

An Overview of the Gulfstream
**Supersonic Technology
Program**



Gulfstream Aerospace Corporation

UC Davis Aviation Noise & Air Quality Symposium

“Revolution in Aviation”

March 1, 2009 / Palm Springs, CA

Photo: NASA Dryden Flight Research Center

Gulfstream[®]

Civil Supersonics / Concorde is Gone – What Now?

- **Gulfstream Perspective...
Quiet Supersonic Jet (QSJ)**

- **Different Market**

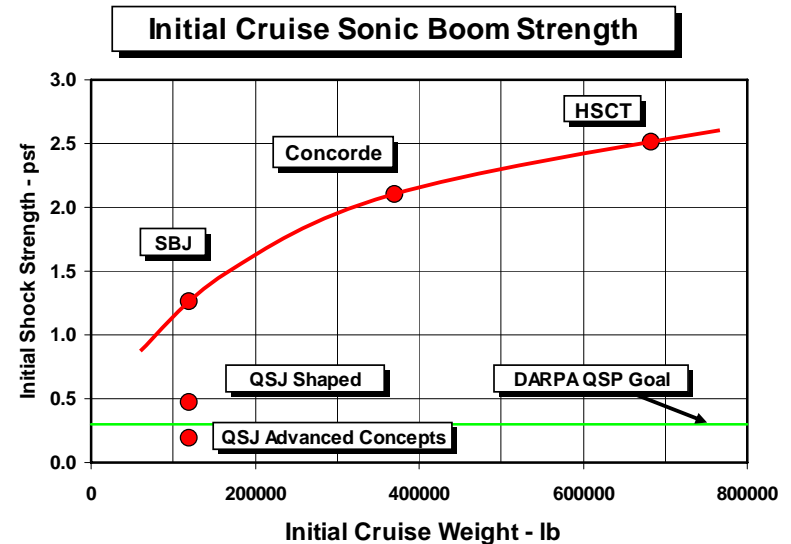
- **Business Jet: Speed is Important & Affordable**

