NASA Low Boom Flight Demonstration (LBFD) Project Overview

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Outline

- Why LBFD?
- Overview of NASA Role
- External Stakeholder Roles
- Project Phases
- Top-Level Schedule
- Sonic Boom Reduction Goal & Rationale

Why LBFD?

- Global demand for air travel is growing, which places a demand on speed

- Supersonic aircraft will be excellent export products that can be capitalized on by the US to support a positive balance of trade

- New supersonic products lead to more high-quality jobs in the US
  - Large potential market predicted: - business aircraft followed by larger commercial aircraft
  - Technology leadership established through initial products will lead to development of larger, more capable airliners

- The government plays a central role in developing the data needed for ***regulation change*** that is essential to enabling this new capability

The LBFD will enable the collection of data required to change regulations that currently prohibit supersonic overland flight

Overview of NASA Role

Overarching Objectives:

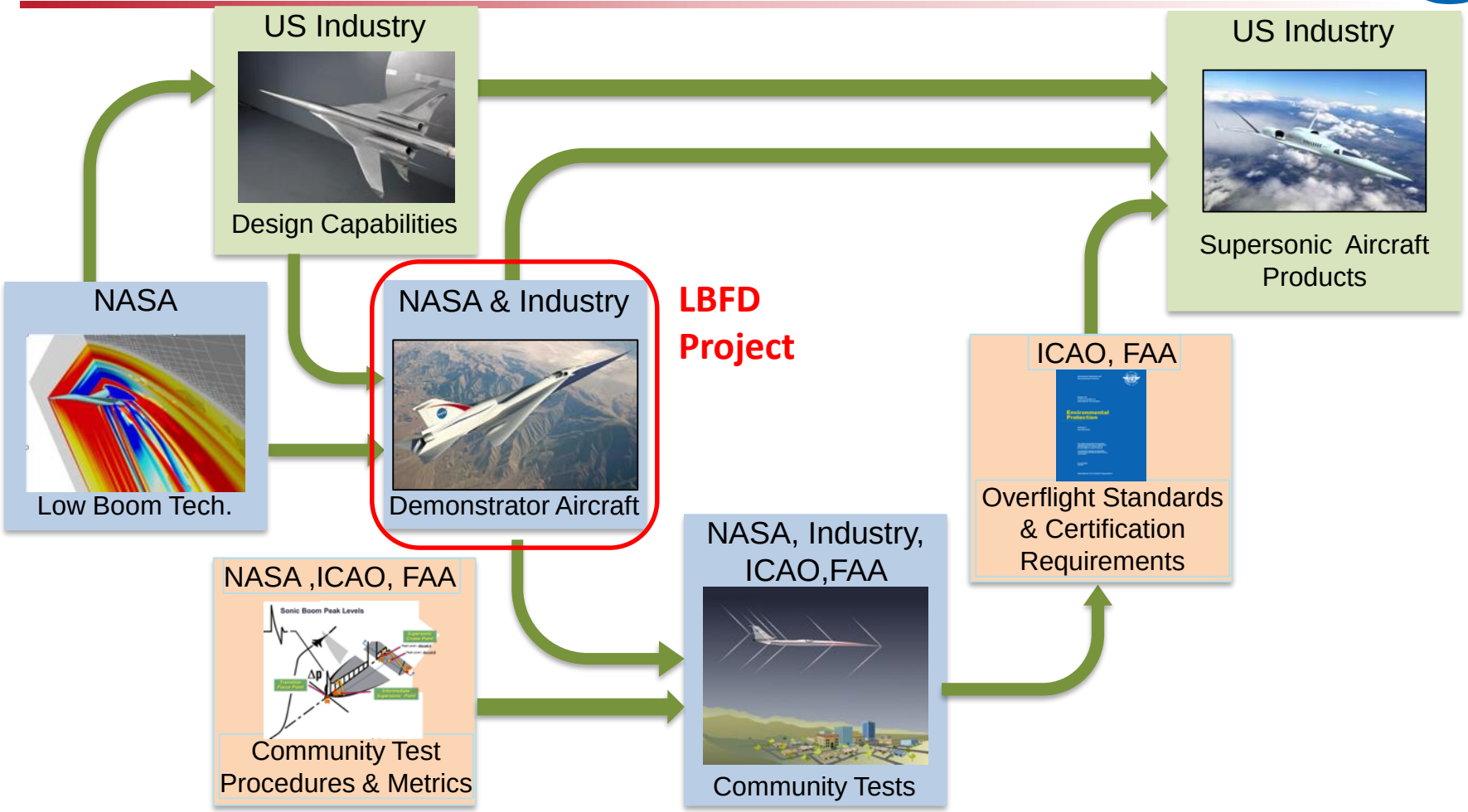
- Demonstrate that noise from sonic booms can be reduced to a level acceptable to the population residing under future supersonic flight paths.
- Create a community response database that supports an international effort to develop a noise based rule for supersonic overflight

