

# AEDT Status and Development Plan

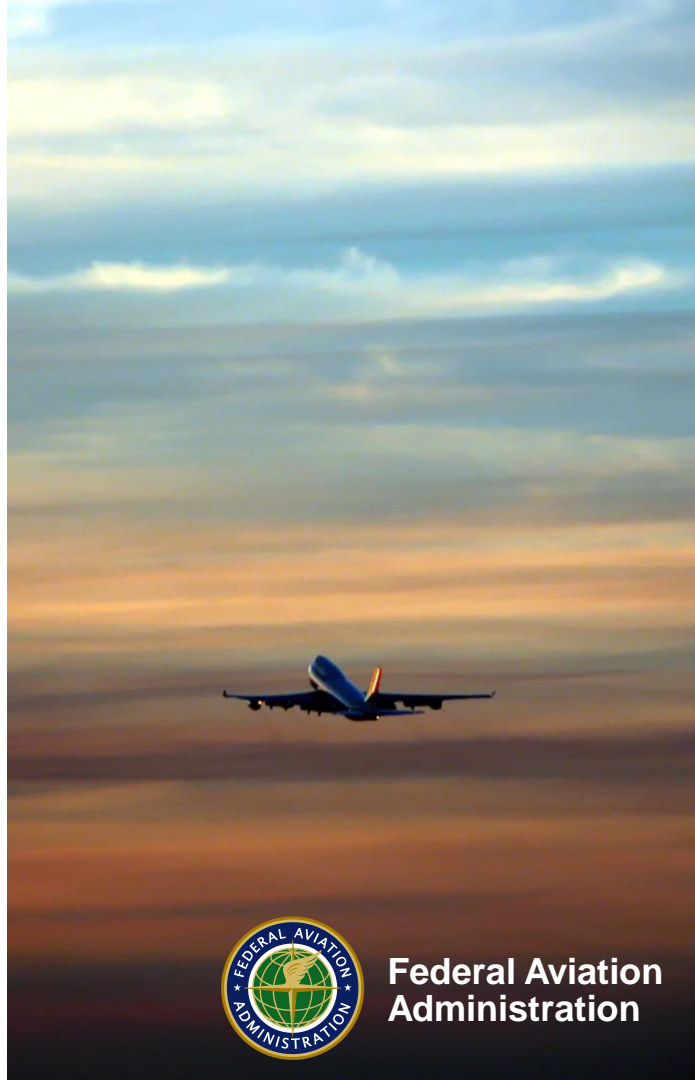
Presented to: Aviation Noise & Emissions  
Symposium 2019

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**Federal Aviation  
Administration**



# Noise Modeling Evolution

- SAE 1854<sup>1</sup>
- Profile Generator
- Terrain Elevation

**INM 4 Series**  
1993 - 1995

- Higher Fidelity Performance
  - Environmental factors
- Non-Standard Profiles
- Acoustic Impedance
- Grid Point Analysis
- Flight Track Dispersion
- Expanded Aircraft Database

**INM 5 Series**  
1995 - 1999

- New lateral attenuation adjustment
- Level Flight Segments
- Added Spectral Class Data
- Line-of-sight blockage attenuation
- Helicopter Noise Modeling
- Expanded Airport Database
- Expanded Aircraft Database

**INM 6 Series**  
1999 - 2006

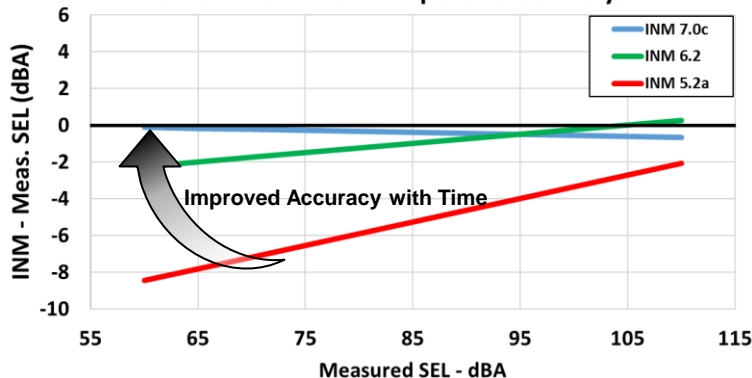
- Lateral attenuation update
- Level flight Approach Segments
- Compliance with ECAC Doc 29<sup>2</sup>
  - Bank angle, procedure steps, thrust reverser
- Expanded Aircraft Database

