



Project 072 Aircraft Noise Exposure and Market Outcomes in the U.S.

Massachusetts Institute of Technology

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University Participants

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- P.I.s: Prof. R. John Hansman; co-PIs: Prof. Christopher R. Knittel, Prof. Steven Barrett, Prof. Jing Li, Dr. Florian Allroggen
- FAA Award Number: 13-C-AJFE-MIT, Amendment No. 075
- Period of Performance: August 11, 2020 to August 10, 2021
- Tasks:
 1. Literature review
 2. Empirical identification strategy and scope of dataset (*not reported; task planned to start in the next reporting period*)
 3. Calculation of noise impact metrics
 4. Cleaning and aggregation of housing transaction dataset (*not reported; task planned to start in the next reporting period*)
 5. Descriptive analysis of dataset (*not reported; task planned to start later*)
 6. Empirical analysis (*not reported; task planned to start later*)

Project Funding Level

\$380,000 FAA funding and \$380,000 matching funds. Sources of match are approximately \$112,000 from MIT, plus third party in-kind contributions of \$268,000 from NuFuels LLC.

Investigation Team

- Prof. R. John Hansman, PI, MIT (Tasks 1, 2, 3, 5, and 6)
- Prof. Christopher R. Knittel, co-PI, MIT (Tasks 1, 2, 4, 5, and 6)
- Prof. Steven R. H. Barrett, co-PI, MIT (Tasks 1, 5, and 6)
- Prof. Jing Li, co-PI, MIT (Tasks 1, 2, 4, 5, and 6)
- Dr. Florian Allroggen, co-PI, MIT (all tasks)
- Madeleine Jansson, Graduate Student, MIT (Tasks 1, 3, and 5)

Project Overview

While enplanements at U.S. airports have increased by almost 50% over the past two decades, the number of Americans exposed to significant levels of aircraft noise has decreased substantially. However, there is still considerable concern within some airport communities about aircraft noise. This project leverages revealed-preference approaches to infer the “implicit price” of aircraft noise exposure from market outcomes in U.S. airport communities. More specifically, the research team is quantifying the capitalized disutility associated with aircraft noise exposure through analyzing the empirical relationship between aircraft noise exposure and transaction values for residential properties in communities surrounding U.S. airports. State-of-the-art empirical methods will be applied, which will leverage quasi-experimental settings of noise exposure changes. The project will empirically analyze the house price impacts of potential changes in noise exposure associated with the quasi-experimental settings. The results will provide insights into the average impacts of noise exposure on residential property values while also assessing dynamic adjustment processes and potential heterogeneities in revealed preferences, targeting factors such as time, location, or noise exposure patterns.

Task 1 – Literature Review

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Objectives

The project team will review and summarize the existing body of literature in two topic areas:

- Empirical analyses of the impacts of noise exposure on residential property values.
- Noise exposure metrics.

Research Approach

The research team will systematically review and summarize the existing literature. This entails:



1. Presenting a detailed overview of existing economic studies on the impacts of noise exposure on residential property values. This overview includes a review of both results and methods. In particular, the team will summarize results by comparing standardized metrics (e.g., noise depreciation index (NDI)). This enables analysis of trends that might be published in the existing body of work.
2. Comparing different noise metrics and their application. This will include, but is not limited to, metrics such as the day-night average sound level (DNL), equivalent sound level (LEQ), maximum sound levels (Lmax), and metrics which consider frequency and amplitude of noise events.

Milestone

The research team started work in September 2020.

Major Accomplishments

The research team prepared a high-level literature summary, which informed the presentation for the ASCENT Fall meeting (see below).

Outreach Efforts

The team prepared a pre-recorded presentation for the ASCENT Fall Meeting (September 29-30, 2020). The presentation included a project overview and a high-level summary of the existing literature.

Plans for Next Period

The team will continue to work towards completing this task.

Task 3 – Calculation of Noise Metrics

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Objective

The goal of this task is to calculate aircraft noise exposure in communities surrounding selected U.S. airports. These analyses will be used to derive noise exposure changes associated with quasi-experimental changes in flight trajectories (e.g. due to new runways, new procedures). The team may develop models to compute exposure metrics that currently are not routinely calculated in the Aviation Environmental Design Tool (AEDT).

Research Approach

The MIT team leverages existing DNL-based noise exposure maps shared by the FAA as a starting point of the analysis. If required, the AEDT is used to model noise exposure based on historical flight track data. If required, these flight tracks will be provided by the FAA for airports with Airport Surface Detection Equipment, Model X (ASDE-X) and different years between 2010 and 2019 (and future years as the study progresses).

The research team will also work with the FAA to examine older noise exposure data from 2000 to 2009. The goal is to explore how insights can be gained for this time period.

Milestone

The research team started work in September 2020.

Major Accomplishments

The team analyzed existing noise exposure maps provided by the FAA. Together with the FAA, the project team identified additional needs for noise analyses and coordinated next steps to obtain the required noise data.

Student involvement

MIT graduate student Madeleine Jansson is conducting the research under this task.

Plans for Next Period

The team will continue this task.