National Aeronautics and Space Administration



NASA Aeronautics – Vision and Outlook

Joint Spring Metting: Aeronautics and Space Engineering Board & Space Studies Board

Robert Pearce
Associate Administrator for the Aeronautics Research Mission Directorate (ARMD)
June 2, 2026

nasa.gov

NASA Delivers Innovative, High-Impact Technologies Across **Four Aeronautics Transformations**



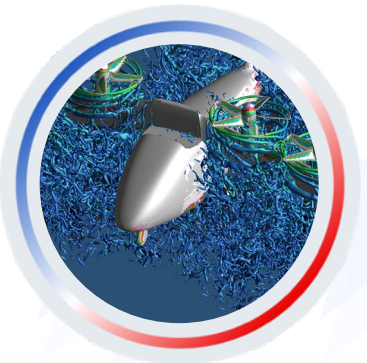
Pioneer High-Speed Flight



Automate Airspace & Safety Management Capabilities



Transform Airframes & Propulsion



Revolutionize Engineering Methods

Strengthening **U.S. Leadership** Through

- **Advanced Concepts and Technologies**
- **World-Class Technical Expertise**
- **State-of-the-Art Capabilities**
- **Novel Engineering Approaches**
- **Exploration-Enabling Innovations**

ARMD FY26 **Structure**

AERONAUTICS RESEARCH MISSION DIRECTORATE



AIRSPACE OPERATIONS AND SAFETY PROGRAM

- Advanced Air Mobility Pathfinders Project
- Air Traffic Management and Safety Project



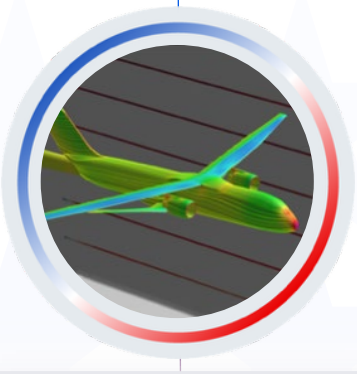
ADVANCED AIR VEHICLES PROGRAM

- Hi-Rate Composite Aircraft Manufacturing Project
- High-Speed Flight Project
- Subsonic Vehicle Technologies and Tools Project



INTEGRATED AVIATION SYSTEMS PROGRAM

- Flight Demonstrations and Capabilities Project
- Low Boom Flight Demonstrator Project
- Subsonic Flight Demonstrator Project



TRANSFORMATIVE AERONAUTICS CONCEPTS PROGRAM

- Transformational Tools and Technologies Project
- University Innovation Project



AEROSCIENCES EVALUATION AND TEST CAPABILITIES PORTFOLIO

Recent **Aeronautics Highlights**



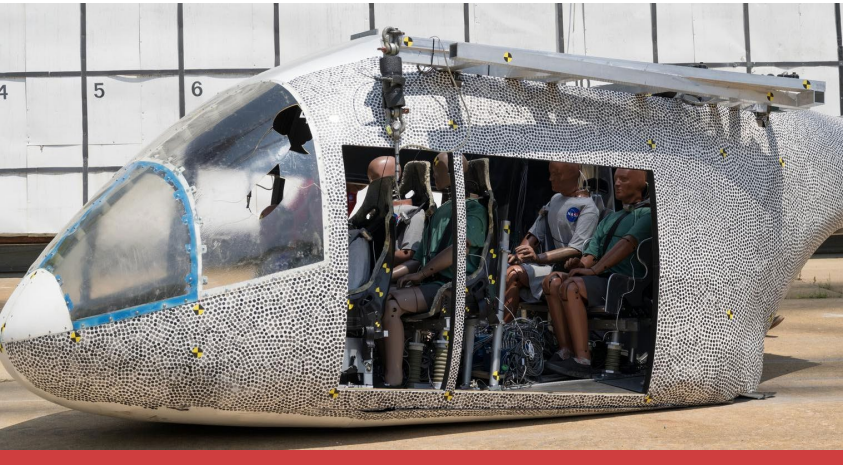
Continued X-59 flight testing



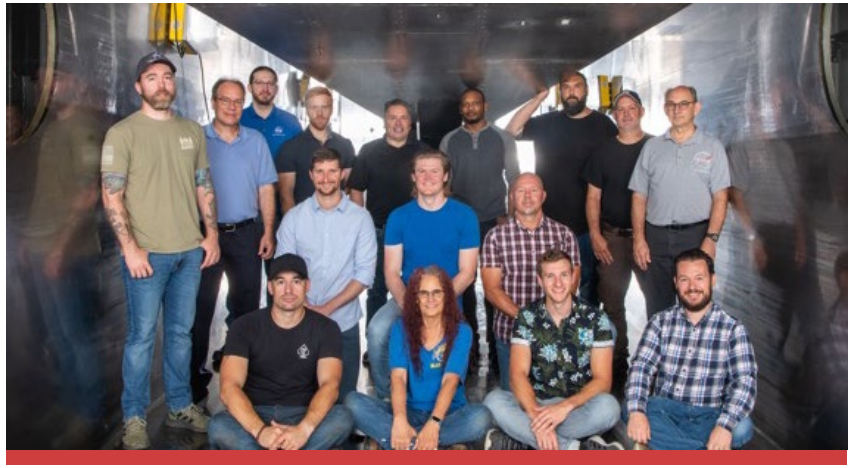
Flight validated a weather-aware departure rerouting tool