**INM 7 Series**  
2007 - 2015



1. Society of Automotive Engineers Aerospace Information Report 1845 "Procedure for the Calculation of Airplane Noise in the Vicinity of Airports"
2. European Civil Aviation Conference Doc 29 "Report on Standard Method of Computing Noise Contours around Civil Airports"

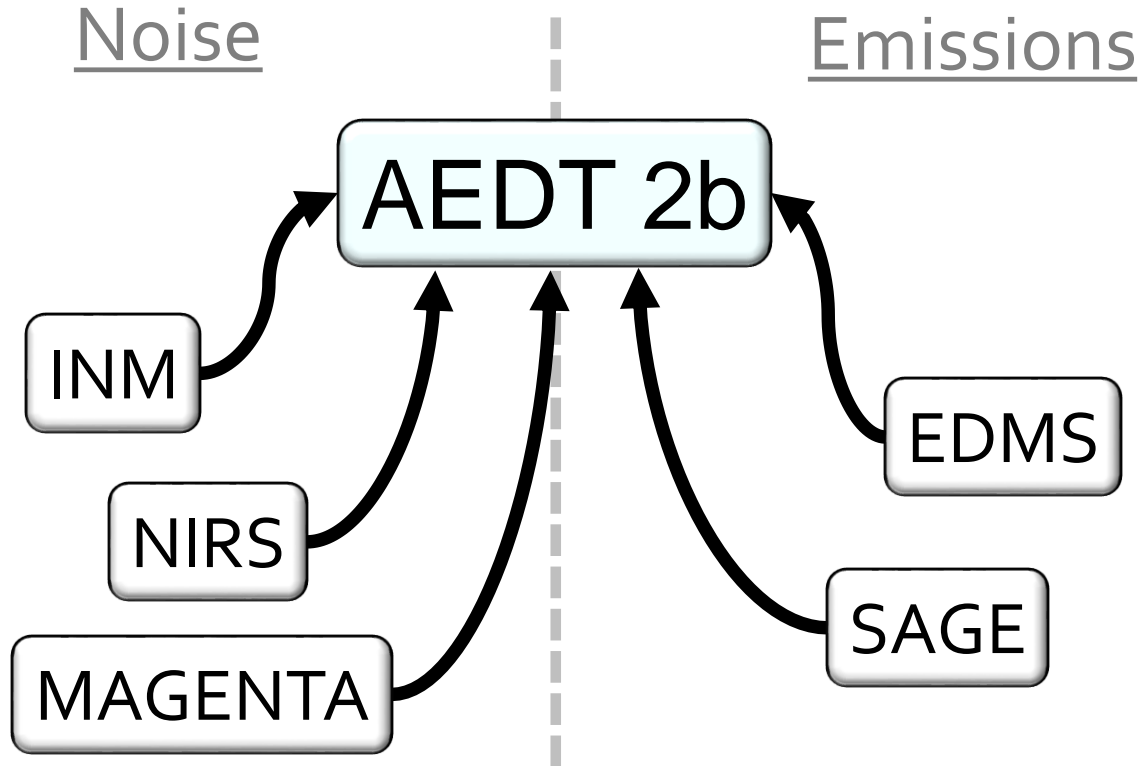
## Predicted (INM) vs. Measured SEL Denver International Airport Noise Analysis



1. Society of Automotive Engineers Aerospace Information Report 1845 "Procedure for the Calculation of Airplane Noise in the Vicinity of Airports"



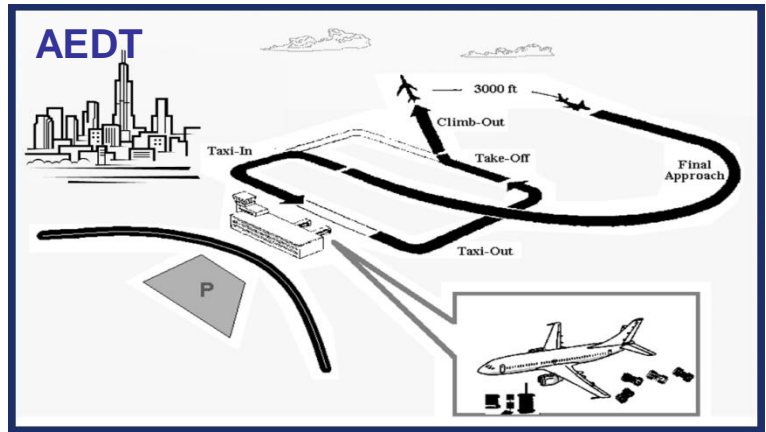
# AEDT Replaced Legacy Tools



# Aviation Environmental Design Tool (AEDT)

## Features

- Computes noise, fuel burn, emissions, and air quality
- Able to conduct analyses at airport, regional, national, and global scales

