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AEDT Software Requirements Document

Doc #AEDT-REQ-01

25 January 2007

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REVISIONS

A	6/19/2006	Initial release version
B	7/10/2006	This revision incorporates changes made at the GUI and Taskmaster meetings at ATAC in June, 2006.
C	8/15/2006	Addition of CAEP global assessment requirements.
D	1/25/2007	Cleaned up links for reference in AEDT Architecture Document (**Doc #AEDT-AD-01**)

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1 Introduction

In accordance with the Agency's flight plan, the Federal Aviation Administration's Office of Environment and Energy (FAA/AEE) is developing a comprehensive suite of software tools that will allow for thorough assessment of the environmental effects of aviation. The main goal of the effort is to develop a new, critically needed capability to assess the interdependencies between aviation-related noise, emissions, and cost valuations.

The building block of this new suite of software tools that integrates all existing AEE noise and emissions models and facilitates the assessment of interdependencies is the Aviation Environmental Design Tool (AEDT). AEDT will consist of four legacy FAA local/global noise and emissions tools: (1) Integrated Noise Model (INM) – local noise; (2) Emissions and Dispersion Modeling System (EDMS) – local emissions; (3) Model for Assessing Global Exposure of Noise to Transport Airplanes (MAGENTA) – global noise; and (4) System for assessing Aviation's Global Emissions (SAGE) – global emissions.

INM, the model required for use on federally funded aircraft noise projects, is used primarily to model aircraft noise exposure near airports. Based on the Society of Automotive Engineers SAE-AIR-1845 guidance document titled "Procedure for the Calculation of Airplane Noise in the Vicinity of Airports," INM has been available to the public and continuously developed since 1978. The INM is generally used to predict population noise exposure based on the day-night average sound level (DNL). Complimentary to INM, EDMS is used to perform air quality analyses near airports. Listed as an Environmental Protection Agency (EPA) "Preferred Guideline" model since 1993, FAA designated it a "Required Model" for aviation air quality analyses in 1998. EDMS predicts emissions in the vicinity of airports and is also capable of evaluating dispersion of those emissions.

MAGENTA has been approved and used for ICAO CAEP global noise exposure analyses since 1998. Based on the INM's core noise prediction module, MAGENTA calculates the aggregate global noise exposure due to aircraft operations. The global emissions compliment to MAGENTA is SAGE, which calculates annual global aircraft-related emissions inventories. SAGE has also been used to analyze the sensitivity of those inventories to changes in operational, policy, and technology-related scenarios.

AEDT, together with EDS and an economic analysis capability, will make up the Aviation environmental Portfolio Management Tool (APMT).

Given the significant amount of legacy code to be combined in the development of AEDT, the integration of the legacy models is being undertaken in a stepwise, prototype-driven process. The prototype analyses are currently envisioned to include: (1) NOx stringency; (2) greenhouse gases; (3) noise trends; (4) continuous descent approaches; and (5) CNS/ATM. The prototype process allows for a gradual conversion to AEDT-specific coding standards in concert with continued and seamless support of legacy users. In particular, database and module harmonization will take place throughout the prototype process, as FAA-specified analyses will be undertaken in support of CAEP.

1.1 Purpose & Scope

This software requirements document serves as the basis for designing and testing the Aviation Environmental Design Tool (AEDT) software. The intended audience for this document consists of the following groups: the AEDT designers, developers, and testers; the APMT team that utilizes the output data products; and the EDS team that produces the new technology aircraft for input into AEDT.

The objective of this document is to provide, as complete and as comprehensive as possible, a set of requirements necessary to guide the development of the AEDT software, and establish a mutual understanding of the functions, features, and constraints between the development team and the stakeholders, and among members of the development team. This set of requirements merges the requirements of the individual legacy tools which AEDT is destined to replace, and establishes a consolidated set of common requirements for all of AEDT. This will be a living document throughout the development process, and updates will be made to it as needs change and as greater clarification and specificity is gained in further development of the requirements at lower levels.

This document will establish the requirements of the components for the AEDT modules that will perform local noise, local emissions, global noise, and global emission analyses.

1.2 Overview

This document is organized as outlined below.

Section 2 provides an overview of the AEDT software application, along with a description of its major functions, how it is used, how it is related to EDS and APMT, and the users of the system.

Section 3 provides the specific details of each requirement, categorized by inputs and outputs, functional requirements, constraints, and other non-requirements. Within each of the major categories, the requirements are grouped by individual local and global noise and emissions functions as well as by functions that are common to all.

2 Application Overview

2.1 Business Process

Since 1998, EDMS has been the required model to perform air quality analyses for aviation sources, and the FAA mandates that an airport air quality analysis using EDMS be completed to an airport development project. This requirement is provided in a policy statement contained in the federal register. As all of the EDMS functions will be incorporated into AEDT, AEDT will be used for required environmental impact analyses by airports in the US.[1]

The INM has been FAA's standard tool since 1978 for determining the predicted noise impact in the vicinity of airports. Statutory requirements for INM use are defined in FAA Order 1050.1E, Policies and Procedures for Considering Environmental Impacts; Order 5050.4A, Airport Environmental Handbook; and Federal Aviation Regulations (FAR) Part 150, Airport Noise Compatibility Planning.

2.2 Product Perspective

AEDT is intended to provide a consistent, transparent, integrated capability for computing and identifying interrelationships between noise and emissions and among various emissions at the aircraft, local, regional, and global (international) levels. APMT will supplement AEDT by providing a capability to conduct related cost–benefit analyses.[2]

It also included plans to split AEDT into separate but linked local and global models and to focus on AEDT use as a tool for airport planning applications. The local AEDT would be publicly available for a wide range of users.

AEDT local will consist of enhanced versions of the existing FAA models EDMS and INM, while AEDT global will consist primarily of SAGE and MAGENTA. AEDT is also supposed to be modular and accept alternative U.S. and international models. Local AEDT and global AEDT should work together and, when fully developed, use the same source sets of data as well as the same algorithms. The plan to eventually use the same data sets is not only to ensure modeling consistency but also to reduce the number of tools that FAA will need to operate and maintain in the future.

EDS will enable users to model new aircraft systems and rigorously estimate environmental performance results such as air quality, noise, and, climate change; as well as the economic performance (airline return on investment), and technology development risk.[3] These aircraft parameters will be input into AEDT for determination of noise and emissions impacts by the local and global noise and emissions modules. The noise and emissions results will then be input into APMT in order to calculate the equivalent economic impacts.

Figure 1 shows the relationship between AEDT, EDS, and APMT.

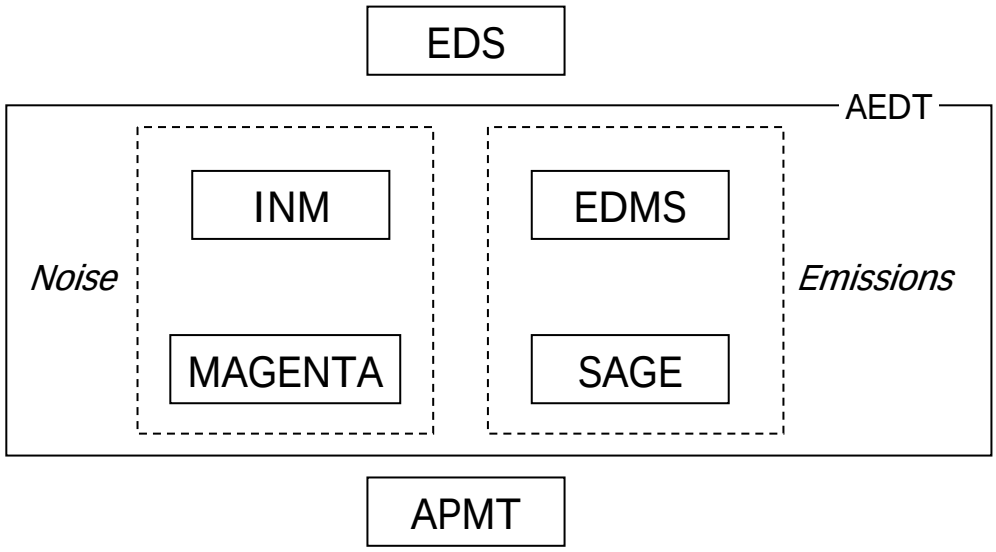

Figure 1. Relationship between AEDT, EDS, and APMT.