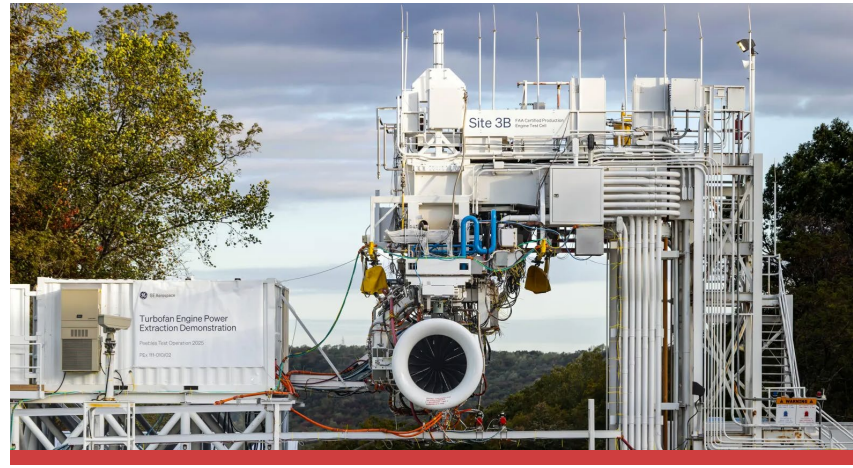
Supported Dragonfly wind tunnel testing



Conducted air taxi design research, safety testing, and comfort studies



Demonstrated control of mode transition on a hypersonic turbine-based combined cycle system



Demonstrated a commercial hybrid-electric turbofan engine

ARMD **Budget**

$ Millions	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031
Aeronautics	$935.0	$935.0	$609.5	$609.5	$609.5	$609.5	$609.5
Airspace Operations and Safety			96.8	112.8	115.5	117.5	117.5
Advanced Air Vehicles			191.1	192.8	186.4	175.6	175.6
Integrated Aviation Systems			152.2	95.6	90.2	90.2	90.1
Transformative Aeronautics Concepts			79.3	113.2	117.3	121.1	121.1
Aerosciences Evaluation and Test Capabilities			90.1	95.1	100.1	105.1	105.2

1 / - FY 2025 reflects the funding amount specified in Public Law 119-4, Full-Year Continuing Appropriations and Extensions Act, 2025.
2 / - FY 2026 reflects the funding amount specified in Public Law 119-74, Commerce, Justice, Science; Energy and Water Development; and Interior and Environment Appropriations Act, 2026.

Strengthens U.S. leadership in the aerospace sector through transformative aeronautics research that maintains American competitiveness, enables next generation air transportation systems, and drives economic growth.

- $97M for Airspace Operations and Safety, in partnership with the Federal Aviation Administration, to automate the air traffic management system and safely accommodate the growing airspace management demands of new advanced air mobility vehicles, including drones and advanced air mobility systems, reducing delays, and improving safety.
- $191M for Advanced Air Vehicles to fund aircraft and propulsion research that provides the nation with a competitive advantage in the aviation industry and includes increased funding for high-speed flight technologies.
- $152M for Integrated Aviation Systems to fund advanced wing technology development, the Low Boom Flight Demonstrator project, supporting NASA's X-59 experimental aircraft for quiet supersonic flight over land, and key flight capabilities that enable revolutionary aircraft designs.
- $79M for Transformative Aeronautics Concepts to fund university innovation and revolutionary aerospace engineering methods, maintaining a strong pipeline of new ground-breaking technologies, and cultivating the next generation of aerospace talent.
- $90M for Aerosciences Evaluation and Test Capabilities to support NASA's large wind tunnels, which are critical to the nation's ground test infrastructure, enabling NASA and U.S. aerospace companies to develop and test next generation aircraft designs.



PIONEER HIGH-SPEED FLIGHT

PIONEER HIGH-SPEED FLIGHT

Quesst: **Quiet Supersonic** Flight

Phase 1: Prove X-59 Performance and Safety

- Demonstrate X-59 is safe to fly through series of flight tests of increasing complexity
- Historic first flight Oct. 28. 2025
- Certify the X-59 is safe for operations in the National Airspace System

Phase 2: Acoustic Validation

- Validate the quiet supersonic technology works as designed
- Ensure aircraft performance is robust in real atmospheric conditions
- Prove acoustic and design tools needed by U.S. industry

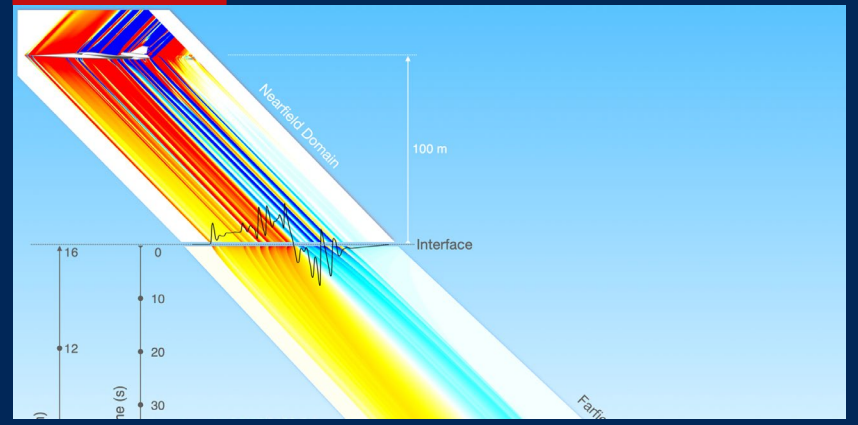
Phase 3: Community Response Tests

- Fly X-59 over several U.S. communities
- Gather data on public responses to sound generated during supersonic flight
- Deliver data set to national and international regulators
- Data could bring about internationally accepted rule change and solidify U.S. competitiveness in the emerging supersonic market

