

Project 46

Surface Analysis to Support AEDT Aircraft Performance Module (APM) Development

Motivation and Objectives

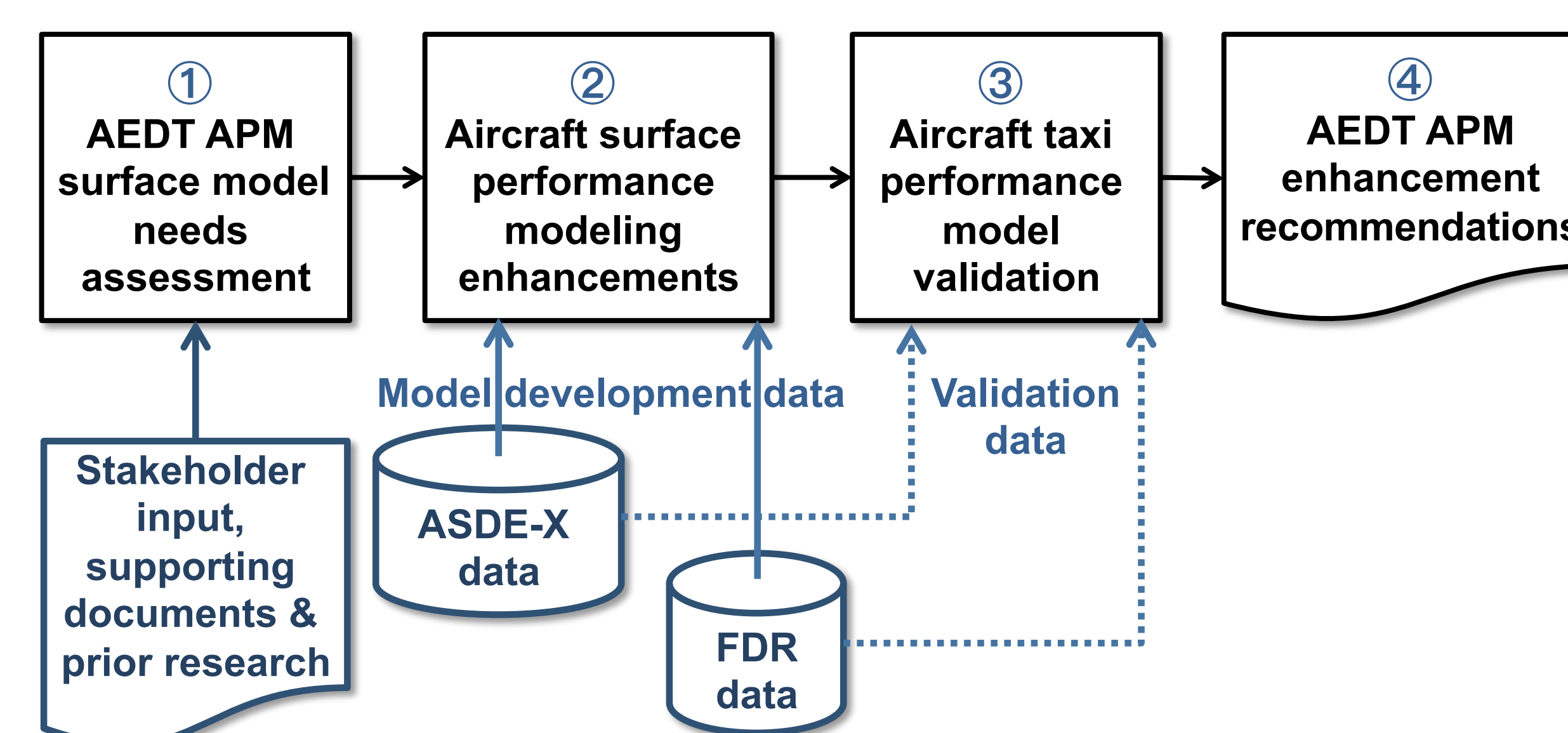
- Motivation
 - A significant fraction (5-10% for short/medium haul A320s) of total fuel burn is expended on the airport surface.
 - Taxi phase in the Aviation Environmental Design Tool (AEDT) currently modeled using simplified taxi times with engine idle fuel and emissions assumptions from the ICAO Aircraft Engine Emissions Databank.
 - Can overestimate taxi fuel.
 - These assumptions reduce the accuracy of the taxi fuel burn and emissions modeling.
- Objectives
 - Identify needs for improving taxi performance modeling in AEDT to better reflect actual operations.
 - Address identified needs by enhancing taxi models within AEDT's Aircraft Performance Module (APM) leveraging surface (ASDE-X) & Flight Data Recorder (FDR) info.

