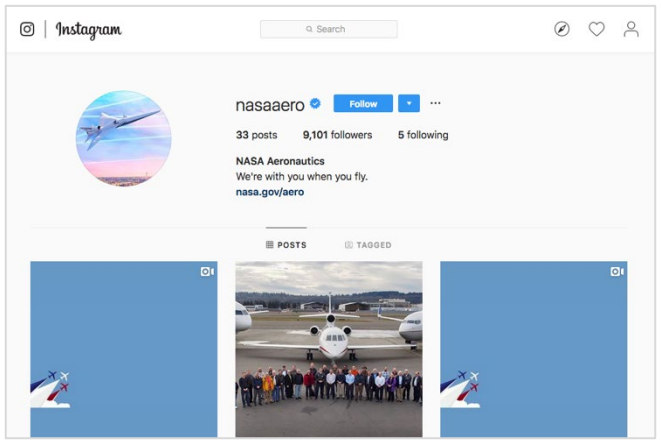
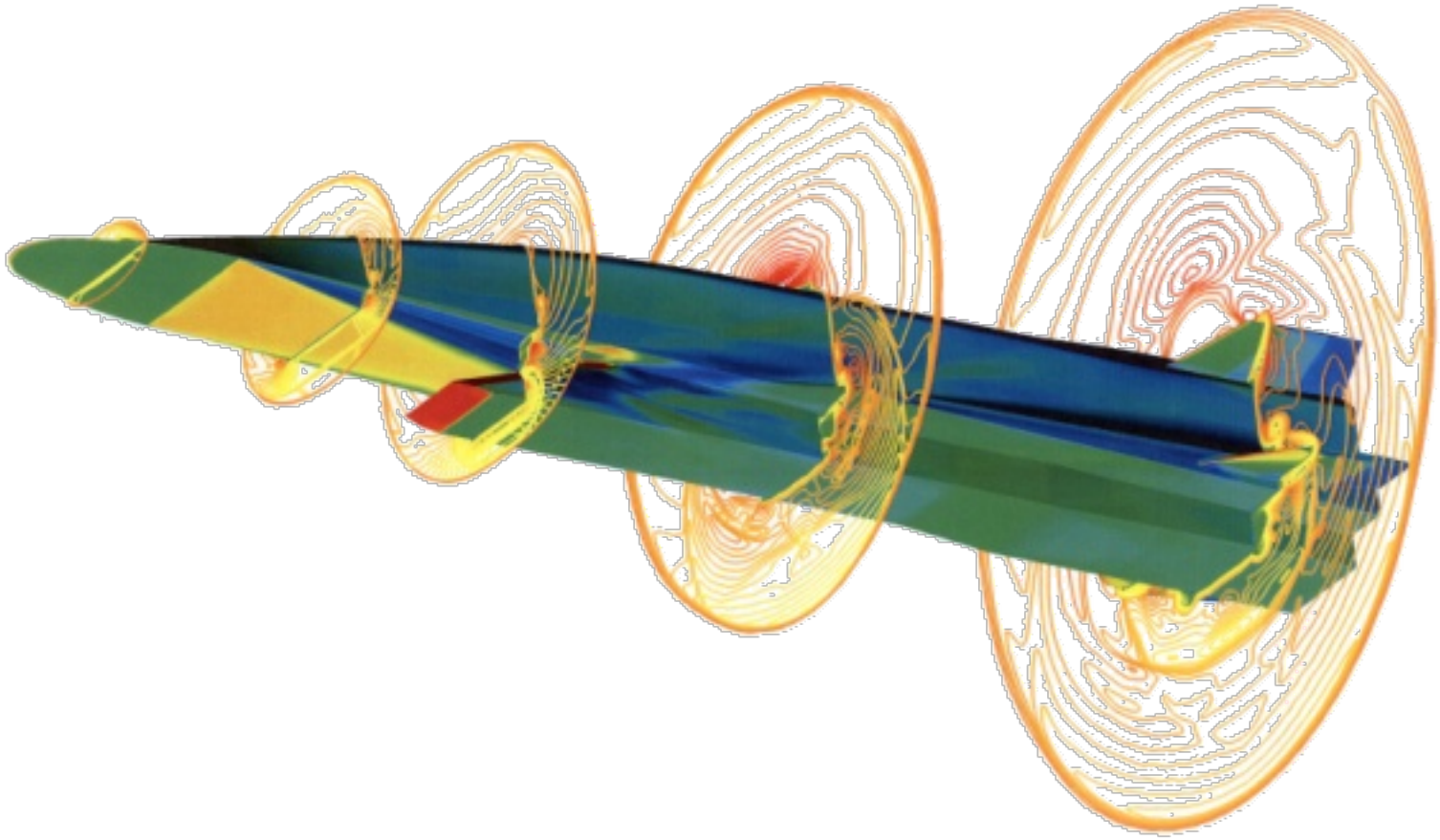




www.nasa.gov/aeroresearch/strategy | www.nasa.gov/aeroresearch/solicitations

Quesst-ions?

Hypersonic Technology Project



Strong Department of Defense Partnership