PHASE 1



PHASE 2



PHASE 3



PIONEER HIGH-SPEED FLIGHT

Contribute to National **Hypersonic Enterprise**

Materials

- Advanced materials and structures for airframes and propulsion
- Static and dynamic high-temperature seals
- Advanced structural instrumentation and combined loads test techniques

Vehicle Designs

- Government reference conceptual designs and trade studies
- Assess design requirements for civil and government use
- Fluid-thermal-structural interaction prediction
- Aerodynamic/aerothermal analysis

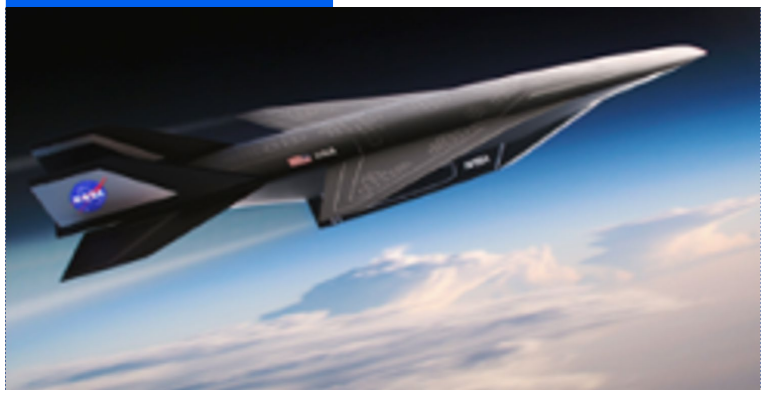
Propulsion

- Turbine Based Combined Cycle technology maturation
- Computational fluid dynamics advanced capability development and application
- High temperature sensors for controls and health monitoring

Materials



Vehicle Designs



Propulsion





AUTOMATE AIRSPACE AND SAFETY MANAGEMENT CAPABILITIES

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Transform & Modernize the **National Air Traffic Management System**







Demonstrate Future Concepts with FAA and Industry

- Enable increasingly automated operations for strategic trajectory management
- Contribute technologies to FAA's Brand New Air Traffic Control System modernization efforts

Enable New Airspace Users to Safely and Efficiently Operate

- Establish requirements for an integrated digital information environment for common operating picture and third-party services
- Modernized data communications technologies to improve information exchange between aircraft and air traffic systems

Demonstrate Feasibility of Highly Automated Airspace and Prognostic Safety Management Systems

- Develop safety capabilities that provide predictive, in time risk identification, enabling resilient responses across complex, mixed operations airspace
- Develop assurance methods for autonomous systems, use of AI /ML for safety critical functions

AUTOMATE AIRSPACE & SAFETY MANAGEMENT CAPABILITIES

Build Systems to Safely **Maximize Potential of New Vehicles**

Tech Transfer to Support Wildland Firefighting

- Transfer techniques using Unmanned Aerial Systems to monitor wildland fires to FAA, industry, and federal and state agencies
- Ongoing development of a portable airspace management system for enhanced coordination of wildland fire aerial response

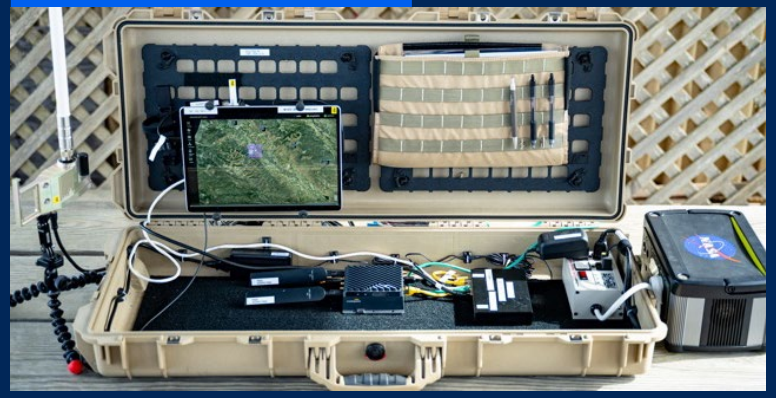
UTM Beyond-Visual-Line-of-Sight

- Demonstrate safe operation of multiple delivery drones in a shared airspace using NASA-developed uncrewed aircraft traffic management system
- Deliver data to FAA and industry to support widespread adoption

Advanced Air Mobility

- Evaluate NASA tools and technologies for strategic deconfliction and scalable operations
- Develop federated airspace management technologies for industry operators
- Deliver data to inform FAA processes and procedures for safe and scalable integration of vehicles

