



Low Boom Flight Demonstrator Project

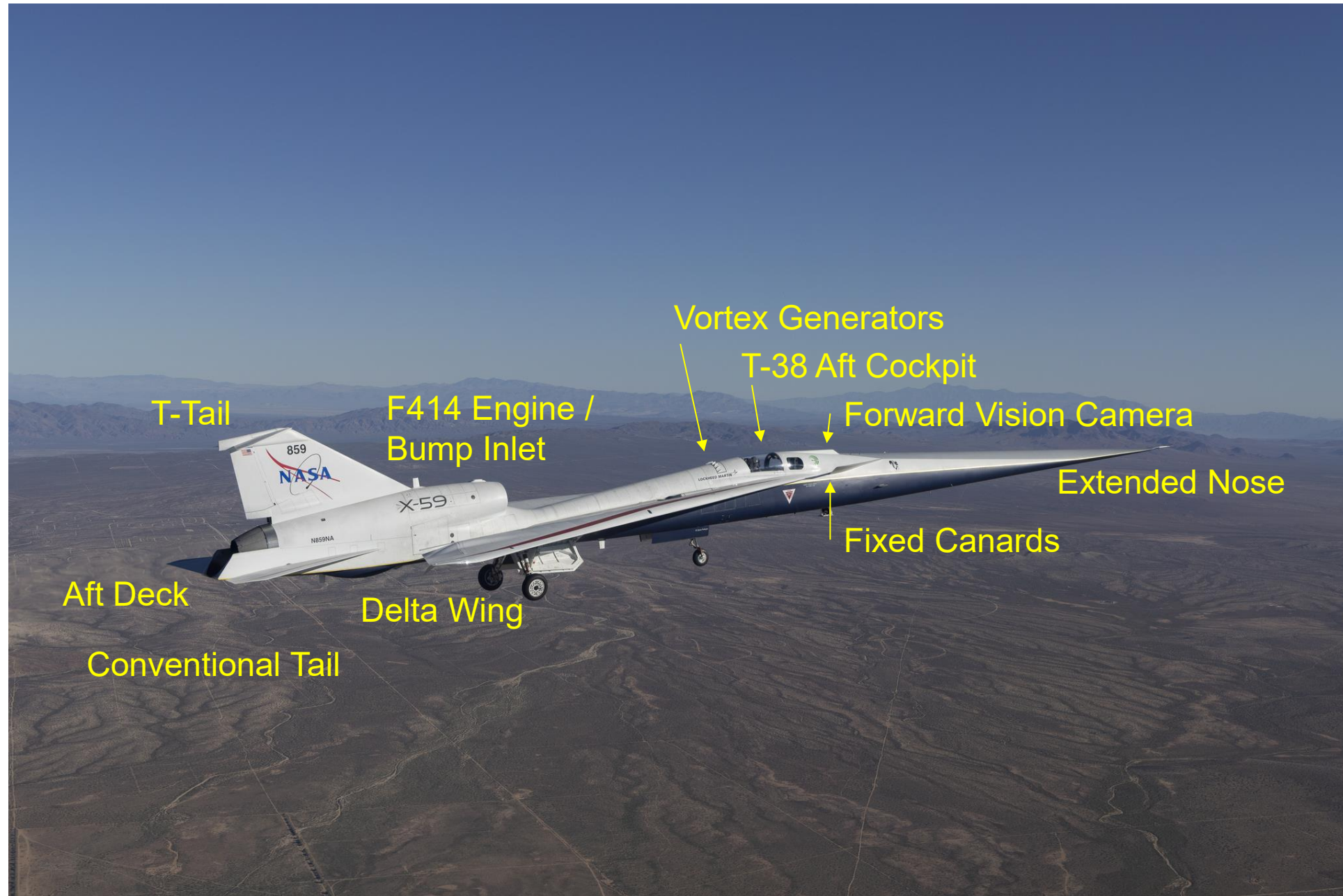


X-59

FLIGHT TEST

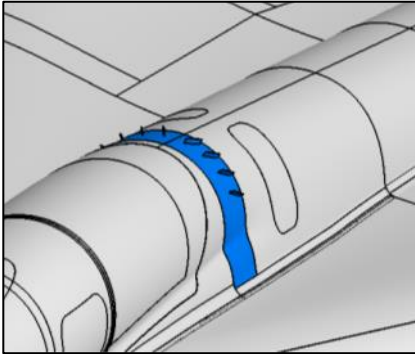


LBFD X-59 Propulsion Overview
Ray Castner, NASA Glenn Research Center
NASA X-59 Propulsion Performance Lead
AIAA Aviation Conference, San Diego CA
June 11, 2026

