Analysis & Tools

Roadmap and Update

Presented to: E&E REDAC Subcommittee

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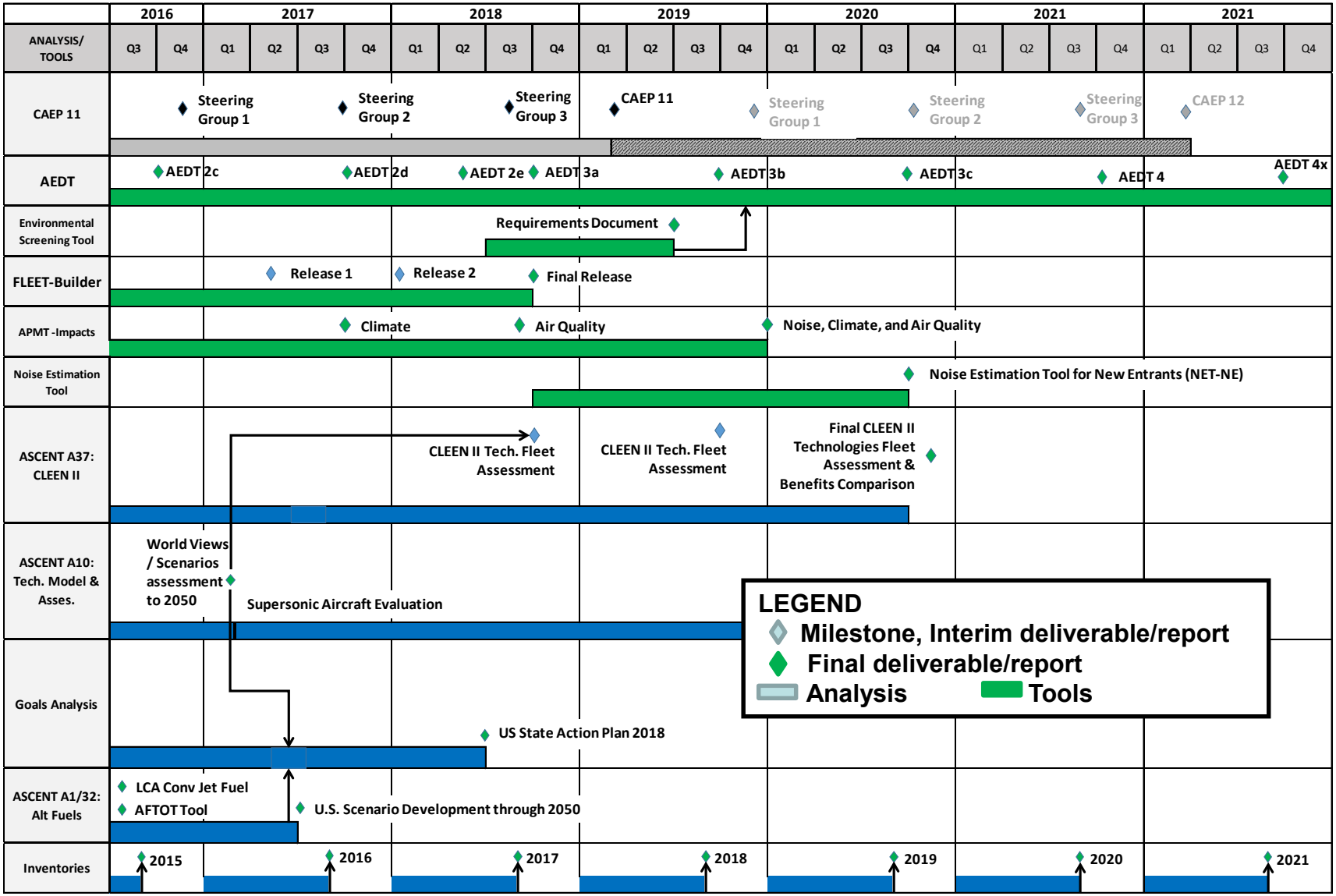
Outline

