

NASA's plans to assess annoyance caused by supersonic overflights of the X-59 aircraft



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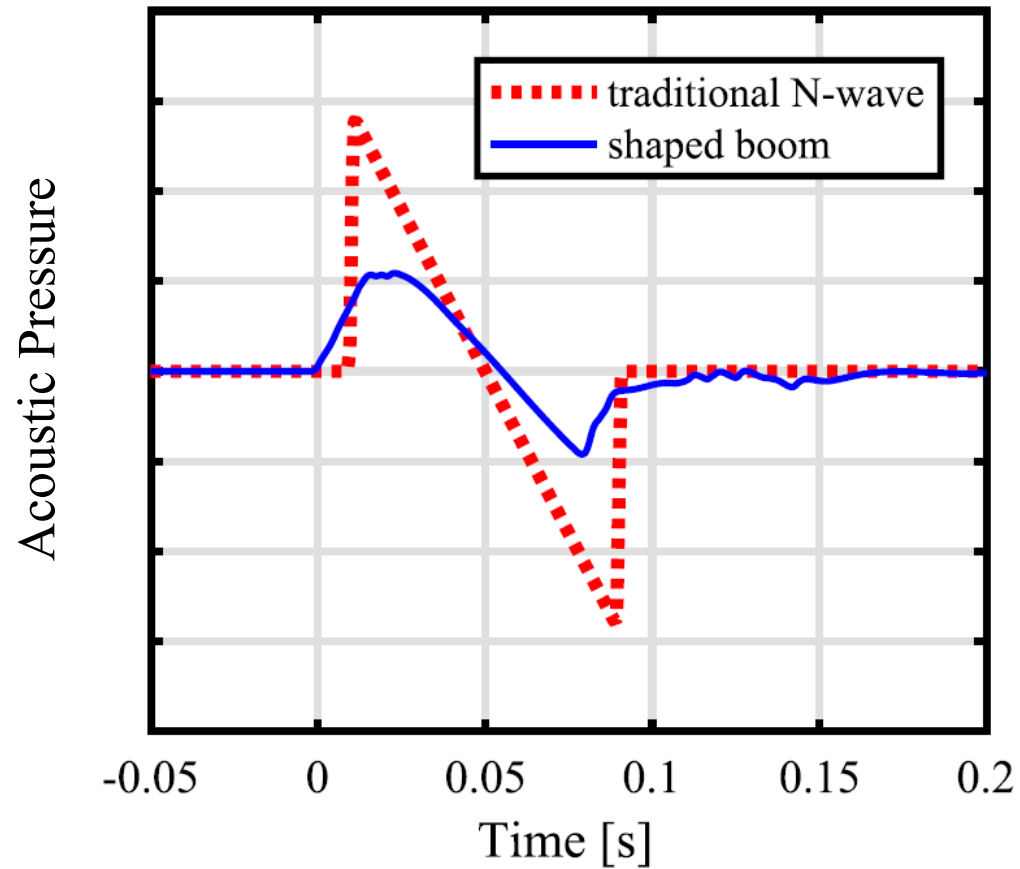
14 - 18 June
Copenhagen

2026

NASA wants to change aviation by decreasing travel time.



Aircraft shape is the key to reducing sonic booms at the ground.



NASA's Quesst mission will generate key community response data needed to develop a noise standard for supersonic aircraft.



The key elements of the community response phase are:

Planning

Execution

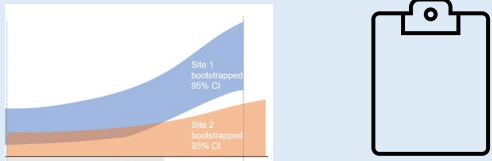
Data Delivery



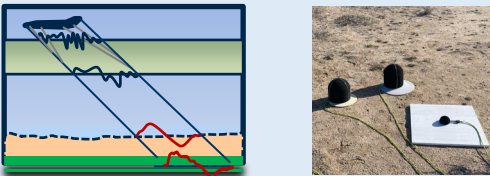
Airfield and Community Selection



Survey Design and Analysis



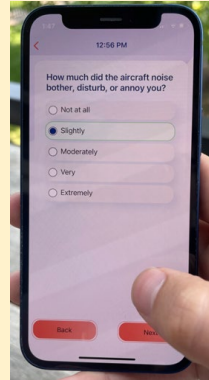
Exposure Estimation



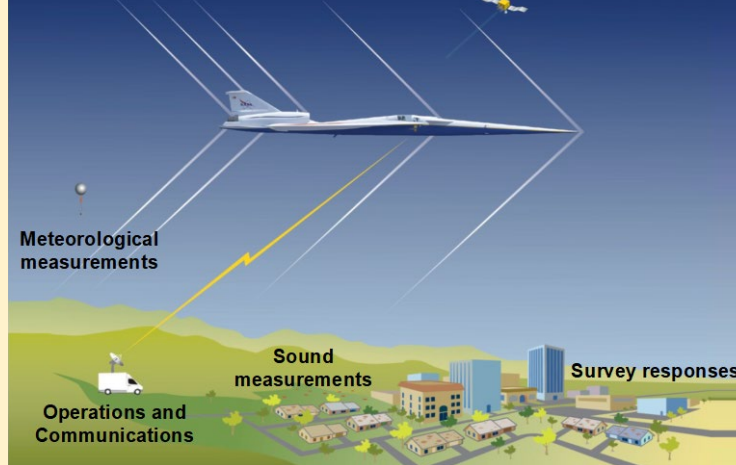
Data System Development



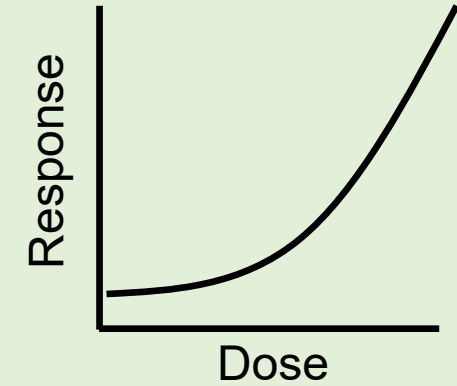
Public Survey Response



X-59 Community Overflights



Dose-Response Relationship



Acoustic Levels

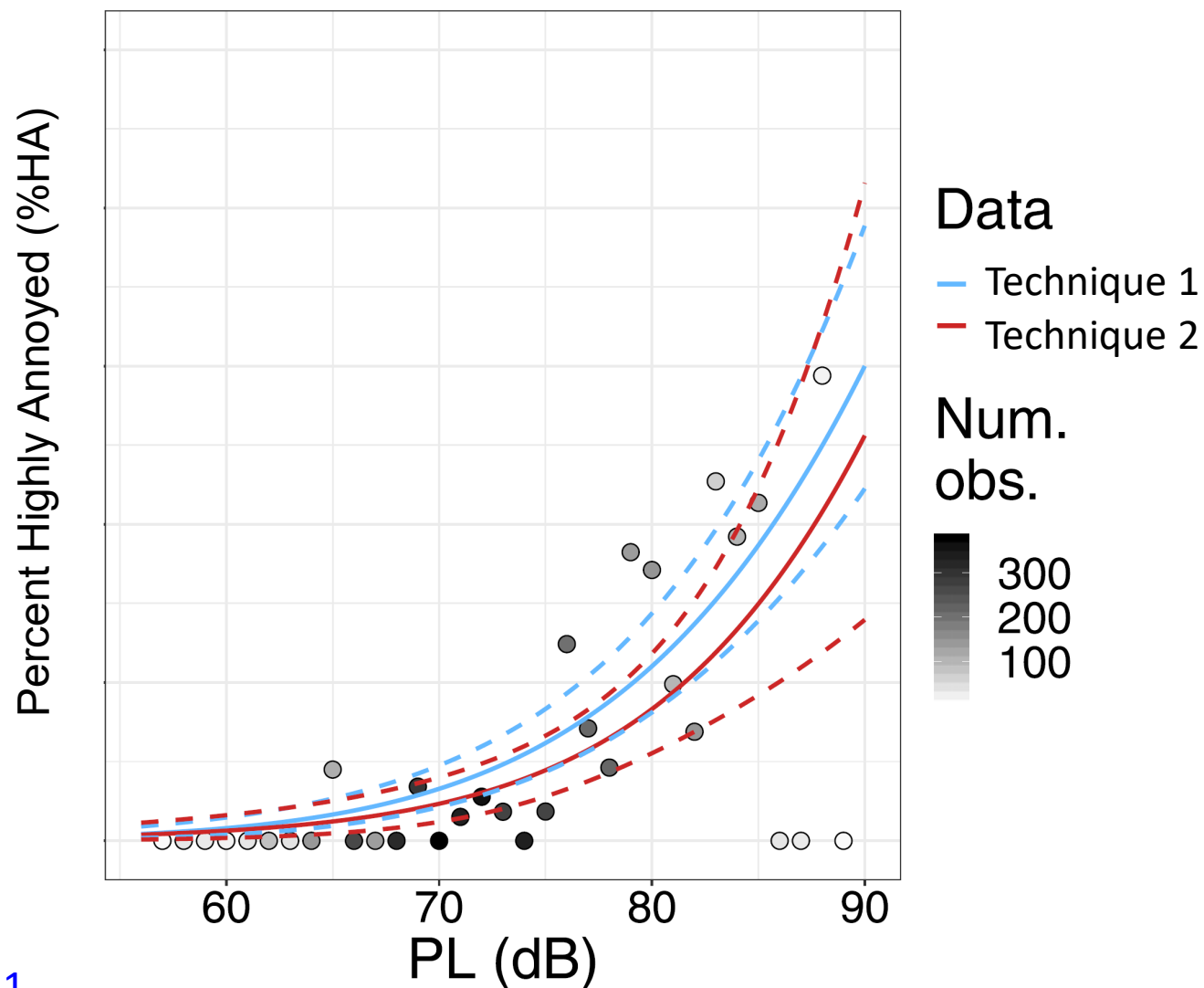


Previous surveys have prepared NASA for the X-59 community survey campaign.