Tech Support Wildland



UTM BVLOS



Advanced Air Mobility





TRANSFORM AIRFRAMES AND PROPULSION

Bottom Right Aircraft Image Credit: University of Illinois / Phillip Ansell

TRANSFORM AIRFRAMES & PROPULSION

Demonstrate Advanced Configurations **for Next Gen Aircraft**

Research Focus

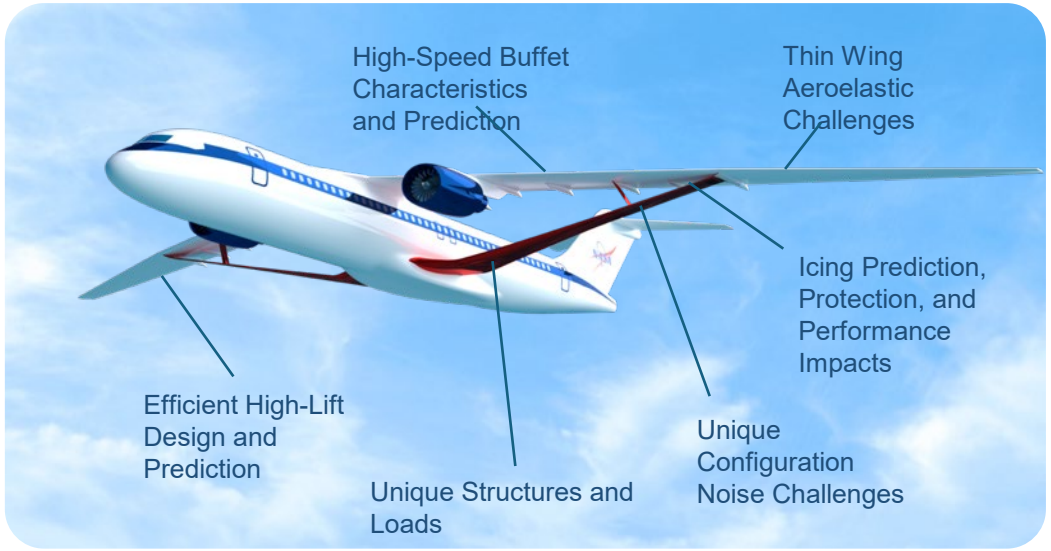
- Develop and test an advanced airframe configuration and related technologies to dramatically reduce aircraft fuel burn to help enable next-generation single-aisle aircraft in the 2030s

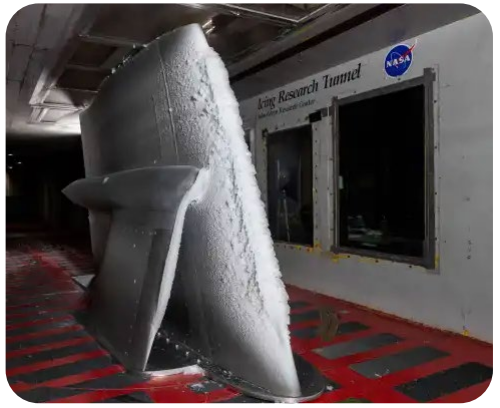
Thin-Wing Technology

- Conduct ground-based demonstration of thin-wing architecture and associated technologies
- Assess icing effects on thin-wing design

Truss-Braced Wing Studies

- Conduct ground-based tests of truss-braced wing configurations and explore methods for integrating propulsion technologies with the new design
- Assess progress to inform the X-66 flight demonstrator decision







TRANSFORM AIRFRAMES & PROPULSION

Advance Critical **Subsystem Technologies**

Hi-Rate Composite Manufacturing

- Demonstrate manufacturing rates that are much faster for large aircraft components and made from lightweight composites without sacrificing quality
- Validate design tools and strength at panel/fuselage scale
- Achieve multiple builds, assemblies and inspections of the components at high technology readiness levels

Advanced Engine Core

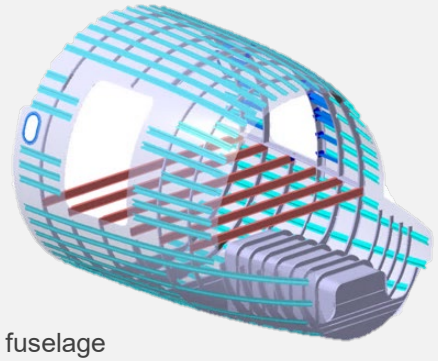
Demonstrate technologies that maintain performance while reducing fuel use:

- High-pressure compressor aerodynamics
- High-pressure turbine aerodynamics
- High-temperature ceramic matrix composite materials
- High-temperature environmental barrier coatings
- Sustainable aviation fuel-compatible combustors
- Turbofan power extraction

Electrified Aircraft Subsystem Technologies

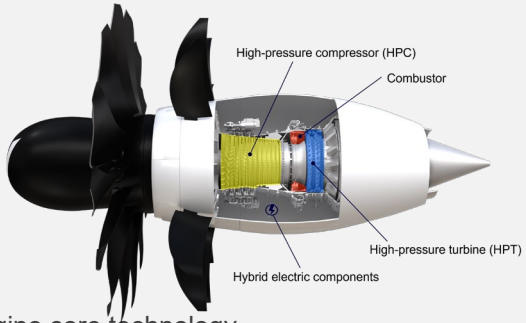
- Address critical challenges for electrified aircraft propulsion components, subsystems, and system design and integration

Hi-Rate Composite Manufacturing



Composite fuselage

Advanced Engine Core



Advanced engine core technology

Electrified Aircraft Subsystem Tech



Engine hybridization testing

TRANSFORM AIRFRAMES & PROPULSION

Pursue Revolutionary **Propulsion Options for 2040+**

Bring Together the Best Ideas

- Fund studies on advanced concept designs
- Gain insight into promising tech and architectures to inform future investments
- Create opportunity for new industry partnerships

Innovate More Efficient Propulsion Cycles

- Advance energy sources to supplement or replace standard jet fuels
- Test and evaluate the overlap of tech and energy
- Accelerate research into hybrid-electric, hydrogen fuel cells, cryogenic fuels, and methane combustion