Overall NASA Goals:

1. Design and build aircraft with low-noise sonic boom signature characteristics
2. Validate sonic boom signature performance
3. Conduct testing to develop a supersonic overflight community response database

40+ years of NASA led investment and technical progress has created an opportunity to overcome the sonic boom barrier

Roles in the development of Supersonic Flight



- NASA Investment in Supersonic Tools and Technologies gives US industry a competitive advantage
- Unique NASA role in development of demonstrator
- NASA leadership provides key data required to determine certification standards for market leading products

Project Phases

Phase 1 - Aircraft Development

- Detailed Design
- Fabrication, Integration, Ground Test
- Checkout Flights
- Subsonic Envelope Expansion
- Supersonic Envelope Expansion

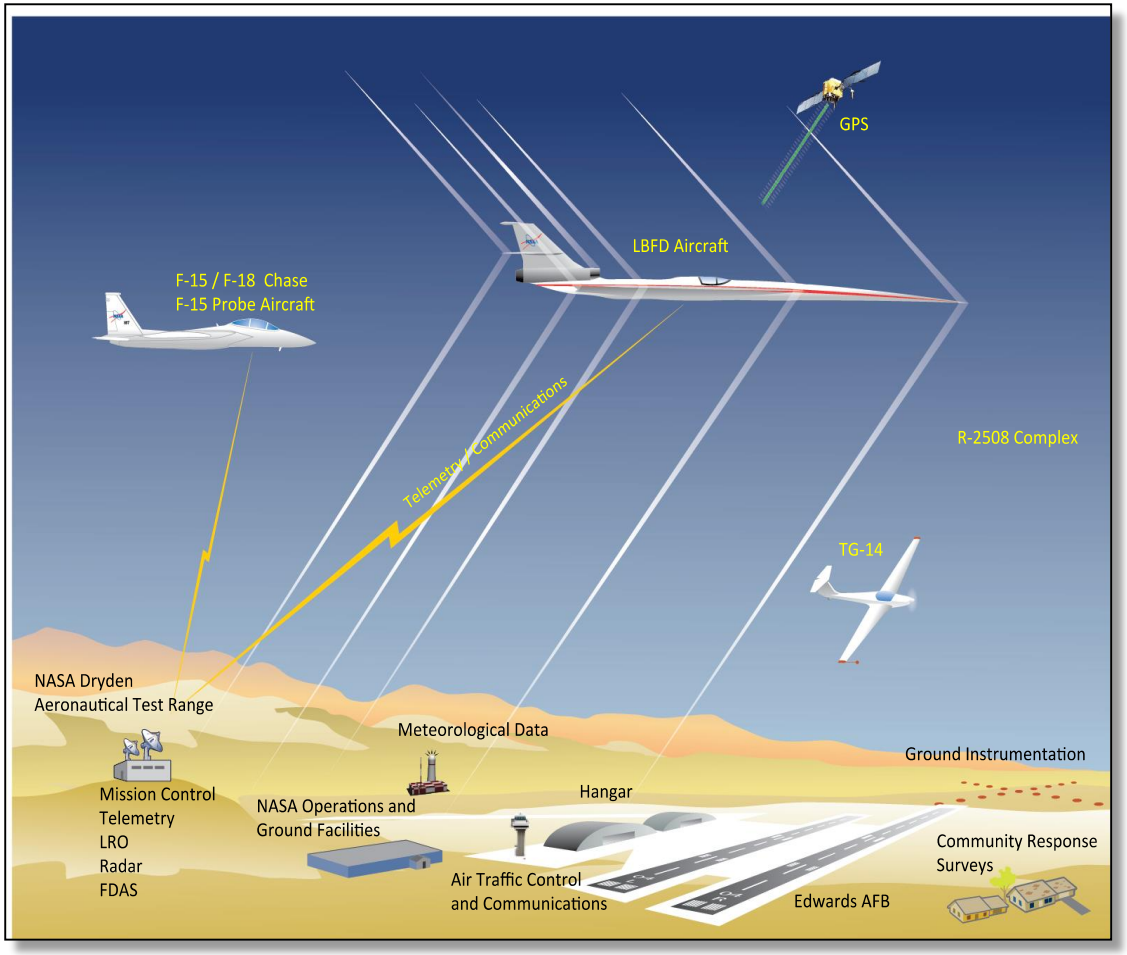