Methods and Materials

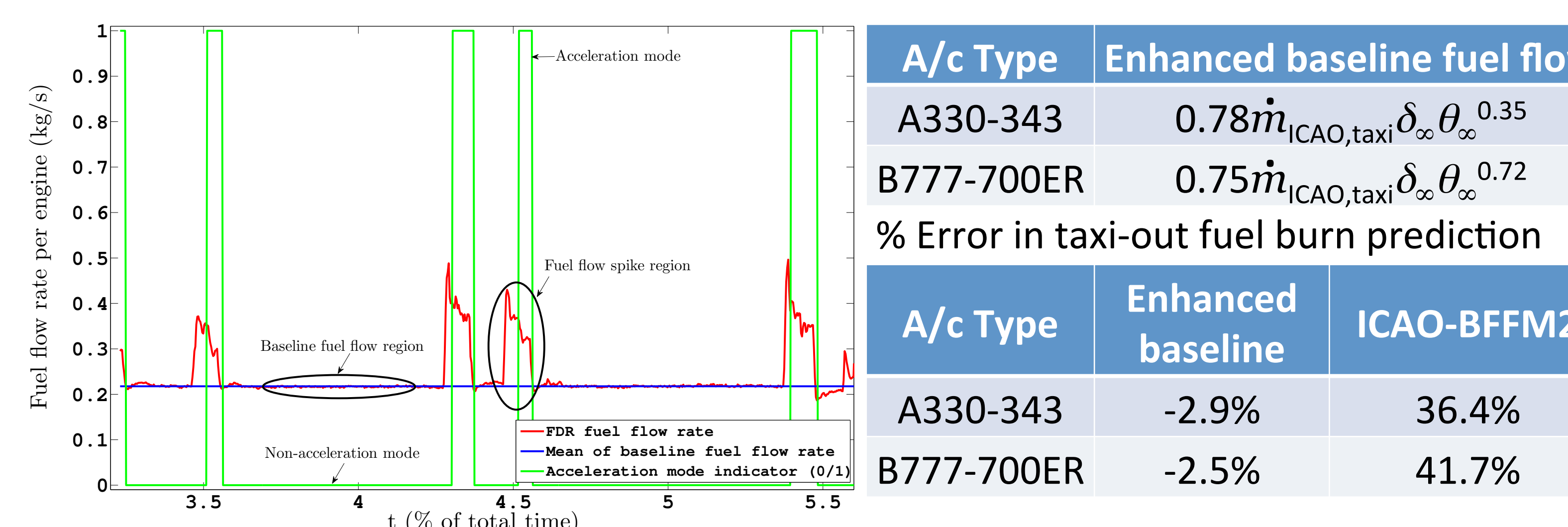
- Assess surface aircraft performance model needs for AEDT.
 - Solicit stakeholder input (including AEDT developers and users, FAA AEE, etc.).
 - Incorporate findings from related studies, e.g., ACRP 02-27 and 02-45.
- Develop enhanced surface models to address identified needs.
 - Data-driven models that represent a wider range of taxi conditions, aircraft types, airports, airlines, and weather conditions.
- Validate proposed model enhancements using independent data.
- Synthesize findings to develop targeted AEDT surface APM enhancement recommendations.