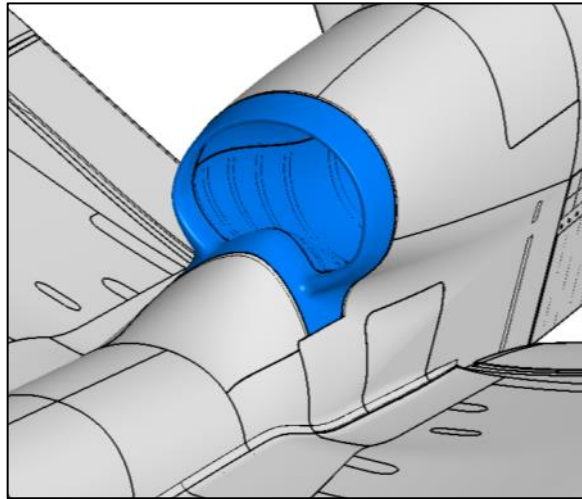




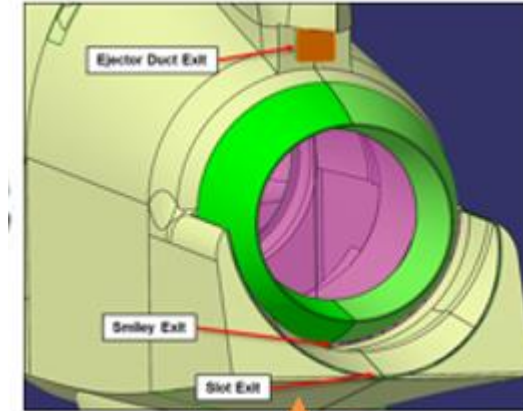
System Overview



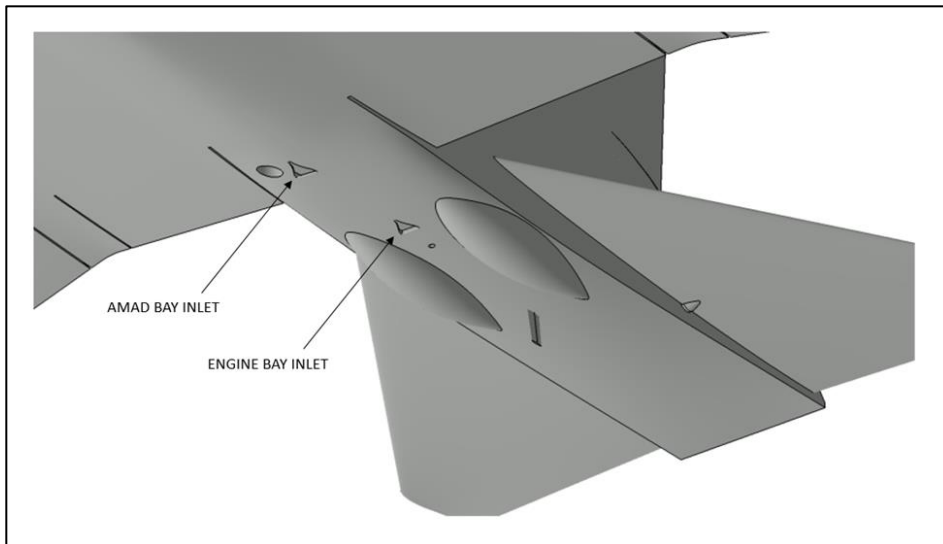
Vortex generators



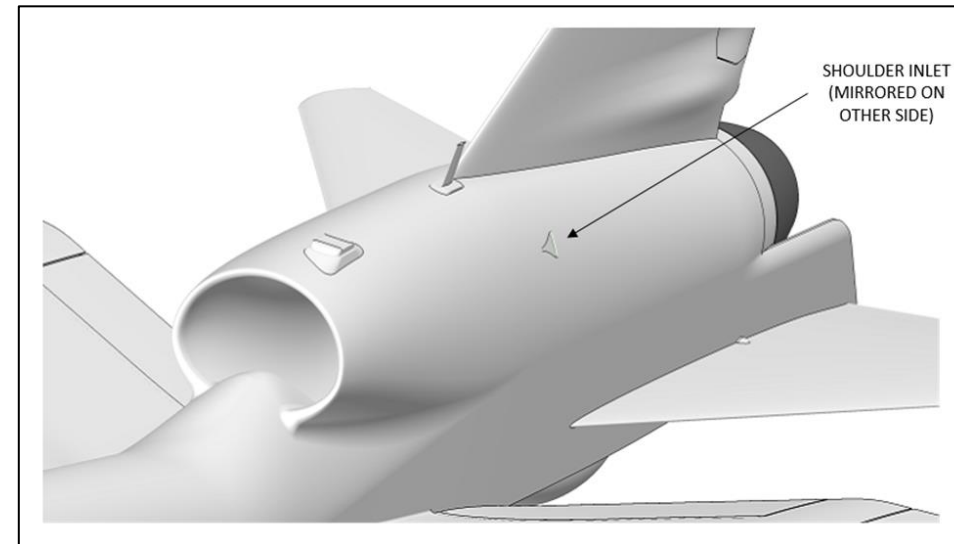
Diverterless, bleedless inlet



Engine bay ventilation exhaust



Bottom inlet scoops (nacelle ventilation)



Shoulder inlet scoops (nacelle ventilation)



