Aviation Environmental Design Tool (AEDT 2b)

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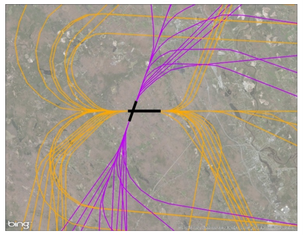
Introduction

The Aviation Environmental Design Tool (AEDT) is a part of FAA's NextGen environmental and modeling tool suite. It provides a means of modeling aircraft in four dimensions for all phases of flight including taxi, takeoff/landing, and cruise. It is scalable so that one can study everything from an individual flight or airport to a global analysis. AEDT unifies noise, fuel consumption and emissions analysis capabilities into a single application for modeling and analysis of the results. The latest public release of the tool is AEDT 2b, Feature Pack 1 (https://aedt.faa.gov).

Inputs

AEDT accepts data from a wide variety of data sources with varying spatial and temporal resolution. In terms of aircraft activity, data are broken down into two types: planned flight data and observed flight data. The planned flight data at the airport level includes planned arrival and departure paths along specific routes. In the cruise regime, flight trajectories are typically great circles at cruise altitude connecting departure and arrival airports. Observed trajectory data are based on sensor observations of the aircraft which include three dimensional position, speed, and direction. Depending on proximity to an airport, observations may be as frequent as once per few seconds. AEDT can also model activity for other airport related emissions sources such as ground support equipment and auxiliary power units. In addition to user defined inputs, AEDT relies on extensive fleet and airport data stored in its system databases. These databases provide the detailed facility and equipment information necessary for modeling the environmental consequences of aviation. The user can further augment their study beyond the system database to incorporate new equipment and airport facilities for their specific analyses.

Planned Flight Tracks

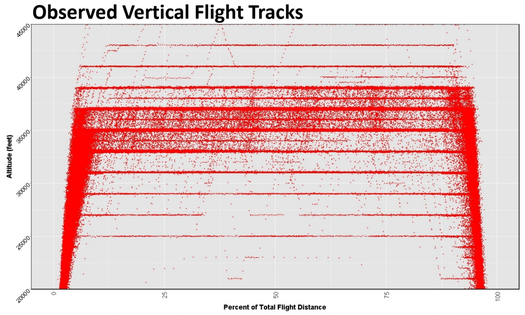


A hypothetical example of an airport with planned arrival and departure flight paths. These planned flight paths are described in two dimensions from which AEDT will calculate the arrival and departure altitudes and speeds based on specific airplane characteristics and aircraft control procedures.

Observed Flight Tracks

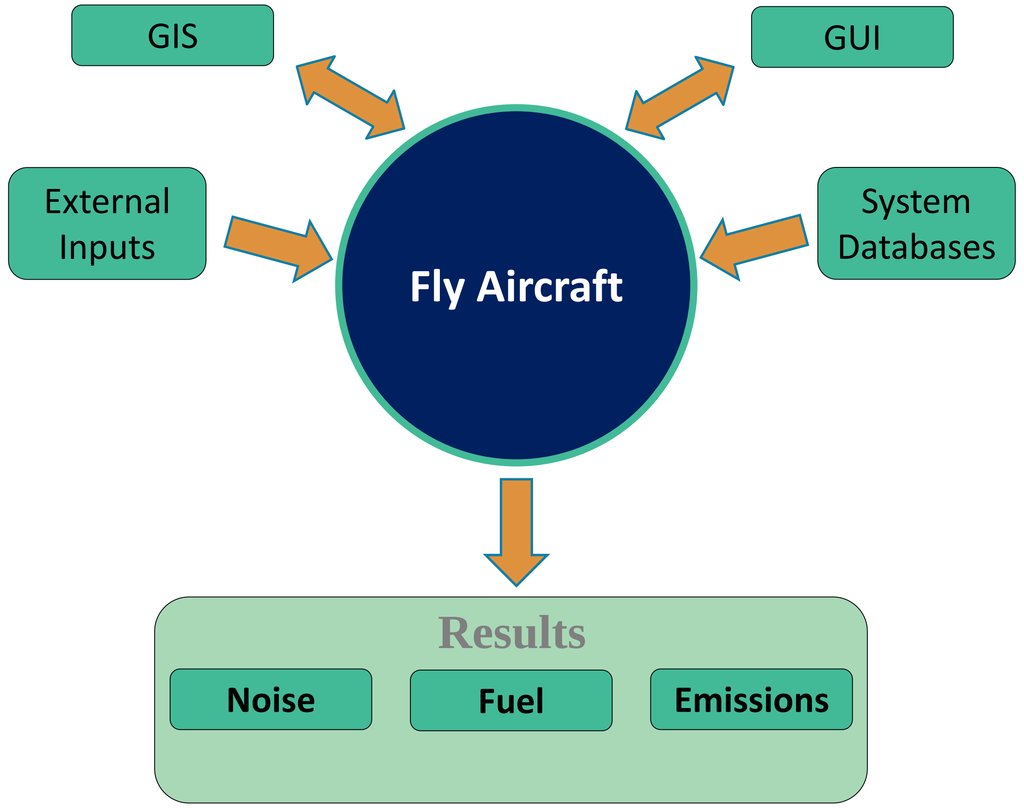
One year of flight trajectories between LA (LAX) and Boston (BOS). Individual flights might be impacted by a combination of factors including winds, weather conditions, or traffic.