Summary

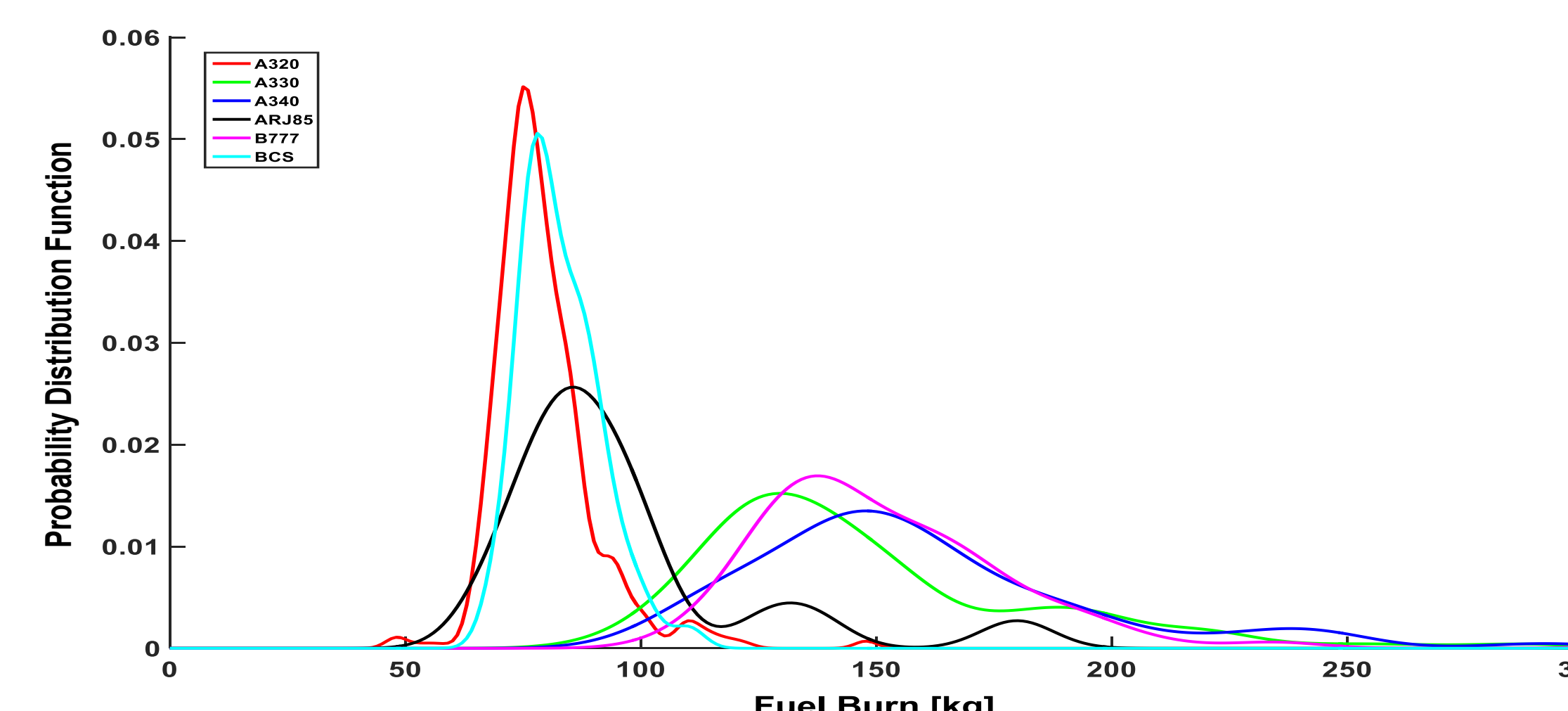
- Refining airport surface fuel burn modeling in AEDT



- Enhanced taxi time predictions based on gate/runway usage at different airports
- Enhanced baseline fuel flow using FDR-based regressions



- Addition of gate, push-back & engine start fuel burn



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Results and Discussion

- Initially developing "first-order" enhancements for AEDT:
 - Taxi time modeling representative of operations at key airports (movement and non-movement areas).
 - Enhanced taxi fuel flow for key aircraft types in fleet.
 - Add fuel burn from gate (APU), push-back and engine start activities.
- Currently developing look-up tables for AEDT to provide:
 - Taxi time distributions covering non-movement and movement area times for typical gate/runway combinations at selected US airports.
 - Regression-based models of baseline taxi fuel flow for key aircraft types.
 - Aircraft-category-based additional fuel burn for non-movement area activities.

Conclusions and Next Steps

- Project is developing "first order" enhancements for AEDT aircraft surface performance modeling
- Enhancements planned to transition into AEDT to improve taxi fuel and emissions modeling by the tool
- Next steps:
 - Expand analyses to more airports and aircraft types of interest.
 - Validation activities.
 - Synthesize into key recommendations for future AEDT enhancements.
 - Collaborate with stakeholders to determine appropriate implementation of surface APM within AEDT.