Title	Aircraft / Flight maneuver	Location	Year	Number of Survey Participants	Number of noise events	Research Goal
Small Community Survey	F-18 / low-boom dive	Edwards, CA	2011	100	110	Pilot Study
Large Community Survey	F-18 / low-boom dive	Galveston, TX	2018	500	52	Risk Reduction
Survey Methods Test	n/a	Nashville, TN	2023	500	n/a	Risk Reduction
X-59 Community Survey Campaign	X-59 / steady level flight	Multiple, TBD	Planned for late 2020s	1000 per site	~80	Data for Regulators

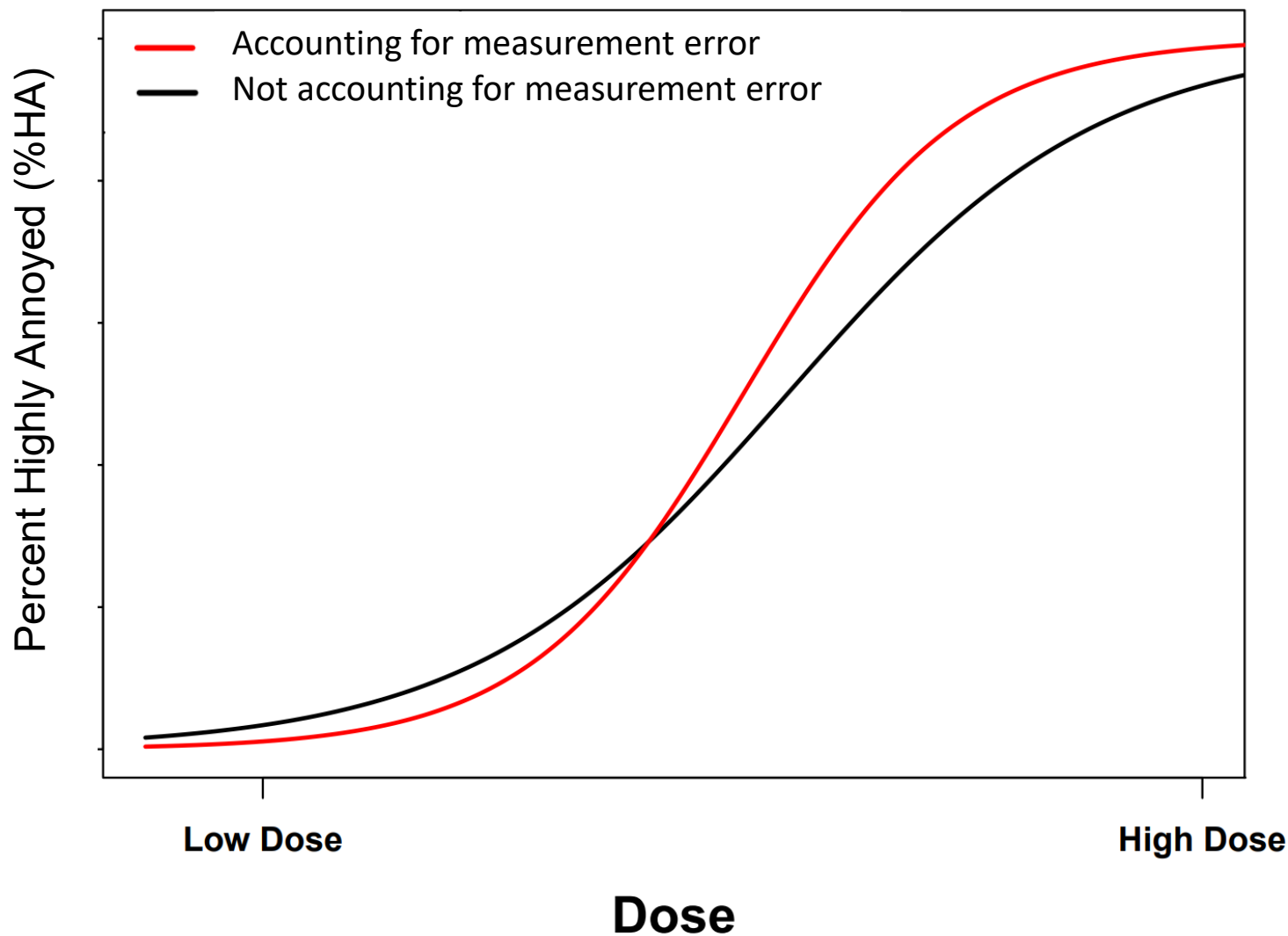
For the dose-response model, several promising techniques have been identified, including multilevel logistic regression and a two-stage model.