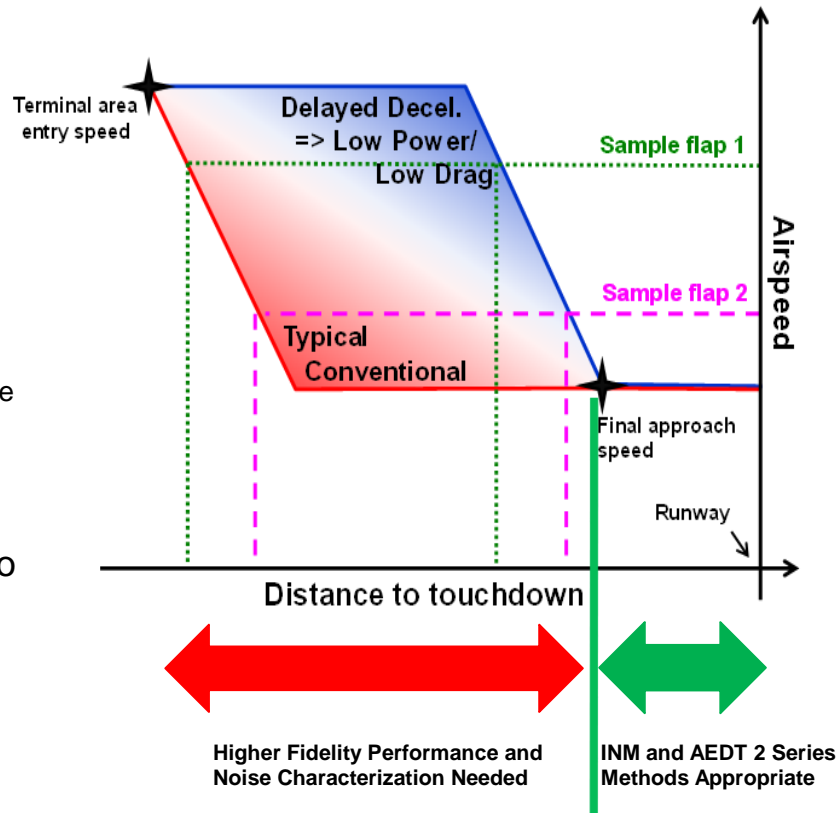


## Applications

- Air space and airport design and planning (e.g., National Environmental Policy Act reviews)
- International Civil Aviation Organization (ICAO) Committee on Aviation Environmental Protection (CAEP) analyses
- Assessing benefits from introducing NextGen and new aircraft and engine technologies (e.g., from FAA CLEEN and NASA Programs)

# Future Direction of Noise and Performance Modeling

- INM/AEDT 2 series assume noise is engine dominant; focus is on departure noise and DNL 65 dB contour.
- Crude accounting of noise effects for different flap/gear settings.
  - As engine noise is reduced, airframe noise becoming important, particularly on approach.
- Higher fidelity performance and noise characterization needed to evaluate advanced operational procedures beyond DNL 65 dB.



# Two-Step Development Approach

## AEDT 3 Series

### High Fidelity Aircraft Performance

- Implementation of BADA4<sup>1</sup>
  - EUROCONTROL model designed for simulation and prediction of aircraft trajectories
  - provides higher fidelity thrust, lift, and drag for more detailed procedure modeling
- Reduced thrust takeoff and alternative takeoff weight
  - Allows user flexibility in departure modeling for more representative flight operations



## AEDT 4 Series

### High Fidelity Noise Characterization

- Develop analytical techniques to capture airframe noise
- Develop NPD + configuration (NPDC) format that enables more accurate noise prediction due to aircraft configuration and speed changes