2.3 Product Functions

The major functions of the AEDT system include:

- Calculation of aircraft performance
- Calculation of emissions from aircraft and other non-aircraft sources at airports
- Calculation of noise from aircraft and supporting equipment
- Calculation of emissions from aircraft from en-route portion of flight for global emissions analyses
- Calculation of noise from multiple airports for global noise analyses

2.4 User Characteristics

The users of AEDT will consist mainly of airport authorities and consulting firms that perform the analyses for the airports. There are currently over 400 users of EDMS and 1,000 users of INM worldwide, with the largest concentration of users being in the United States and Europe. Users in the United States use EDMS to perform an environmental impact assessment as required by the FAA before the start of any construction work at airports, and could potentially perform several studies a year on various airports. Once a study is completed, the user submits the EDMS application study files associated study to the FAA for review and approval. In addition, AEDT will also be used for environmental analyses that are not specifically to satisfy regulatory purposes, such as analyses that may be used to define environmental standards.

Users will order the software for a fee and a CD is mailed to the user for a stand alone installation on their personal computer. These users have strong backgrounds in environmental subjects and/or aviation and have proficiency with using a computer, but will generally not have as much experience with computers or software as an AEDT software developer. So, there is a need for the AEDT local components to be redistributable, robust, user-friendly, and able to be installed by a user with minimal computer proficiency on a personal computer.

The AEDT functionality for global analyses is expected to be used by the FAA and the developers of AEDT, including ATAC, CSSI, Georgia Tech, Volpe, and Wyle. These global studies are expected to support CAEP and will occur with much less frequency than local users, and with a much greater amount of data and number of airports.

2.5 General Constraints

Because AEDT will be used to support compliance with environmental regulations, the application must satisfy certain statutory requirements. Statutory requirements for local noise analyses are defined in FAA Order 1050.1E, Policies and Procedures for Considering Environmental Impacts; Order 5050.4A, Airport Environmental Handbook; and Federal Aviation Regulations (FAR) Part 150, Airport Noise Compatibility Planning.

2.6 Assumptions and Dependencies

[TBD]

3 Specific Requirements

This section provides the specific requirements for the AEDT system. The requirements are organized into Inputs, Outputs, Functional Requirements, User Interface, Performance, Database, and Design Constraints. In order to facilitate the transition of the individual legacy tools into AEDT and to better identify requirements for each function, the requirements are further grouped into the following categories where appropriate:

a) Requirements that apply to or are common to all of the local and global noise and emissions modules
b) Requirements that are specific to the local emissions component
c) Requirements that are specific to the local noise component
d) Requirements that are specific to the global emissions component
e) Requirements that are specific to the global noise component

Each requirement consists of the following columns:

Req No.	Requirement Description	Critical or Supporting	Future Phase-Out?

3.1 Inputs

3.1.1 Common Inputs

3.1.1.1	The software shall include a standard database of airport, runway, and NAVAID/fix data.	Critical	N
3.1.1.2	Each of the flights modeled in generating historical inventories will have as specific aircraft and engine information as possible. This includes the use of aircraft airframe mapping tables to match an aircraft in the flight schedules with an aircraft in the performance tables. This is in contrast to the concerted use of a small set of aircraft that used to model the entire world fleet. Also, engines will be as specific as possible using the following hierarchy: First, Tail number mappings with BTS data to obtain exact engine call-outs; second, engine distributions from a world fleet database, and third, default engine by aircraft type.	Critical	N
3.1.1.3	The software shall provide the ability to import study inputs in convenient file types (e.g. CSV or DBF files).	Critical	N
3.1.1.4	The software shall provide the following methods of inputting location information: a) in terms of X,Y coordinates relative to an origin b) in terms of latitude and longitude values.	Support	N
3.1.1.5	The software shall be configurable to accept input and provide output in English and Metric units.	Critical	N
3.1.1.6	The software shall provide the following methods of defining aircraft profiles used to dynamically calculate flight profiles: a) as a series of fixed points b) as a set of procedural instructions that are used to dynamically calculate flight profiles incl	Critical	N
3.1.1.7	The software shall allow interactive graphical definition and editing of ground tracks.	Critical	N
3.1.1.8	The software shall provide the following methods for defining ground tracks: a) as a series of fixed points b) as a set of flight vectoring instructions.	Critical	N
3.1.1.9	The Software shall permit the user to define flight operations levels by peak quarter hour value or by total annual value.	Support	N
3.1.1.10	The software shall allow user-defined aircraft data including performance characteristics.	Critical	N
3.1.1.11	The software shall allow aircraft substitutions including the creation of hybrid and composite aircraft.	Critical	N

3.1.1.12	The software shall allow user-defined atmospheric data in the form of hourly meteorological data.	Critical	N
3.1.1.13	The software shall allow user-defined airport and runway data.	Critical	N
3.1.1.14	The software shall allow the definition of flight operations using dispersed ground tracks.	Critical	N
3.1.1.15	The software shall provide the ability for the automated creation of dispersed ground tracks.	Support	N
3.1.1.16	The software shall allow flight operations to be defined by specifying how operations for the airport as a whole are distributed across runways and ground tracks. (ops airport group percent)	Critical	Y
3.1.1.17	The software shall include data allowing the calculation of corrected net thrust per engine for jets as a function of power-setting parameters EPR and N1 where available.	Critical	N
3.1.1.18	The Software shall permit the user to define aircraft operations by total number (per time period) of takeoffs, landings, and touch and goes.	Critical	N
3.1.1.19	The Software shall provide default values for all inputs except for number of operations, equipment populations, and ground tracks.	Critical	N
3.1.1.20	The Software shall permit the user to override default values.	Critical	N
3.1.1.21	The Software shall permit the user to define the location of noise and emission sources using coordinates.	Critical	N
3.1.1.22	The Software shall permit the user to define the location of noise and emission sources graphically.	Critical	N
3.1.1.23	The system shall allow user-defined versions for each method of defining aircraft flight profile	Critical	N
3.1.1.24	The software shall allow flight operations to be defined individually.	Critical	N
3.1.1.25	The software shall allow user-defined aircraft data including emissions characteristics.	Critical	N
3.1.1.26	The software shall allow user-defined aircraft data including general characteristics (e.g. owner category, max takeoff weight).	Critical	N
3.1.1.27	The software shall allow user-defined aircraft data including noise characteristics.	Critical	N
3.1.1.28	The software shall allow user-defined atmospheric data in the form of annual average values.	Critical	N
3.1.1.29	The software shall include a standard database of aircraft performance data allowing airport noise and emissions levels to be modeled in the absence of any user-provided performance data.	Critical	N
3.1.1.30	The software shall incorporate updates to commercial and general aviation aircraft performance and profile data as they occur within EUROCONTROL's Aircraft Noise and Performance (ANP) database.	Critical	N
3.1.1.31	The software shall incorporate updates to military aircraft flight profiles as they occur within the U.S. Air Force's NOISEMAP noise model.	Critical	N
3.1.1.32	The software shall provide automated study conversion from the previous version of AEDT to the current.	Critical	N

3.1.1.33	The software shall provide the ability for system data to be protected from users.	Critical	N
3.1.1.34	The software shall accommodate data formats from other common models as input.	Critical	N
3.1.1.35	The software shall include all fields from the BACK database in the fleet database to support APMT. (May flow to other system-level databases also, e.g. airports).	Critical	N
3.1.1.36	The software shall allow the user to input all positions in UTM coordinates	Critical	N

