

The background of the slide is a vibrant, stylized aerial view of New York City, specifically the Manhattan skyline. The sky is a mix of blue, purple, and orange, suggesting a sunset or sunrise. Several aircraft are depicted in flight: a large white stealth bomber (B-2 Spirit) on the left, a smaller white fighter jet in the center, a blue and white commercial jet on the right, and a helicopter on the far right. A small drone is visible in the lower right, hovering over a rooftop helipad. The city below is densely packed with skyscrapers, with the Empire State Building being a prominent feature. The overall aesthetic is futuristic and high-tech.

EXPLORE FLIGHT

WE'RE WITH YOU WHEN YOU FLY

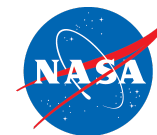
Preparations for Quesst Mission Community Response Testing – Overview and Status

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2023 AIAA SciTech Forum

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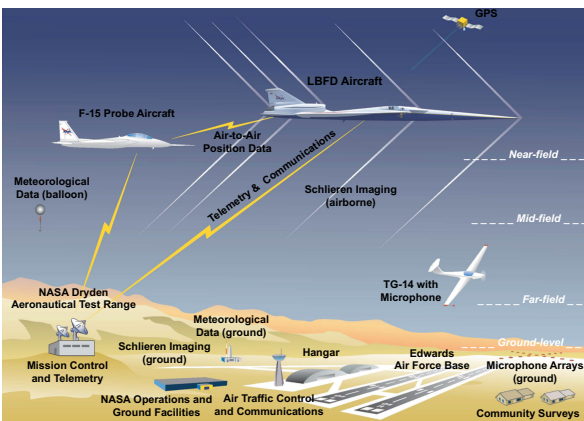
What is the NASA Quesst Mission?



Phase 1 – Aircraft Development

In progress (2018-2024)

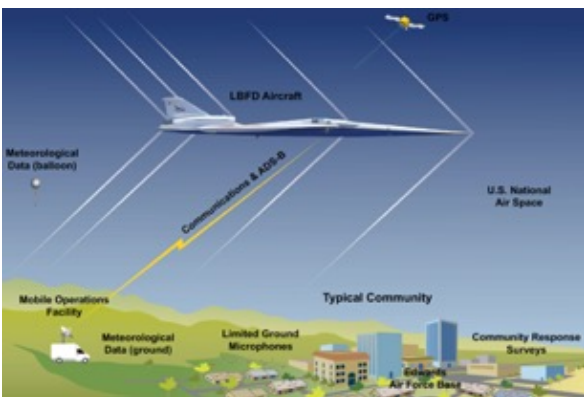
- Design, fabricate a quiet supersonic research aircraft
- Prove performance in test range flights
- Prove safety for flights in normal airspace



Phase 2 – Acoustic Validation

Preparation in progress, execution begins 2024

- Prove the acoustic characteristics match design targets
- Detailed in-flight and ground measurements in test range



