

## ASCENT Project 60



# Analytical Methods for Expanding the AEDT Aircraft Fleet Database

## Georgia Institute of Technology

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Cost Share Partner: Georgia Institute of Technology

## Objective:

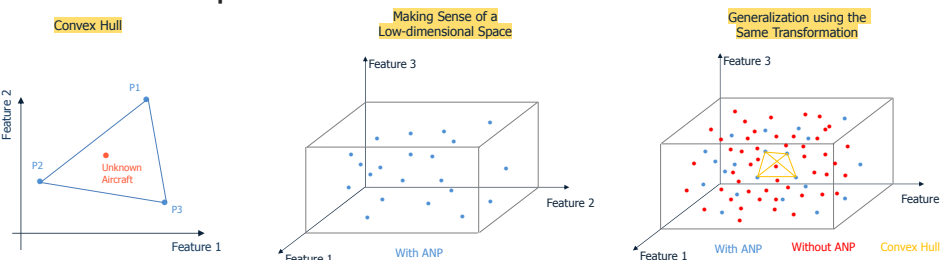
Improve the accuracy of AEDT noise and emissions modeling of aircraft not currently in the Aircraft Noise and Performance (ANP) database by developing ANP data for those aircraft to expand the AEDT FLEET database.

## Project Benefits:

This research will improve the noise and emissions modeling of the aircraft that are not currently represented in AEDT's FLEET database and eventually enhance AEDT's environmental modeling capability. This will also improve the accuracy of AEDT to better reflect the environmental assessment of the aircraft operations.

## Research Approach:

- Construct a master database to collect information and necessary data of the aircraft
- Formulate a statistical learning method – Mixture Models to develop ANP and noise data for the target aircraft
- Utilize high fidelity data to validate the developed methods



## Major Accomplishments (to date):

- Conducted literature review and constructed a master database to better understand the characteristics of the target aircraft
- Proposed representative aircraft model portfolio and mixture model to develop ANP data for the aircraft

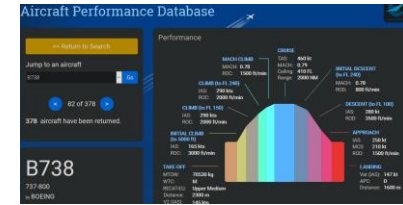
## Future Work / Schedule:

- Investigate new methods or improve the proposed analytical methods
- Validate the developed methods against high fidelity data and develop ANP and noise data to expand the current FLEET database

# Main Tasks

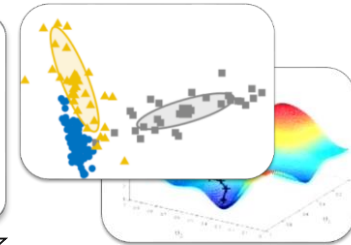
## Task 1 - Identification and Review of Aircraft not in AEDT

- Identifying aircraft that are not currently modeled with ANP data in AEDT
- Understanding the gaps between them and the substitution aircraft in terms of performance, noise, and emissions



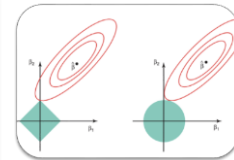
## Task 2 - Analytical Method Development

- Using statistical analysis techniques to investigate the distribution of the aircraft characteristics to distinguish different aircraft types
- Developing the ANP performance and NPD data for the new aircraft



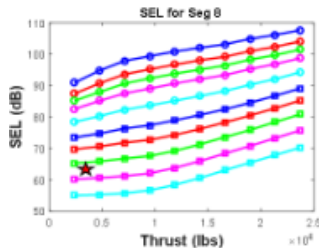
## Task 3 - Method Validation

- Ensuring the accuracy and robustness of the developed methods
- Conducting sensitivity analysis to fully test and validate the methods



## Task 4 - ANP and Noise Data Development

- Developing the ANP and NPD correction factors or new data for different aircraft types that are not currently modeled with ANP data in AEDT