3.1.2 Local Emissions Inputs

3.1.2.1	The software shall include a standard database of emissions factors allowing airport emissions levels to be modeled in the absence of any user-provided emissions factors.	Critical
3.1.2.2	The Software shall include a database of aircraft engine emission indices for all the pollutants that the software will model.	Critical
3.1.2.3	The Software shall contain a database of emission factors to permit modeling of the above pollutants from auxiliary power units installed on aircraft.	Critical
3.1.2.4	The Software shall include default operating times per Landing Takeoff Cycle (LTO) for APUs.	Critical
3.1.2.5	The Software shall permit users to enter their own APU emissions data in lieu of using the APU database.	Critical
3.1.2.6	The Software shall include default values to be supplied to NONROAD for computing GSE emissions.	Critical
3.1.2.7	The Software shall permit the user to enter their own GSE emissions data in lieu of using NONROAD.	Critical
3.1.2.8	The Software shall include default values to be supplied to NONROAD for computing construction emissions.	Critical
3.1.2.9	The Software shall permit the user to enter their own construction emissions data in lieu of using NONROAD.	Critical
3.1.2.10	The Software shall provide a default fleet mix of on-road vehicles for use in the United States.	Critical
3.1.2.11	The Software shall include a database of publicly available emissions data (e.g., AP-42) for stationary sources likely to be found at or near an airport.	Critical
3.1.2.12	The Software shall include a database of publicly available emission factors for fuels used for fire fighter training at airports.	Critical
3.1.2.13	The Software shall permit the user to define aircraft operations as a schedule (time and date).	Critical
3.1.2.14	The Software shall permit the user to define aircraft operations by peak quarter hour number of takeoffs, landings, and touch and goes.	Critical

3.1.2.15	The Software shall permit the user to define all non-aircraft operations by peak quarter hour value or by total annual value.	Critical	
3.1.2.16	The Software shall permit the user to define operational profiles that describe quarter hour, daily, and monthly variation of operations.	Critical	
3.1.2.17	The Software shall use user-supplied airport configuration data to allocate aircraft to the appropriate taxiways, queues, and runways.	Critical	
3.1.2.18	The software shall provide automated study conversion from the last legacy version of EDMS.	Critical	
3.1.2.19	The software shall be able to perform an emissions analysis, with potential additional needed user input, if a study from the last legacy version of EDMS is imported.	Critical	

3.1.3 Local Noise Inputs

3.1.3.1	The software shall be able to import data from Heliport Noise Model (HNM) studies.	Support	Y
3.1.3.2	The software shall provide automated study conversion from the last legacy version of INM.	Critical	N
3.1.3.3	The software shall incorporate updates to military aircraft source noise data as they occur within the U.S. Air Force's NOISEMAP and NMSim noise models.	Critical	N
3.1.3.4	The software shall incorporate updates to commercial and general aviation aircraft source noise data as they occur within EUROCONTROL's Aircraft Noise and Performance (ANP) database.	Critical	N
3.1.3.5	The software shall include a standard database of aircraft noise data allowing airport noise levels to be modeled in the absence of any user-provided noise data.	Critical	N
3.1.3.6	The software shall be able to perform a noise analysis, with potential additional needed user input, if a study from the last legacy version of INM is imported.	Critical	N

3.1.4 Global Emissions Inputs

3.1.4.1	The software shall accept as input ETMS radar trajectories in the form of a flight schedule with aircraft type, 4-D geometry, and speed information.	Critical	N
3.1.4.2	The software shall accept as input OAG schedules.	Critical	N
3.1.4.3	The software shall use ETMS radar data when both ETMS radar data and OAG data are available.	Critical	N

3.1.5 Global Noise Inputs

3.1.5.1	The system shall be able to use the Harmonized Fleet and Operations Database as the source of fleet and operations data.	Critical	N
3.1.5.2	The system shall be able to use the Harmonized Airport Database as the source of information for airports for which an INM study is not available.	Critical	N
3.1.5.3	The system shall be able to use the Harmonized Fleet Database as source of aircraft information.	Critical	N
3.1.5.4	The system shall be able to use the Harmonized Population Database as source of population information.	Critical	N
3.1.5.5	The system shall be able to map the aircraft information contained in the Harmonized Fleet and Operations Database to INM aircraft types.	Critical	N
3.1.5.6	The system shall be able to allow the use of Noise adjustment factors to modify the standard INM aircraft source noise output.	Critical	N
3.1.5.7	The system shall be able to allow the use of user defined aircraft and aircraft substitutions information.	Critical	N
3.1.5.8	The system shall allow the use of user defined aircraft profiles and related information.	Critical	N
3.1.5.9	The system shall allow the use of user defined noise/power/distance information.	Critical	N

3.2 Outputs

3.2.1 Common Outputs

3.2.1.1	The software shall allow the graphic visualization of calculated aircraft flight profiles including altitude, speed, and thrust values.	Support	N
3.2.1.2	The software shall provide visualization of US CENSUS data.	Support	N
3.2.1.3	The software shall provide visualization of terrain data (Micropath 3CD or DEM or GridFloat).	Support	N
3.2.1.4	The software shall provide visualization of Geographic Boundary files.	Support	N
3.2.1.5	The software shall provide visualization of TIGER/Line data.	Support	N
3.2.1.6	The software shall provide visualization of AutoCAD .dxf files.	Support	N
3.2.1.7	The software shall provide visualization of radar track data.	Support	N

3.2.1.8	The software shall be able to graphically display Noise-Power-Distance (NPD) curves.	Support	N
3.2.1.9	The software shall be able to graphically display regions within a defined geographic boundary that require the collection of ambient data for use in the calculation of Time Audible metrics (ambient screening).	Support	N
3.2.1.10	The software shall provide the ability to export output databases to convenient file types (e.g. CSV or DBF files).	Critical	N
3.2.1.11	The software shall provide the ability to export output graphics data (e.g. contours terrain, tracks, etc.) into AutoCAD .dxf files and Geographic Information Systems (GIS) software (e.g. ArcExplorer, ArcView and MapInfo).	Support	N
3.2.1.12	The software shall provide the ability to graphically layer a user specified selection of graphical input and output data.	Critical	N
3.2.1.13	The software shall provide locations of points that make up each calculated noise and emissions dispersion contour.	Support	N
3.2.1.14	The software shall calculate population levels within calculated noise and emissions dispersion contours based on US CENSUS or user-defined population data.	Support	N
3.2.1.15	The software shall provide the area covered by each calculated noise and emissions dispersion contour.	Support	N
3.2.1.16	The software shall provide the ability to report detailed descriptions of all calculated flight paths.	Critical	N
3.2.1.17	The Software shall allow the user to print all inputs entered into a study.	Critical	N
3.2.1.18	The Software shall permit the user to view the airport layout graphically on the screen.	Critical	N
3.2.1.19	The Software shall permit the user to display a raster / bitmap image on the graphical airport layout view below the user-defined airport objects.	Critical	N
3.2.1.20	The Software shall be able to propagate uncertainties of individual data elements through to output results. (Need to get feedback from FAA on reporting of uncertainty on local side (noise and air quality).)	Critical	N
3.2.1.21	The Software shall output results at the level of… – does it need to be at chord level?	Critical	N
3.2.1.22	Regardless of the units or format used in data storage, numerical user input shall not change between an accepted entry and any subsequent display of the entered value, more than a fixed predetermined precision.	Critical	N

3.2.2 Local Emissions Outputs

3.2.2.1	The software shall be able to calculate and graphically display emissions dispersion contours around an airport.	Critical	