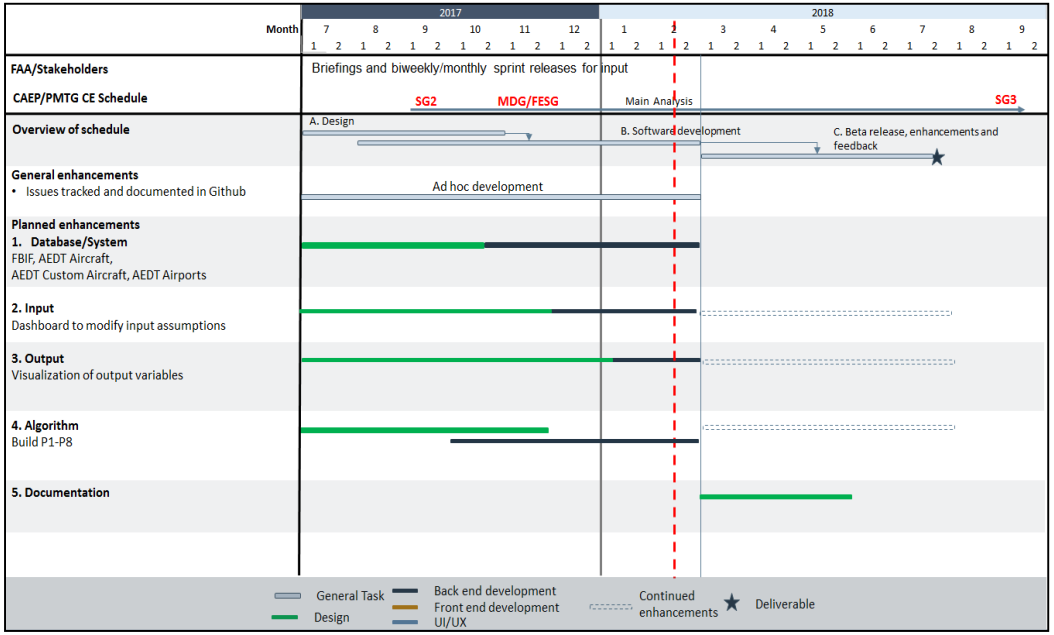
- Tools and analysis roadmap
- Tools Update
  - FLEET-Builder
  - Noise Estimation Tool for New Entrants (NET-NE)
  - ASCENT Projects
- Coordination efforts
  - Coordination with AJV-114
  - Screening tool
- Significance
- Final Notes

Tools and Analysis Roadmap



FLEET-Builder Requirements

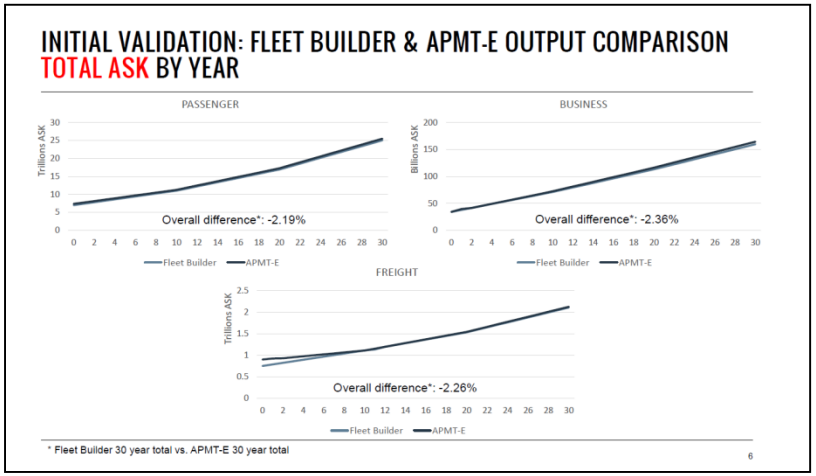
- **Use generic fleet and traffic demand forecasts as inputs to:**
  - Develop and allocate fully-defined fleets
  - Generate projected AEDT-compatible schedules of operations assigned to specific aircraft
  - Generate associated airline industry operating costs data
  - Estimate associate fuel and emissions data

