



Learjet Flight Test Update

Commercial Supersonic Technology Project
Advanced Air Vehicles Program

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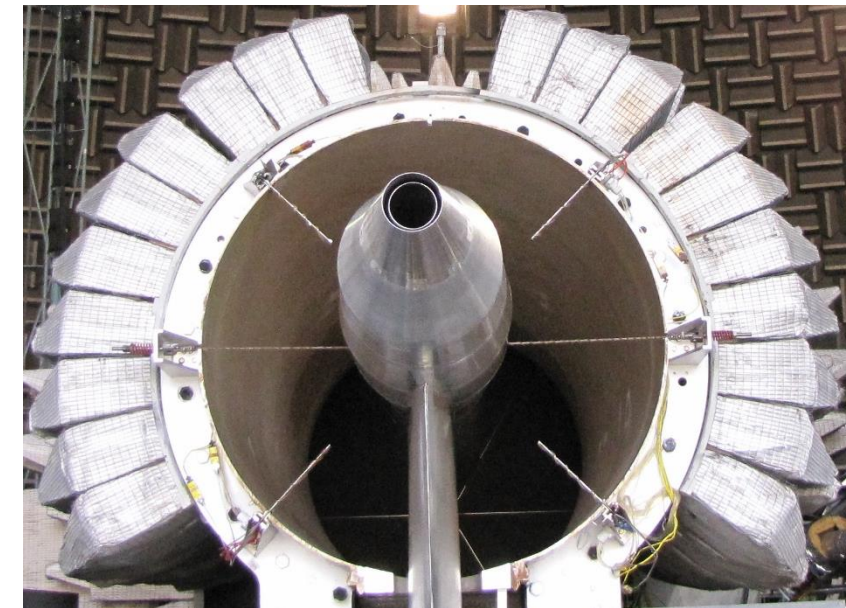
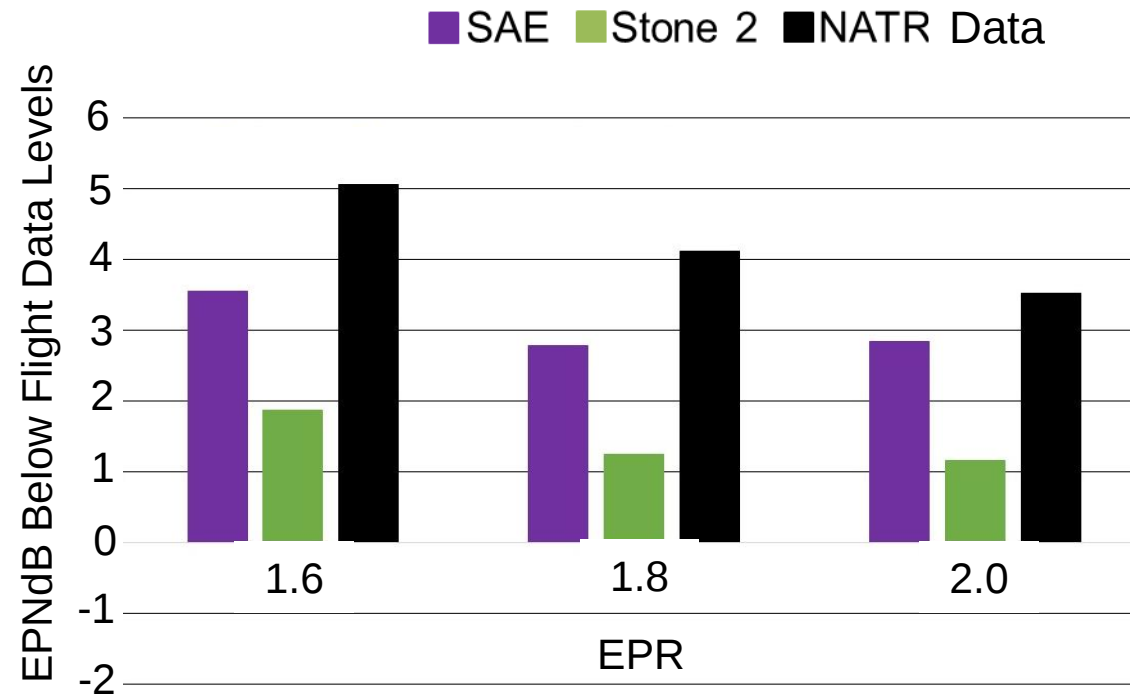
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NASA Glenn Research Center

