



Partnership for AiR Transportation Noise and Emission Reduction
An FAA/NASA/TC-sponsored Center of Excellence

PARTNER Supersonics: Assess Overland Supersonic Flight

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**Panel Session on Civil Supersonic Aircraft Research
Palm Springs, CA
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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

Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the FAA, NASA, or Transport Canada.

PARTNER Supersonics Overview



Objective:

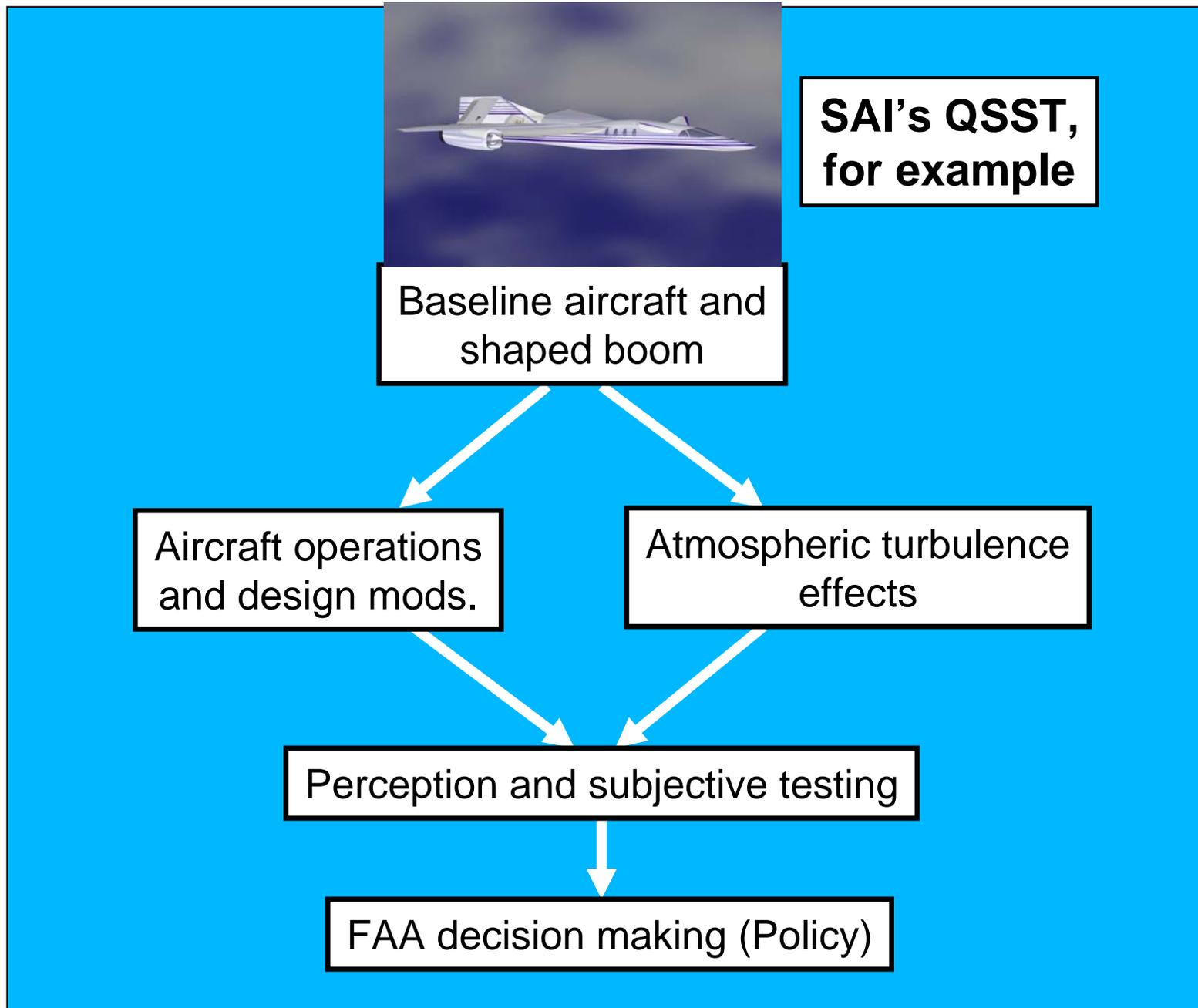
Understand human response to low-boom sonic boom noise

(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



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]



NASA Langley



Lockheed-Martin



Gulfstream

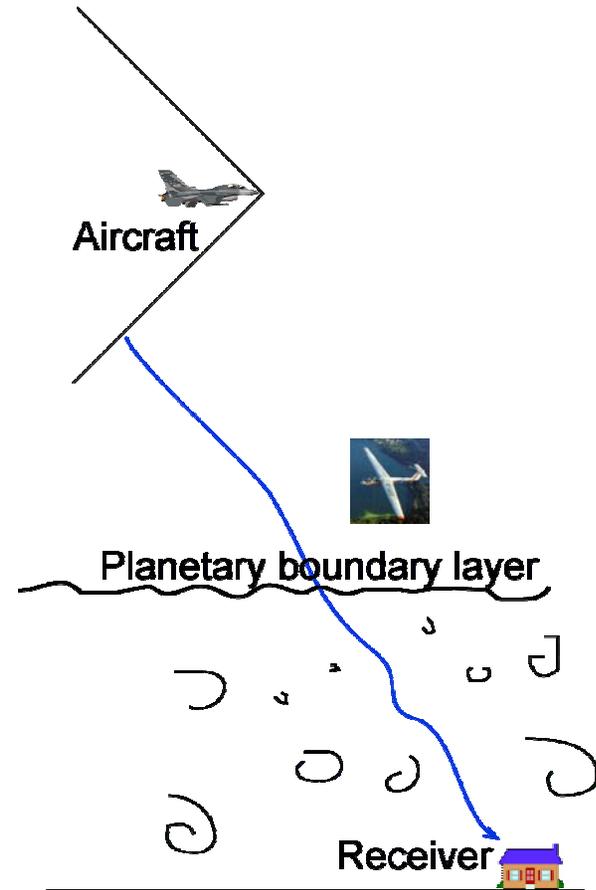
Sonic Boom Metric Research



- 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.



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- 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.
 - Now performing design study on how to build a sonic boom simulator that can present a low-boom to an entire house

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.