- **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

Today's Reality



Cruise Speed **0.85 M**

Tomorrow's Vision



1.80 M

Environmental Considerations

- Boom Overpressure
- Takeoff Emissions
- Cruise Emissions
- Airport Noise

Requirement

Acceptable for Overland SS Flight

ICAO with Margin

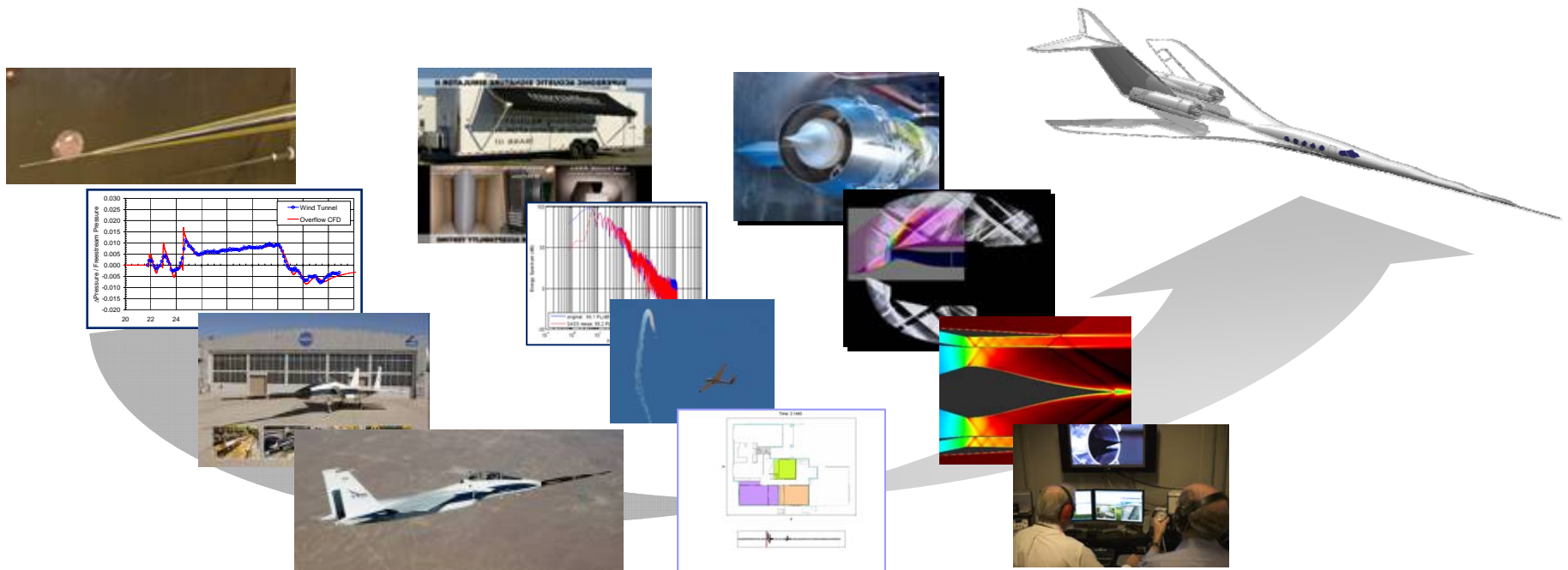
Minimum Impact

Stage 4 with 10dB Margin

Manage Environmental Impacts Through Design Requirements

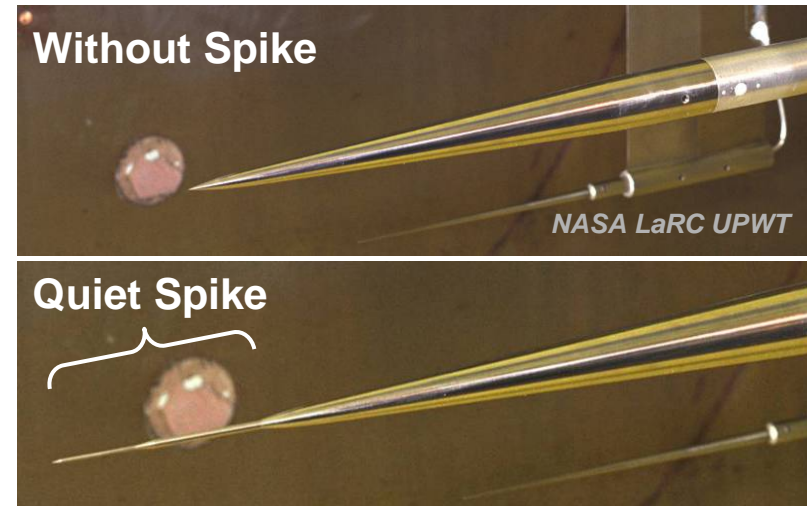
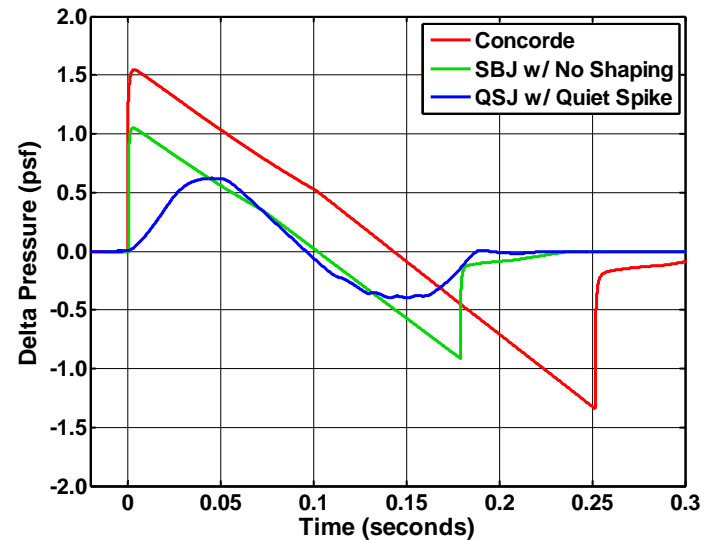
Supersonic Technology Development