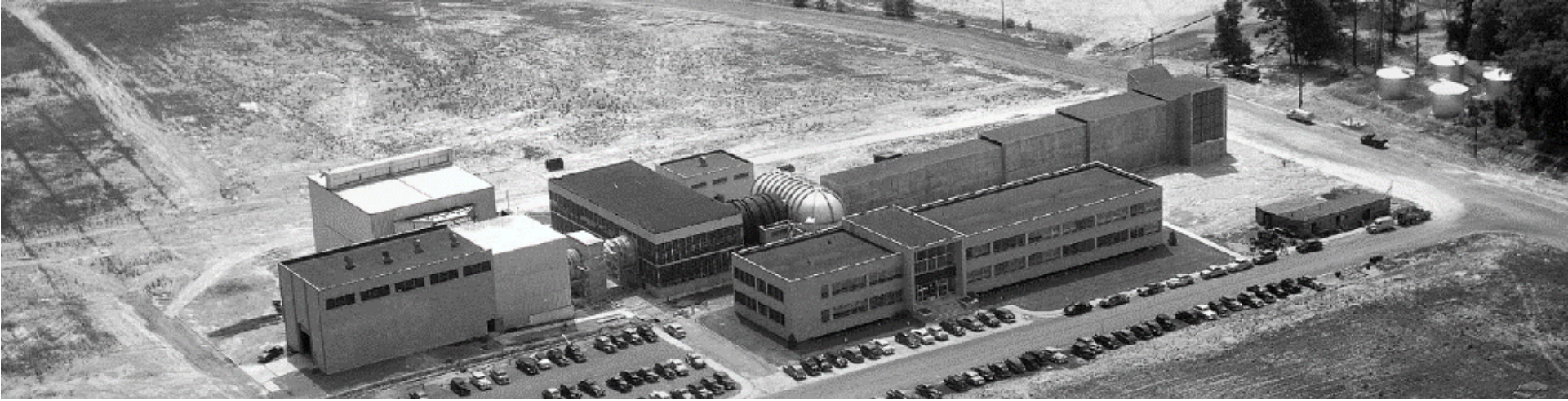
Engine Acceptance – April 2020





WIND TUNNEL TESTING

8- by 6-foot and 9- by 15-foot Wind Tunnel Complex



1949 overhead image of 8x6 complex



2015 overhead image of 8x6/9x15 complex

Historical Relevance



↑ C-1960-54465

↓ C-1983-6425

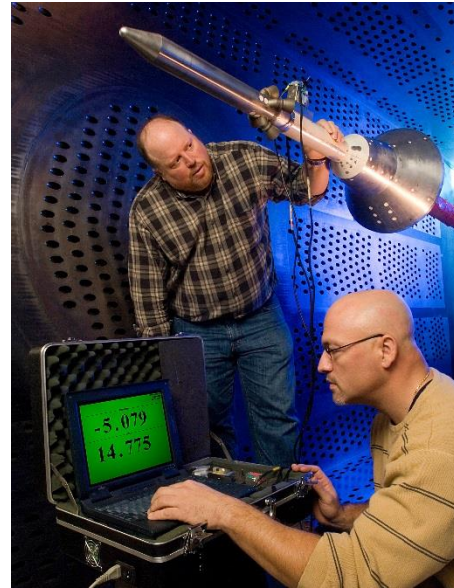