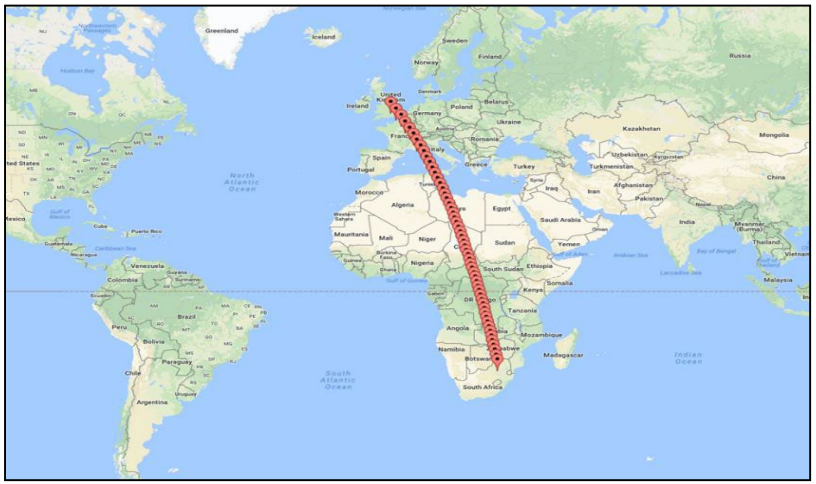


- **Allow the user to:**
  - Explore fleet-related policy scenarios, including analyses that alter the relative importance of aircraft properties in the fleet allocation process, vary geographical scope, vary criteria by market, vary environmental performance, etc.
  - Generate AEDT-compatible data, upload bulk data inputs, execute efficiently, provide document set-up functionality for transparency

FLEET-Builder Status

- **Development in still ongoing and on schedule**
- **Algorithms development currently focusing on testing at multiple levels**
  - Input/Output checks
  - Checking output vs. equations
  - Comparing output to other tools (APMT-E and AAT)
- **Comparison to European model AAT**
  - Comparisons are this stage are important as they lay the ground work for the CAEP Models Comparison Process required for tool acceptance
  - Current testing is focusing on nvPM work
- **AEDT integration**
  - Testing the tools capability to push airport and fleet information to AEDT

