



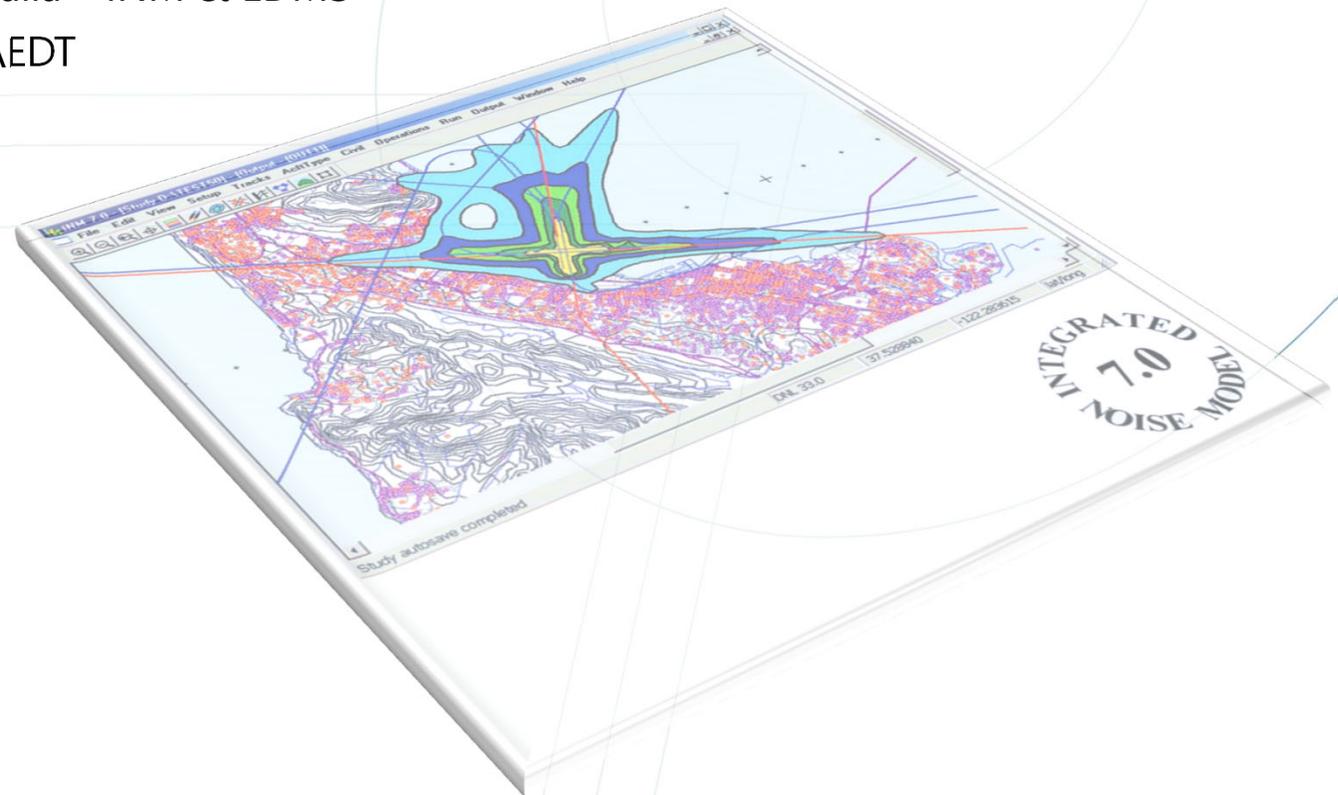
Aviation Noise Modeling in Australia Transition from INM 7.0d to AEDT

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Booth #25



Modelling of Aircraft Noise & Emissions

- Current situation in Australia – INM & EDMS
- Rationale for change to AEDT
- Impacts & Changes
- Next steps



Current Situation – 2 modelling systems – INM & EDMS

Integrated Noise Model

- Released in 1978, currently at Version 7.0d
- Developed to assess aircraft noise impacts based on weather, aircraft type and operation mode for:
 - Understanding noise impacts around airports
 - Assessing changes to airports such as new or extended runways
 - Assessing changes to operational procedures
 - Evaluating noise from aviation at sensitive locations
- Used for the creation and endorsement of Australian Noise Exposure Forecasts (ANEF)
- As of May 2015, no longer updated