Phase 3 – Community Response Testing

Preparation in progress, execution begins 2025

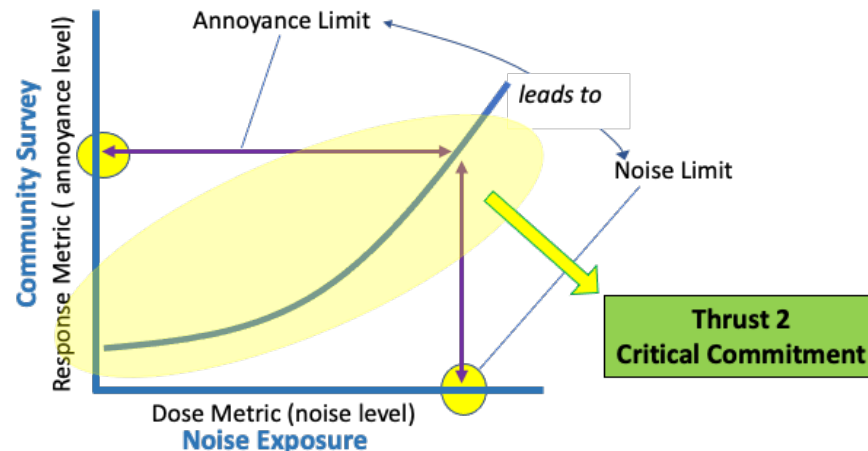
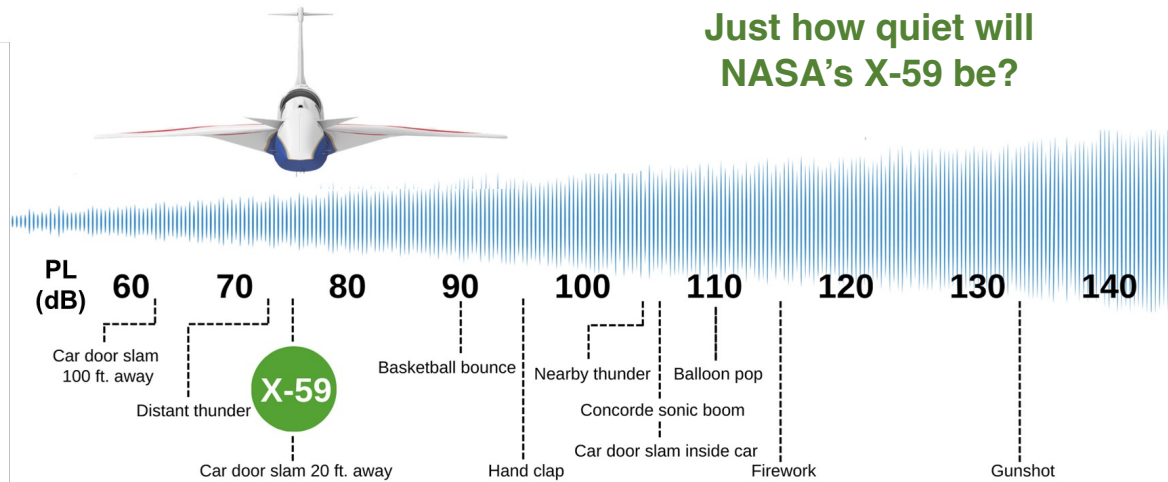
- Select communities
- Outreach and engagement (including STEM)
- Obtain necessary approval
- Plan surveys and recruit participants
- Collect ground measurements

**Systematic
Approach Leading
to Community
Testing**

Quesst Phase 3 - Community Response Testing



Just how quiet will
NASA's X-59 be?



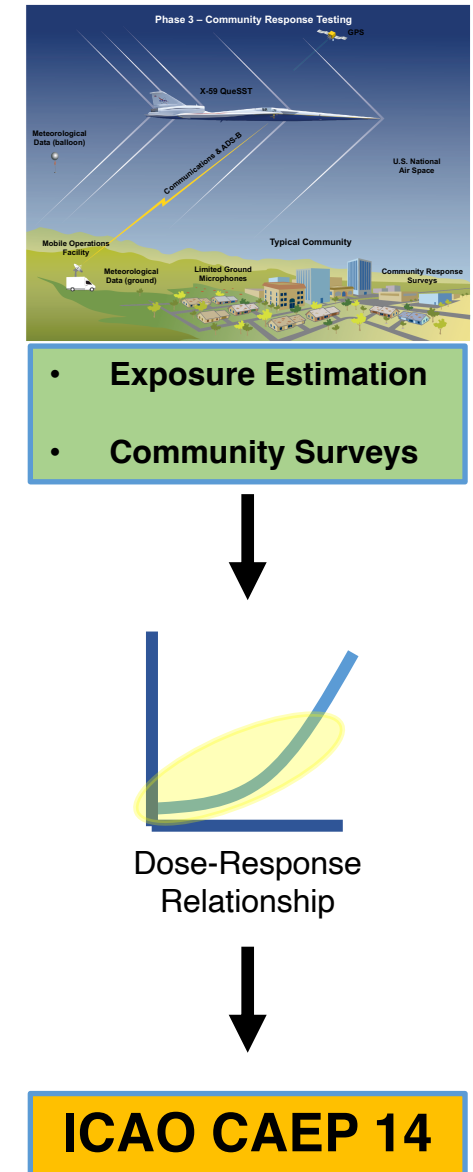
Some aspects of community tests

- 4-6 tests in different communities across the US
- Location selection will consider:
 - Variation in climate zones
 - Population demographics
 - Urbanization level
- Each test approximately 1 month long
- Daytime/waking hours
- Range of sound levels
- Acquire community response representative of the general population

