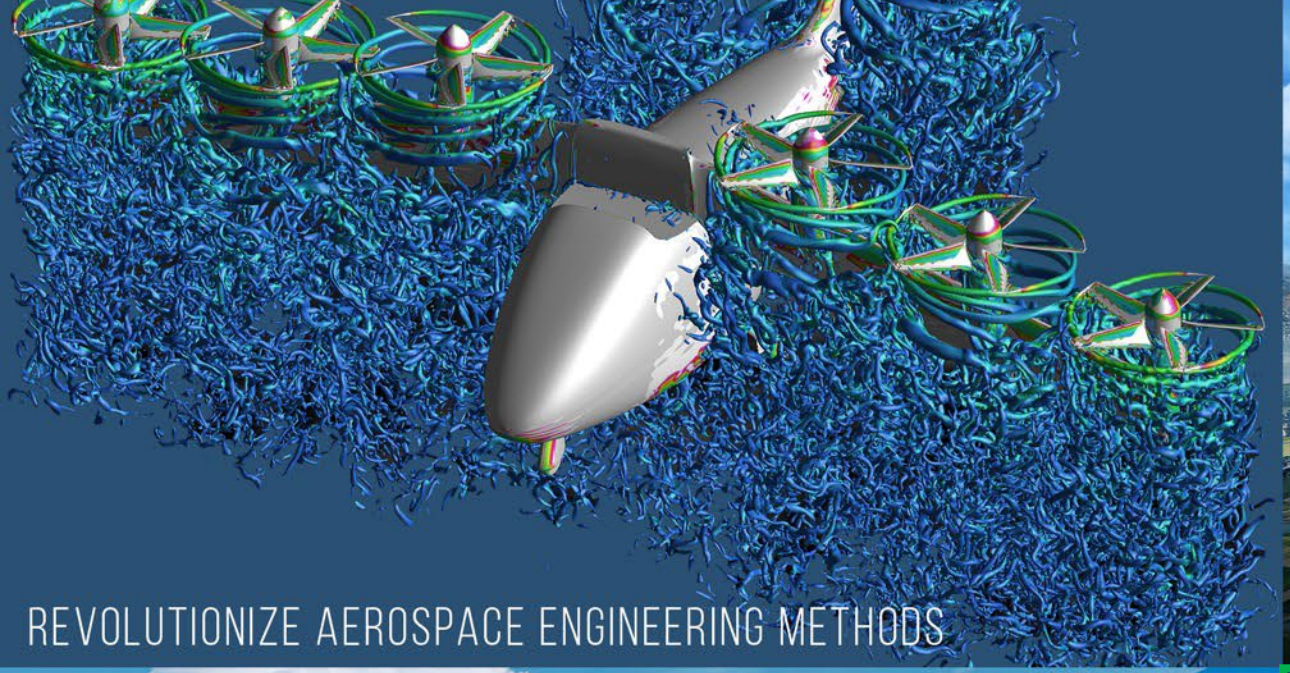
Joint Aeronautics and Space Engineering Board (ASEB) and Space Studies Board (SSB) 2025 Meeting