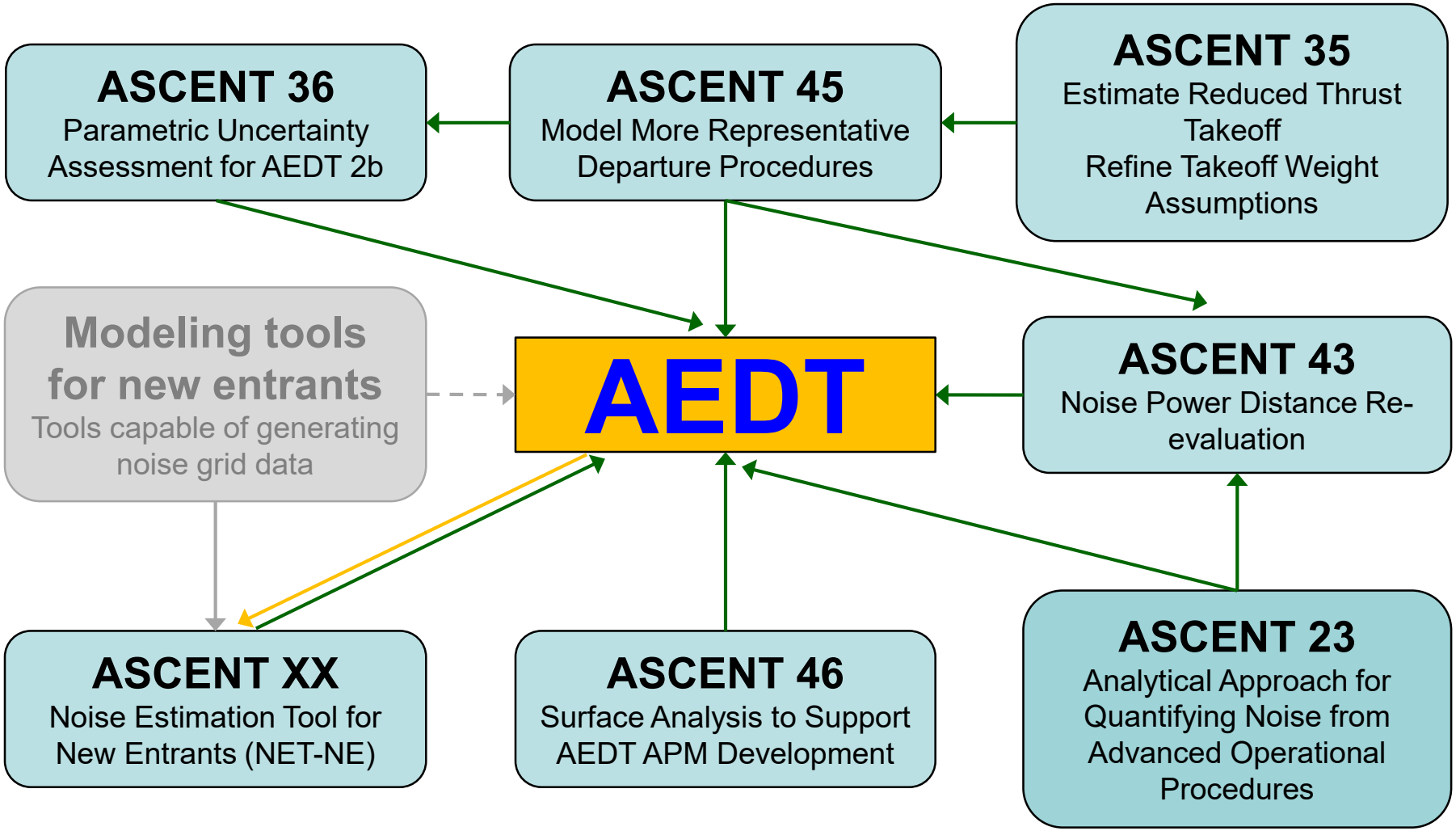




Noise Estimation Tool for New Entrants (NET-NE)

- **The tool will provide a framework for assessing the impact of new systems entering the NAS, with UAS being the first target**
  - Easily develop conventional and non-conventional operational scenarios
  - Quickly estimate noise impacts (and others as available/appropriate)
- **The user will build scenarios visually in a GIS-powered interface**
  - Define flight origin and destination locations
  - Draw flight trajectories
  - Define networks of trajectories
  - Associate operational parameters
- **Computation of metrics will rely on small vehicle-specific precomputed grids that are scaled, added, and then placed end-to-end under the flight trajectories by the GIS-powered system**
- **With the appropriate grid data the tool could be extended to support most vehicles (e.g. fixed-wing, rotary-wing, supersonic)**

AEDT-related ASCENT Projects*



*This is not a comprehensive list

Federal Aviation Administration

Coordination with AJV-114

AJV-114: Airspace Policy and Regulations Group - Environmental Policy Team

- **Coordination with AJV-114 has been focusing on several topics**
  - Continued support of the integration of AEDT in TARGETS for flight track design
  - Common approach to the development and distribution of AEDT-ready flight trajectories
  - Way forward on the development of the next generation Screening Tools
- **Currently 2 tools are used to perform screening analysis**
  - The Aviation Environmental Screening Tool (AEST), an AJV tool developed leveraging AEDT software components
  - TARGETS in conjunction with the environmental AEDT plug-in
- **Discussions have been initiated to potentially integrate the screening functionality in AEDT**
  - Both current tools were not designed to model the airspace design changes being introduced as part of NextGen
  - Integration of the functionality in AEDT would ensure consistency between screening and full analyses

FAA Screening Tools: Purpose

- **Screening tools provide an initial assessment of the level of environmental review required to meet NEPA obligations**

- **Modeling accuracy is dependent on a range of factors, but broadly on:**
  1. How well the fundamental quantity to be modeled is understood and calculated, and
  2. How accurately the inputs needed by the model are provided

- **Screening Tools accurately account for fundamentals, but are optimized to provide narrowly defined results**
  - Where appropriate can take advantage of simplified inputs and "*conservative"* assumptions
  - Results must always be presented in context and only for their intended purpose

FAA Screening Tools: Future Development

- **Current FAA screening tools meet existing regulatory needs, but updates may be needed to meet future requirements**
  - To ensure “conservative” outcomes are evaluated, updated assumptions for aircraft operating behaviors need to be incorporated
  - Supplemental noise metrics to both evaluate and communicate environmental impacts may need to be included
  - Screening for environmental changes further from airports may need to be considered
- **Current screening tools are supported by AEDT data, but are not yet fully integrated**
  - Integrating screening tools will result in development efficiencies and will ensure that screening tools stay current with the latest AEDT capabilities
  - Allow for more efficient screening evaluations by taking advantage of other AEDT capabilities (e.g. GIS integration and data management features)
  - Allow for better integration of screening tools for multiple purposes including airport and airspace evaluations as well as noise, air quality and fuel burn considerations