NASA Acoustics Technical Working Group

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EPNL Comparison with 2001 Learjet Flight Data



There is significant jet-noise EPNL discrepancy between ANOPP models (SAE, Stone 2), NATR test data, and flight data.

Original flight test did not include adequate instrumentation on the aircraft

2018 AAPL Test

Objectives



- Develop a new single-stream jet-noise model for ANOPP
 - Model details were presented at the Spring ATWG 2021
 - Data was from scale model test in AAPL
- Acquire jet-noise flight data from a Learjet 25
 - Compare results from AAPL to flight data
 - Develop flight correction model if required

Desired outcome is to improve our ability to predict takeoff noise for future supersonic commercial aircraft

Learjet Flight Test Schedule



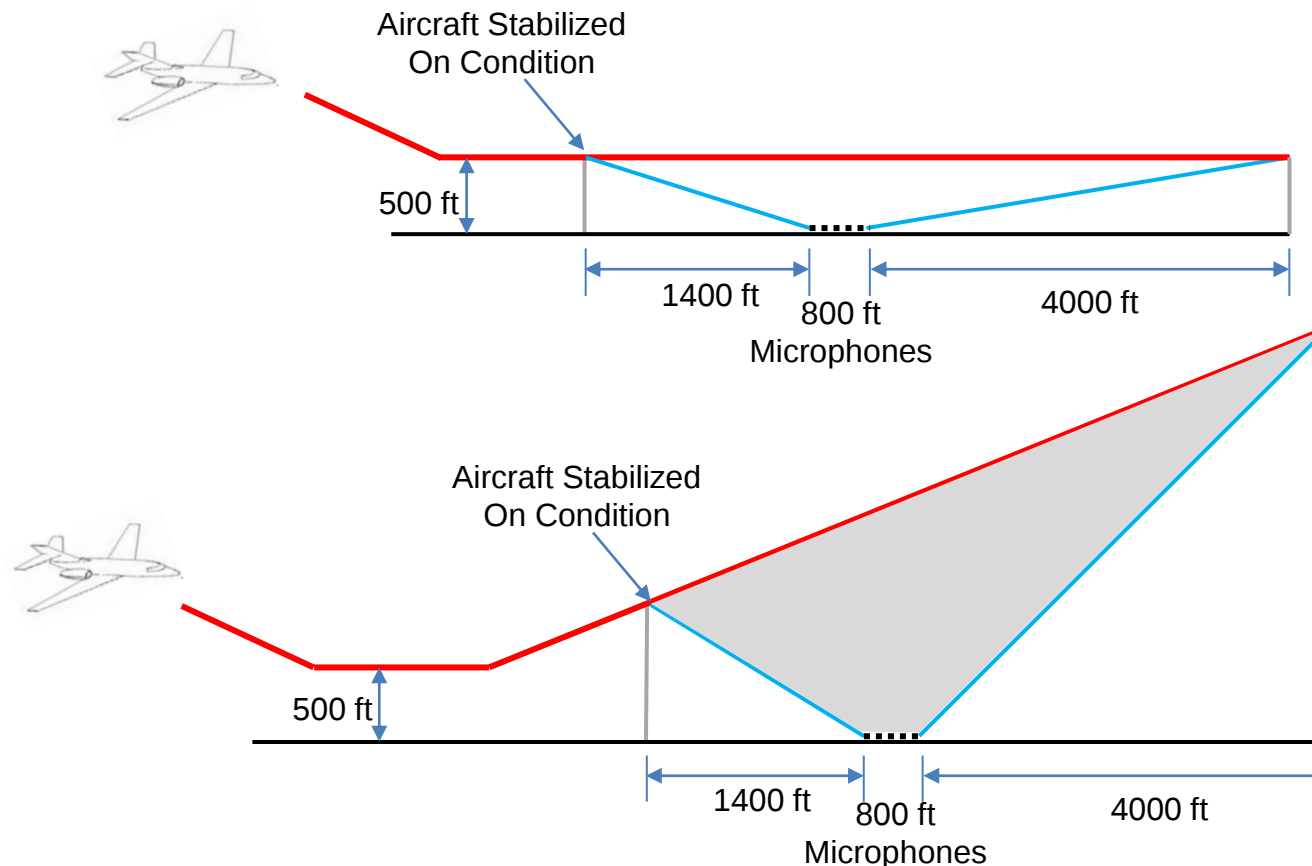
Task	Date
Contract Award	September 28, 2021
Pre-Flight	June 2022
Flight Test	July 2022
Follow-On AAPL Scale Model Test	September 2022

