Civil Supersonics / Concorde is Gone – What Now?

- Gulfstream Perspective…
  - Quiet Supersonic Jet (QSJ)
    - Different Market
      - Business Jet: Speed is Important & Affordable
    - Different Requirements
      - High Speed Civil Transport: Mach 2.4, 600K airliner
      - Quiet Supersonic Jet: Mach 1.8, 100K transport

- Advantages
  - Smaller Aircraft → Reduced Sonic Boom
  - Lower Speed → Less Complexity (Inlets, Materials, Etc.)

Better Chance at Enabling Acceptable Supersonic Civil Aircraft
Redefining the Speed Envelope

5 Hour Range Circle \(\approx\) Day Trip
There and back with 2 hours on location

Worldwide Coverage in 10 Hours

* Assumes Mach 1.8 over land, 4,800 nm range capability
† CFR Part 91.817 explicitly prohibits aircraft operation in US airspace at flight speeds > Mach 1

Supersonic Overland Is Key – Requires Regulatory Change
Redefining the Speed Envelope

Today’s Reality

Cruise Speed 0.90 M

Redefining the Speed Envelope

Tomorrow’s Vision

Cruise Speed 1.80 M

Environmental Considerations

- **Boom Overpressure**: Acceptable for Overland SS Flight
- **Takeoff Emissions**: ICAO with Margin
- **Cruise Emissions**: Minimum Impact
- **Airport Noise**: Stage 4 with 10dB Margin

Manage Environmental Impacts Through Design Requirements
Supersonic Technology Development

Objective: Conduct basic research into reducing the impact of sonic boom on people and the environment to enable regulatory change for supersonic flight overland, domestically and internationally.
Sonic Boom Suppression

- **Gulfstream Quiet Spike™**
  - Extendable Nose Spike
  - Generate Series Of Weak Shocks
  - Propagate Parallel To Each Other
  - Transform Sharp Crack Into Quiet Whisper
Quiet Spike™ Flight Test

2008 Laureate Award
Aviation Week & Space Technology

Excellent Correlation & Flight Validation of Sonic Boom Suppression

Photo: NASA Dryden Flight Research Center

Comparison of CFD-Predicted vs.Measured Near-field Signature
Preliminary Outdoor Loudness Assessment

Gulfstream Signature Development & Simulation

Low Boom Simulation & Preliminary Flight Results
Independently Point Toward Signature Levels ~ 70 PLdB

NASA F-18 Low Boom Flight Test – October 2005

- Boom Sound Levels
- Acceptability Thresholds
- Sound Pressure Levels (PLdB)

Gulfstream Signature Development & Simulation

Low Boom Simulation & Preliminary Flight Results
Independently Point Toward Signature Levels ~ 70 PLdB
Global Impact Assessment

Low Boom Signature Robust in Non-Standard Atmosphere

Concorde, Std. Atm.: >105 PLdB

QSJ, Std. Atm.: <70 PLdB

St. Helena Island (summ) 58.6 PL(dB)
Oimakon, Russia (wint) 69.5 PL(dB)
Std. Atm. 66.8 PL(dB)

Perceived Loudness (PLdB)

Predicted QSJ Under Track Perceived Loudness Levels, Dec-Feb Atmospheric Averages

Gulfstream

Gulfstream Proprietary Information
Partnering For Quiet Supersonic Flight

Key Scientific & Regulatory Partnerships

Pioneering Low Boom Supersonic Research

Innovative Low Boom Propulsion Development & Testing
Summary

• Continued Market / Industry Interest in Future Supersonic Concepts
  – Supersonic Overland Flight is Required
  – Manage Environmental Design Requirements for Success

• Promising Research Results in Sonic Boom Suppression
  – Validated Quiet Spike Technology
  – Acceptable Noise Level Achieved Through Low Boom Shaping

Quiet Spike Video
Questions?

Supersonic Acoustic Signature Simulator (SASS II)

Listening Area
Looking toward the Speaker

Operator's Station

Listening Area
Looking toward the Bass Trap

A MOBILE FACILITY FOR ASSESSING SIGNATURE ACCEPTABILITY