Emissions & Dispersion Modeling System

- Released in 1991, currently at Version 5.0
- Designed to assess the air quality impacts of airport emission sources, notably aviation related sources such as:
 - Aircraft
 - Auxiliary power units (APU)
 - Ground support equipment (GSE)
 - Ground access vehicles
 - Stationary sources
- In Australia, a local product (TNIP Carbon Counter) used for carbon footprint and fuel burn assessment but EDMS used for dispersion modelling when required.
- As of May 2015, no longer updated



Rationale for change

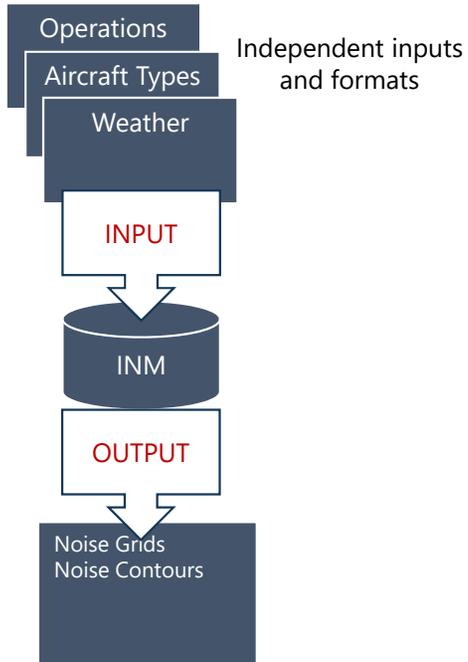
- Modelling is processor intensive work, new software can take advantage of today's faster computers
- Algorithms used for creating the models have changed
- Use of common technical architecture, interfaces and inputs to simultaneously model aviation noise, fuel consumption and emissions



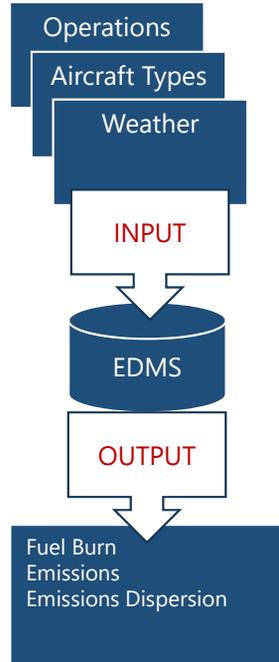


Consolidated inputs

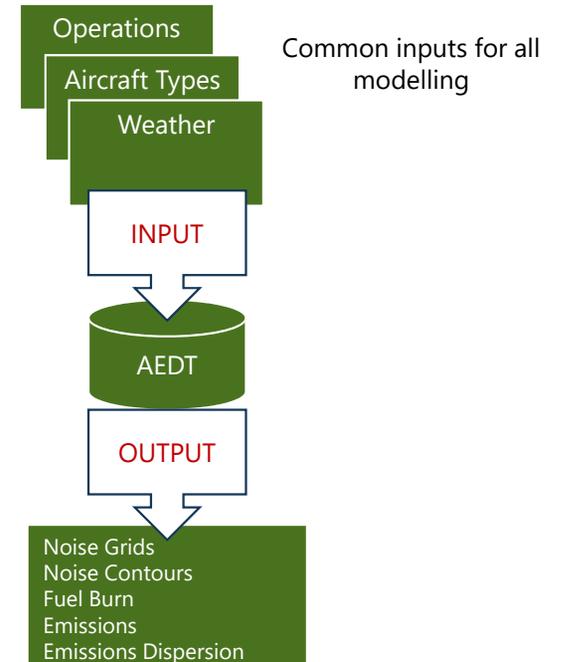
Integrated Noise Model (INM)



Emissions & Dispersions Modelling System (EDMS)



Aviation Environmental Design Tool (AEDT)

