



EXPLORE FLIGHT

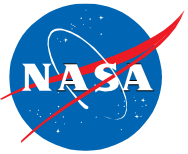
WE'RE WITH YOU WHEN YOU FLY

Advanced Air Vehicles Program
Advancing Research in Hypersonic Flight

Jimmy Kenyon
Director, Advanced Air Vehicles Program

January 13, 2020

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



Innovation in Commercial Supersonic Aircraft



Ultra-Efficient Commercial Transports



Transition to Alternative Propulsion and Energy



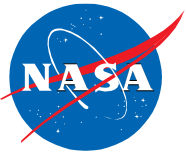
In-Time System-Wide Safety Assurance



Assured Autonomy for Aviation Transformation

U.S. leadership for a new era of flight

Research Programs Align with Strategic Thrusts



MISSION PROGRAMS

Airspace Operations & Safety

AOSP

Safe,
Efficient
Growth in
Global
Operations

In-Time System-Wide
Safety Assurance

Advanced Air Vehicles

AAVP

Ultra-
Efficient
Commercial
Vehicles

Innovation in Commercial
Supersonic Aircraft

Transition to Alternative
Propulsion and Energy

Integrated Aviation Systems

IASP

Flight
research-
oriented,
integrated,
system-
level R&T
that supports all six thrusts

X-planes/
test environment

Transformative Aeronautical Concepts

SEEDLING PROGRAM

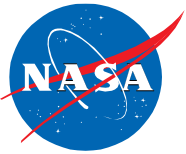
TACP

High-risk, leap-frog ideas that
support all six thrusts

Critical cross-cutting tool
development

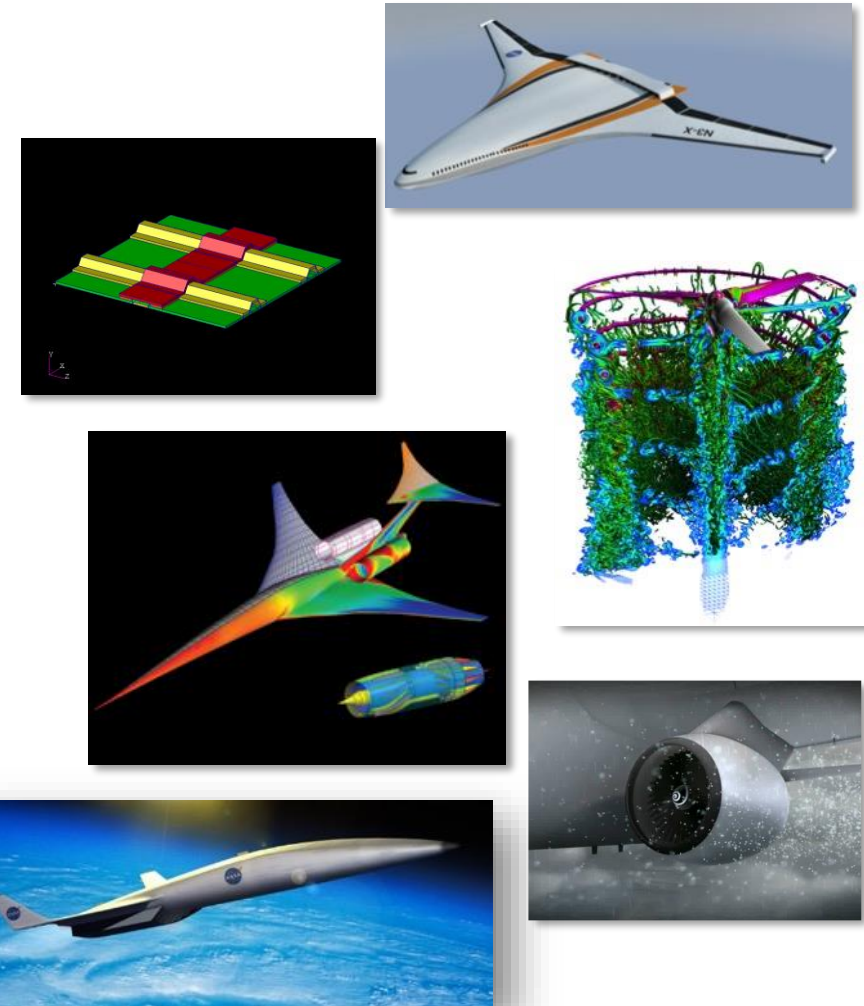
Assured Autonomy for
Aviation Transformation

Advanced Air Vehicles Program

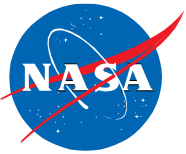


Cutting-edge research that will generate innovative concepts, technologies, capabilities & knowledge to enable revolutionary advances for a wide range of air vehicles.