Key Technical Elements of Community Response Testing



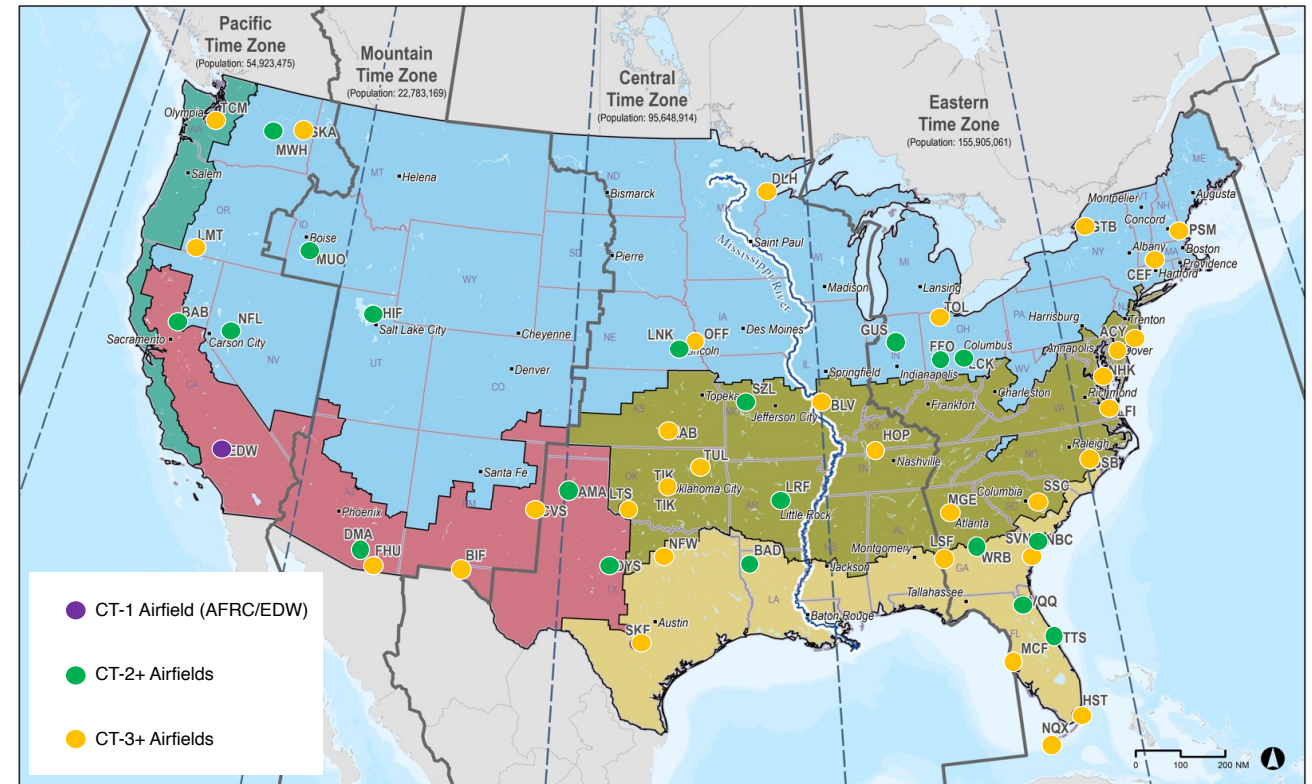
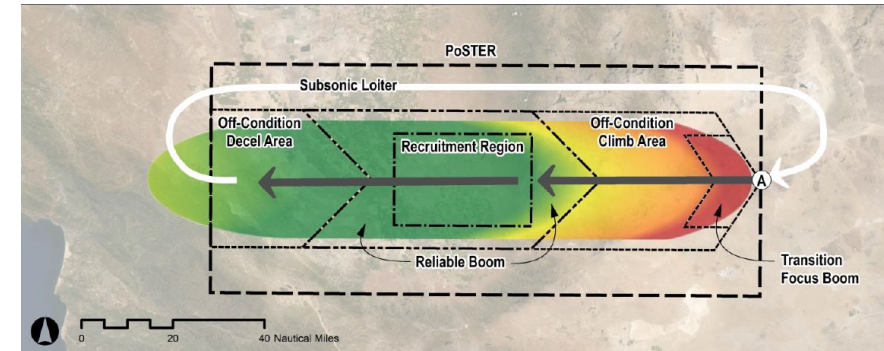
- Test site selection
 - Ensure representativeness
 - Deployment coordination/logistics
 - Public engagement
- Survey Design and Analysis
 - Participant recruitment
 - Data analysis/statistical methods
 - Tests of survey implementation, automated data processing methods
- Exposure Design and Estimation
 - Acoustic monitor placement strategies
 - Recording and extraction of signature
 - Characterization of carpet over test area (combining prediction and measurements)
- Developing Dose-Response Relationship and Delivery to ICAO
 - Matching exposure levels with participant location
 - Aggregating of multiple community test results
 - Ensuring validity/acceptance of technical approach