Lee et al. 2020

<https://doi.org/10.1121/10.0001021>

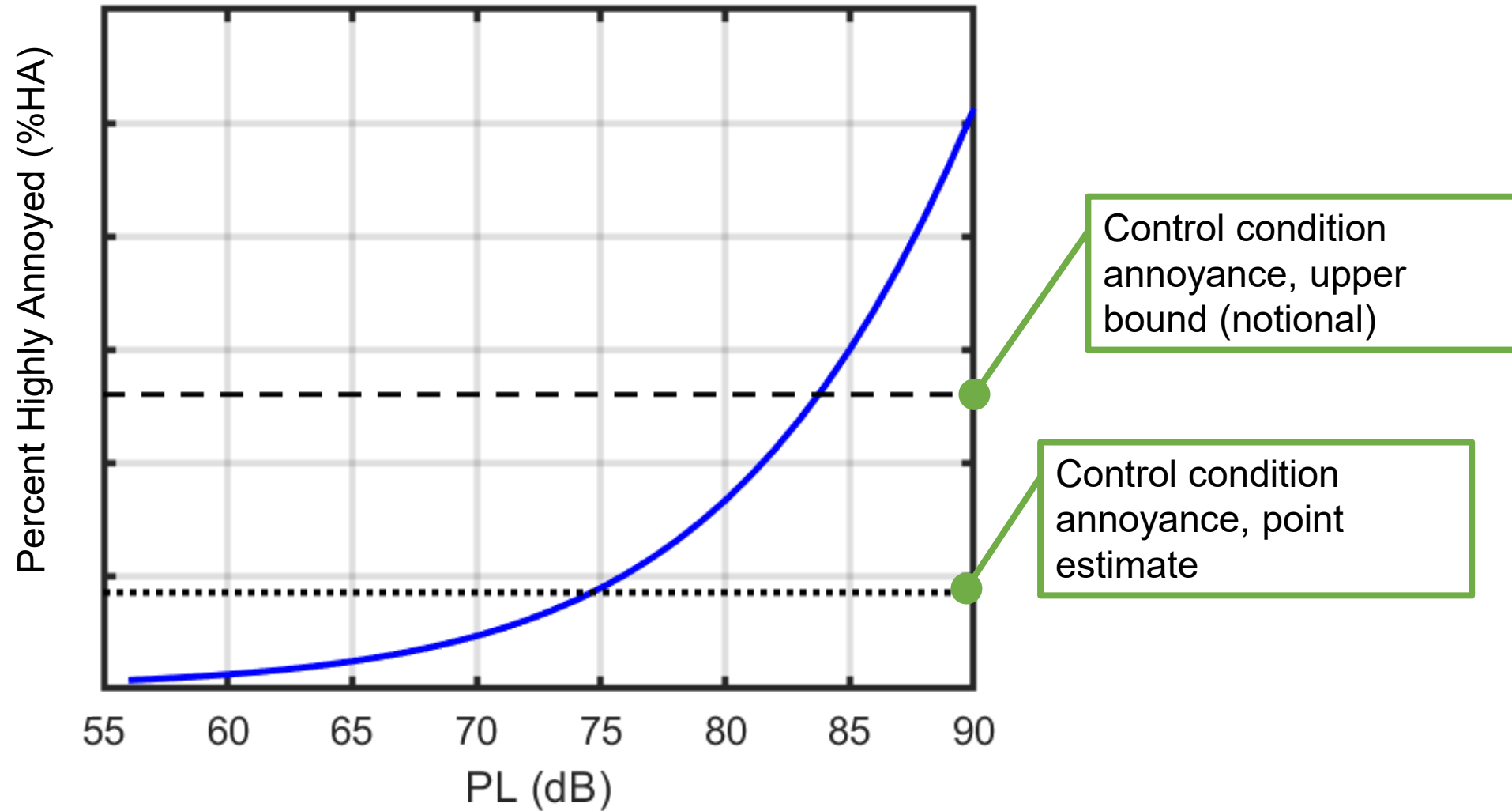
To minimize distortion in the dose-response curves, Bayesian hierarchical models will be used to attempt to account for measurement error.