3.2.2.2	The Software shall output an emissions inventory consisting of the total annual mass emissions for each of the pollutants modeled.	Critical	
3.2.2.3	The Software shall allow the user the choice to show the output emissions inventory in pounds, short tons, kilograms, and metric tons.	Critical	
3.3.2.4	The Software shall generate a set of files suitable for AERMOD to compute concentrations for the study.	Critical	
3.3.2.5	The Software shall permit the user to run AERMOD to compute concentrations without having to exit the Software.	Critical	
3.2.2.6	The Software shall allow the user to print emissions inventory results.	Critical	
3.2.2.7	The Software shall produce the emission comparison reports required by the Airport Emissions Reduction Credit (AERC) program.	Critical	

3.2.3 Local Noise Outputs

3.2.3.1	The software shall provide the ability to merge/add/subtract multiple noise contours from each other.	Support	N
3.2.3.2	The software shall provide the ability to overlay noise contours from separate runs and older versions of the AEDT local software and the INM legacy tool.	Support	N
3.2.3.3	The software shall provide detailed information on the source of noise levels at individual points at each point within a regularly spaced grid of points that can be rotated relative to an X,Y coordinate system (e.g. noise values, aircraft and profile information, flight operation information, elevation angles, and individual flight contribution to aggregate sound levels at the grid point).	Support	N
3.2.3.4	The software shall provide the ability to produce noise exposure maps that contain and identify: a. Runway locations. b. Flight tracks. c. 65, 70, and 75 dB DNL noise contours. d. Outline of the airport boundaries. e. Noncompatible land uses within the noise contours, including those within the 65 dB DNL contours. f. Location of noise sensitive public building (i.e. schools, hospitals, and health care facilities), and properties on or eligible for inclusion in the National Register of Historic Places. g. Locations of any aircraft noise monitoring sites utilized for data acquisition and refinement procedures. h. Estimates of the number of people residing within the 65, 70, and 75 dB DNL noise contours.	Critical	N

3.2.3.5	The software shall be able to calculate and graphically display noise contours around an airport.	Critical	N
3.2.3.6	Noise must be reported at flight level with time information to the millisecond.	Critical	N

3.2.4 Global Emissions Outputs

3.2.4.1	The software shall report emissions within 3 altitude bins: a) at and below 3,000 feet AGL, b) at and below 10,000 feet AGL, and c) for the entire flight.	Critical	N
3.2.4.2	The software shall report emissions by ICAO region or other user-defined region.	Critical	N

3.2.5 Global Noise Outputs

3.2.5.1	The software shall be able to compute population and area exposure counts.	Critical	N
3.2.5.2	The software shall be able to generate noise and population inventory data.	Critical	N

3.3 Functional Requirements

3.3.1 Common Functional Requirements

3.3.1.1	The software shall model the noise and emissions due to engine run-up operations on airport property.	Critical	N
3.3.1.2	The software shall be capable of calculating noise and emissions levels produced by commercial, civilian, military fixed-wing aircraft, and helicopters.	Critical	N
3.3.1.3	The software shall have an aircraft performance module that is dynamic (i.e., rather than a static lookup table). The module will be based on a mixture of SAE AIR 1845/INM for the terminal area (below 10,000 ft) and BADA for en route (above 10,000 ft).	Critical	N

3.3.1.4	The software shall model the affects of varying airport elevations and atmospheric conditions on aircraft performance, aircraft noise and emissions levels, and aircraft sound propagation and emissions dispersion.	Supporting	N
3.3.1.5	The software shall have an aircraft emissions module that is based on BFFM2 and fuel composition-based factors from Boeing.	Critical	N
3.3.1.6	The software shall be able to model standard ISA and no winds when actual weather data is not available.	Critical	N
3.3.1.7	The software shall be able to utilize US CENSUS data points in noise calculations and emissions dispersion.	Critical	N
3.3.1.8	The software shall be able to utilize terrain data (Micropath 3CD or DEM or GridFloat) in noise calculations and emissions dispersion.	Critical	N
3.3.1.9	The software shall be able to utilize Geographic Boundary files to define boundaries for noise calculations and emissions dispersion contours.	Support	N
3.3.1.10	The software shall automatically adjust the flight path calculated from user-defined flight profiles to eliminate errors that are within defined tolerances and report on any adjustments made.	Critical	N
3.3.1.11	The software shall allow variable contour grid minimum spacing based on distance, noise level, and emissions concentrations differences between adjacent points.	Critical	N
3.3.1.12	The software shall provide the ability to report on all inputs used in the study, including explicit tracking of any changes made to system data, primarily for auditing purposes.	Critical	N
3.3.1.13	The Software shall permit the user to define airport operating configurations dynamically activated by the following parameters: wind direction, wind speed, temperature, visibility, ceiling, and time of day.	Critical	N
3.3.1.14	The Software shall use user-provided meteorological data to determine the active runway configuration for each hour.	Critical	N
3.3.1.15	The Software shall allow the user to include more than one airport in a study at a time, without considering airport interaction.	Critical	N
3.3.1.16	The Software shall allow the user to model more than one analysis year at a time.	Critical	N
3.3.1.17	The Software shall use common AEDT modules and data to compute aircraft performance.	Critical	N
3.3.1.18	The system shall consider the affects of variations in runway, atmospheric, and weight data in dynamically calculating flight profiles.	Critical	N
3.3.1.19	The Software shall allow the user to enter surface temperature, pressure, humidity, and headwind to affect aircraft performance calculation for non-standard conditions.	Critical	N
3.3.1.20	The software shall determine when an action, compared to the no action alternative for the same timeframe, would cause noise and emissions impacts.	Critical	N

3.3.1.21	The software shall model the noise and emissions due to aircraft departure, approach, touch and go, circuit, and over flight operations in an airport's Terminal Area.	Critical	N
3.3.1.22	The software shall be able to recalculate just one small element (e.g. one flight) without having to redo entire scenario. [Is this too restrictive?]	Supporting	N
3.3.1.23	The software shall allow the modeling of noise only, emissions only, or both and only require the appropriate data based on the output desired	Critical	N

3.3.2 Local Emissions Functional Requirements

3.3.2.1	Each combination of pollutant and source below constitutes an individual requirement. They are provided here as a list to enhance readability. The Software shall compute the following mass emissions: · CO · THC · NMHC · VOC · NOx · SOx · PM10 · PM2.5 for the following sources: · Aircraft engines · APU · Ground support equipment · Construction Equipment · On-Road Vehicles · Stationary sources · Training fires	Critical	N
3.3.2.2	Aircraft engines used for emissions modeling shall include all engines in the ICAO aircraft engine emissions databank as of the development freeze date.	Critical	N
3.3.2.3	Aircraft engines used for emissions modeling shall include other engines where emissions data are publicly available (e.g., from the manufacturers, USAF, etc.)	Critical	N
3.3.2.4	The Software shall permit users to assess compliance with the National Ambient Air Quality Standards (NAAQS).	Critical	N

3.3.2.5	The Software shall allow the user to enter surface temperature, pressure, and humidity to affect emission calculation for non-standard conditions.	Critical	N
3.3.2.6	The Software shall use the current version of EPA's NONROAD or EPA equivalent model as of the development freeze date to obtain emission factors for ground support equipment.	Critical	N
3.3.2.7	The Software shall use the current version of EPA's NONROAD or EPA equivalent model as of the development freeze date to obtain emission factors from construction vehicles.	Critical	N
3.3.2.8	The Software shall use the current version of EPA's MOBILE or EPA equivalent model as of the development freeze date to model the emissions from on-road vehicles.	Critical	N
3.3.2.9	The Software shall model on-road vehicles on user-defined roadway segments.	Critical	N
3.3.2.10	The Software shall model on-road vehicles on user-defined parking structures.	Critical	N
3.3.2.11	The Software shall model a user-defined fleet mix of on-road vehicle classes, fuel types, and age.	Critical	N
3.3.2.12	The Software shall use data that is common across AEDT modules to compute aircraft emissions.	Critical	N
3.3.2.13	The Software shall use the current promulgated release of AERMOD at the time of development to compute emissions concentrations. As of June 15, 2006, the current promulgated release of AERMOD is version 04300.	Critical	N
3.3.2.14	The Software shall model aircraft ground delays as a result of runway availability.	Critical	N