Supersonic and Hypersonic Flight Tech & Airspace Considerations

PIONEER HIGH-SPEED FLIGHT

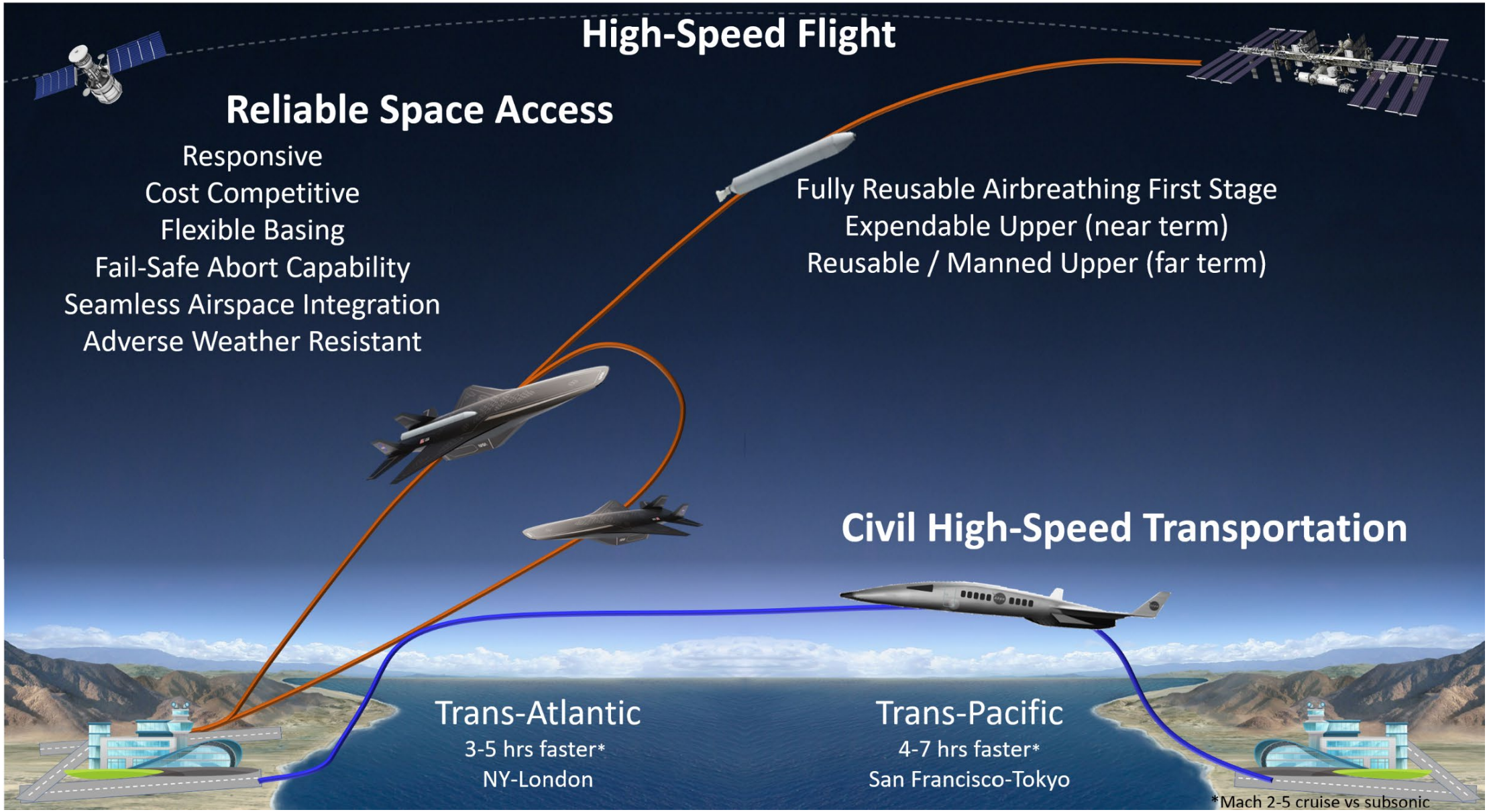
Maureen Kudlac, Acting Deputy Director
Advanced Air Vehicles Program
NASA Aeronautics Research Mission Directorate



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

Four Focus Areas to Ensure U.S. Technological Competitiveness

High-Speed Flight (HSF) Project



NASA-DoD Synergistic Relationship

Defense

Requirements
- Responsive
- Supportable
- Competitive

Contributions
- Flight test opportunities and data
- Ground test opportunities and data
- Subject matter expertise
- Workforce development

Common, Dual-Use Technology Challenges

- System-Level Design, Analysis, and Validation
- Propulsion Technologies
- Vehicle Technologies
- High Temperature, Durable Materials

Joint Projects

Technology Roadmaps

National Planning

Civil

Requirements
- Certifiable
- Affordable
- Reusable
- Reliable

Contributions
- Fundamental research
- Ground test facilities and data
- Subject matter expertise
- Workforce development

NASA and the DoD collaborate and develop common technologies for airbreathing, hypersonic vehicles, but with different operational requirements.