Cruze 2024

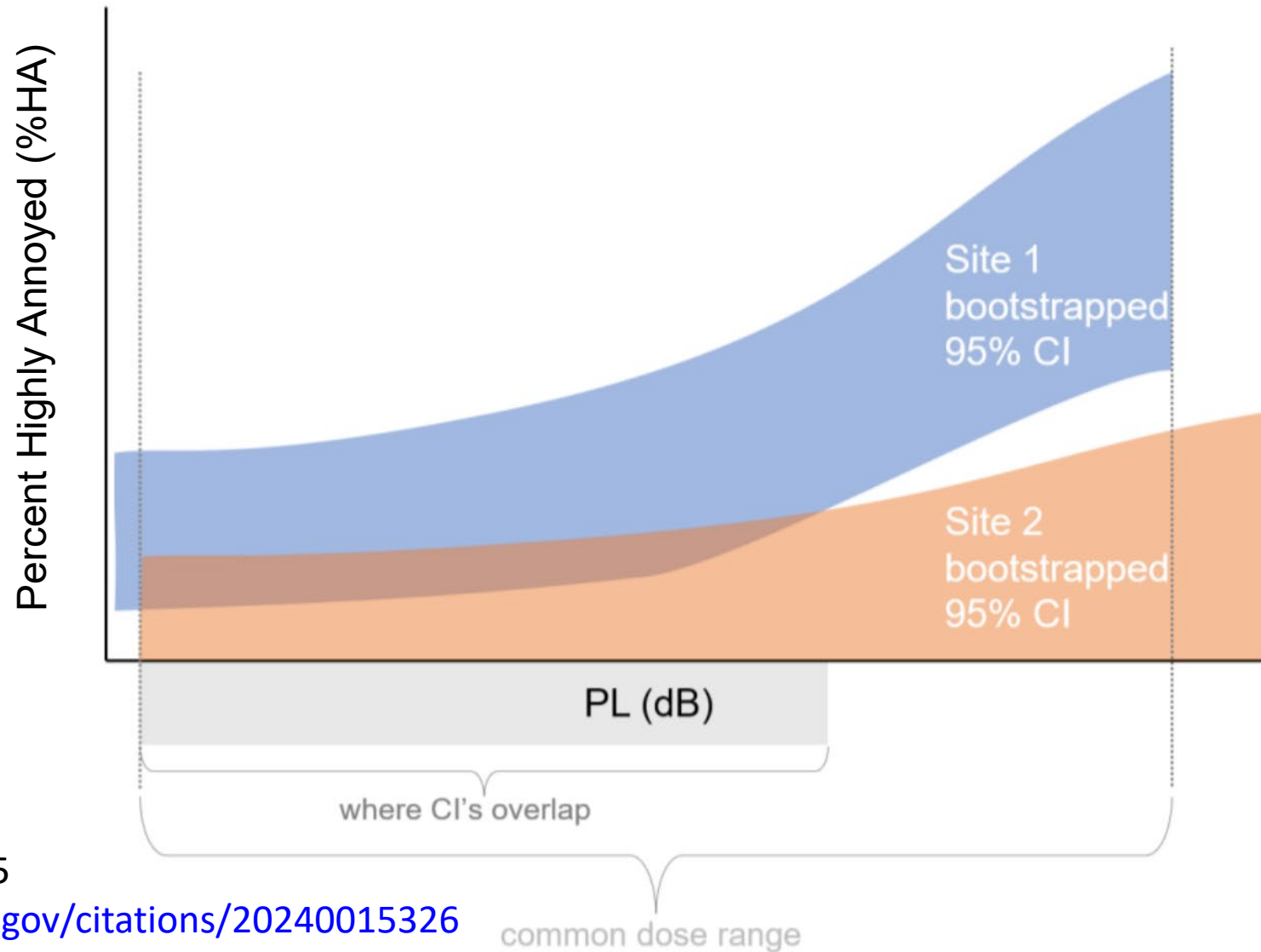
<https://ntrs.nasa.gov/citations/20240015301>

A control condition is planned to assess baseline annoyance without any X-59 flights.



Parker, not published

Careful consideration will be given to if and how data from multiple survey sites are combined into a single, representative dose-response relationship.



Ballard et al. 2025

<https://ntrs.nasa.gov/citations/20240015326>

In summary, many steps have been taken to maximize the robustness and validity of the X-59 community survey data.



- Previous community survey data
- Regression techniques
- Measurement error techniques
- Control condition
- Combining data across sites

...Questions?