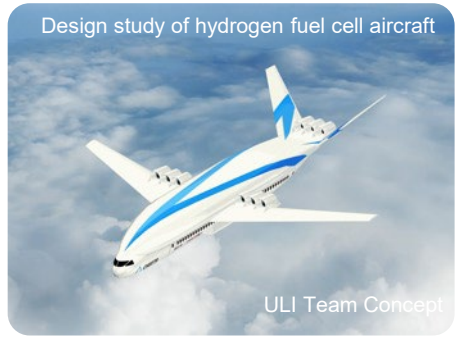
DESIGN



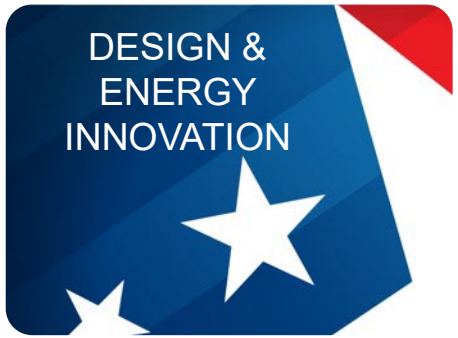
DESIGN

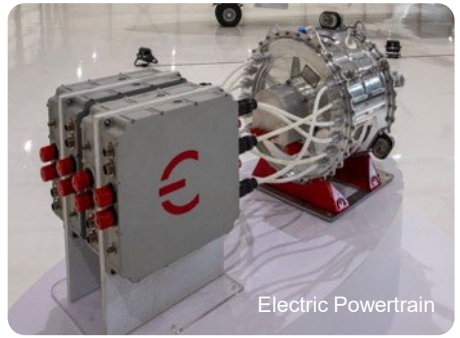


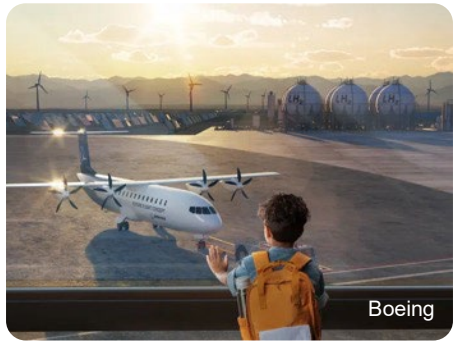
ENERGY INNOVATION

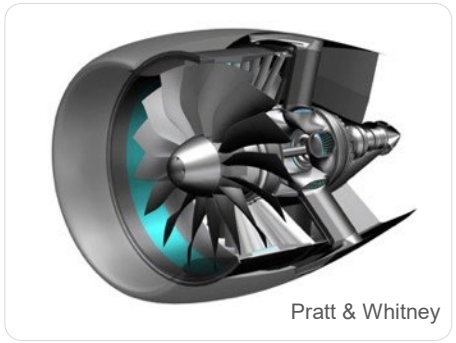


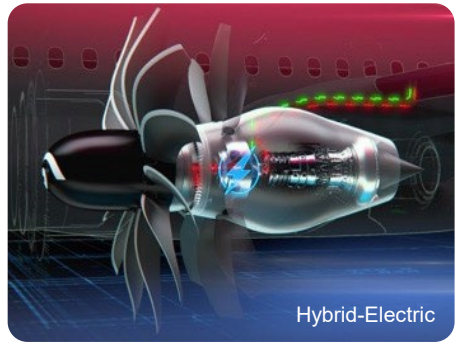




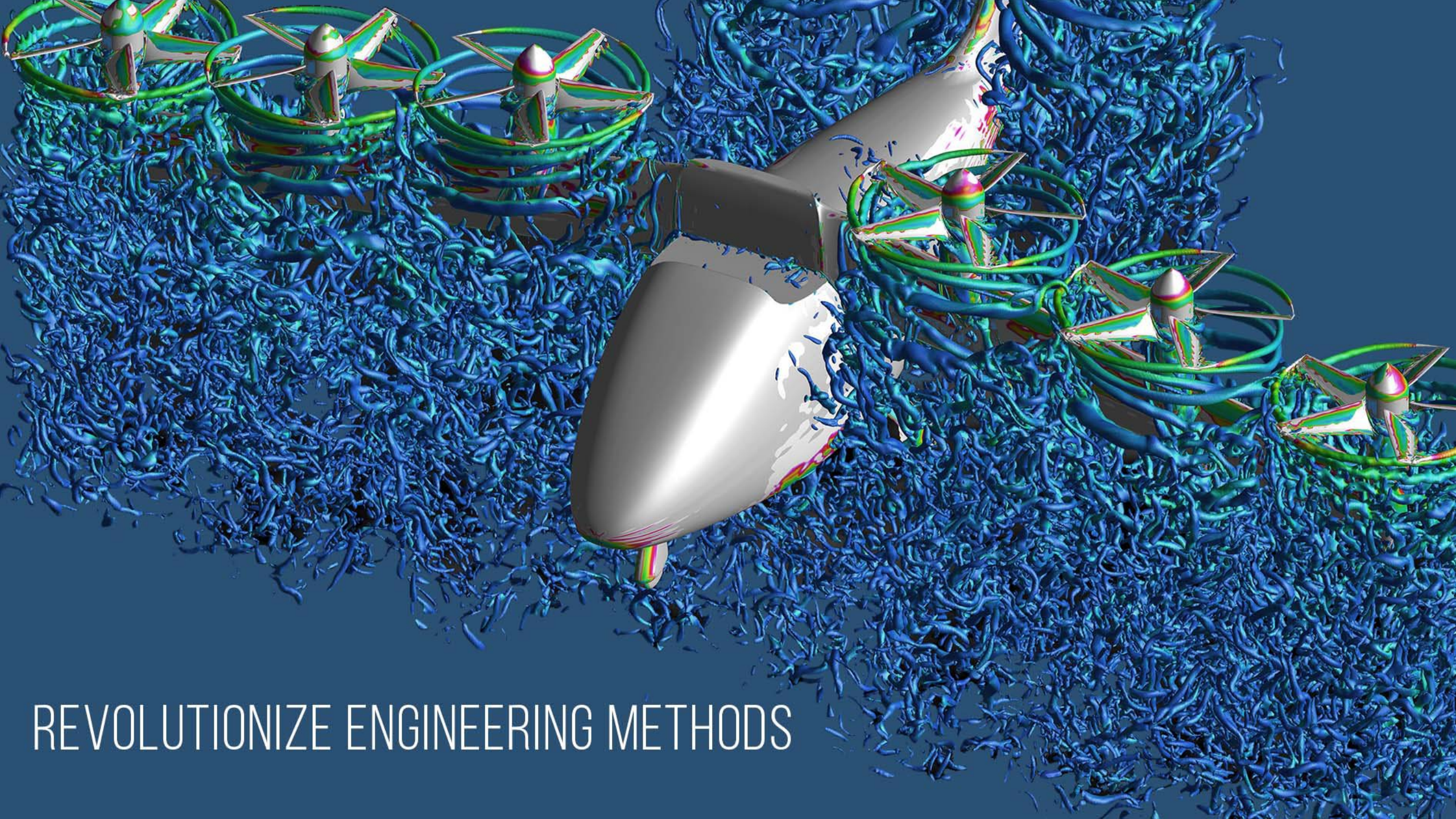








NASA has trust of the aviation community to explore “what’s next?”



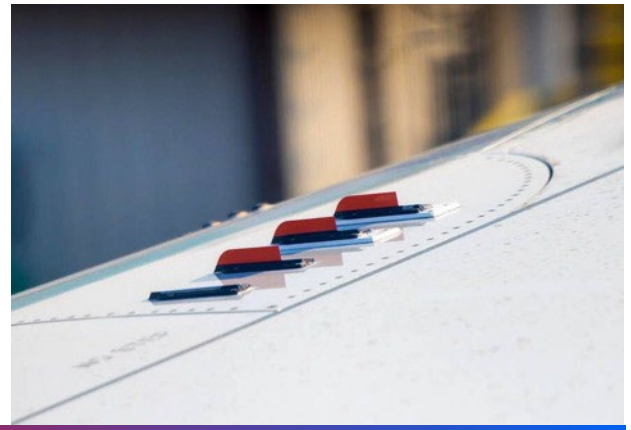
REVOLUTIONIZE ENGINEERING METHODS

REVOLUTIONIZE ENGINEERING METHODS

NASA is Uniquely Positioned to Advance the **State of the Art**



GRX-810 superalloy for aviation and space



Shape memory alloys as smart vortex generators



High fidelity, high resolution computational fluid dynamics



Fluorescent oil to model lift and drag

MATERIALS & STRUCTURES

- Innovate new materials (e.g., GRX-810)
- Develop material properties that create new functionality (e.g., Shape Memory Alloys, short-fiber composites)
- Use of subscale electric Vertical Take-Off and Landing (eVTOL) model research platform to accelerate time from design to flight

