ASCENT Research
&
AEDT Development

Presented to: ASCENT Advisory Committee Meeting

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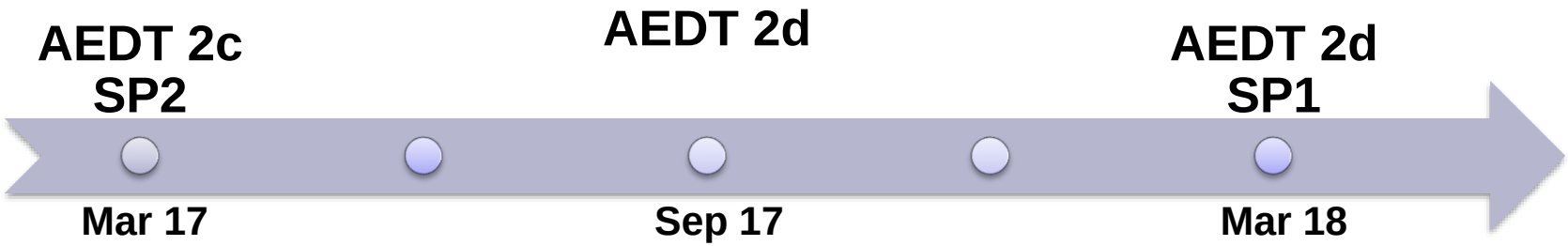
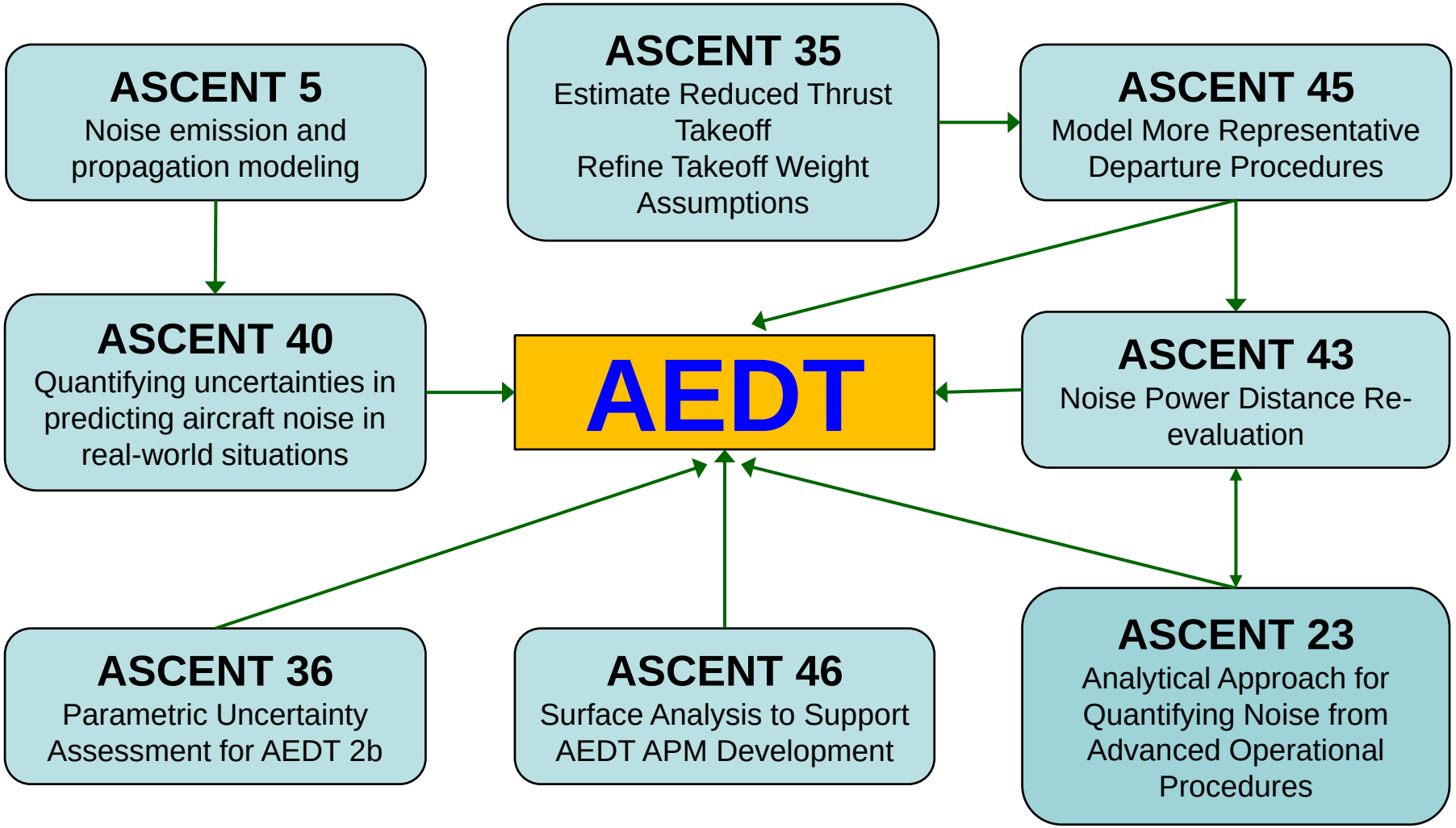
FY17 Development Plan (AEDT2 Series)



- **2c SP1 (12/2016)**
  - Enhanced Emissions Modeling Analysis Capability & Improved Input Workflow
- **2c SP2**
  - AERMOD/AERMET update and emissions dispersion computation improved efficiency
  - Application enhancements: detail grid support and multi-version support
  - ***Research only:*** BADA 4 with Sensor path, nvPM, MERRA &WRF weather inputs
- **2d Releases**
  - Define airport roadway network in AEDT GUI
  - Aircraft database updates - Utilize manufacturer data submittals
  - Usability Improvements: Managing and editing Inputs, Vector tracks, Backbone tool, Combining contours over different receptor sets