Backup



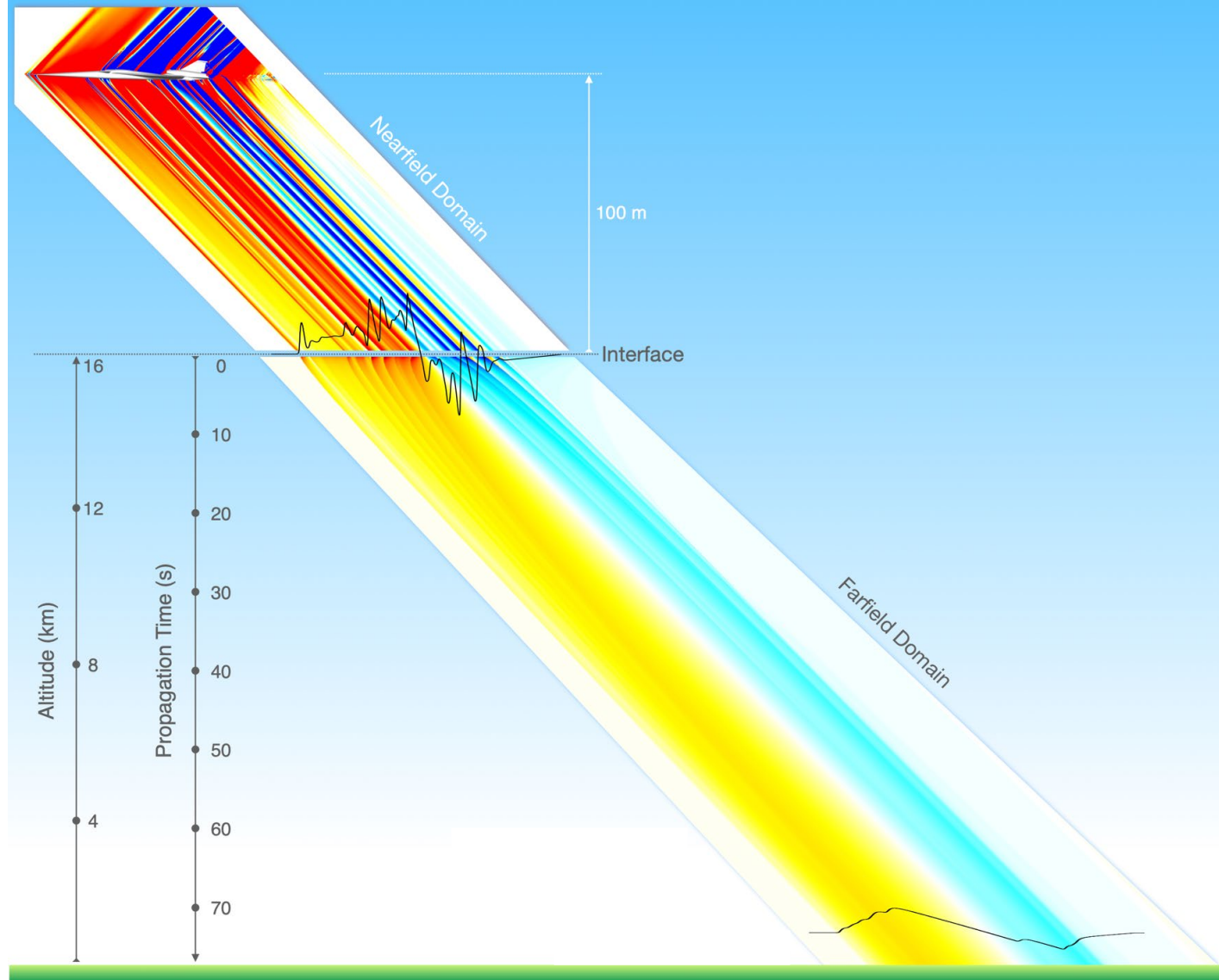
The goal of Phase 2 is to validate NASA's prediction tools as well as X-59's acoustic signature.



Shock sensing
probe mounted on
NASA F-15



Ground recording
system unit

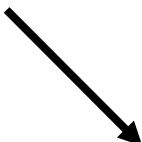


TG-14 motorized glider
with wing-tip mounted
microphone

The survey questions below address dose-response data and help interpret results.

