PARTNER Supersonics: Assess Overland Supersonic Flight

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PARTNER

• 9 universities and 53 advisory board members
• Fostering breakthrough technological, operational, policy, and workforce advances for the betterment of mobility, economy, national security, and the environment

PARTNER Supersonics Participants

• The Pennsylvania State University
• Purdue University
• FAA, NASA, & Industry Partners

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PARTNER Supersonics Overview

Objective:

Understand human response to low-boom sonic boom noise
(Do background research needed for FAA to make well-informed decisions regarding supersonics)

Activities:

• Determine representative sonic boom sounds that people will hear
• Find good methods for playback of sonic booms
• Assess people’s responses to sonic booms
• Develop models and metrics for individual and community perception
Approach

- Baseline aircraft and shaped boom
- Aircraft operations and design mods.
- Atmospheric turbulence effects
- Perception and subjective testing
- FAA decision making (Policy)

SAI’s QSST, for example
Presentation System Studies

• Determine realism of existing playback systems

• Results show agreement between
  – Simulators and real booms
  – Different simulators

[2005 PARTNER Test at Edwards, CA]
Sonic Boom Metric Research

• Capture time dependence of human hearing needed for short sounds like sonic booms
  – Instead of usual dBA or DNL metrics, use time varying metrics.
  – Applied Glasberg and Moore Time-varying Loudness to sonic booms for the 1st time

• Compare low-boom sonic boom sounds to other man-made and natural transient sounds
  – E.g., distant thunder

• Develop proper testing methodologies
Atmospheric Turbulence

- Sonic boom traveling down from aircraft to ground is distorted by turbulence.
- You can hear the difference.

PARTNER Supersonics

- Developed techniques to add turbulence effects to “clean” sonic booms provided by industry
  - Measure on ground and in sailplanes above turbulence
  - Developed computer code to model propagation through turbulence
Redirection toward indoor boom

• During 2005-2007 only worked on sonic booms as heard outdoors, but now directing efforts to **indoor sonic boom**

• Many signs point toward low-booms being perceived more annoying indoors than outdoors
  – Rattle may be an important cause

• PARTNER research approach has refocused:
  – **Accurate time histories** of low-booms indoors
  – **Assess human reaction** to low-booms indoors

• Working with NASA and Industry on concentration shift from outdoor to indoor.
Summary

• FAA needs thorough research to provide basis for regulatory decisions.

• PARTNER Supersonics is helping by
  – Providing signatures for playback
  – Comparing and developing audio presentation systems
  – Applying appropriate new metrics to sonic boom
  – Performing subjective testing

• Current challenge is to get all pieces in place to assess individual and community perception to low-boom sonic booms as heard indoors.

• Work is ongoing.
Thank you.