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

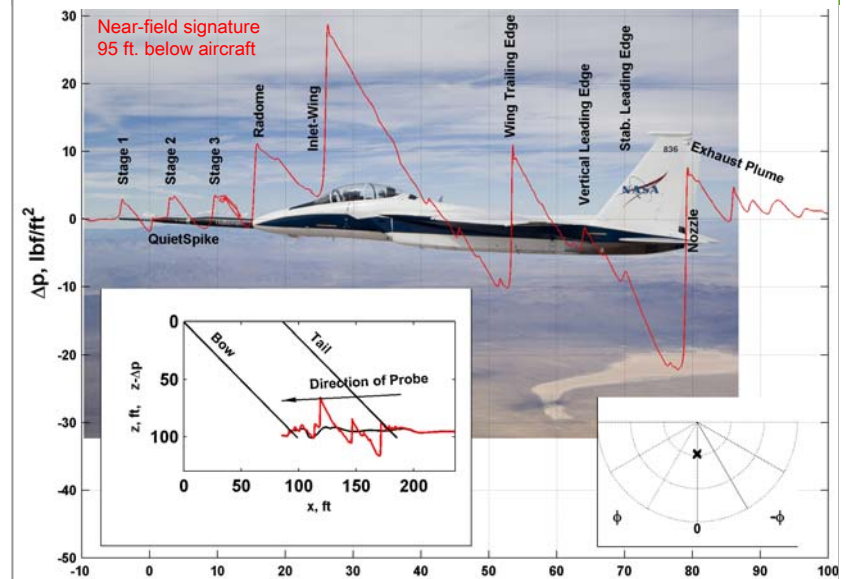
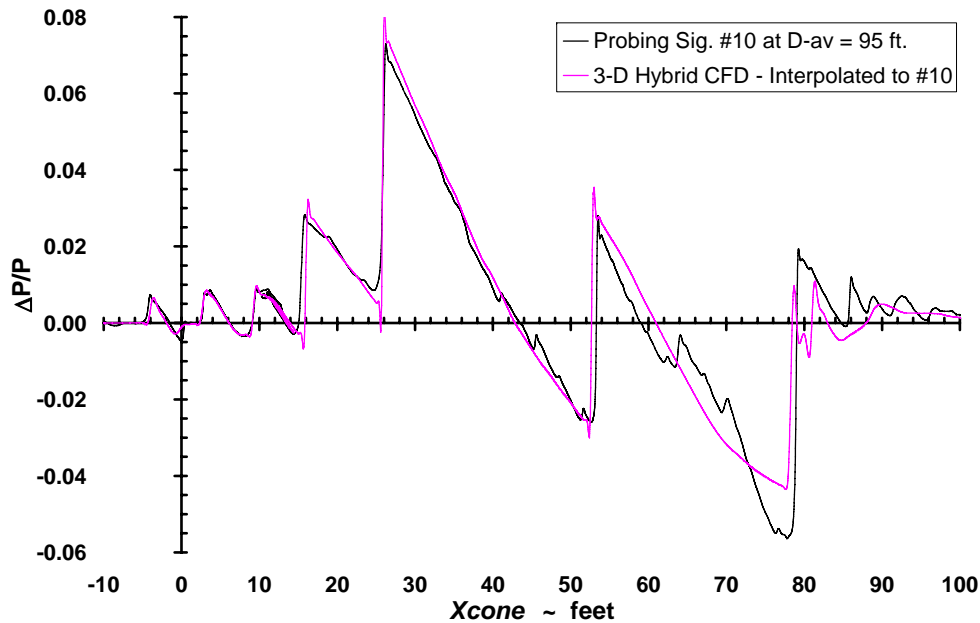
- **Gulfstream Quiet Spike™**
 - Extendable Nose Spike
 - Generate Series Of Weak Shocks
 - Propagate Parallel To Each Other
 - Transform Sharp Crack Into Quiet Whisper