- **Advanced Air Transport Technology Project (AATT)** Conducts fundamental research to improve aircraft performance & minimize environmental impacts from subsonic air vehicles
- **Revolutionary Vertical Lift Technology Project (RVLT)** Develops & validates tools, technologies & concepts to overcome key barriers, including noise, efficiency, & safety for vertical lift vehicles
- **Advanced Composites Project (AC)** Conducts research to reduce the timeline for development & certification of composite structures for aviation [Completing in early FY20]
- **Commercial Supersonics Technology Project (CST)** Develops tools & explores concepts for potential advanced capabilities & configurations for low boom supersonic aircraft.
- **Hypersonic Technology Project (HT)** Develops tools & technologies in the area of hypersonic flight



A New Era of Flight Is Emerging



Breaking down barriers to open new markets, advance U.S. competitiveness, and make air travel better for all Americans and for people around the world

Electrified Aircraft Propulsion

Making air travel cleaner, quieter, and more affordable

Urban Air Mobility

Allowing people to move about more easily

Commercial Supersonic Flight

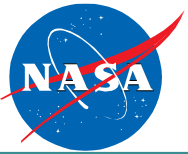
Connecting people faster

Hypersonic Flight

Enabling a future vision for hypersonic transport



Community Vision for Point-to-Point Hypersonic Transport



INVESTING IN SPACE

Virgin Galactic shares to triple as it disrupts airlines with hypersonic travel, Morgan Stanley says

PUBLISHED MON, DEC 9 2019 8:28 AM EST | UPDATED MON, DEC 9 2019 4:11 PM EST



Michael Sheetz
@THESHEETZTWEETZ

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KEY POINTS

- Morgan Stanley says Virgin Galactic's stock will soar as it proves out a long-term plan of flying people around the world at hypersonic speeds.
- "A viable space tourism business is what you pay for today ... but a chance to disrupt the multi-trillion-dollar airline [total addressable market] is what is really likely to drive the upside," Morgan Stanley analyst Adam Jonas says.
- Morgan Stanley forecast \$800 billion in annual sales for hypersonic travel by 2040 and Virgin Galactic is in the early stages of exploring how the technologies it developed for space tourism might apply to hypersonic travel.



AIRLINES

Boeing unveils rendering of hypersonic jet that would fly from US to Japan in 3 hours

PUBLISHED TUE, JUN 26 2018 5:57 PM EDT | UPDATED WED, JUN 27 2018 12:40 PM EDT



Phil LeBeau
@LEBEAUCARNEWS



TECHNOLOGY

This hypersonic airliner would take you from Los Angeles to Tokyo in under two hours

The 300-passenger Stratoflyer MR3 would hit speeds of up to 5,400 miles an hour. Just don't expect to book a flight anytime soon.



Stratoflyer jet. Stratoflyer

Aug. 23, 2019, 5:24 PM EDT
By Kate Baggaley

CNN travel

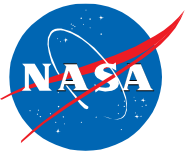
DESTINATIONS FOOD & DRINK PLAY

Hermeus hypersonic jet aims to fly New York to London in 90 minutes

Amy Woodyatt, CNN • Published 21st May 2019



NASA Hypersonic Research



Enable routine, reusable, airbreathing hypersonic flight

Engaging industry to foster emerging vision

Addressing key technical challenges for reusable hypersonic flight

- System analysis and uncertainty quantification
- Combined cycle propulsion systems
- Aerodynamics, aerothermodynamics, and controls
- High temperature, durable materials and structures

Leveraging comprehensive DoD ground and flight tests

Unique NASA testing capability and analysis provides a National resource