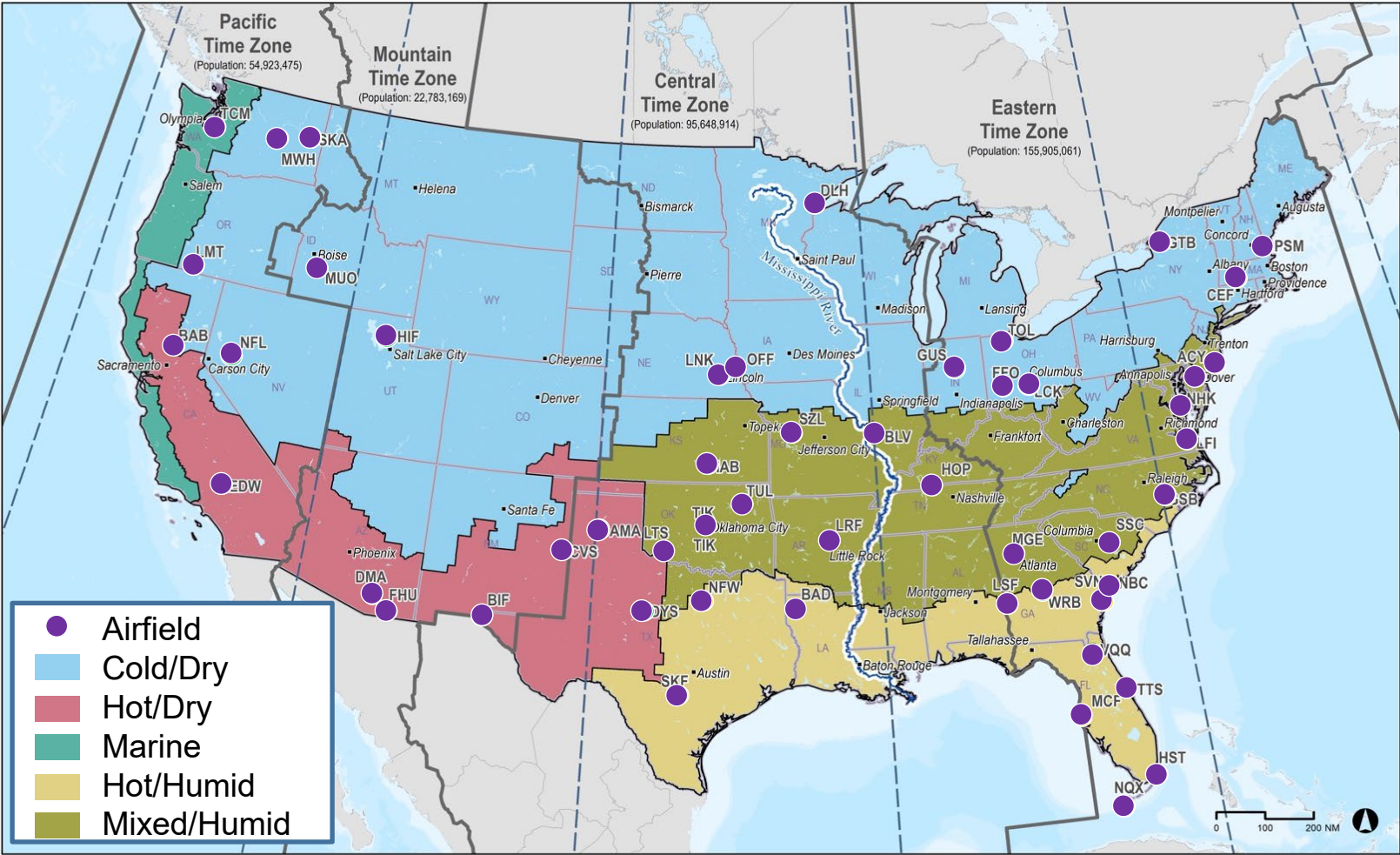


- 1. The supersonic plane may have flown over your area at approximately (TIME), causing a brief noise like thunder or a car door closing. Where were you at approximately (TIME)? Home/Work/Somewhere else
- 2. (IF SOMEWHERE ELSE) Please enter your location at approximately (TIME). You can provide an approximate address, named location, e.g., a store or other landmark, or cross street.
- 3. **How much did noise from the supersonic plane bother, disturb, or annoy you?**
- 4. Did noise from the supersonic plane startle you? Y/N
- 5. Vibration is a motion. The motion may be seen or felt. Did you see or feel vibration from the supersonic plane? Y/N
- 6. Rattle is a type of noise that can occur when objects move due to vibration. Did you hear rattle from the supersonic plane? Y/N
- Etc.

