

Motivation and Objectives

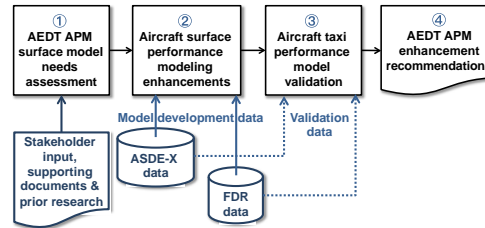
- Motivation
 - ❑ Taxi phase in the Aviation Environmental Design Tool (AEDT) currently modeled using simplified taxi times with engine idle fuel and emissions assumptions from the ICAO Aircraft Engine Emissions Databank.
 - ❑ These assumptions reduce the accuracy of the taxi fuel burn and emissions 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

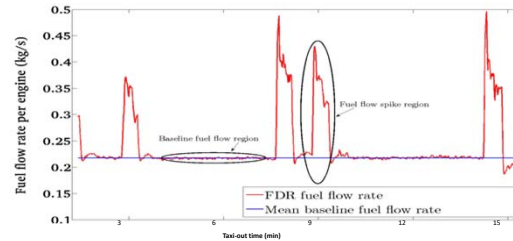
- Assess AEDT aircraft surface performance modeling needs
 - ❑ Solicit stakeholder input (including AEDT developers and users, FAA AEE, etc.).
 - ❑ Incorporate findings from related studies, e.g., ACRP 02-27 and 02-45.
- Develop enhanced surface models to address identified needs
 - ❑ Use ASDE-X & FDR data to develop models that are representative of a wider range of taxi conditions, aircraft types, airports, airlines, and weather conditions.
- Validate enhanced models
 - ❑ Use independent data to validate proposed model enhancements.
- Recommend AEDT APM enhancements
 - ❑ Synthesize findings to develop targeted APM enhancement recommendations.

Results and Accomplishments

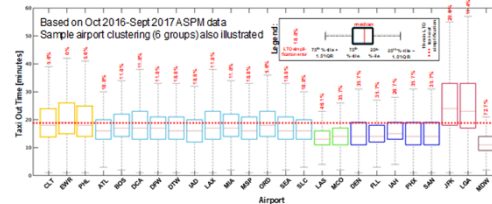
- Refining airport surface fuel burn modeling in AEDT



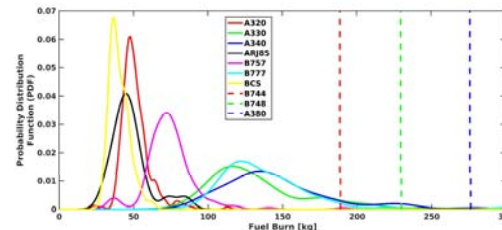
- Enhanced baseline fuel flow using FDR-based regressions



- Improved taxi time predictions (airport aggregate distributions using ASPM data)



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



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Discussion

- Developed “first-order” enhancements for airport surface modeling in AEDT:
 - ❑ Enhanced taxi fuel flow for key aircraft types in fleet (A320, A330, A340, B737, B777, CRJ).
 - ❑ Taxi time modeling representative of operations at top 25 US airports.
 - ❑ Add fuel burn from gate (APU), push-back and engine start activities for key aircraft types.
- Developed look-up tables for AEDT 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 developed “first order” enhancements for AEDT aircraft surface performance model
- Transitioning to an assessment of the Delay & Sequencing Model (DSQM) for surface queuing dynamics and potential use of enhancements to improve taxi noise and emissions modeling
- Next steps:
 - ❑ Assess current DSQM model using a queuing network model and ASPM data.
 - ❑ Identify enhancements to DSQM model.
 - ❑ Develop improved taxi noise and emissions modelling by implementing enhanced DSQM model.
 - ❑ Synthesize into key recommendations and coordinate with AEDT development team.
 - ❑ Socialize findings with stakeholders.