1. BADA = Base of Aircraft Data



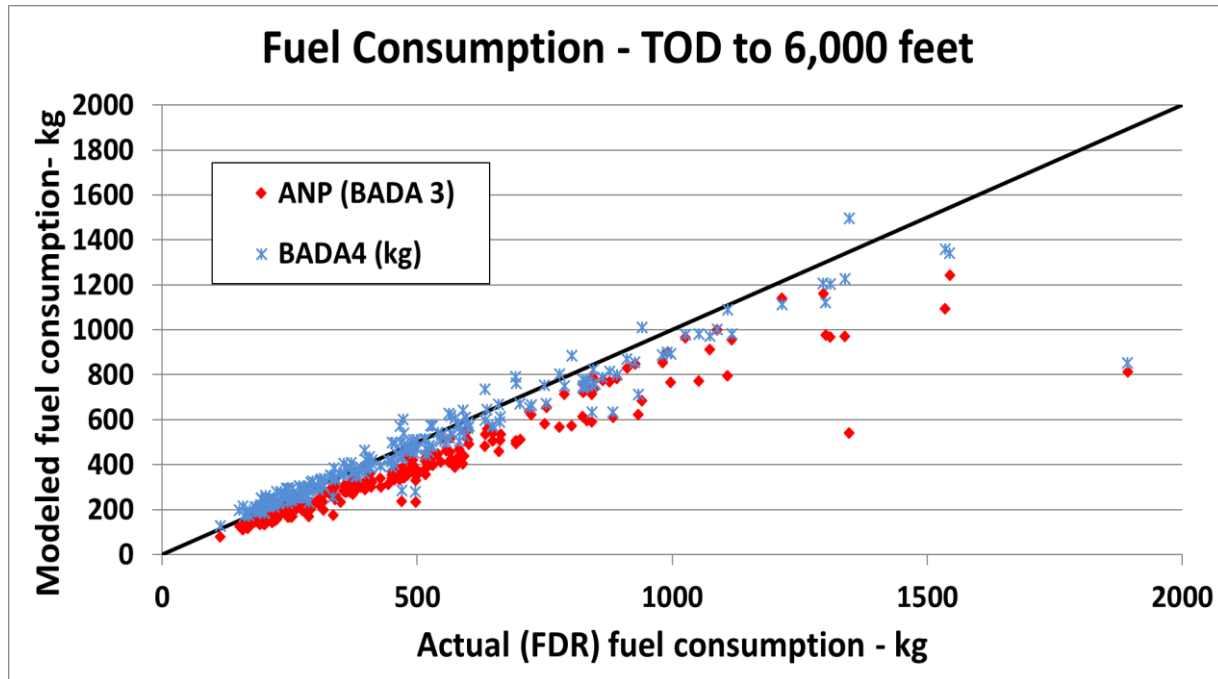
# AEDT Development Status

- **AEDT 3b scheduled for release in March 2019**
- **Aircraft performance modeling update**
  - BADA4 implementation provides more accurate and unified modeling of aircraft performance for both terminal area and cruise operations
  - Improved aircraft takeoff weight and takeoff thrust modeling to better represent flight operations
- **Aviation emissions dispersion modeling updates in AEDT 3b**
  - AERMOD/AERMET update to latest version
  - 3-tiered screening approach to NO2 modeling
  - AERMET updates
- **Fleet database updates**
  - Gulfstream G650; Boeing 737- MAX8; Boeing 737-800 Approach; Airbus 320-271Neo, Falcon 900, A350-941



# AEDT 3b Improved Performance Model

- BADA 4 improves accuracy of fuel burn calculation below cruise.