Every effort is being made to move the dates in **red** forward in the schedule

Flight Test Details



- Aircraft will be operated and instrumented by Calspan Corp.
 - Engine Pressure Ratio (EPR), Exhaust Gas Temperature (EGT), and engine RPM will be recorded for both engines
 - One engine will be at idle
 - Recorded data will include a GPS timestamp
 - Flight trajectories will include level flyover and climb to achieve desired engine and flight speed conditions
 - Flights will occur at Niagara Falls International Airport



Flight Test Details (con't)

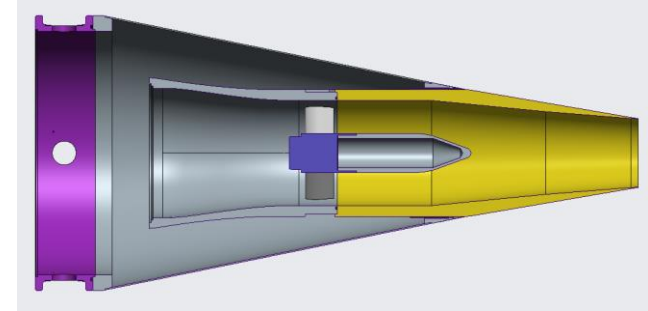


- NASA Instrumentation
 - Aircraft will be equipped with an IMU (Inertial Measurement Unit), differential GPS system, and logging computer (GPS timestamped)
 - Ground plate microphones will be used in the microphone array (the intent of this test is not certification type data)
 - Array will be located directly beneath the flight path
 - Microphone array will GPS timestamped
- Atmospheric conditions will be recorded up to an altitude of ~ 500 ft (still planning on using a drone)
 - Layered data will be acquired
- A preflight will be used to determine the engine and flight speeds that can be achieved
- Flight speeds will remain at or below Mach 0.3
- Jet exhaust conditions of interest are in the mid subsonic and low supersonic regime
- Previous background level measurements indicate that a cricket mitigation strategy may need to be implemented (depends on the actual flight date)

Follow-On AAPL Test



- Intent of follow-on tests is to acquire scale model data at the same conditions as those in the flight test
 - Need engine conditions and GPS data processed before scale model test
- Two models will be used – single stream and Learjet
 - Models have similar primary nozzle exit diameters, flow lines, and external contours
 - Exit diameter is 3.56"
 - Learjet model flow lines and configuration were taken from a Learjet nozzle
 - Learjet nozzle on aircraft has a secondary unpowered nozzle used to exhaust cooling air (NACA scoop on nacelle)



Single Stream Model



Learjet Model

Questions and Feedback



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