A Gulfstream Perspective on the DARPA QSP Program and Future Civil Supersonic Initiatives

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GAC View of DARPA QSP

• The viability of a civil supersonic vehicle hinges on supersonic flight over land.

• The sonic boom mitigation element of the DARPA QSP program represents a positive step toward supersonic transportation.

• QSP program participants demonstrated positive teamwork toward a common goal.

• Technical Exchange Meetings provided excellent forums for program advancement.

• Visionary DARPA leadership and DARPA style program facilitated rapid and meaningful development.
Significant Accomplishments Achieved

• Technology Development
  – Pushing State-of-the-Art Boundaries
  – Aerodynamics, Propulsion, and Structures
  – Sonic Boom Mitigation
  – Design Methods

• Configuration Development (for Low Boom)
  – Incorporating “Nontraditional” Design Criteria
  – Pushing Performance Boundaries
  – Integrating and Evaluating Technologies

• F5 Shaped Sonic Boom Flight Demonstration (SSBD)
  – Excellent Validation of Design Methodology
  – Enhanced Understanding of Acoustic Signature Propagation
  – Experimental Proof of Shaped Ground Signatures
DARPA SSBD Success a First Step

First-Ever Shaped Sonic Boom
Recorded 27 August 2003

Signatures recorded during SSBD back-to-back data flights in the Edwards AFB supersonic flight corridor early morning.

Estimated conditions:
Mach 1.36*,
Altitude 32,000 ft

SSBD Flight 9
August 27, 2003
06:46:32.7502 PDT
NASA Dryden
BADS West
Future Civil Supersonic Initiatives
Supersonic Aircraft Progress

- **Military**
  - X-1
  - D558
  - F104
  - B58
  - XB70
  - B2707 U.S. Never Built

- **Commercial**
  - SR71
  - Tu144 Russia Ops Stopped
  - Concorde Fr/UK “In Service” Ops Stopped 2003

- **Years**
  - 1940-2020

- **Mach Number**
  - 0.0 to 3.5

- **Timeline**
  - 45 Years of Civil Subsonic Jet Transports
  - 30 Years with No New Civil Supersonic Transport

(Slide 6)
Civil Supersonics / Concorde is Dead - What Now?

- Different Market - Quiet Supersonic Jet (QSJ)
  - Business Jet: Speed is Important & Affordable

- Smaller Size
  - TOGW ~ 100K lb

- Lower Mach Number
  - 1.6-2.0

- Boom Suppression Progress
  - DARPA Shaped Sonic Boom Demonstration
  - Boom Suppression Technology Development

Numerous Attributes Combine to Enhance QSJ Feasibility and Acceptability
Doubling Speed Redefines Air Transport

Speed that redefines a 12 hour work day -- there and back with 2 hours minimum on location

Assuming Mach 1.8, 4,500 nm range capability

Worldwide Coverage in 10 hours
Quiet Supersonic Jet (QSJ) Market Assessment

- Productive Use of Time an Imperative in Worldwide Commerce
  - Speed is Important - Target: $M=1.6-2.0$
- Two Gulfstream Market Assessments Identify Conservative Sales of 180-350 Aircraft
- Two Independent Market Assessments (Meridian and Teal) 300-400 Aircraft
- Fractional Ownership Offers Large Potential for QSJ
- Supersonic Overland Flight Is a Requirement
- Range Beyond 4000 nm Is an Advantage

Market Assessment is Favorable If It Can Be Accomplished Technically
Cruise Acoustic Signature Levels

QSJ Advanced+ > 35dB Quieter Than Concorde

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QSJ Conceptual Program Highlights

- Supersonic Over Land Flight a Market Requirement
  - FAA Prohibition Must Be Replaced With Rational Rule If Progress Is To Be Made

- Sonic Boom Suppression a Key Technology

- Supersonic Over Land Flight Requires Two-Part Program
  - Boom Technology Demonstrator / Rule-Making
  - Production Program

- High Risk R&D $ Required

- Entry Into Service a Decade Away
Pushing the Performance Envelope

Today’s Reality

- Max Weight: 91,000 lb
- Typical Payload: 8 pax
- TO Field Length: 6,000 ft
- Cruise Speed: 0.80 M
- Range: 6,750 nm

Tomorrow’s Vision

- Max Weight: 100,000 lb
- Typical Payload: 8 pax
- TO Field Length: 6,000 ft
- Cruise Speed: 1.80 M
- Range: 4,800 nm

QSJ – Potential to be First Successful Civil Supersonic Aircraft

(Slide 12)