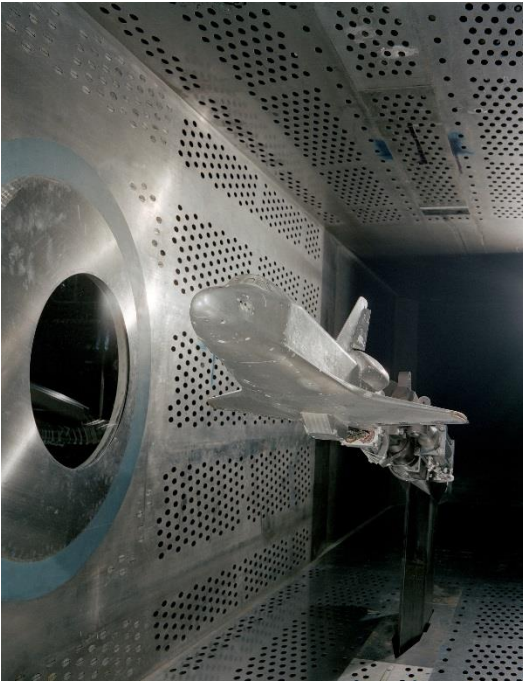


↓ C-2007-2471



↓ C-1970-1385

↑ C-1964-72479



↑ C-1986-4703

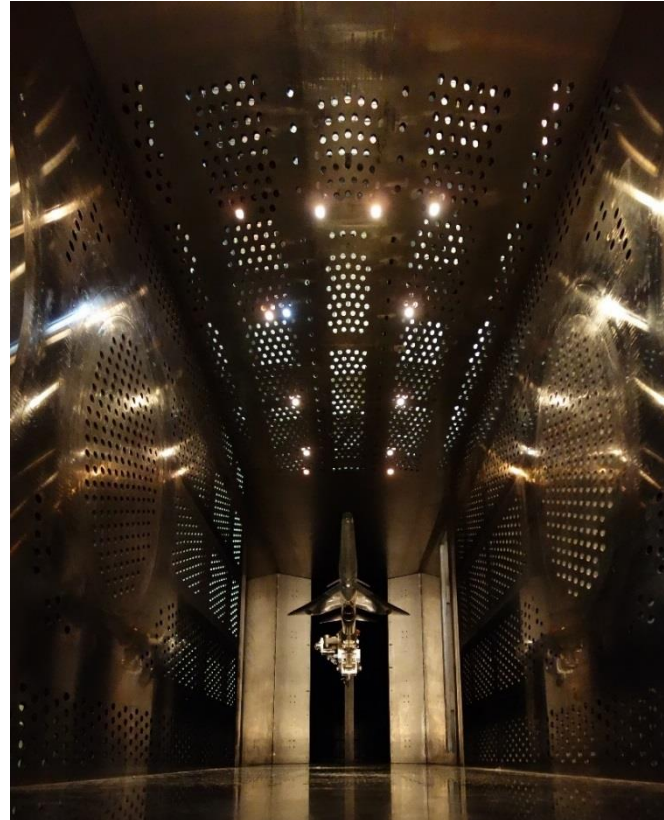
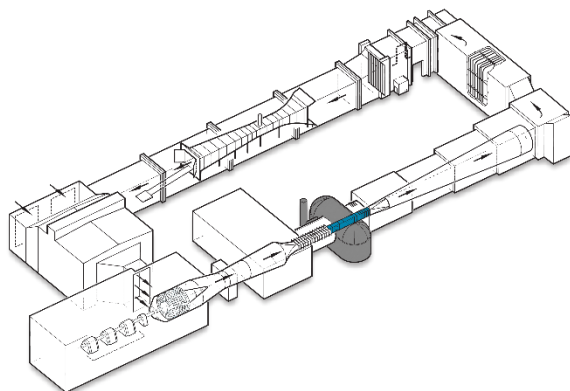


Test Section

“South wall” of test section showing both smooth and porous sections with both Schlieren windows and porous blanks