AEDT-ASCENT Connectivity



FY18 Development Plan (AEDT 3a - 9/2018)

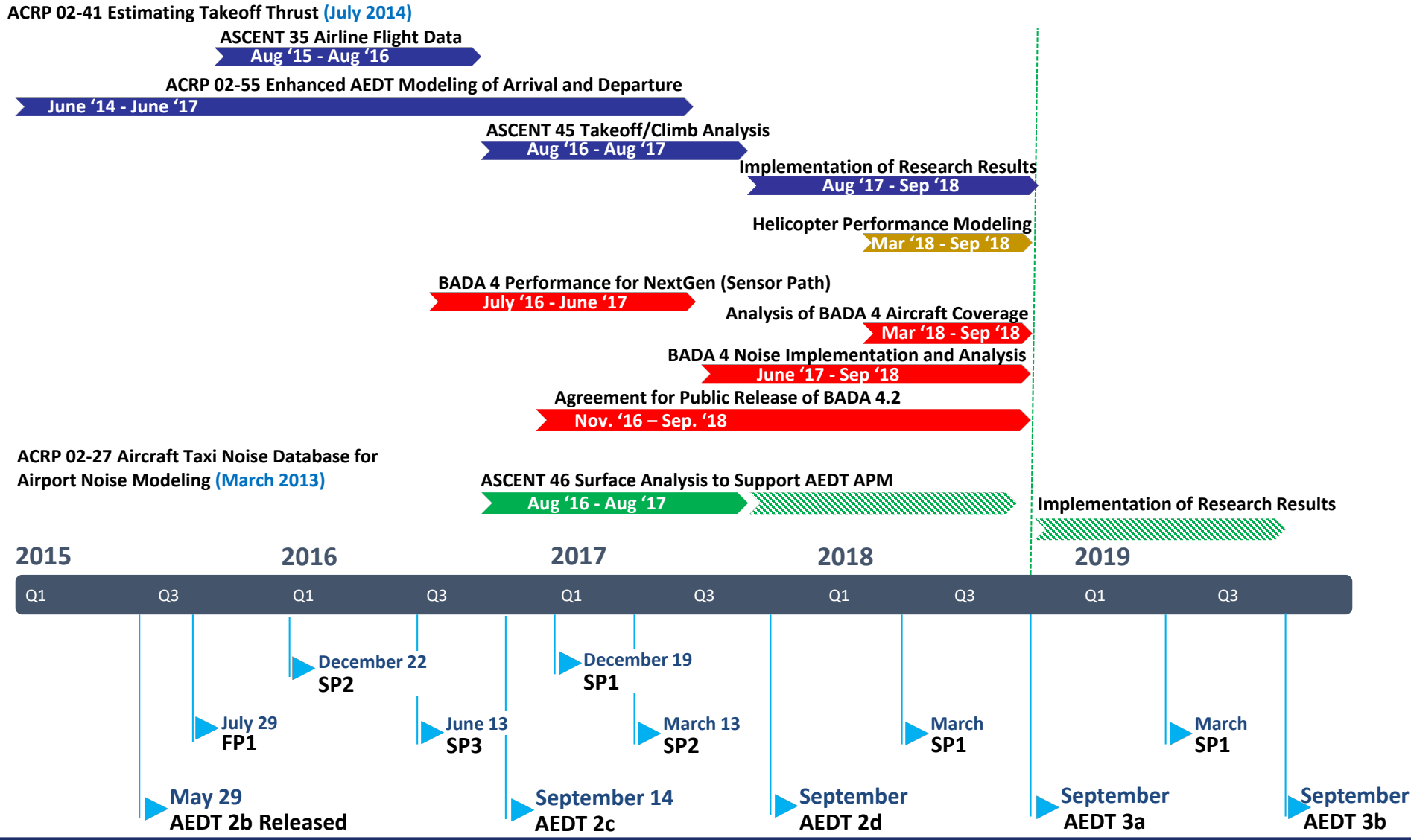
- **Focus of AEDT 3a will be improved aircraft performance modeling**
  - Public release of BADA 4 (considered most accurate data source)
  - A35 and A45 will result in more accurate aircraft profiles
    - Improved aircraft takeoff weight
      - 10% variation in weight can lead to roughly 5% variation in fuel burn and 11% variation in noise (A36)
    - Reduced thrust takeoff
    - Additional standard procedures
      - ACRP 02-55 – Profile customization tool
  - Improved helicopter performance
    - New Rotorcraft Performance Model (RPM) is physics-based: power requirements from weight, speed, altitude determine fuel flow
    - When OEM data are not available, use NASA performance models to generate data

Long term development Plans

- **FY19 – AEDT 3b**
  - Improved taxiway modeling
    - ACRP 02-27 Aircraft Taxi Noise Database for Airport Noise Modeling
    - ASCENT 46 Surface Analysis to Support A

- **FY20 and beyond (AEDT 4)**
  - Higher fidelity noise characterization
    - Utilize improved aircraft performance from BADA 4
    - Develop analytical techniques to capture airframe noise (ASCENT 23)
    - Develop NPD + configuration (NPDC) format that enables more accurate noise prediction due to aircraft configuration and speed changes (ASCENT 43)
    - Understand sources of uncertainty for noise (ASCENT 5 and 40)
  - Incorporate improved version of AERMOD for local-scale airport air quality modeling
  - Include capabilities to model supersonic aircraft

AEDT 3 Development Timeline



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.