Commercial Supersonics Technology

Environmental Barriers

Sonic Boom
- Design for low noise sonic boom
- Understand Community Response

Airport Noise
- Noise levels not louder than subsonic aircraft at appropriate airports

High Altitude Emissions
- No or minimal long-term impact at supersonic cruise altitudes

Efficiency Barriers

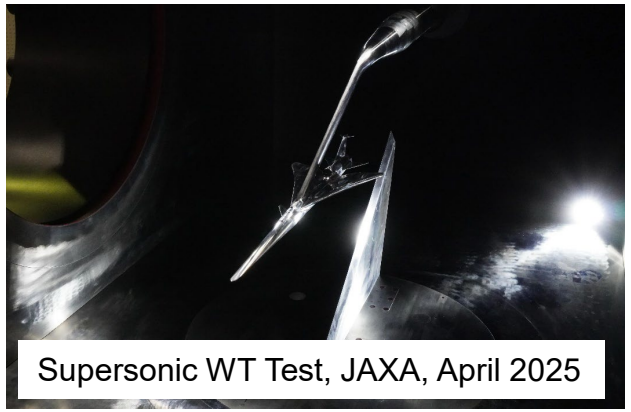
Efficient Vehicles
- Efficient airframe and propulsion throughout flight envelope

Efficient Operations
- Airspace-Vehicle interaction for full utilization of high speed

Light Weight, Durable Vehicles
- Low airframe and propulsion weight in a slender flexible vehicle operating at supersonic cruise temperatures

Quesst - X-59 Development

Iron-bird Testing, May 2025


Supersonic WT Test, JAXA, April 2025


Shock Sensing Probe, June 2025

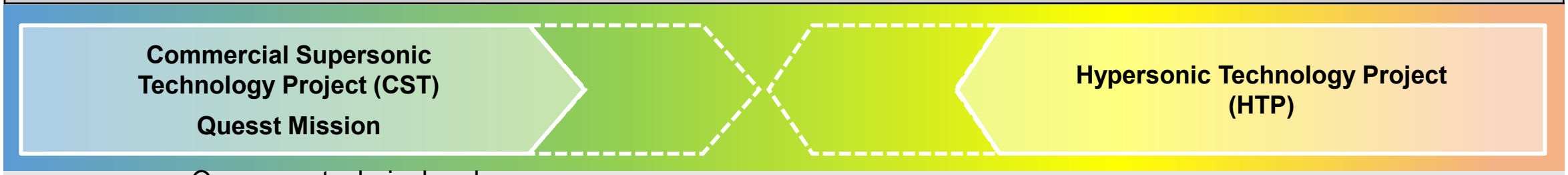

Acoustic Validation Dry Run, June 2025


Low-Speed Taxi Test, July 2025

First flight anticipated in 2025

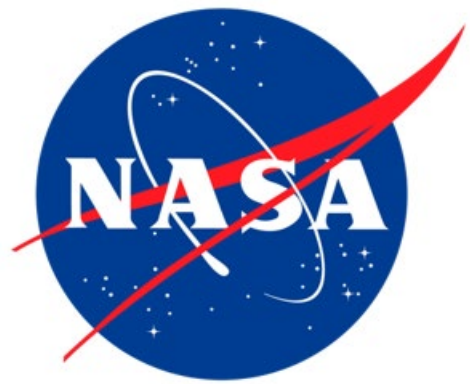
High-Speed Strategy: Current Objectives

M1	M2	M3	M4	M5	M6	M7	M8+
Supersonic	Emerging 'High-Supersonic' Market				Hypersonic		



Near-Term (2025→)	Overcome technical and regulatory barriers to quiet supersonic flight over land by providing data to FAA/ICAO for both US and international markets	Support development of technologies, standards, and certification requirements to enable *affordable, sustainable* commercial market	Develop capabilities and enabling technologies for reusable airbreathing hypersonic vehicles with speeds up to Mach 8
Mid-Term (2035→)	Continue research leading to affordable, low-boom, low-noise, and low-emission commercial supersonic aircraft		Develop capabilities and enabling technologies for sustainably-fueled reusable airbreathing hypersonic vehicles with speeds up to Mach 12

Overarching Strategic Goal: Lay the foundation to enable new commercial high-speed markets to benefit U.S. economic competitiveness


NASA