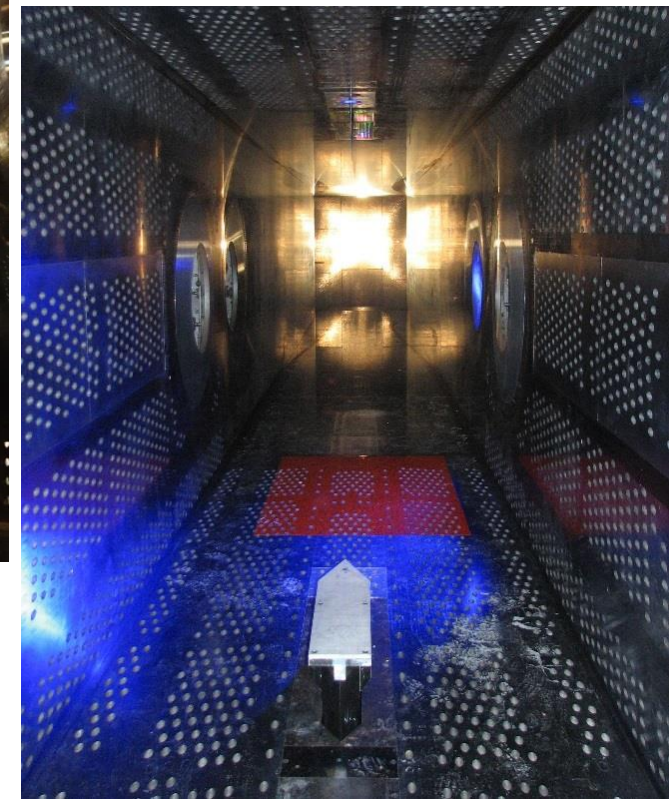
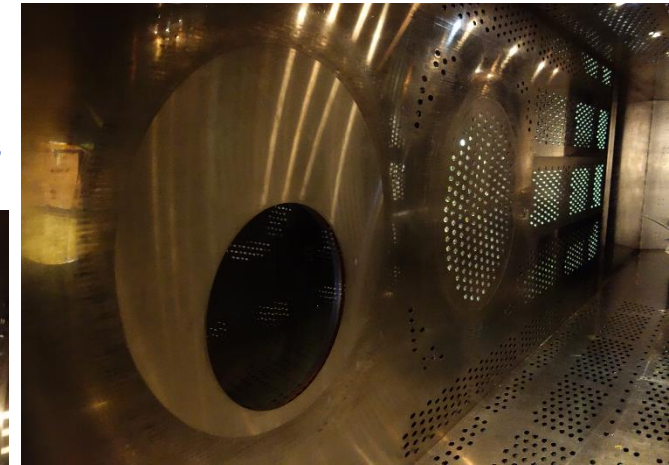


C-1956-42930
Porosity hole drilling operation in
8x6 SWT, 1956



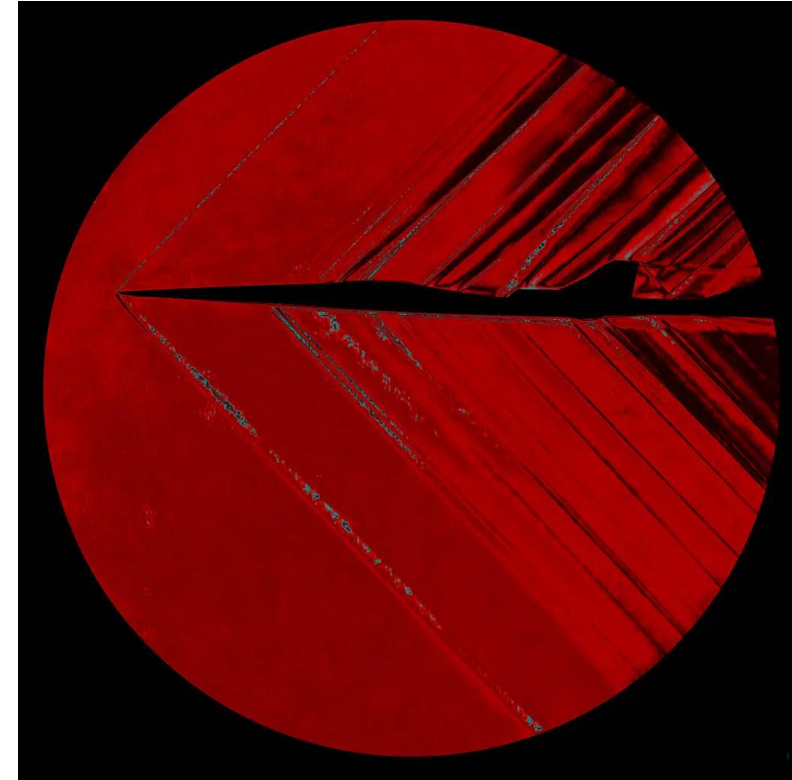
QueSST model installed in 8x6 SWT test section