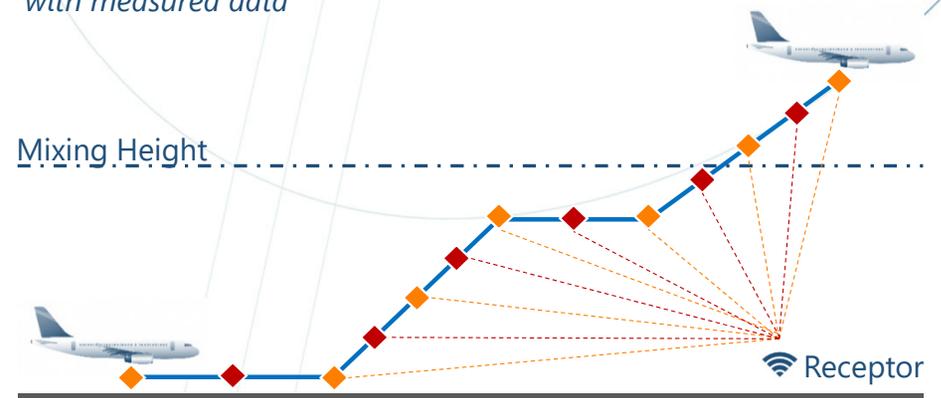
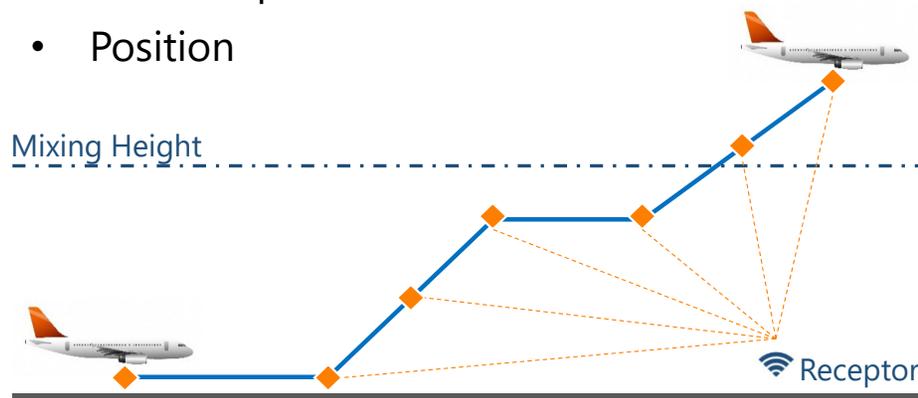


Flight Path Segments

Both legacy models and AEDT break up flight profiles into smaller pieces, called flight path segments containing data such as:

- Engine power settings
- Aircraft state (bank angle, flap setting, etc)
- Aircraft Speed
- Position

*AEDT typically uses more flight path segments than legacy models
More segments give a better correlation with aircraft state and therefore produce more accurate noise models when compared with measured data*



Aircraft Characteristics

- Newer aircraft types will be available in AEDT and will be updated in future releases
- Changes in generic characteristics (e.g. AEDT more accurately models lateral attenuation (noise to the side) for aircraft with fuselage mounted engines)
- AEDT sources aircraft performance data from EUROCONTROL Base of Aircraft Data (BADA) for modelling of operations above 10,000ft