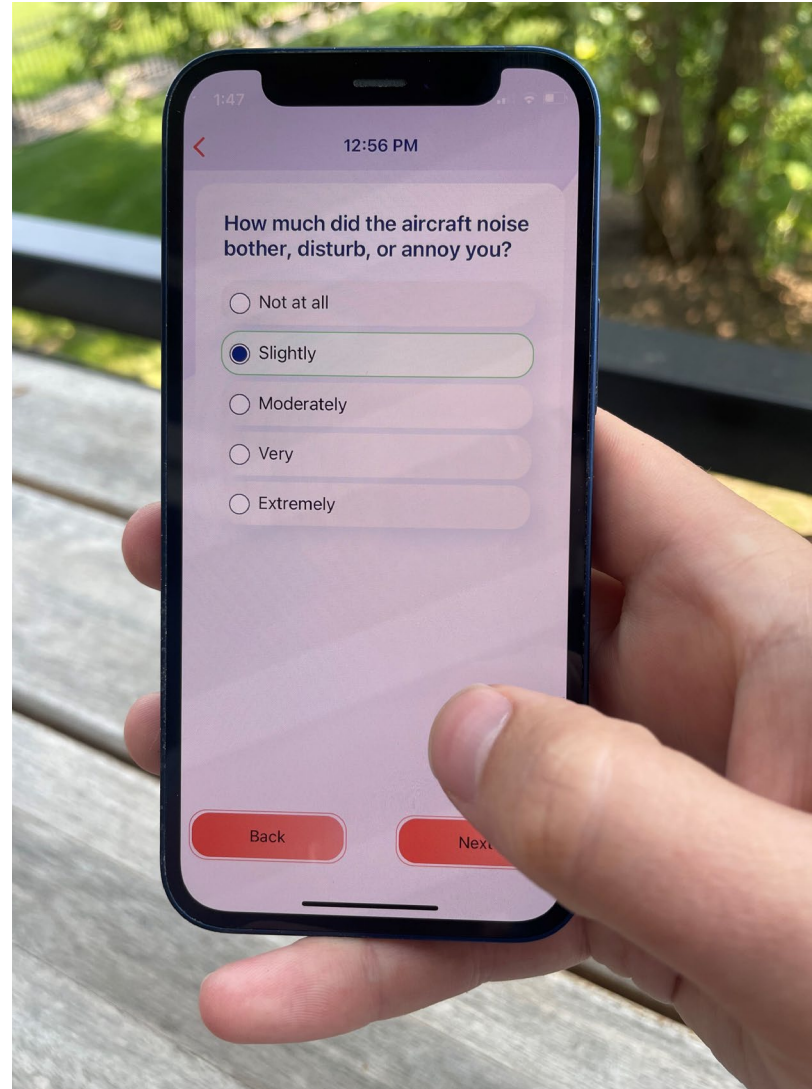


Annoyance
Not at all
Slightly
Moderately
Very
Extremely

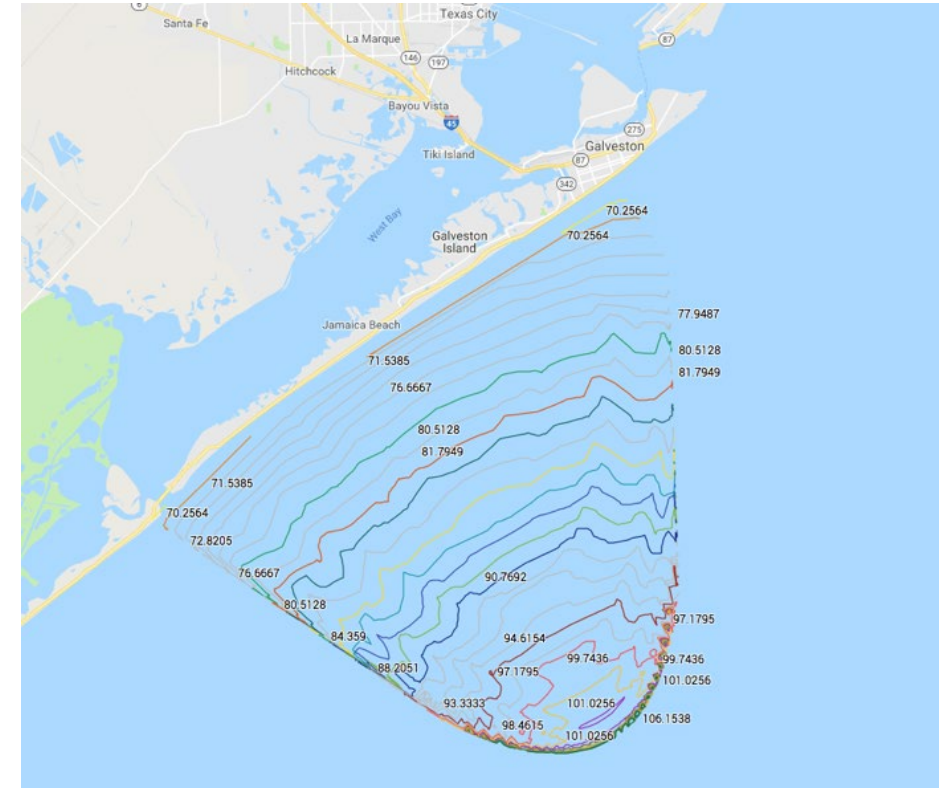
NASA plans up to five community surveys in different geographic regions of the US.



A minimum sample size of 1000 participants per community survey is currently planned.



Noise exposure will be estimated via a combination of measurements and calculations.



The Quesst mission focuses on *human* response to **supersonic** **cruise** during *daylight* hours.

