



Project 005 Noise Emission and Propagation Modeling

**Pennsylvania State University
Purdue University**

Project Lead Investigator

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University Participants

Pennsylvania State University

- P.I.: Victor W. Sparrow, United Technologies Corporation Professor of Acoustics
- FAA Award Number: 13-C-AJFE-PSU, amendments 005, 015, 029
- Period of Performance: August 18, 2014 to December 31, 2017
- Task(s):
 1. Assess applicability of meteorological reanalysis models for possible use in FAA noise tools
 2. Assess measurement data sets for noise propagation model validation

Purdue University

- P.I.(s): Kai Ming Li, Professor of Mechanical Engineering
- FAA Award Number: 13-C-AJFE-PU, amendments 002, 007, 009, 016
- Period of Performance: June 1, 2014 to June 2017
- Task(s):
 3. Extend model for fast moving sources (completed)

Project Funding Level

FAA funding to Penn State in 2014-2015 was \$132K and in 2015-2016 was \$110K. FAA funding to Purdue in 2014-2015 and 2015-2016 was \$80K and \$90K, respectively.

In-kind cost sharing from Vancouver Airport Authority received in October 2016 was \$294,500 to Penn State and \$294,500 to Purdue. The point of contact for this cost sharing is Mark Cheng, mark_cheng@yvr.ca. Project support is in the form of aircraft noise and trajectory data, meteorology data, and consulting on those datasets.

Investigation Team

Penn State

Victor W. Sparrow (PI)
Graduate Research Assistant Rachel Romond (meteorological reanalysis data investigation)
Graduate Research Assistant Manasi Biwalkar (measurement data sets for model validation investigation)

Purdue

Kai Ming Li (PI)
Graduate Research Assistant Bao Tong (moving source investigation)
Graduate Research Assistant Yiming Wang (moving source investigation)



Project Overview

The FAA has been funding research efforts in developing enhanced noise emission and propagation capabilities to better support environmental impact studies at both local and national levels. The main emphasis in the near and mid-term is to increase the Research Readiness Level (RRL) of the capabilities so that they can be further matured for implementation into the FAA tools. Validation of the modeling capabilities has been the central focus of the project. Via recent US-EU research collaboration, the field measurement database (BANOERAC) is becoming available for model validation. This database contains acoustic time history of flight events from various types of commercial aircraft during cruise, climb and descent phases of the flight. In addition, the DISCOVER/AQ and Vancouver Airport Authority databases have already come on line for use in this and other FAA projects. These datasets make model validation possible. In addition, the work will make existing models ready for simulating real weather conditions via proper treatment of the meteorological input parameters and to establish a common basis for comparing US and EU models.

Task 1 - Assess applicability of meteorological reanalysis models for possible use in FAA noise tools

Task 2 - Assess measurement data sets for noise propagation model validation

Pennsylvania State University

Objective(s)

The objective of Project 5, Task 1 was to determine if meteorological reanalysis datasets and corresponding input parameters are useful for aircraft noise propagation prediction and whether the same can be integrated into the AEDT noise analysis framework. The objective of Project 5, Task 2 was to begin examination of aircraft measurement databases and ascertain their applicability for validating aircraft noise prediction tools.

Concluding Work

All of the tasks for ASCENT Project 5 have been completed. In the period October 1, 2017 until September 30, 2018 covered by this annual report, Penn State paid for and received the BANOERAC flight trajectory data from ANOTEC Engineering of Motril, Spain. BANOERAC stands for "Background noise level and noise levels from en-route aircraft" and that European project concluded in 2009. Specifically, Project 5 had funds budgeted to obtain the BANOERAC flight trajectory data through ANOTEC. Since the beginning of the project, Penn State has been working with ANOTEC Engineering to obtain suitable data sharing agreements with the European Aviation Safety Agency (EASA) for the use of the BANOERAC dataset for ASCENT research.

ANOTEC had the raw ADS-B data to calculate the flight trajectories, but never produced those trajectories under EASA funding. ASCENT Project 5 was no-cost extended to December 31, 2017 to ensure that a Penn State purchased services agreement to ANOTEC would remain in place so that ANOTEC could provide those flight trajectories.

In early 2017, the data sharing agreements were put into force, and in the spring and summer of 2017 Penn State worked with ANOTEC to establish a purchased services agreement. ANOTEC delivered the BANOERAC flight trajectory data to Penn State and Purdue on November 20, 2017.

The BANOERAC data is now being used in the ongoing ASCENT Project 40.

Milestone(s)

N/A

Major Accomplishments

The BANOERAC data, including the flight trajectory data, was received by Penn State and Purdue.

Publications

None



Outreach Efforts

None

Awards

None

Student Involvement

None

Plans for Next Period

None

References

BANOERAC Project final report, Document ID PA074-5-0, ANOTEC Consulting S.L. (2009).