3.3.3 Local Noise Functional Requirements

3.3.3.1	The software shall determine when an action, compared to the no action alternative for the same timeframe, would cause noise sensitive areas located at or above 65 dB DNL to experience a noise increase of at least 1.5 dB DNL.	Critical	N
3.3.3.2	The software shall model the following impacts of aircraft on noise levels in and around National Parks: a) Time Audible metrics b) Affects of Line of Sight Blockage on aircraft sound propagation.	Critical	N

3.3.3.3	The software shall be able to calculate standard A-weighted, C-weighted, and P-weighted exposure-based, maximum level based, and time-above based noise metrics. It shall also allow the definition of user-defined noise metrics within these categories.	Critical	N
3.3.3.4	The software shall be able to calculate noise levels at individual points defined by US CENSUS data and at a user-specified height above the ground at individual points.	Support	N
3.3.3.5	The software shall provide noise levels for multiple noise metrics at individual points or at each point within a regularly spaced grid of points that can be rotated relative to an X,Y coordinate system.	Support	N
3.3.3.6	The Software shall allow the user to enter surface temperature, pressure, and humidity to affect noise calculation for non-standard conditions.	Critical	N
3.3.3.7	The Software shall use data that is common across AEDT modules to compute aircraft noise.	Critical	N

3.3.4 Global Emissions Functional Requirements

3.3.4.1	3.3.1.3 Overall, AEDT will generate fuel burn and mass emissions of Nitrogen Oxides (NOx), Carbon Monoxide (CO), Total Hydrocarbons (THC), Carbon Dioxide (CO2), Water (H2O), and Sulfur Oxides (SOx) from aircraft for each of the following historical inventories: a. Results by per-flight total (each worldwide flight) and by totals for each of the modes: i. Ground unimpeded taxi from gate (at Airport Field Elevation, AFE) ii. Ground delay (at AFE) iii. Takeoff (runway roll and airborne up to and including 1000 ft). iv. Climbout (greater than 1000 ft up to and including 3000 ft) v. Cruise (above 3000 ft) vi. Approach (airborne below and including 3000 ft) vii. Terminal altitudes (above 3000ft and below 10000ft) viii. Airborne Approach delay (at holding pattern altitude) ix. Ground delay (at AFE) x. Ground unimpeded taxi to gate (at AFE) b. Results by flight segment specifying the various performance-related parameters for each head and tail position of each segment: i. Fuel flow ii. Thrust iii. Drag iv. Atmospheric parameters (e.g., T, P, and H) v. Speed and Mach number vi. Delta time vii. Distance viii. Weight	Critical	N

ix. Reference EIs for each pollutant
x. Latitude
xi. Longitude
xii. Altitude
xiii. Absolute time
xiv. Flight key
xv. Mode indicator
xvi. Segment sequence number
c. Results by a portion of a flight segment that pierced a world grid with the with dimensions of 1 degree latitude by 1 degree longitude by 1 kilometer altitude. The results by each segment portion will also include:
i. Flight key
ii. Segment sequence number
iii. Mode
iv. i, j, and k-type indices that reflect the grid location
v. Time entered into grid
vi. Delta time (duration in grid)
vii. Speed of segment portion
viii. Distance of segment portion

3.3.4.2	The software shall be able to model the dispersion of aircraft flight trajectories (i.e., dispersion around a Great Circle route).	Critical	N
3.3.4.3	The Software shall model aircraft ground delays as a result of runway availability.	Critical	N
3.3.4.4	The Software shall model aircraft approach airborne delays.	Critical	N
3.3.4.5	The Software shall be able to account for fuel tankering.	Critical	N
3.3.4.6	The Software shall be able to trace mass emissions, by pollutant, to each flight segment of every flight modeled by the system.	Critical	N
3.3.4.7	The Software shall provide facilities for aggregating mass emissions totals by Aircraft/Engine ID, date range, airport, O/D pair, state, country, or region.	Critical	N
3.3.4.8	The Software shall be able to compute fuel-burn predictions for user specified O/D pair and Aircraft/EngineID from the Airport and Fleet Databases	Critical	N

3.3.5 Global Noise Functional Requirements

3.3.5.1	The system shall be able to assess noise exposure at multiple airports.	Critical	N

3.3.5.2	The system shall be able to compute noise exposure at airports for which only runway information is available.	Critical	N
3.3.5.3	The system shall be able to compute noise contours at multiple levels.	Critical	N
3.3.5.4	The system shall be able to allow the selection of the noise levels for which noise contours will be computed.	Critical	N
3.3.5.5	The system shall be able to assess the effects of land use policies.	Critical	N
3.3.5.6	The system shall be able to account for population growth.	Critical	N

3.4 User Interface

3.4.1 Common User Interface

3.4.1.1 The system shall meet the following requirements of the U.S. Rehabilitation Act, Section 508 (29 U.S.C. ‘794d) Subpart B, 1194.21 Software applications and operating systems:

a. When software is designed to run on a system that has a keyboard, product functions shall be executable from a keyboard where the function itself or the result of performing a function can be discerned textually.

b. Applications shall not disrupt or disable activated features of other products that are identified as accessibility features, where those features are developed and documented according to industry standards. Applications also shall not disrupt or disable activated features of any operating system that are identified as accessibility features where the application programming interface for those accessibility features has been documented by the manufacturer of the operating system and is available to the product developer.

c. A well-defined on-screen indication of the current focus shall be provided that moves among interactive interface elements as the input focus changes. The focus shall be programmatically exposed so that assistive technology can track focus and focus changes.

d. Sufficient information about a user interface element including the identity, operation and state of the element shall be available to assistive technology. When an image represents a program element, the information conveyed by the image must also be available in text.

e. When bitmap images are used to identify controls, status indicators, or other programmatic elements, the meaning assigned to those images shall be consistent throughout an application's performance.
f. Textual information shall be provided through operating system functions for displaying text. The minimum information that shall be made available is text content, text input caret location, and text attributes.
g. Applications shall not override user selected contrast and color selections and other individual display attributes.
h. When animation is displayed, the information shall be displayable in at least one non-animated presentation mode at the option of the user.
i. Color coding shall not be used as the only means of conveying information, indicating an action, prompting a response, or distinguishing a visual element.
j. When a product permits a user to adjust color and contrast settings, a variety of color selections capable of producing a range of contrast levels shall be provided.
k. Software shall not use flashing or blinking text, objects, or other elements having a flash or blink frequency greater than 2 Hz and lower than 55 Hz.
l. When electronic forms are used, the form shall allow people using assistive technology to access the information, field elements, and functionality required for completion and submission of the form, including all directions and cues.

3.4.1.2 The system shall meet the following requirements of the U.S. Rehabilitation Act, Section 508 (29 U.S.C. ‘794d) Subpart D, 1194.41 Information, documentation, and support:

a. Product support documentation provided to end-users shall be made available in alternate formats upon request, at no additional charge.
b. End-users shall have access to a description of the accessibility and compatibility features of products in alternate formats or alternate methods upon request, at no additional charge.
c. Support services for products shall accommodate the communication needs of end-users with disabilities.