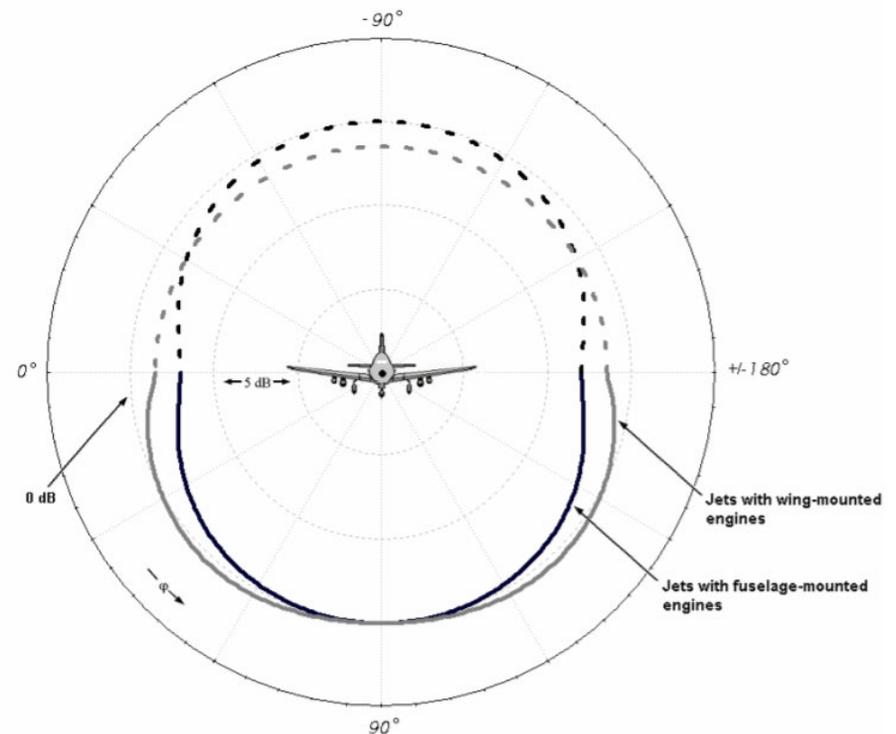


Figure 4-6 Illustration of Engine-Installation Effects for Jet-Powered Airplanes²⁵

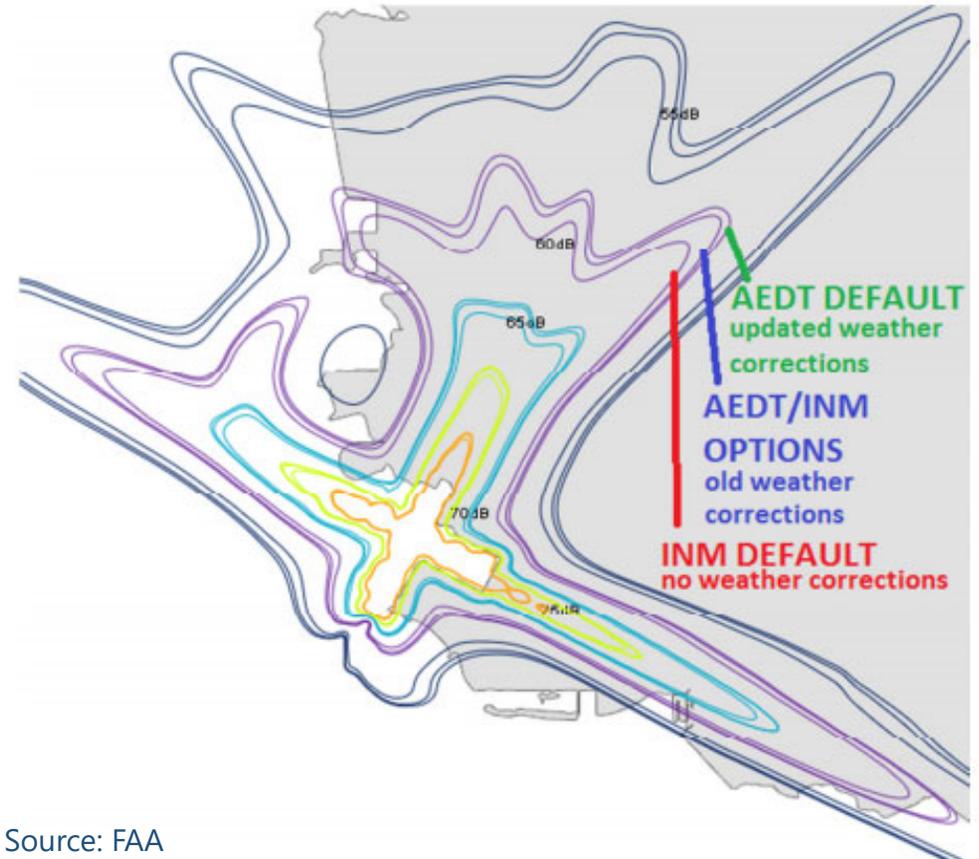
Source: AEDT 2d Technical Manual

Weather data

Changes made to weather inputs to meet the combined requirements for noise and emissions modelling (can be customised for specific airport)