Airfield and Community Test Site Selection



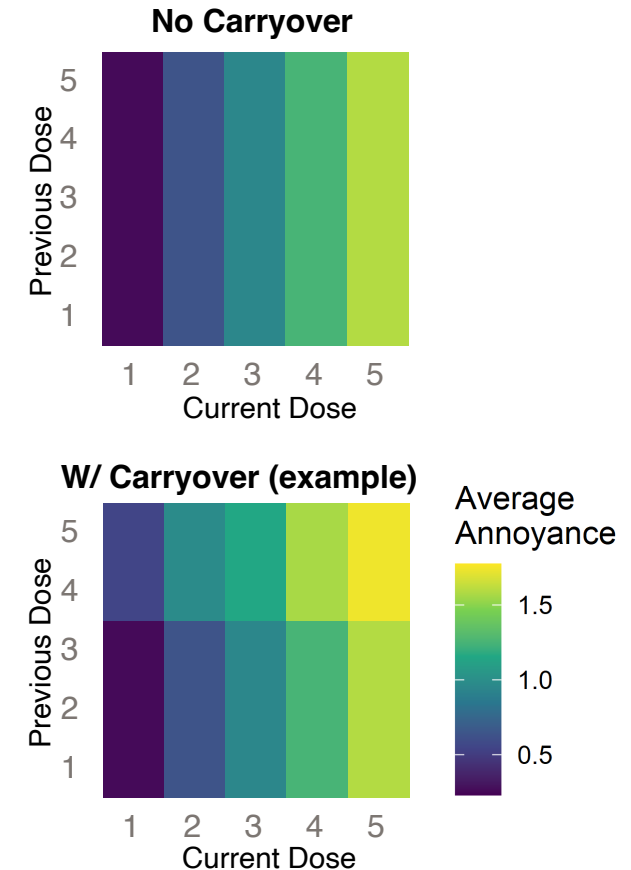
- **4-6 Tests planned for 2025-2026**
 - Test #1 from NASA Armstrong
 - Subsequent test locations TBD
- **Technical and aircraft-related constraints**
 - Runway, airfield infrastructure
 - Emergency/alternate landing sites
 - Available population centers
- **Ensuring representativeness**
 - Sampling approaches and statistical validity
 - Geographic and climate zone variation
 - Survey participant demographic diversity
 - Variation in urbanization level



Survey Design and Analysis – Recent Progress



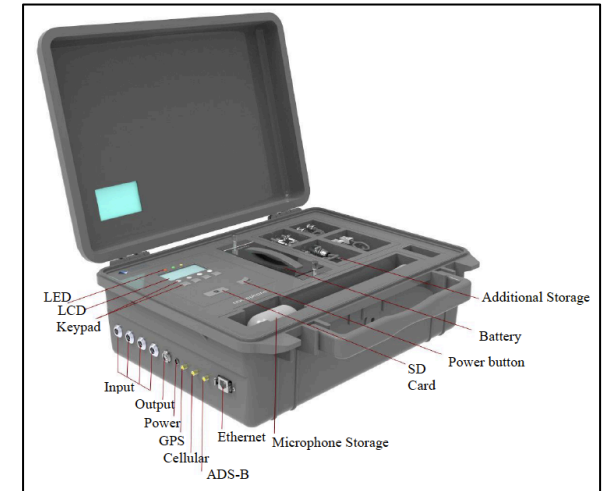
- **Development of dose-response simulation dataset**
- **Survey Methods and Analysis Plans**
 - Proposed methods are generally robust with high likelihood of success
 - Addressing / Refining specific aspects
 - Sparse data / data sufficiency; Dose error mitigation
 - Combining data from multiple communities
- **Research on Effect of Dose Error on Dose-Response Curve**
 - Dose error creates a bias in dose-response curve (upper plot)
 - Bias not alleviated by increasing number of survey participants
 - Accuracy requires emphasis on quantifying, minimizing, and mitigating error
- **Study of potential for carryover effects in survey results**
- **Feedback from Independent Expert Panel on survey plans**



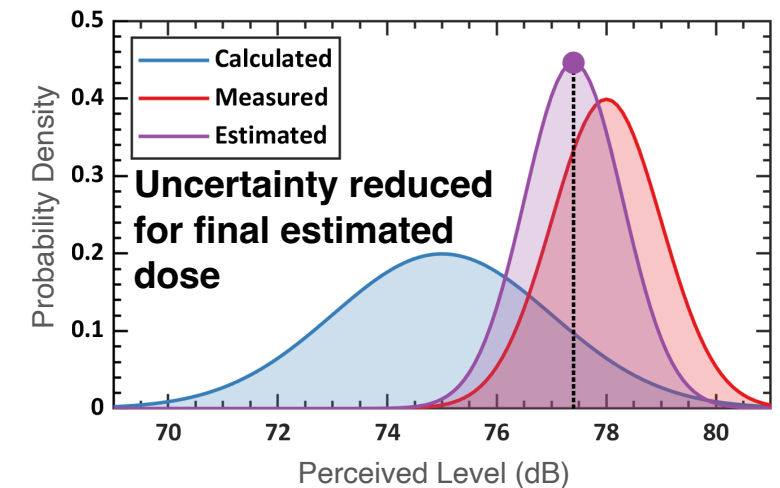
Exposure Design, Estimation, and Analysis – Recent Progress