3.4.1.3 If local tool will be used for global analyses also, separate local functionality from global functionality and don’t show global functionality / capabilities in GUI for local users (i.e. hide global capabilities for local users)

3.5 Performance

3.5.1 Common Performance

3.5.1.1 The system shall meet the following requirements of the U.S. Rehabilitation Act, Section 508 (29 U.S.C. ‘794d) Subpart C, 1194.31 Functional performance criteria:

a. At least one mode of operation and information retrieval that does not require user vision shall be provided, or support for assistive technology used by people who are blind or visually impaired shall be provided.

b. At least one mode of operation and information retrieval that does not require visual acuity greater than 20/70 shall be provided in audio and enlarged print output working together or independently, or support for assistive technology used by people who are visually impaired shall be provided.

c. At least one mode of operation and information retrieval that does not require user hearing shall be provided, or support for assistive technology used by people who are deaf or hard of hearing shall be provided.

d. Where audio information is important for the use of a product, at least one mode of operation and information retrieval shall be provided in an enhanced auditory fashion, or support for assistive hearing devices shall be provided.

e. At least one mode of operation and information retrieval that does not require user speech shall be provided, or support for assistive technology used by people with disabilities shall be provided.

f. At least one mode of operation and information retrieval that does not require fine motor control or simultaneous actions and that is operable with limited reach and strength shall be provided.

3.6 Logical database requirements

3.7 Design constraints

3.7.1 Standards compliance

3.7.1.1	The software shall use only publicly available methods and data.	Critical	N
3.7.1.2	The software shall model flight performance in accordance with the methods defined in SAE-AIR-1845, ECAC Doc 29 and ICAO Circular 205.	Critical	No
3.7.1.3	The Software shall meet the requirements of the National Environmental Policy Act (NEPA).	Critical	N
3.7.1.4	The Software shall represent emissions sources within AERMOD using the methodology approved by EPA.	Critical	N
3.7.1.5	The software shall model aircraft noise with the methods defined in SAE-AIR-1845, SAE-AIR-5662, SAE-ARP-5534, ECAC Doc 29 and ICAO Circular 205.	Critical	N
3.7.1.6	The system shall compute global emissions following the United Nations Framework Convention on Climate Change (UNFCCC) methodology.	Critical	N

3.8 External Interfaces

3.8.1.1 The software shall enable APMT to access all data within the software.

3.8.1.2 The software shall allow for APMT to run components & modules in batch mode without GUI.

3.8.1.3 The system shall provide controlled access to research data to remote users throughout the world. Ability to query output of data in various ways without having to provide baseline data, i.e. central storage of output data (primary driver is global, but nice to have on local) – to be discussed further by global group during breakout. (???)

3.8.1.4 Interaction to external models / tools is through data IO only (API will not be provided to external tools).

3.9 Software system attributes

3.9.1 Hardware & Operating System

3.9.1.1	The system shall be compatible with Microsoft Windows XP	Critical	N
3.9.1.2	The system shall require only a single CPU PC P4 or similar – [further details later]	Critical	N

3.9.2 Availability & Portability

3.9.2.1	The Software shall be made available to the public.	Critical	N
3.9.2.2	The local emissions functionality of the system shall cost less than $50 to distribute to users within the United States.	Critical	N
3.9.2.3	The system shall be able to be redistributable and installed by the user using a single installer.	Critical	N
3.9.2.4	The software shall be able to perform regulatory work with standalone version	Critical	N
3.9.2.5	The software shall not require internet access to perform a local emissions or noise analysis, but could use internet access for data updates, etc.	Critical	N
3.9.2.6	The software shall have no licensing fees for third-party software components (if any)	Critical	N

3.9.3 Reliability

3.9.4 Security

3.9.5 Maintainability

3.10 Other Requirements

1. Results from AEDT 1.0 should compare well with the last legacy version of the tools. (An exact match may not be feasible, but an order of magnitude difference will be unacceptable).
    a. Perhaps separate changes in underlying equations / data that affect output results from changes in name of tool (i.e. make these changes to legacy tools before incorporating them into AEDT, e.g. BADA 4.0)

The following list of needs are not complete requirements, but are anticipated to become requirements in the near future.

1. Ability to use a European dispersion model instead of AERMOD for European users.
2. Ability to model toxics / hazardous air pollutants.
3. Ability to accept DXF/CAD drawings of airports to define current configurations.
4. Integration with SIMMOD and TAAM.

5. Migration from NONROAD and MOBILE to MOVES when available.

Appendixes

Stationary Sources

Stationary Sources being modeled in EDMS As of June 20, 2006.

Category	Source Type
Boiler/Space Heater	Bituminous Coal: Pulverized, Dry Bottom, Wall Fired, Pre-NSPS
Boiler/Space Heater	Bituminous Coal: Pulverized, Dry Bottom, Wall Fired, Pre-NSPS with LNB
Boiler/Space Heater	Bituminous Coal: Pulverized, Dry Bottom, Wall Fired, NSPS
Boiler/Space Heater	Subbituminous Coal: Pulverized, Dry Bottom, Wall Fired, Pre-NSPS
Boiler/Space Heater	Subbituminous Coal: Pulverized, Dry Bottom, Wall Fired, NSPS
Boiler/Space Heater	Bituminous Coal: Pulverized, Dry Bottom, Cell Burner Fired
Boiler/Space Heater	Subbituminous Coal: Pulverized, Dry Bottom, Cell Burner Fired
Boiler/Space Heater	Bituminous Coal: Pulverized, Dry Bottom, Tangentially Fired, Pre-NSPS
Boiler/Space Heater	Bituminous Coal: Pulverized, Dry Bottom, Tangentially Fired, Pre-NSPS LNB
Boiler/Space Heater	Bituminous Coal: Pulverized, Dry Bottom, Tangentially Fired, NSPS
Boiler/Space Heater	Subbituminous Coal: Pulverized, Dry Bottom, Tangentially Fired, Pre-NSPS
Boiler/Space Heater	Subbituminous Coal: Pulverized, Dry Bottom, Tangentially Fired, NSPS
Boiler/Space Heater	Bituminous Coal: Pulverized, Wet Bottom, Wall Fired, Pre-NSPS
Boiler/Space Heater	Bituminous Coal: Pulverized, Wet Bottom, Wall Fired, NSPS
Boiler/Space Heater	Subbituminous Coal: Pulverized, Wet Bottom, Wall Fired
Boiler/Space Heater	Bituminous Coal: Cyclone Furnace
Boiler/Space Heater	Subbituminous Coal: Cyclone Furnace
Boiler/Space Heater	Bituminous Coal: Spreader Stoker
Boiler/Space Heater	Bituminous Coal: Spreader Stoker, Multiple Cyclones, Reinjection
Boiler/Space Heater	Bituminous Coal: Spreader Stoker, Multiple Cyclones, No Reinjection
Boiler/Space Heater	Subbituminous Coal: Spreader Stoker
Boiler/Space Heater	Subbituminous Coal: Spreader Stoker, Multiple Cyclones, Reinjection
Boiler/Space Heater	Subbituminous Coal: Spreader Stoker, Multiple Cyclones, No Reinjection
Boiler/Space Heater	Bituminous Coal: Overfeed Stoker
Boiler/Space Heater	Subbituminous Coal: Overfeed Stoker
Boiler/Space Heater	Bituminous Coal: Overfeed Stoker, Multiple Cyclones
Boiler/Space Heater	Subbituminous Coal: Overfeed Stoker, Multiple Cyclones
Boiler/Space Heater	Bituminous/Subbituminous Coal: Underfeed Stoker
Boiler/Space Heater	Bituminous/Subbituminous Coal: Underfeed Stoker, Multiple Cyclones
Boiler/Space Heater	Bituminous/Subbituminous Coal: Hand-fed Stoker
Boiler/Space Heater	Bituminous/Subbituminous Coal: Atmospheric Fluidized Bed, Circulating
Boiler/Space Heater	Bituminous/Subbituminous Coal: Atmospheric Fluidized Bed, Bubbling
Boiler/Space Heater	Anthracite Coal: Stoker Fired
Boiler/Space Heater	Culm Fuel: Fluidized Bed
Boiler/Space Heater	Anthracite Coal: Pulverized
Boiler/Space Heater	Anthracite Coal: Residential Space Heater
Boiler/Space Heater	Anthracite Coal: Hand Fired
Boiler/Space Heater	Fuel Oil: Utility Boiler >100 Million BTU/hr, No. 6 Oil, Normal Firing
Boiler/Space Heater	Fuel Oil: Industrial Boiler >100 Million BTU/hr, No. 6 Oil, Normal Firing
Boiler/Space Heater	Fuel Oil: Commercial Boiler >100 Million BTU/hr, No. 6 Oil, Normal Firing
Boiler/Space Heater	Fuel Oil: Utility Boiler >100 Million BTU/hr, No. 6 Oil, Normal Firing, LNB
Boiler/Space Heater	Fuel Oil: Industrial Boiler >100 Million BTU/hr, No. 6 Oil, Normal Firing, LNB
Boiler/Space Heater	Fuel Oil: Boiler >100 Million BTU/hr, No. 6 Oil, Tangential Firing
Boiler/Space Heater	Fuel Oil: Boiler >100 Million BTU/hr, No. 6 Oil, Tangential Firing, LNB