If available, AEDT can use “high fidelity” weather models which vary according to altitude and position of aircraft

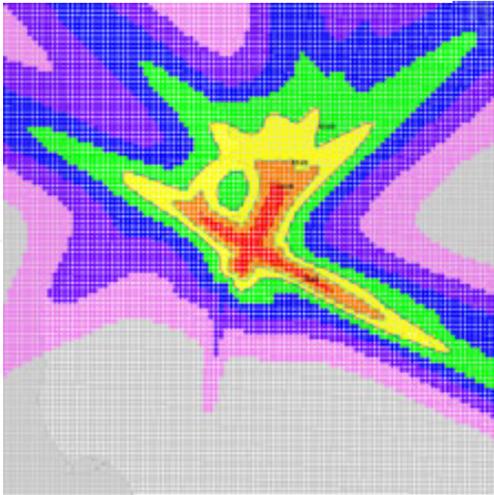
Additional methodology for atmospheric absorption has been applied to contour generation, resulting in slight increase of contours in AEDT



Source: FAA

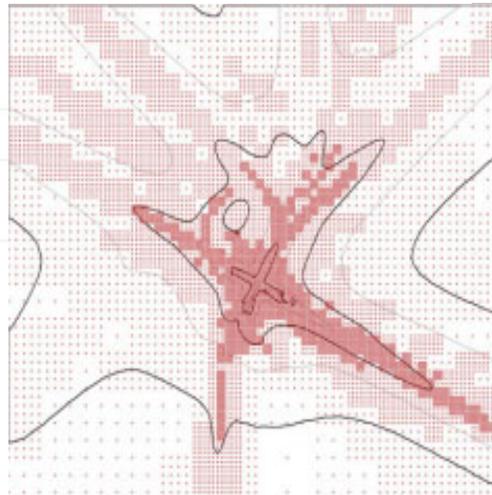
Noise Contours

Fixed Grid (AEDT & INM)



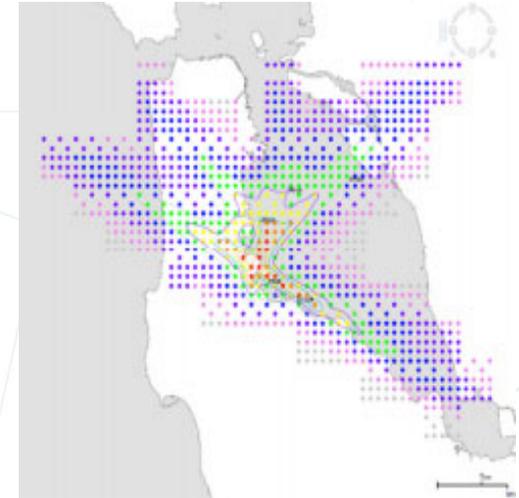
- Equally spaced contour grid
- Can result in contours that do not close in INM
- AEDT will not output contours that do not close

Recursive Grid (INM only)



- Irregularly spaced contour grid
- Outer edge of the grid is defined
- Start with a large grid, and add in additional points to areas with noise level changes
- Can result in contours that do not close

Dynamic Grid (AEDT only)



- Irregularly spaced contour grid
- Start with small grid, and expand grid points until the contours close

Other changes

- Ability to combine studies for multiple locations
- More granular operational profiles (quarter hourly, daily or monthly)
- Inclusion of helicopter taxiing operations
- Number above modelling now available for additional metrics such as LAMAX, LCMAX, SEL and CEXP
- Time audible metrics for evaluating aviation noise against ambient noise (activation code currently required for this feature)

Next Steps

- Transition from INM to AEDT in Australia will happen 2019-2021
- To70 are running parallel AEDT modelling for existing INM based projects to:
 - build expertise
 - demonstrate the model variations to airports and their stakeholders
 - explore the ANEF endorsement process with Airservices
- Airports and governments may start looking more closely at associated emissions and dispersions outputs to leverage consolidated inputs in AEDT
- To70 has worked with airports and regulators on similar projects in Europe
 - Implications of changing models, standard input data, and contours

Come and see us at Booth #25 for more information or a chat