Significance of the Tools and Analysis Work

- **Tools development provides the foundation on which decisions are made**
  - As a regulatory tool AEDT is the fundamental asset for addressing NEPA requirements
  - As a research tool AEDT provides the analysis capabilities necessary for assessing the effects of future technologies and new operational strategies
  - The FAA Tool Suite as an integrated system provides the functionality for generating the data that are the fundamental bases on which policy decisions can be made

- **Analysis work provides the common and consistent repository of data that are used as the basis of our work**
  - The yearly inventory analyses not only provide the information needed to satisfy the agency's reporting requirements, but they also provide a consistent historical representation of the NAS operation in an analysis and processing ready format
  - The CLEEN, Goals, and CAEP analyses provide a representation of possible future conditions of the NAS operations that are also consistent to the historical datasets

Final Notes

- **Continuing to focus our efforts on key tool users:**
  - Practitioners for airspace and airport design and planning
  - CAEP
  - NextGen
  - Research
- **Using ASCENT to advance AEDT capabilities**
- **Reaching across Lines of Business to pool resources and expertise**
- **Internal analyses have mostly stalled due to the small staff not having the necessary uninterrupted time**
- **Will face challenges due to the expected reduction in funding**

BACKUP INFORMATION

AEDT-related ASCENT Projects

- **A5 - Noise emission and propagation modeling**
  - As part of the balanced solution in managing aviation noise, the FAA insulates residential buildings near airports. It is important to understand and estimate the noise reduction performance of the buildings exposed to aircraft noise.
- **A23 - Analytical Approach for Quantifying Noise from Advanced Operational Procedures**
  - Conduct an assessment of gaps in current noise modeling tools in terms of capturing non-standard operational procedures (e.g., Optimized Profile Descents, Optimized Profile Climbs, Delayed Deceleration Approaches, etc.) with specific interest in an approach to modeling Delayed Descent Approach (DDA) .
- **A35 - Airline flight data examination to improve flight performance modeling**
  - Access aircraft takeoff weight, actual (reduced) takeoff thrust, fuel burns and other parameters collected by airlines and conduct a comprehensive statistical analysis to obtain trends or distributions and plausible explanations of the observations. Develop reduced data sets to evaluate the aircraft performance modeling capabilities of AEDT and other relevant research efforts and make suggestions on priorities in further enhancing AEDT and other aircraft performance prediction tools.
- **A36 - Parametric Uncertainty Assessment for AEDT 2b**
  - Perform a system level parametric uncertainty analysis on the Aviation Environmental Design Tool (AEDT). This system level assessment will quantify how input uncertainties propagate through the system and contribute to uncertainty in overall policy outcomes. The team will also report any issues encounter while running the tool and assist the development team in diagnosing the software problem.

AEDT-related ASCENT Projects (cnt'd)

- **A40 - Quantifying uncertainties in predicting aircraft noise in real-world situations**
  - Review and analyze available field measurement data for patterns that are influenced by the meteorological conditions which are suitable for input into modeling capabilities for validation and subsequently use the enhanced capabilities to understand the field measurement data and quantify uncertainties.
- **A43 - Noise Power Distance Re-evaluation**
  - Evaluate possible improvements to the existing NPD methodologies for noise propagation modeling to develop NPD datasets that can capture aircraft configuration, speed, and thrust (NPD "plus configuration" or NPDC) thus enabling assessment of noise impacts of certain advanced operational procedures. This work will build upon the research done under A23 on the assessment framework.
- **A45 - Takeoff/Climb Analysis to Support AEDT APM Development**
  - Build on the research under A35, the Airport Cooperate Research Program (ACRP), and the Fuel Efficiency Metric task efforts to develop a robust set of recommendations for improved estimation processes for takeoff weight, reduced thrust takeoffs, and departure profiles within AEDT, which currently assume full rated takeoff power/thrust.
- **A46 - Surface Analysis to Support AEDT APM Development**
  - Identify and evaluate methods for improving taxi performance modeling in AEDT by building thrust profiles by taxi segment given a surface trajectory (whose geometry can vary) for a variety of aircraft types. Recommendations should also be made on how the outcomes of this research can be combined with existing research (e.g., ACRP projects 02-45 and 02-27) to inform development of the Aircraft Performance Model (APM) in AEDT.