Category	Source Type
Boiler/Space Heater	Fuel Oil: Utility Boiler >100 Million BTU/hr, No. 5 Oil, Normal Firing
Boiler/Space Heater	Fuel Oil: Industrial Boiler >100 Million BTU/hr, No. 5 Oil, Normal Firing
Boiler/Space Heater	Fuel Oil: Boiler >100 Million BTU/hr, No. 5 Oil, Tangential Firing
Boiler/Space Heater	Fuel Oil: Utility Boiler >100 Million BTU/hr, No. 4 Oil, Normal Firing
Boiler/Space Heater	Fuel Oil: Industrial Boiler >100 Million BTU/hr, No. 4 Oil, Normal Firing
Boiler/Space Heater	Fuel Oil: Boiler >100 Million BTU/hr, No. 4 Oil, Tangential Firing
Boiler/Space Heater	Fuel Oil: Utility Boiler >100 Million BTU/hr, No. 2 Oil
Boiler/Space Heater	Fuel Oil: Industrial Boiler >100 Million BTU/hr, No. 2 Oil
Boiler/Space Heater	Fuel Oil: Commercial Boiler >100 Million BTU/hr, No. 2 Oil
Boiler/Space Heater	Fuel Oil: Utility Boiler >100 Million BTU/hr, No. 2 Oil, LNB/FGR
Boiler/Space Heater	Fuel Oil: Industrial Boiler >100 Million BTU/hr, No. 2 Oil, LNB/FGR
Boiler/Space Heater	Fuel Oil: Commercial Boiler >100 Million BTU/hr, No. 2 Oil, LNB/FGR
Boiler/Space Heater	Fuel Oil: Industrial Boiler <100 Million BTU/hr, No. 6 Oil
Boiler/Space Heater	Fuel Oil: Commercial Boiler <100 Million BTU/hr, No. 6 Oil
Boiler/Space Heater	Fuel Oil: Boiler <100 Million BTU/hr, No. 5 Oil
Boiler/Space Heater	Fuel Oil: Boiler <100 Million BTU/hr, No. 4 Oil
Boiler/Space Heater	Fuel Oil: Industrial Boiler <100 Million BTU/hr, Distillate Oil
Boiler/Space Heater	Fuel Oil: Commercial Boiler <100 Million BTU/hr, Distillate Oil
Boiler/Space Heater	Fuel Oil: Residential Furnace
Boiler/Space Heater	Natural Gas: Wall Fired Boiler, >100 Million BTU/hr, Uncontrolled, Pre-NSPS
Boiler/Space Heater	Natural Gas: Wall Fired Boiler, >100 Million BTU/hr, Uncontrolled, NSPS
Boiler/Space Heater	Natural Gas: Wall Fired Boiler, >100 Million BTU/hr, Controlled, LNB
Boiler/Space Heater	Natural Gas: Wall Fired Boiler, >100 Million BTU/hr, Controlled, FGR
Boiler/Space Heater	Natural Gas: Wall Fired Boiler, <100 Million BTU/hr, Uncontrolled
Boiler/Space Heater	Natural Gas: Wall Fired Boiler, <100 Million BTU/hr, Controlled, LNB
Boiler/Space Heater	Natural Gas: Wall Fired Boiler, <100 Million BTU/hr, Controlled, LNB/FGR
Boiler/Space Heater	Natural Gas: Tangential Fired Boiler, Uncontrolled
Boiler/Space Heater	Natural Gas: Tangential Fired Boiler, Controlled, FGR
Boiler/Space Heater	Natural Gas: Residential Furnace
Boiler/Space Heater	Liquified Petroleum Gas: Industrial (10-100 Million BTU/hr), Butane
Boiler/Space Heater	Liquified Petroleum Gas: Industrial (10-100 Million BTU/hr), Propane
Boiler/Space Heater	Liquified Petroleum Gas: Comerical (0.3-10 Million BTU/hr), Butane
Boiler/Space Heater	Liquified Petroleum Gas: Comerical (0.3-10 Million BTU/hr), Propane
Emergency Generator	Gasoline Fuel (EPA Methodology)
Emergency Generator	Diesel Fuel (EPA Methodology)
Emergency Generator	Distillate Oil (Diesel) (USAF Methodology)
Emergency Generator	Kerosene/Naphtha (Jet Fuel) (USAF Methodology)
Emergency Generator	Gasoline (USAF Methodology)
Emergency Generator	Natural Gas (USAF Methodology)
Emergency Generator	LPG (Propane or Butane) (USAF Methodology)
Emergency Generator	Residual/Crude Oil (USAF Methodology)
Incinerator	Multiple Chamber
Incinerator	Single Chamber
Aircraft Engine Testing	[Load all system and user-created engines]
Fuel Tank	Horizontal: Jet Naphtha (JP-4)
Fuel Tank	Horizontal: Jet Kerosene
Fuel Tank	Horizontal: Gasoline
Fuel Tank	Horizontal: Distillate Fuel Oil No. 2
Fuel Tank	Horizontal: Residual Fuel Oil No. 6

Category	Source Type
Fuel Tank	Vertical Fixed Roof: Jet Naphtha (JP-4)
Fuel Tank	Vertical Fixed Roof: Jet Kerosene
Fuel Tank	Vertical Fixed Roof: Gasoline
Fuel Tank	Vertical Fixed Roof: Distillate Fuel Oil No. 2
Fuel Tank	Vertical Fixed Roof: Residual Fuel Oil No. 6
Fuel Tank	Internal Floating Roof: Jet Naphtha (JP-4)
Fuel Tank	Internal Floating Roof: Jet Kerosene
Fuel Tank	Internal Floating Roof: Gasoline
Fuel Tank	Internal Floating Roof: Distillate Fuel Oil No. 2
Fuel Tank	Internal Floating Roof: Residual Fuel Oil No. 6
Fuel Tank	External Floating Roof: Jet Naphtha (JP-4)
Fuel Tank	External Floating Roof: Jet Kerosene
Fuel Tank	External Floating Roof: Gasoline
Fuel Tank	External Floating Roof: Distillate Fuel Oil No. 2
Fuel Tank	External Floating Roof: Residual Fuel Oil No. 6
Fuel Tank	Domed External Floating Roof: Jet Naphtha (JP-4)
Fuel Tank	Domed External Floating Roof: Jet Kerosene
Fuel Tank	Domed External Floating Roof: Gasoline
Fuel Tank	Domed External Floating Roof: Distillate Fuel Oil No. 2
Fuel Tank	Domed External Floating Roof: Residual Fuel Oil No. 6
Surface Coating/Painting	Paint (Solvent Base)
Surface Coating/Painting	Paint (Water Base)
Surface Coating/Painting	Enamel
Surface Coating/Painting	Lacquer
Surface Coating/Painting	Primer
Surface Coating/Painting	Varnish/Shellac
Surface Coating/Painting	Thinner
Surface Coating/Painting	Adhesive
Deicing Area	Runway & Taxiway Surface Deicing (Ethylene Glycol)
Deicing Area	Runway & Taxiway Surface Deicing (Propylene Glycol)
Deicing Area	Aircraft Deicing (Ethylene Glycol)
Deicing Area	Aircraft Deicing (Propylene Glycol)
Solvent Degreaser	Acetone
Solvent Degreaser	Alcohol (ethyl)
Solvent Degreaser	Alcohol (methyl)
Solvent Degreaser	Carbon Tetrachloride
Solvent Degreaser	Chloroform
Solvent Degreaser	Ether
Solvent Degreaser	Isopropyl Alcohol
Solvent Degreaser	Methylene Chloride
Solvent Degreaser	Perchloro-ethylene
Solvent Degreaser	Stoddard Solvent
Solvent Degreaser	1,1,1-Trichloroethane