Looking upstream; flow imaging installation
and full view of 8x6 SWT test section

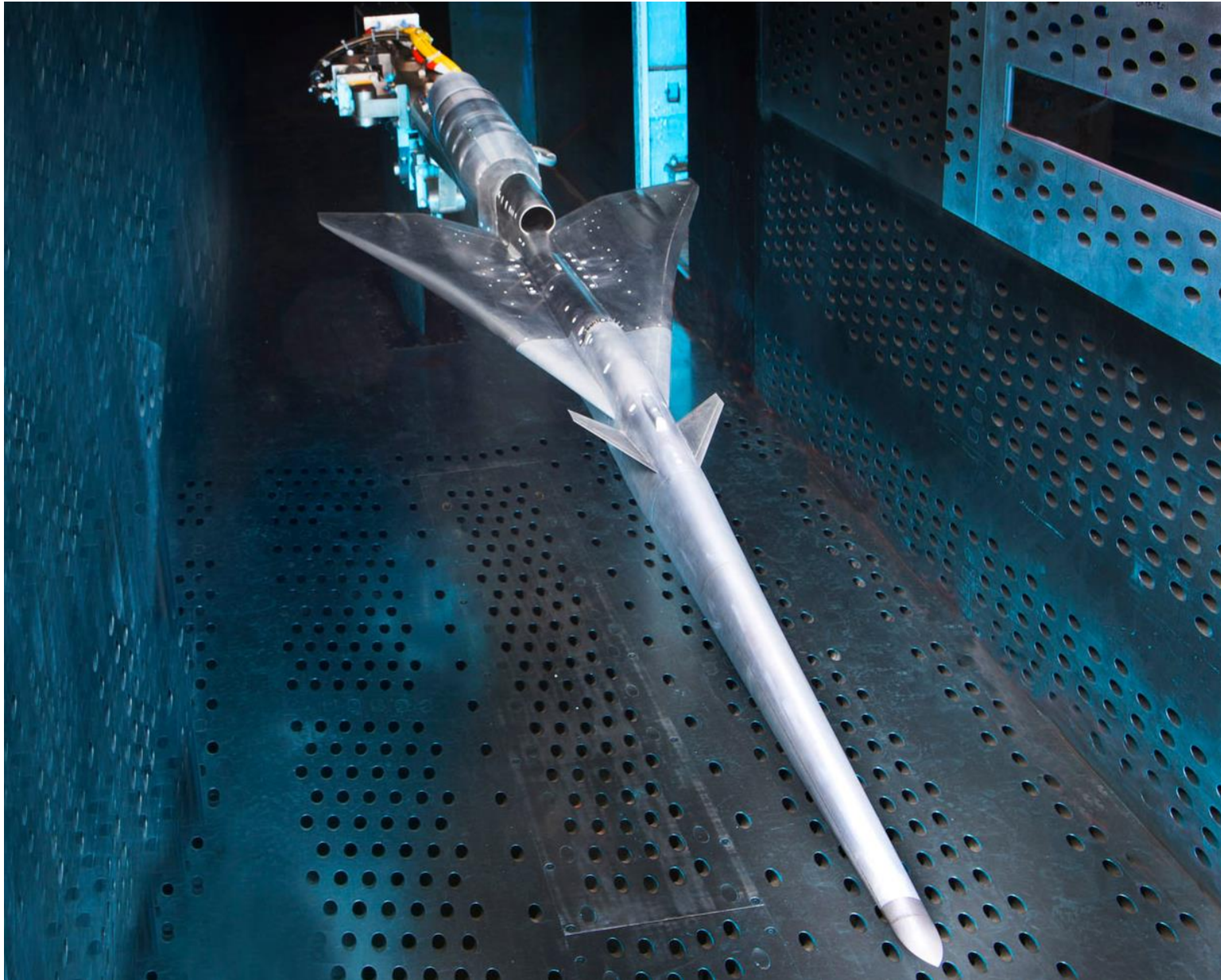


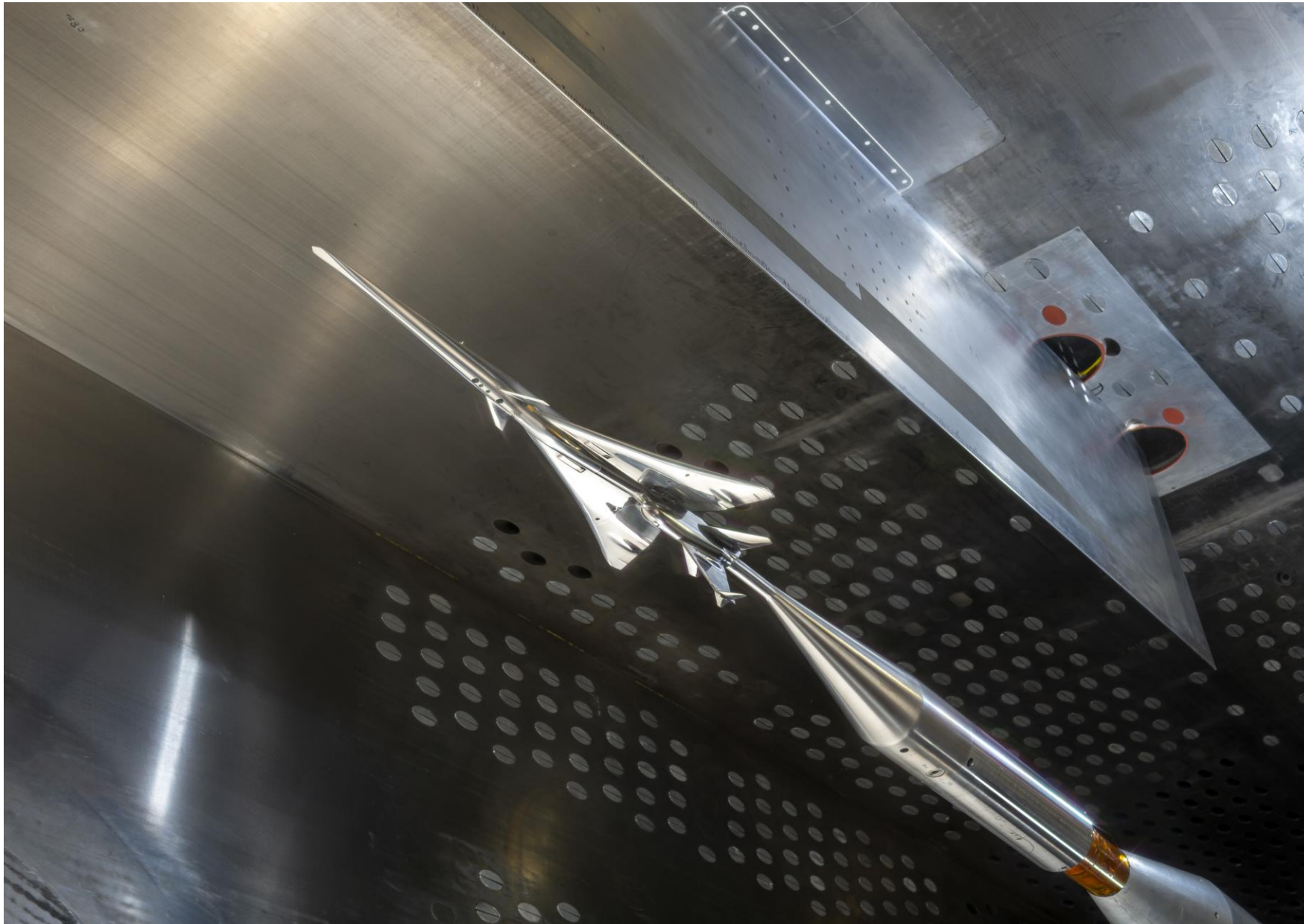
5 Wind Tunnel Tests at NASA GRC:

- Vehicle Aerodynamics – 2017
 - Collected vehicle lift/drag database
- Propulsion Performance – 2017
 - Collected steady state inlet performance
- Propulsion Inlet Distortion – 2019
 - Collected dynamic inlet performance
- Sonic Boom – 2021
 - Collected sonic boom signature for comparison to predictions and flight data
- Nose Probe – 2022
 - Calibrated the actual flight test air data probe