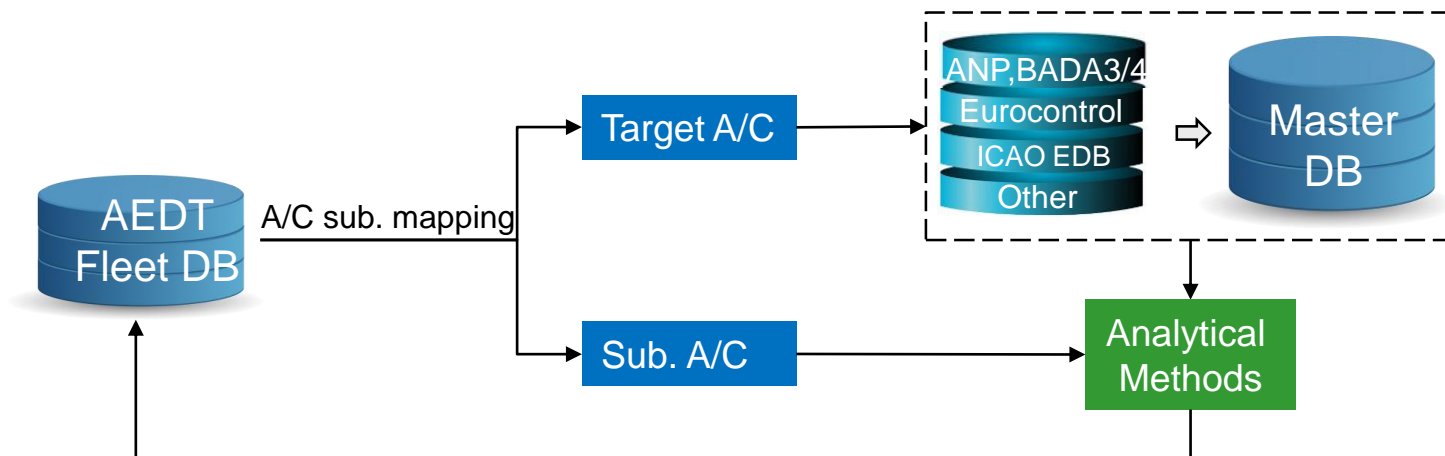


## Task 5 - Guidance on AEDT Implementation

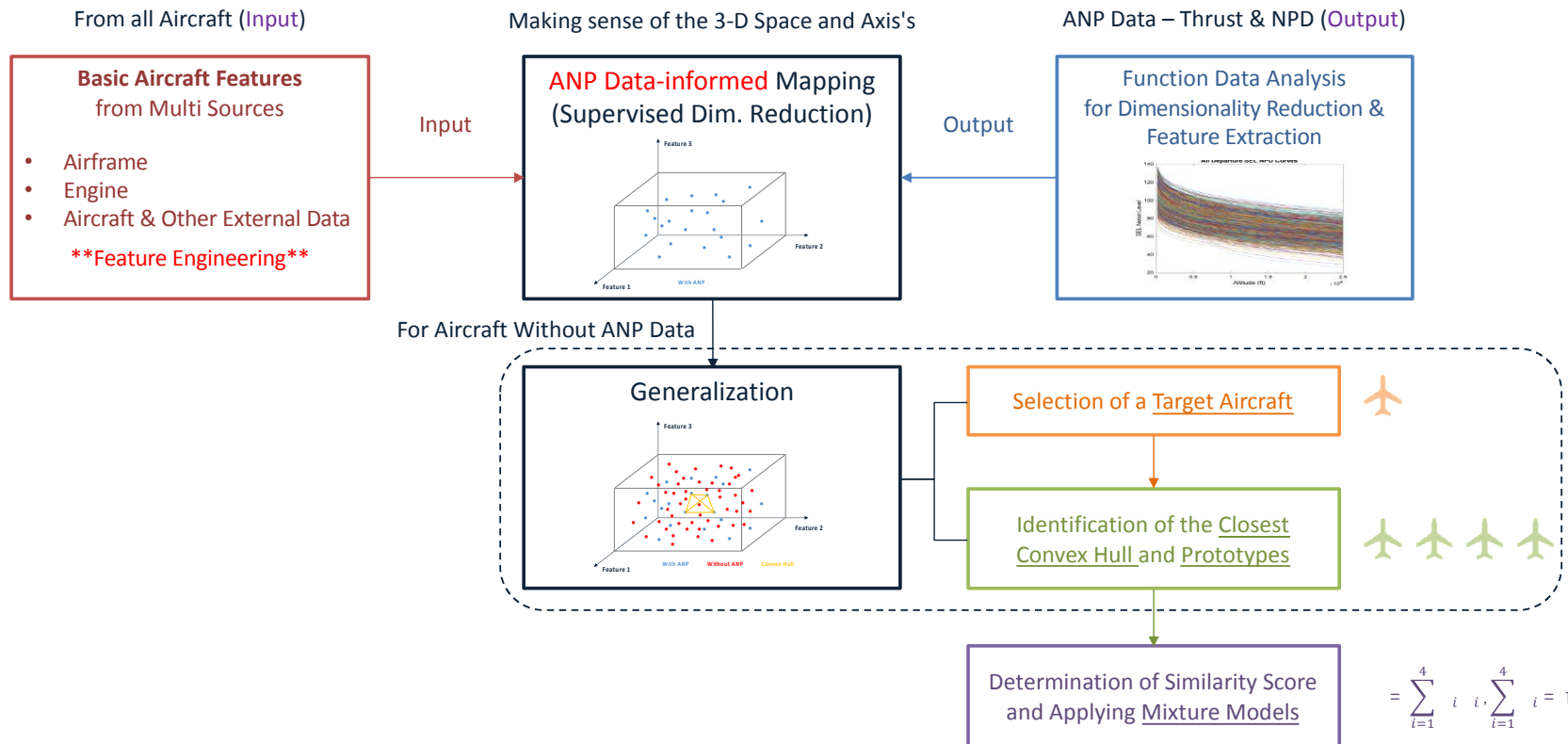
- Providing guidelines on how to implement the data to AEDT and recommendations for further development

# Construction of Master Database

- Identify the target-substitute aircraft pairs in AEDT
- Conduct literature review on external databases to acquire the data necessary for the target aircraft
- Construct a master database containing data of interest for the analytical methods
- Review the substitution method implemented in AEDT



- Mixture Models
  - model the data in terms of a mixture of several components, where each component has a simple parametric form
  - use ANP data-informed dimensionality reduction (supervised dimensionality reduction)



- External
  - Weekly telecon with the AEDT development team
  - On-line communication via Team Foundation Server (TFS)
- Within ASCENT
  - Bi-weekly telecon with the FAA management
  - P54 (Takeoff/Climb Analysis), P43 (NPD+C), P10
- Contributors
  - Georgia Tech Team: Prof. Dimitri Mavris (PI), Dr. Yongchang Li (Co-PI), Dr. Michelle R. Kirby
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