- **Estimation and refinement of attainable range of boom levels**
- **Noise Exposure Scheduling Tool Developed**
 - Automated, adaptable dose scheduling for Phase 3
 - Inputs for dose range, operational constraints (X-59, crew rest, etc.)
- **Meteorological data needs identified**
 - Finalized hardware selection with data-based assessment of resolution
 - Validation cases finalized for regional forecast model under development
 - Devised method to extract turbulence parameters from atmospheric models
- **Progress of Ground Recording System towards Phase 3 use**
 - Prototype units evaluated
 - Initial operations procedures for community test usage developed
- **Key components of dose and uncertainty calculation assembled**
 - Algorithms to identify measured boom, mitigate ambient noise, compute metrics
 - Combine measurements with calculated doses at participant locations



Ground Recording System Unit



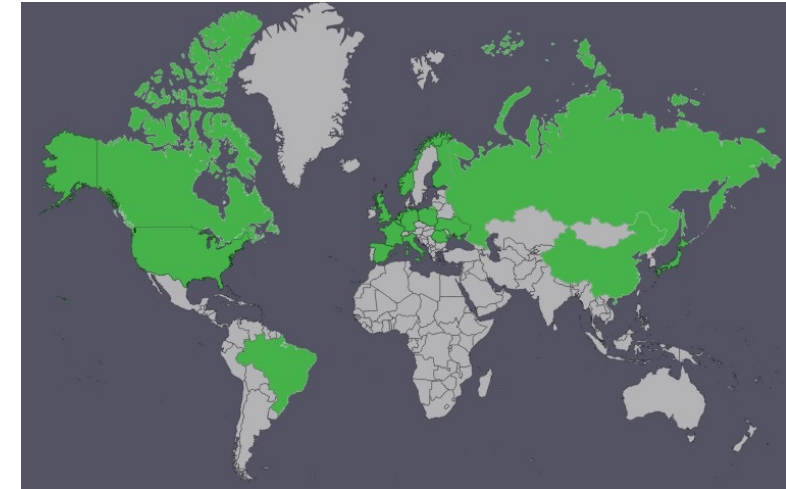
**Uncertainty reduced
for final estimated
dose**

Combining calculated and measured levels
(Notional Example)

International Community Test Workshop 2 - Dec 2021



- **First major dissemination of scope of NASA plans**
 - Quesst mission overview and timeline
 - Technical approaches for site selection, survey, exposure estimation
- **Workshop Goals**
 - Communicate current status and overall plans for community testing
 - Obtain feedback; Identify any significant concerns on suitability of the proposed approaches and dataset as basis for international standards
- **Robust interchanges and discussions**
 - General concurrence with overall technical approach
 - Concerns expressed and discussed during workshop included:
 - Applicability of dataset; methods to expand representativeness
 - Characterization of annoyance relationship to rattle/vibration
 - Incorporating inputs to survey and exposure design/analysis plans as appropriate
 - Ongoing follow-up/engagement with key SME's via WG1 and other technical forums
- **NASA plans and workshop findings presented at Internoise Conference, Glasgow – Aug 2022**



Broad International Participation

- 18 Countries
 - 120+ attendees
 - 50+ organizations
- | | |
|--------------|------------------------|
| - Research | - Academia |
| - Regulatory | - Industry – technical |
| - Government | - Industry - OEM |

Quesst Mission Phase 3 Overall Timeline



2019 - 2024	2025 - 2026	2027
<i>Planning Stage</i>	<i>Execution Stage</i>	
• Develop overall Community Testing plans ○ Survey design ○ Exposure estimation ○ Operations ○ Public outreach and communication • Risk reduction activities ○ Survey test ○ Acoustic monitor and infrastructure checkout ○ Automated data processing validation • Obtain feedback on survey methods and exposure estimation approaches ○ ICAO CAEP Working Group 1 participation ○ Virtual and in-person international workshops ○ Independent review panel	• Community Test 1 near AFRC • Additional community tests ○ Various regions ○ Participant demographics • Survey and exposure data analysis • Develop dose-response relationship • Aggregate analyses and extend to nationally-representative database	Database delivery for CAEP14



QUEST

Any Questions?