Quiet Spike™ Flight Test



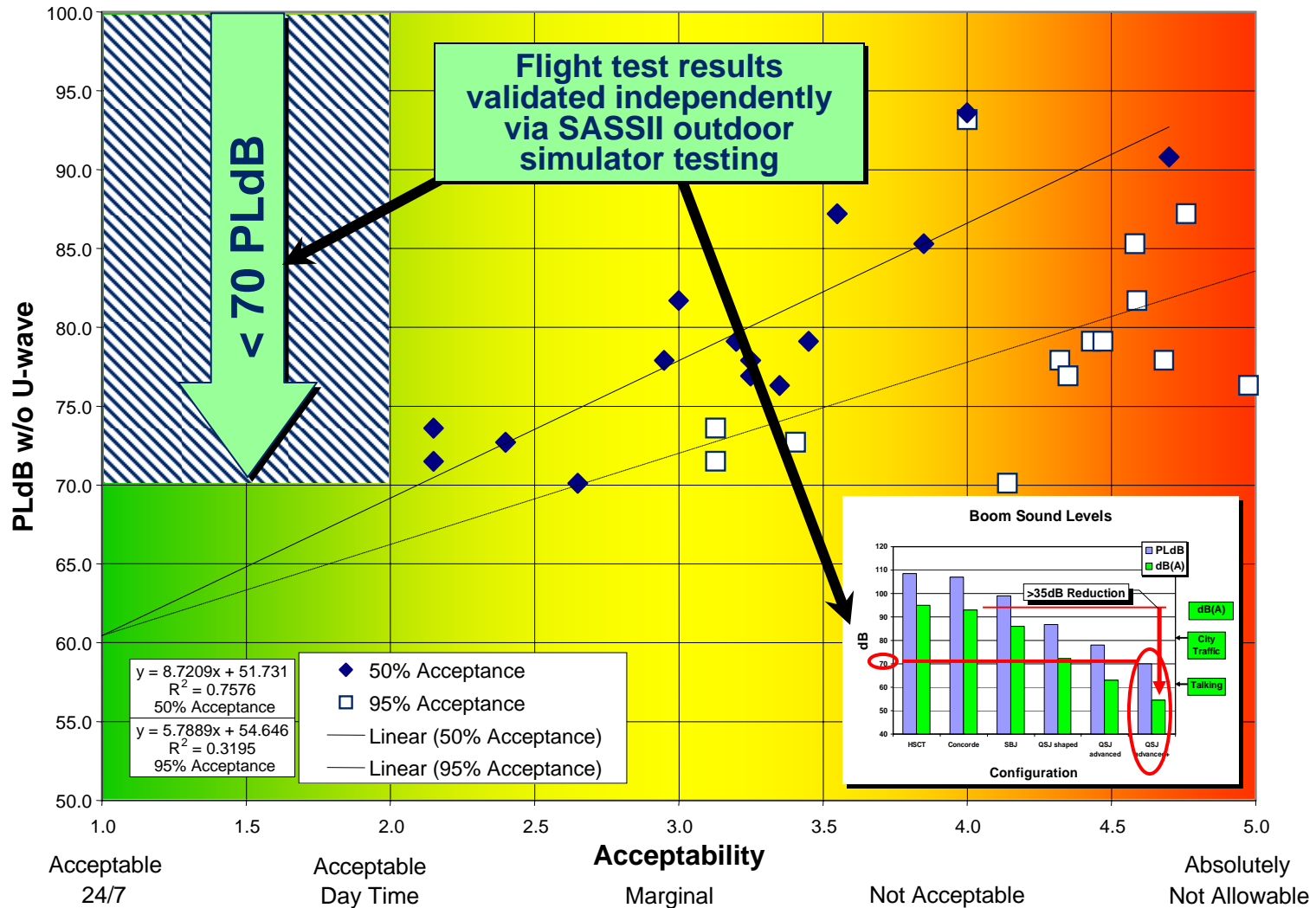
Comparison of CFD-Predicted vs. Measured Near-field Signature