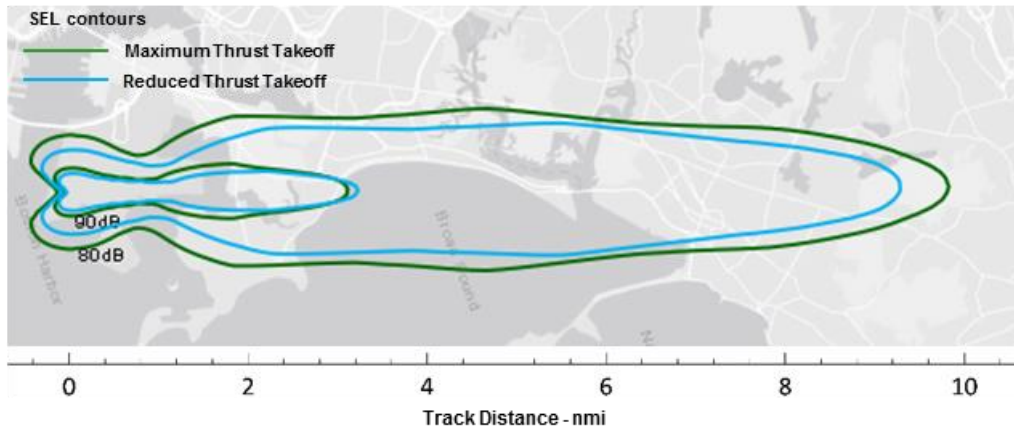
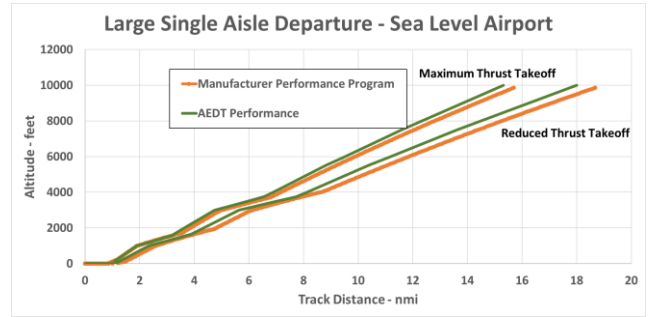
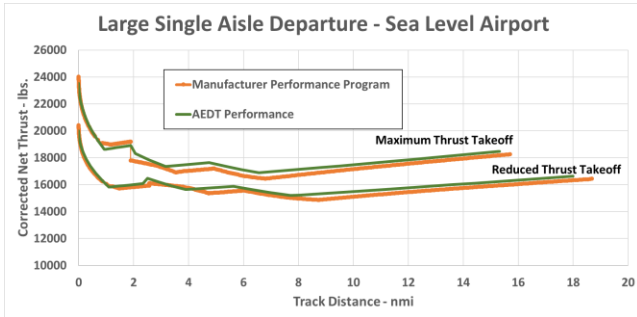


**Notes:**

1. ANP = Aircraft Noise and Performance



# Reduced Thrust Takeoff



# AEDT Future Development Goals

ACRP 02-27 Aircraft Taxi Noise Database  
 ACRP 02-52 Noise Modeling of Mixed Ground Surfaces  
 ACRP 02-55 Enhanced AEDT Modeling of Aircraft Arrival and Departure Profiles  
 Volpe helicopter polar sphere research  
 ASCENT 10 Aircraft Technology Modeling and Assessment  
 ASCENT 19 Development of Aviation AQ Tool for Airport-Specific Impact Assessment: AQ Modeling  
 ASCENT 36 Parametric Uncertainty Assessment for AEDT  
 ASCENT 38 Rotorcraft Noise Abatement Procedures Development  
 ASCENT 45 Takeoff/Climb Analysis to Support AEDT APM Development  
 ASCENT 46 Surface Analysis to Support AEDT APM Development

ACRP 02-66 Commercial Space Operations Noise and Sonic Boom Modeling and Analysis  
 ACRP 02-79 Aircraft Noise with Terrain and Manmade Structures  
 ACRP 02-81 Commercial Space Operations Noise and Sonic Boom Measurements  
 ACRP 02-85 Commercial Space Vehicle Emissions Modeling  
 ASCENT 9 GIS-based Noise Estimation Tool  
 ASCENT 19 - Development of Aviation AQ Tool for Airport-Specific Impact Assessment: AQ Modeling  
 ASCENT 23 Noise from Advanced Operational Procedures  
 ASCENT 36 Parametric Uncertainty Assessment for AEDT  
 ASCENT 40 Quantifying Uncertainties in Predicting Aircraft Noise in Real-world Situations  
 ASCENT 43 Noise Power Distance Re-Evaluation (Research)  
 ASCENT 44 Aircraft Noise Abatement Procedure Modeling and Validation



- Supersonic Aircraft performance modeling
- Infrastructure and usability updates to improve efficiency and workflow
- Aircraft database updates
- Enhance noise modeling for airports near water
- Taxiway Modeling (Noise and Emissions)
- Helicopter noise modeling improvements
- Air quality modeling enhancements

- Higher fidelity aircraft noise characterization
- Update GIS engine to reduce development costs
- Modeling noise with Terrain and Manmade Structures
- Commercial Space
- New Air Quality model

**AEDT 3x – Release AEDT updates biannually**

**AEDT 4a**

**AEDT 4x**



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