Phase 2 – Acoustic Validation

- Aircraft Operations / Facilities
- Research Measurements

Follow on to the LBFD Project

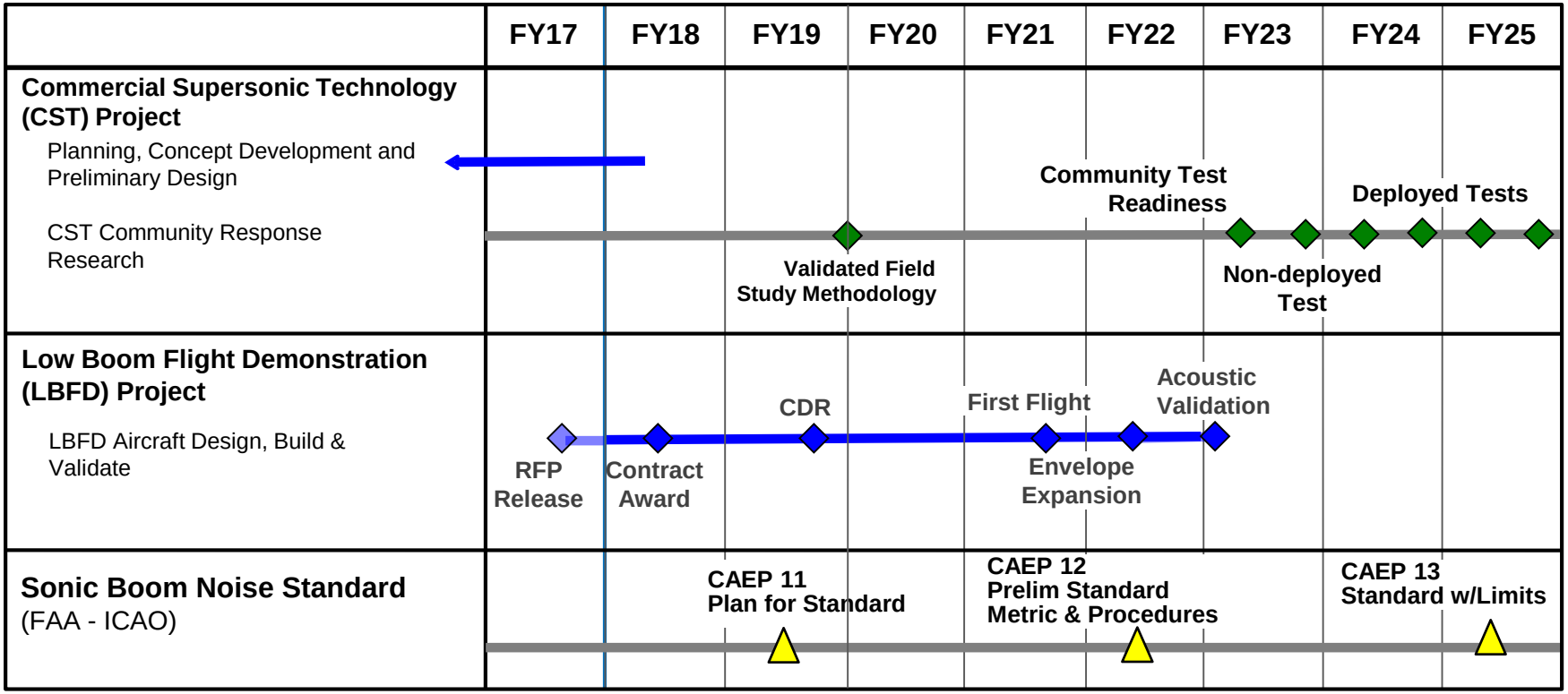
Phase 3 – Community Response

- Multiple community response flight campaigns (4 to 6) over representative communities and weather across the U.S.



Top-Level Schedule

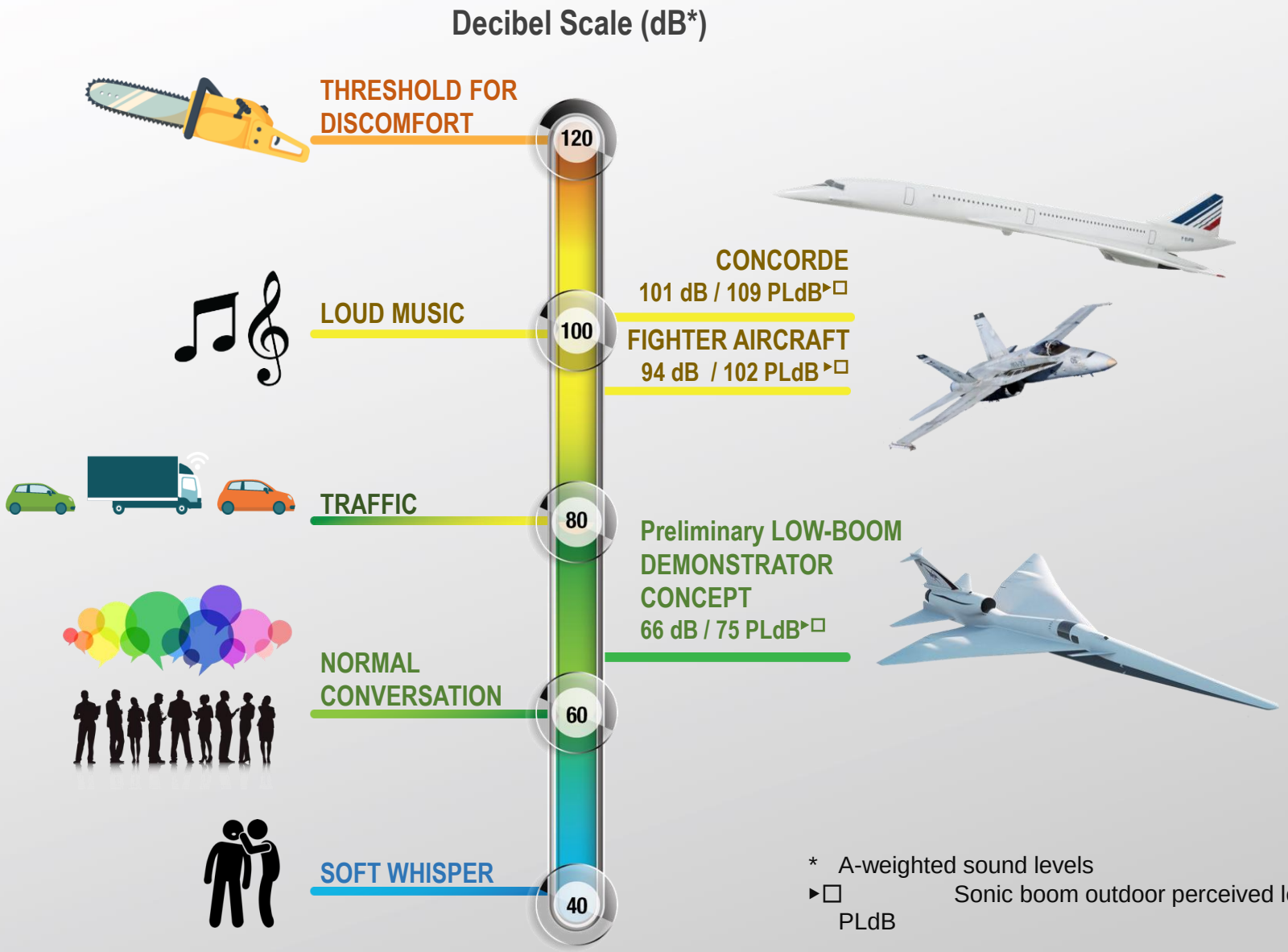
Parallel, Integrated Efforts Supporting International Rule Change Efforts