Observed Vertical Flight Tracks

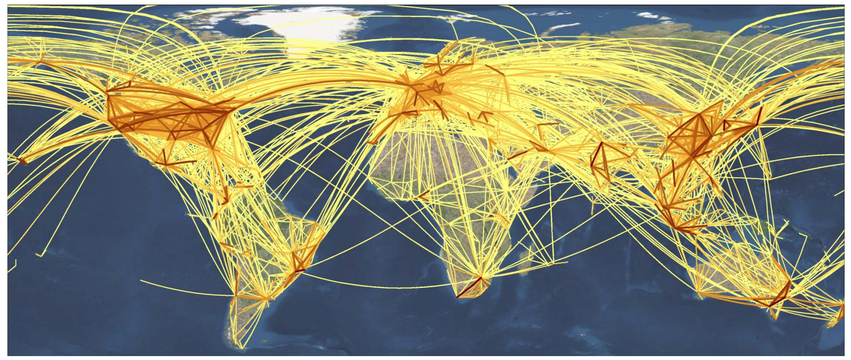


Variation in the vertical trajectory of the flights between LAX and BOS. Each dot is an individual observation for an airplane on a particular day and time.

AEDT System Overview



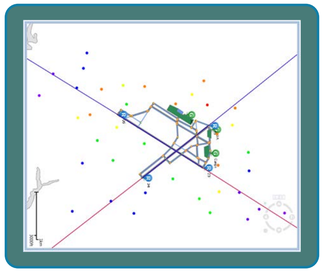
Global Flight Inventory



Global flight inventories are an annual composition of best available data covering approximately 35 million flights.

MOVES and AERMOD

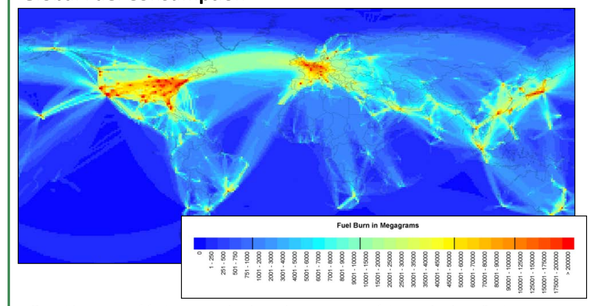
AEDT can be augmented with MOVES2014 to model the onroad component of airport emissions. For these types of studies, one would run MOVES2014 (external to AEDT) in project mode to develop emissions for the parking garages, airport ramps, and various roads and intersections within the airport. The user can then import specific emission results into the system for further analysis. Whether one is running MOVES or not, AEDT uses AERMOD to model the dispersion of emissions (aircraft and airport related) to a network of receptors. For airplane emissions, the generation of AERMOD inputs and the running of the dispersion model are integrated into the system. For MOVES2014 generated emissions, the AERMOD inputs need to be externally created and imported into the system before running AEDT's integrated AERMOD.



Results

AEDT produces fuel burn, emissions, and noise. It can calculate and display results at the individual track segment level or aggregate the results up to various spatial and temporal resolutions (e.g. daily, monthly, or annual). AEDT has integrated GIS capabilities, including the ability to overlay demographic data or other map layers, produce plots, or export tabular data for customized reports and analyses.

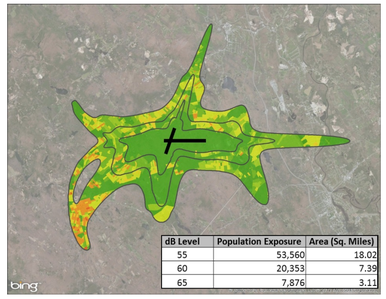
Global Fuel Consumption



Global inventory of fuel consumption is a primary product of the application. Such results are easily transformed into emissions of CO_2, criteria pollutants or HAPs.

Airport Noise Study

An airport study with noise exposure contours in decibels (dB). AEDT calculates the noise levels at a series of receptors based on the aircraft's state and characteristics as well as the distance of the flight trajectory from the receptor. The noise contours are calculated and overlaid with population data.



dB Level	Population Exposure	Area (Sq. Miles)
55	53,560	18.02
60	20,353	7.39
65	7,876	3.11