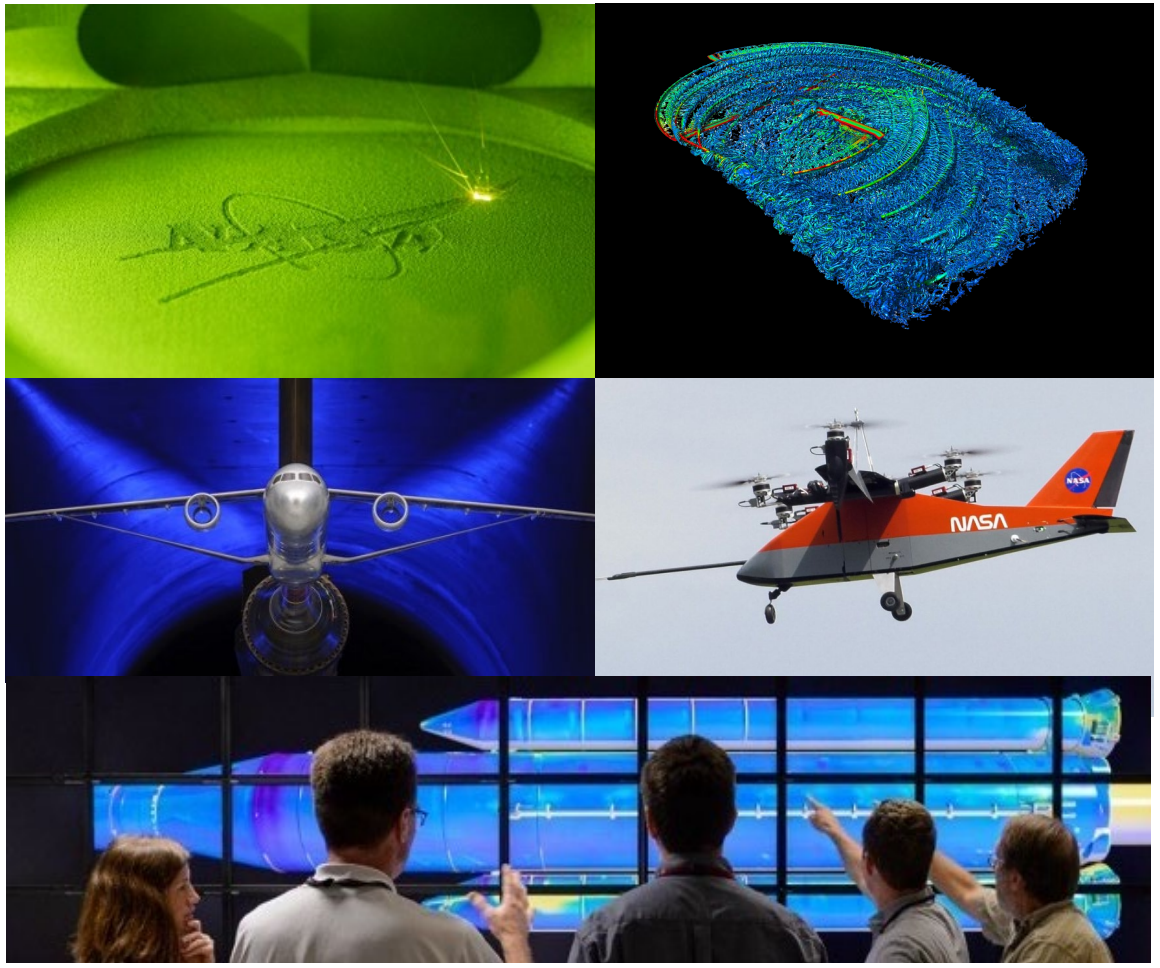
AEROSCIENCES MODELING

- Accelerate ability to perform rapid, high fidelity computational design and analysis of complex aerospace systems to analyze, understand and predict performance
- Validate computational tools to predict complex turbulent airflow around vehicles and within propulsion systems. (e.g., juncture flow experimentation and analysis)

Advancing tomorrow’s engineering methods to innovate faster and maximize resources.

REVOLUTIONIZE ENGINEERING METHODS

Understanding and **Defining Opportunities**



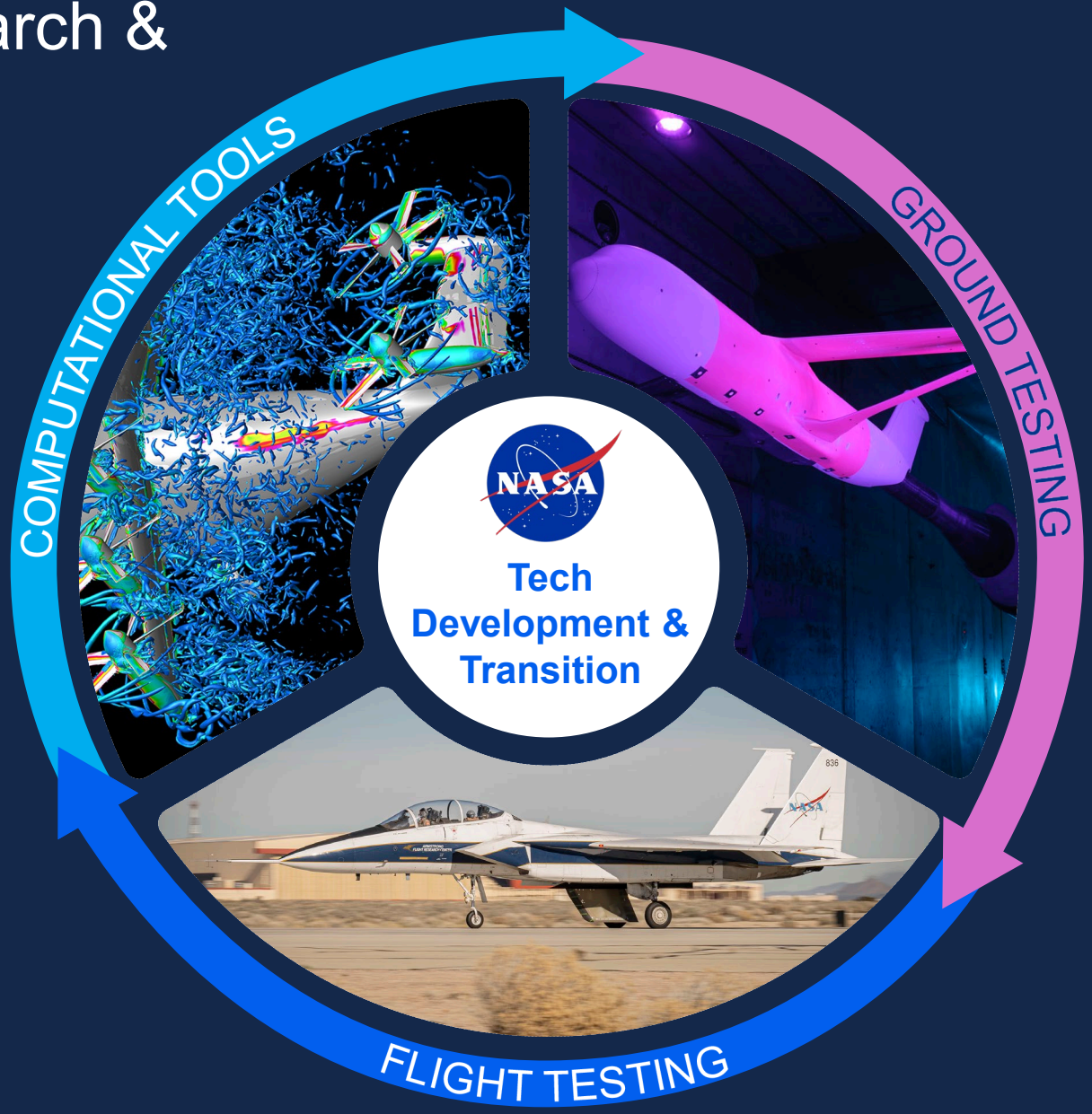
Modern Solutions to Accelerate Innovation