CST Milestones **LBFD Milestones** **NASA Input to CAEP**

CAEP – Committee on Aviation and Environmental Protection
ICAO – International Civil Aviation Organization
RFp – Request for Proposal
CDR – Critical Design Review

Supersonic Aircraft – Loudness Comparison



* A-weighted sound levels

▸□ Sonic boom outdoor perceived levels, PLdB

Rationale for LBFD 75 PLdB Requirement

- Numerous studies using both simulated sonic booms and real booms with low noise features generated by a special dive maneuver have demonstrated that 75 PLdB represents a threshold value for low annoyance reactions to sonic boom noise.

- Levels below 75 PLdB have been shown to result in very low to no response annoyance to a boom event. The ability to expose the public to this range of boom noise in the most realistic conditions (i.e. by overflight of actual communities) is key to defining acceptable noise targets for future supersonic aircraft.

- Practical considerations for design of an affordable demonstrator aircraft powered by existing engines indicate that 75 PLdB is the minimum value that can be robustly achieved over a variety of flight conditions. Such a design will also be able to create 70 PLdB exposures using a modified, but repeatable, flight profile.

- These elements form the rationale for the 75 PLdB mission requirement for the LBFD aircraft.

Summary

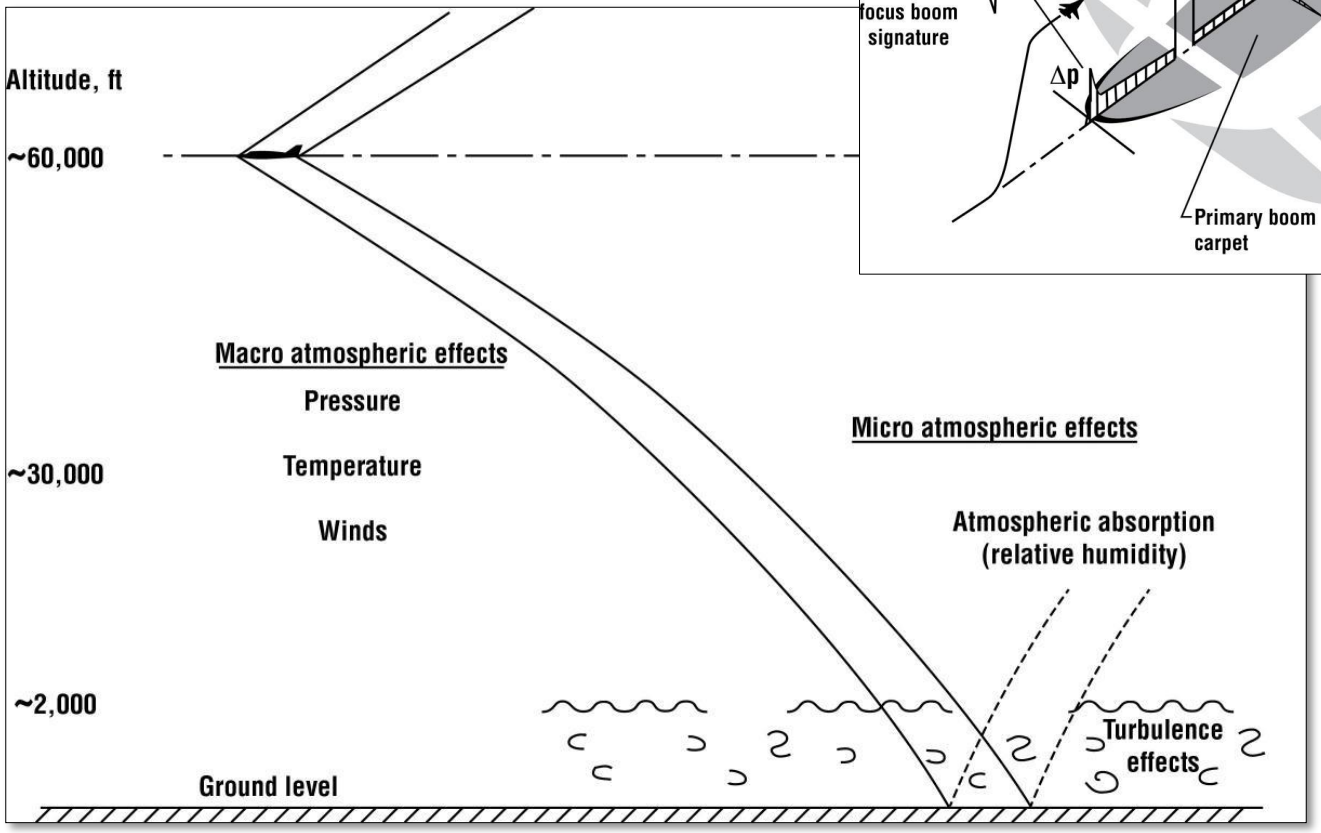
- Commercial supersonic flight represents a potentially large world-wide market
- NASA led investment and technical progress has created an opportunity to overcome the sonic boom barrier
- Regulation change required to allow commercial supersonic overland flight
- The Low Boom Flight Demonstration project will build a demonstrator aircraft to support the international effort to develop a noise based rule for supersonic overland flight

NASA

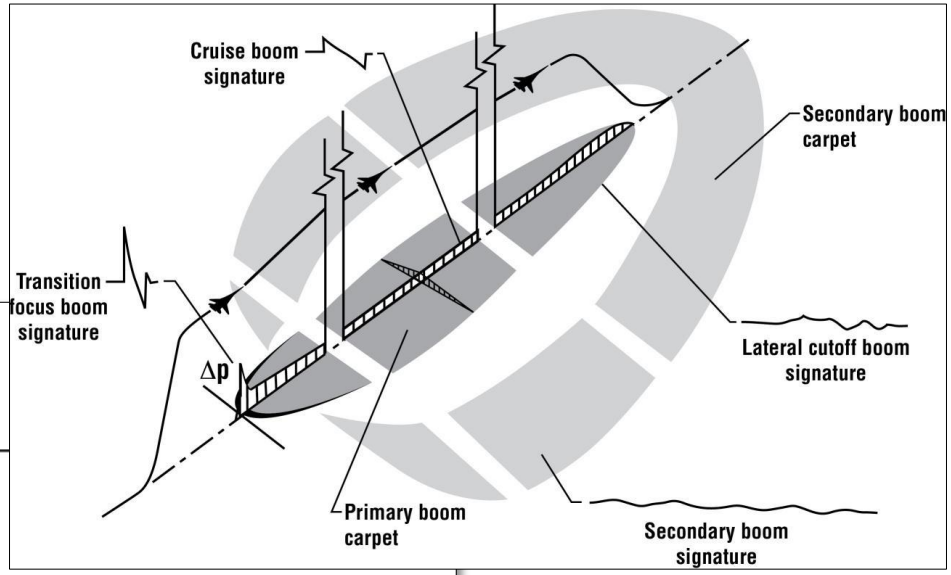
Backup

Sonic Boom 101

Sonic Boom with Atmospheric Effects



Boom Signature Carpet



Shaped Ground Signature Reduces Noise