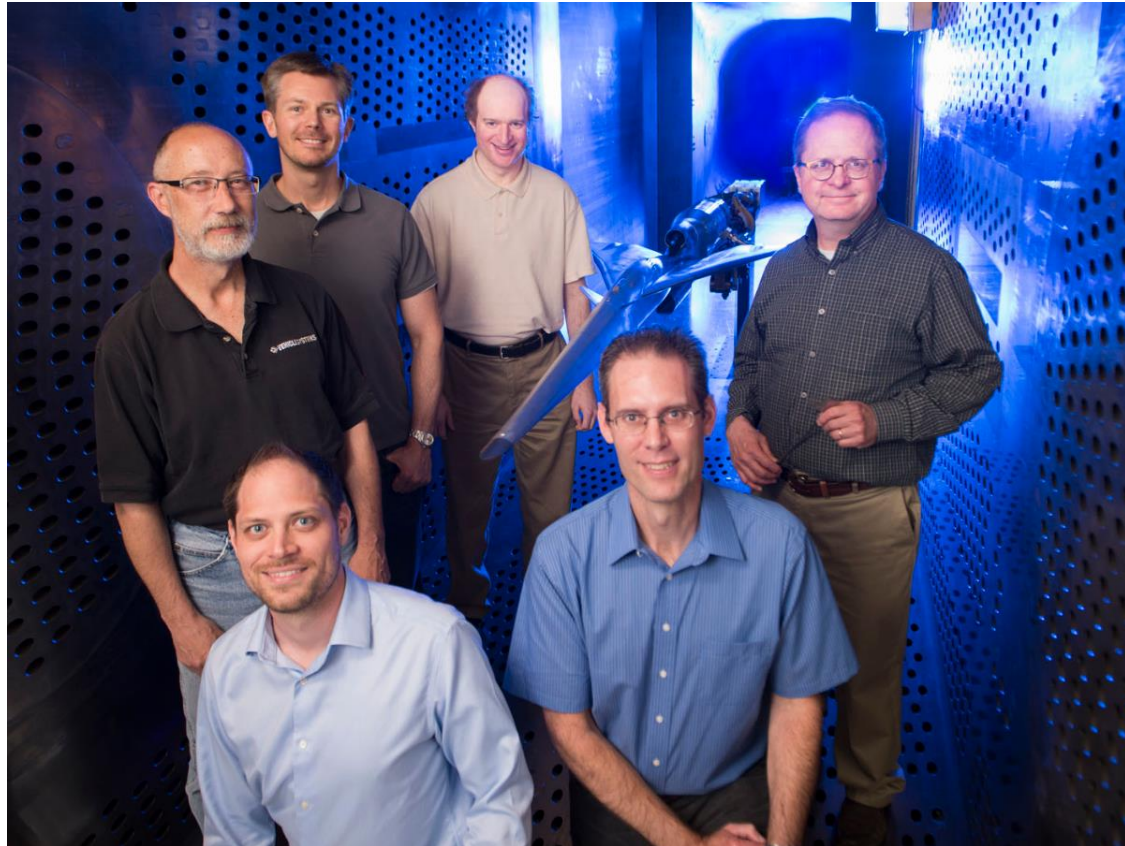












Engine Ground Test - 2025

Why we ground test:

Engine Integration

- Verify throttle works correctly
- Check for engine bay cooling
- Check engine air and fuel flow
- Verify power generation
- Verify bleed air/cabin pressure
- Check pilot cockpit displays



Engine Ground Test



Engine Ground Test



Flight Test Plan - Engine

What we test:

Continued from ground test

- Verify throttle works correctly
- Check for engine bay cooling
- Check engine air and fuel flow
- Verify power generation
- Verify bleed air/cabin pressure
- Check pilot cockpit displays

Plus

- Ride-along performance data
- Dedicated test points
 - Throttle snap movements
 - Speed hold checks



Notable Findings – Engine

Mostly minor integration findings:

- Speed hold software updates
- Engine bay cooling valve replaced
- Updated assessment for inlet angle of attack



Lessons – Engine

Examples:

- Cost estimating/budget
- Teamwork and culture
- Software
- Unplanned work
- Control room preparation and training
- Reporting / documentation
- Working through COVID19
- Managing schedule pressure