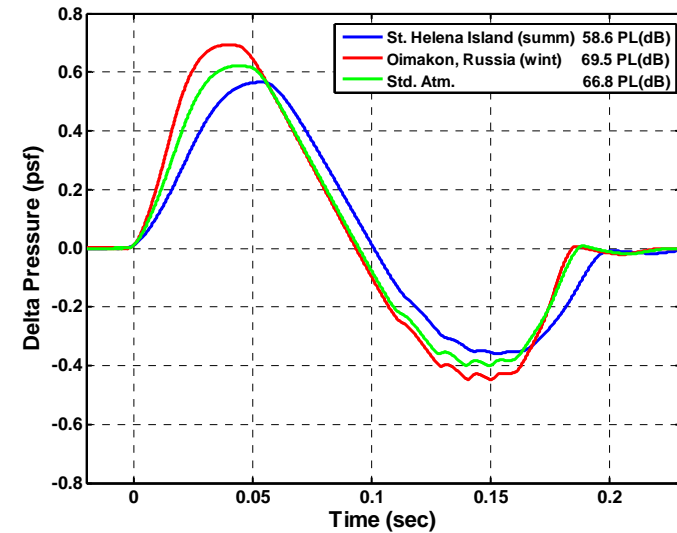
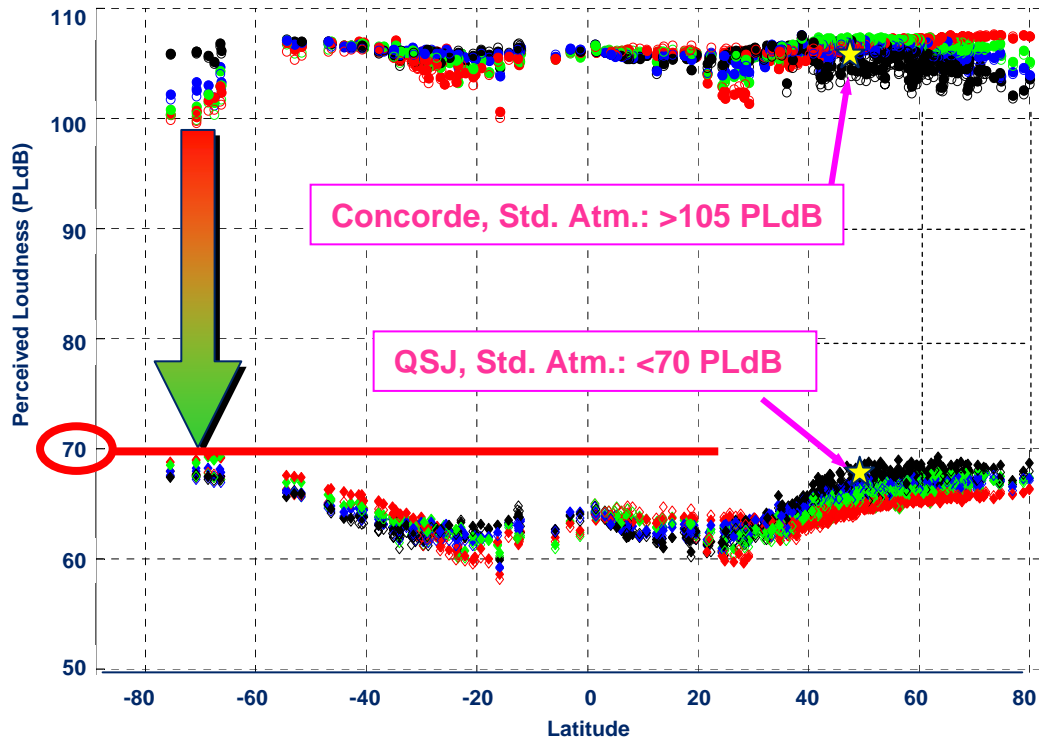
Excellent Correlation & Validation of Sonic Boom Suppression

Preliminary Outdoor Acceptability Results

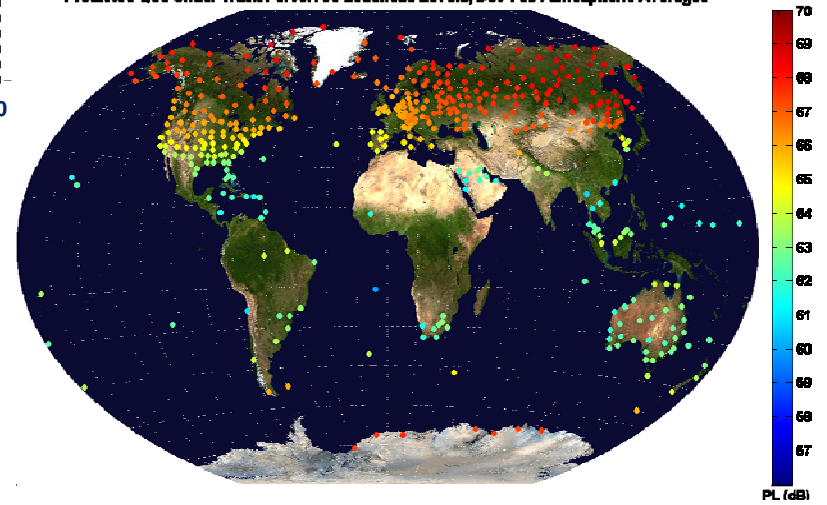
NASA F-18 Low Boom Flight Test – October 2005



Global Impact Assessment



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



**Low Boom Signature
Robust in Non-Standard
Atmosphere**

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 ?



Listening Area

Looking toward the Speaker



Operator's Station



Listening Area

Looking toward the Bass Trap



A MOBILE FACILITY FOR ASSESSING SIGNATURE ACCEPTABILITY