Category	Source Type
Solvent Degreaser	Trichloro-ethylene
Solvent Degreaser	Turpentine
Sand/Salt Pile	Coal
Sand/Salt Pile	Sand
Sand/Salt Pile	Clay/Dirt Mix
Sand/Salt Pile	Clay
Sand/Salt Pile	Fly Ash

Acronyms and Abbreviations

ACI	Airport Council International
ACIM	Air Carrier Investment Model
ACSYNT	AirCraftSYNThesis
ADD	Algorithm Description Document
AEDT	Aviation Environmental Design Tool
AEE	Office of Environment and Energy
AEM	Area Equivalent Model
AHS	American Helicopter Society
AIR	Aerospace Information Report
AIR	Aerospace Information Report
ALCCA	Aircraft Life Cycle Cost Analysis
ANCAT	Abatement of Nuisances Caused by Air Transport
ANOPP	Aircraft Noise Prediction Program
ANSI	American National Standards Institute
AOPA	Aircraft Owners and Pilots Association
API	Application Programmer Interface
APMT	Aviation Environmental Portfolio Management Tool
APO	Office of Aviation, Policy and Plans
APP	Office of Planning and Programming
APU	Auxiliary Power Unit
ARP	Aerospace Research Report
ARTCC	Air Route Traffic Control Center
ASPM	Aviation System Performance Metrics
ASQP	Airline Service Quality Performance
ASTM	American Society of Testing and Materials
ATA	Air Traffic and Airspace
ATAA	Air Transport Association of America
ATC	Air Traffic Control
ATM	Air Traffic Management
BACK	BACK Aviation Solutions
BADA	Base of Aircraft Data
BFFM2	Boeing Fuel Flow Method 2
BTS	Bureau of Transportation Statistics
BWB	Blended Wing Body
CAA	Civil Aviation Authority
CAEP	Committee on Aviation Environmental Protection
CDA	Continuous Descent Approach
CFMU	Central Flow Management Unit
CNS	Communication, Navigation, and Surveillance
CO	Carbon Monoxide
COE	Center of Excellence
CREW	Concurrent Read Exclusive Write
CRS	Computer Reservation System

CY	Calendar Year
DBF	Flat File Database Format
DDD	Database Design Document
DEM	Digital Elevation Model
DFAD	Digital Feature Analysis Data
DLL	Dynamic Link Library
DLR	Deutsche Zentrum für Luft- und Raumfahrt
DNL	Day Night Average Sound Level
DoD	Department of Defense
DoI	Department of Interior
DoS	Department of State
DoT	Department of Transportation
DRG	Design Review Group
DSADS	Detailed System Architecture and Design Specification
DTED	Digital Terrain Elevation Data
ECAC	European Civil Aviation Conference
EDMS	Emissions and Dispersion Modeling System
EDS	Environmental Design Space
EPA	Environmental Protection Agency
ESRI	Environmental Systems Research Institute
ETMS	Enhanced Traffic Management System
Eurocontrol	European Organization for the Safety of Air Navigation
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
FBE	Fuel Burn and Emissions
FESG	Forecasting and Economic Analysis Support Group
FHWA	Federal Highway Administration
FLOPS	Flight Optimization System
FOA	First Order Approximation
FOIA	Freedom of Information Act
FOQA	Flight Operational Quality Assurance
FSS	Flight Service Station
FY	Fiscal Year
GA	General Aviation
GC	Great Circle
GCAM	Generalized Contour Area Model
GDP	Gross Domestic Product
GE	General Electric
GIS	Geographic Information System
GPS	Global Positioning System
GPU	Graphics Processing Unit
GRC	Glenn Research Center
GSE	Ground Support Equipment
GSFC	Goddard Space Flight Center (NASA)
GUI	Graphical User Interface
HAI	Helicopter Association International

HAP	Hazardous Air Pollutant
HNM	Heliport Noise Model
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
ICCIA	International Coordinating Committee of Aerospace Industries Associations
ICD	Interface Control Document
IDL	Interactive Data Language
IFR	Instrument Flight Rules
INM	Integrated Noise Model
IOAG	International Official Airline Guide
IPCC	Intergovernmental Panel on Climate Change
ISA	International Standard Atmosphere
JPDO	Joint Planning and Development Office
KSN	Knowledge Services Network
LaRC	Langley Research Center
LMI	Logistics Management Institute
LMINET	Logistics Management Institute network queuing model of the US
LOS	Line of Sight
LTO	Landing-Take-Off
MAGENTA	Model for Assessing Global Exposure of Noise to Transport Airplanes
MIT	Massachusetts Institute of Technology
MOBILEx	Vehicle Emission Modeling System
MOVES	Mult-scale Motor Vehicle and Engine Emissions System
NAE	National Academy of Engineering
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NASPAC	National Airspace System Performance Analysis Capability
NATO/CCMS	North Atlantic Treaty Organization/Challenges Combating Modern Society
NCDC	National Climatic Data Center
NIH	Not Invented Here
NOAA	National Oceanic and Atmospheric Administration
NPD	Noise-Power-Distance
NPD	Noise Power Distance
NPS	National Park Service
NPSS	Numerical Propulsion System Simulation
NRC	National Research Council
NWS	National Weather Service
O/D	Origin-Destination
OMT	Object Modeling Technique
PAHs	Polycyclic Aromatic Hydrocarbons
PARTNER	Partnership for Air Transportation Noise and Emissions Research
PDARS	Performance Data Analysis and Reporting System
PM	Particulate Matter
RDBMS	Relation Database Management System
RNP	Required Navigational Performance
RPM	Revenue Passenger Mile

RTCA	Radio Technical Commission for Aeronautics
SAE	Society of Automotive Engineers
SAGE	System for assessing Aviation's Global Emissions
SDTS	Spatial Data Transfer System
SFC	Specific Fuel Consumption
SIMD	Single Instruction Multiple Data
SIMMOD	Airport and Airspace Simulation Model
SMAAQ	Screening Model for Airport Air Quality
SQL	Structured Query Language
SRTM	Shuttle Radar Topography Mission
STATFOR	Air Traffic STATistics and FORcast Service
SUA	Special Use Airspace
TAAM	Total Airspace and Airport Modeling
TAF	Terminal Area Forecast
TCP/IP	Internet communications Protocol
TERP	Terminal and En Route Procedure
TIM	Time In Mode
TNM	Traffic Noise Model
TRACON	Terminal Radar Approach Control
TRB	Transportation Research Board
UML	Unified Modeling Language
UN	United Nations
USA	United States of America
USGS	United States Geological Survey
VFR	Visual Flight Rules
VOC	Volatile Organic Compound
VQ	Vector Quantization
VSP	Vehicle Systems Program
WAAS	Wide Area Augmentation System for GPS
WWLMINET	Worldwide version of the LMINET

References

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