- Link high-end computational analysis with NASA's unique ground and flight test assets
- Leverage AI alongside physics expertise and high-quality datasets
- Develop next-generation design and analysis capabilities for significantly more complex, multi-disciplinary problems

Broad Industry Benefit

- Shortened design cycles
- Reduced development cost
- Improved performance
- Strengthened U.S. industry competitiveness

Integrated Research & Experimentation

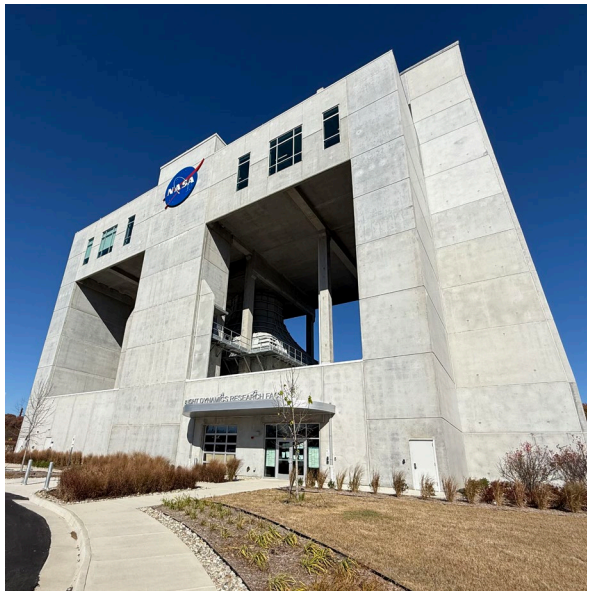


AEROSCIENCES EVALUATION & TEST CAPABILITIES

Large-Scale Ground **Test Capabilities for the Nation**







Aerosciences Validation

- Combine simulation tools with ground test capabilities
- Mature operational data portal to make unique experimental databases more accessible to assist in revealing complex physics and drive next generations of computational methods

Ground Tests

- Support vital test campaigns for NASA exploration and science missions, Department of War, and industry
- Digitally transform wind tunnel operations
- Data driven management, using real-time performance and value metrics to enhance decision-making and align with Federal Data Strategy

Management Model

- All 12 AETC tunnel facilities will remain viable for future use
- Implement re-deployable, cross-functional workforce aligned with test demand, budget; maintaining facility readiness
- Begin operations at new Flight Dynamics Research Facility
- Explore standardization of systems to drive campaign efficiency

NASA has one-of-a-kind facilities that advance national capabilities.

University Innovation **Expands Innovation Ecosystem**

NASA-funded academic research fuels innovation, talent, and tech transfer to U.S. industry.

More than 1000 students engaged

73 awards to 124 universities



Over $220M in awards across a diverse portfolio of investments

>50% faculty principal investigators are first time NASA awardees

Graduating students join Boeing, GE Aerospace, Joby, Exponent, Sentient Science, Northrup Grumman, Bell Helicopter, Exxon Mobil, Oakridge National Labs, Tesla, GM, NASA, …

Industry perspective is UI plays a key role in supporting low- to mid-TRL technology development

Representative Nationwide **Industry Engagements**

INDUSTRY EXISTING + EMERGING



STANDARDS DEVELOPMENT & NON-PROFITS



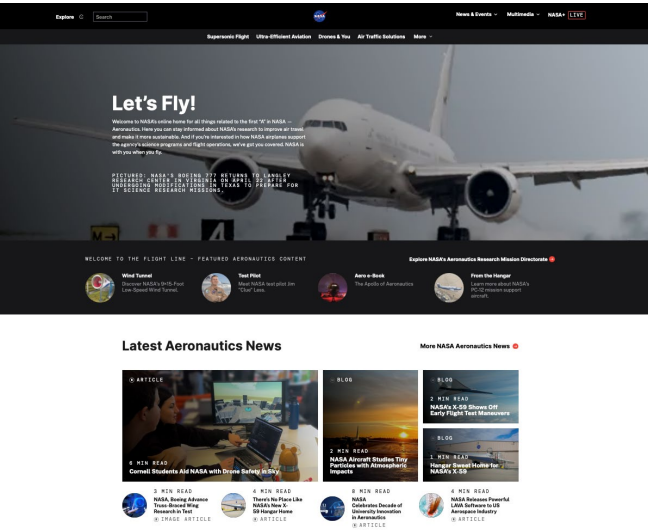
INTERNATIONAL



Industry engagements are fundamental to ARMD success with over 500 Space Act Agreements, cost-share contracts and other partnership agreements

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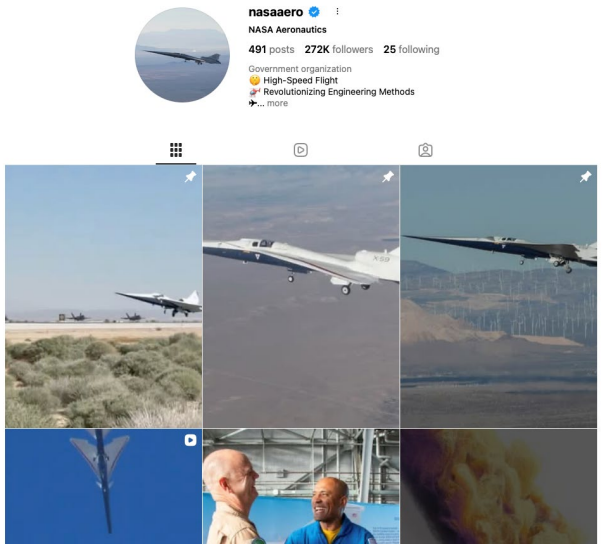
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