Emissions and Dispersion Modeling System
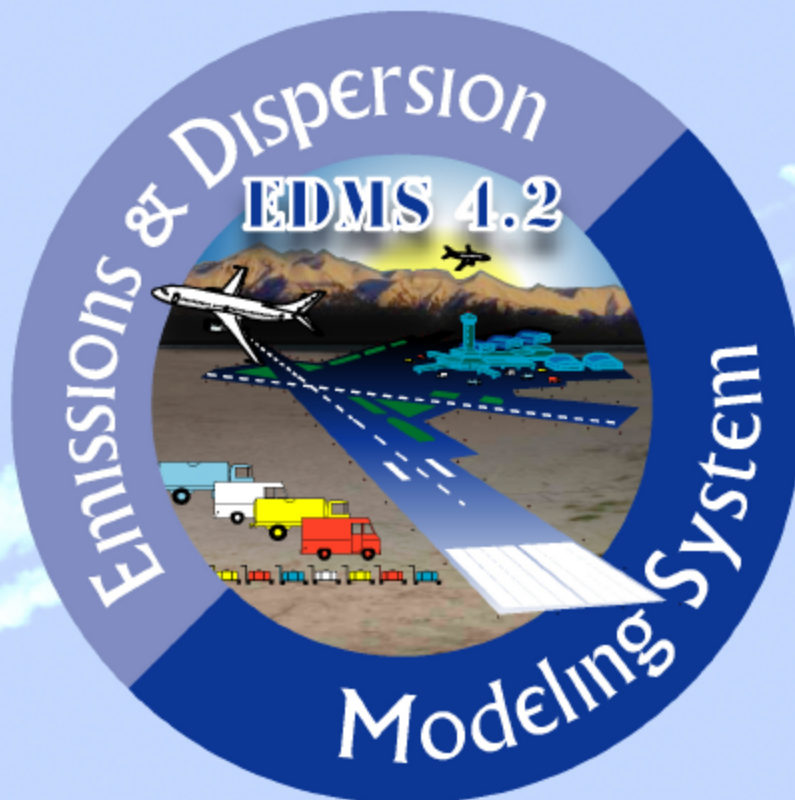
(EDMS) User's Manual

Prepared for

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Office of Environment and Energy
Washington, DC

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Errata

Revision 1

1. Preface. Page i, Paragraph 2. Erratum: "method used to estimate emissions". Correction: "method used to estimate stationary source emissions".

2. Appendix B. Pages B-1 through B-45. Erratum: Several sections, tables and figures were misnumbered or mislabeled. Correction: Sections, tables and figures renumbered and renamed appropriately. Pages B-14 and B-43 removed. Remaining pages renumbered.

Preface

The Emissions and Dispersion Modeling System (EDMS) was developed in the mid-1980s as a complex source microcomputer model designed to assess the air quality impacts of proposed airport development projects. In response to the growing needs of the air quality analysis community and changes in regulations (Conformity requirements from the Clean Air Act Amendment of 1990) the Federal Aviation Administration (FAA), in cooperation with the United States Air Force (USAF), re-engineered and enhanced EDMS in 1997 and released version 3.0. In 2001, EDMS was updated again to take advantage of the Environmental Protection Agency's (EPA) state of the art dispersion software, AERMOD and was released as version 4.0. One year later EDMS 4.1 was released and included updated Ground Support Equipment (GSE) emission factors based on EPA's NONROAD model.

EDMS 4.2 represents nearly two years of software engineering and takes advantage of many new algorithm and data developments during the time period. The user will immediately notice that emissions for new pollutants are provided. These include: Total Hydrocarbons (THC), Non-Methane Hydrocarbons (NMHC), Volatile Organic Compounds (VOC), and $PM_{2.5}$. The current release of EDMS interfaces with EPA's latest version of AERMOD (02222) and its supporting weather and terrain processors, AERMET and AERMAP. Users are also able to select the version of the EPA MOBILE on-road vehicle emission factor tool to use with their study, to allow greater flexibility when using EDMS to support a State Implementation Plan or similar study. Interfaces to MOBILE versions 5a, 5b, and 6.2 are included with EDMS 4.2. The method used to estimate stationary source emissions has been completely revised for this release in order to allow the exact procedures described in *Air Quality Procedures for Civilian Airports and Air Force Bases* (The Air Quality Handbook) to be followed. A detailed list of the changes made to EDMS from version 4.1 to 4.2 is provided in the *Reference Manual Supplement.*

This User's Guide is intended to provide detailed information on the functionality of the model and acts as an extension and elaboration of the on-line help. The section on References provides an extensive listing of documents that may be of further assistance to the analyst in the use of EDMS and the preparation of an Environmental Impact Statement (EIS).

This user manual provides instructions for installing and using EDMS version 4.2. The manual describes how to enter data, how to obtain various forms of output, and includes an example that exercises many commonly-used features of the software. The chapters are organized in the following manner:

- Chapter 1 provides instructions for installing the software and a note to users of EDMS from outside of the United States.

- Chapter 2 includes a brief history of the evolution of EDMS, a high level overview of the model architecture, and a summary of the features and limitations of EDMS.

- Chapter 3 gives a summary of the types of data accepted by EDMS for generating an emissions inventory.

- Chapter 4 is similar to chapter 3 and provides a description of the data used to estimate concentrations.

- Chapter 5 describes the functionality offered by the EDMS utilities, including: user-created aircraft, ground support equipment and the ability to import and export data using text files.

- Chapter 6 in contrast to the previous chapters gives specific step-by-step instructions for interacting with each of the EDMS screens. It is anticipated that most users will read chapters 2 through 5 to familiarize themselves with EDMS and then will use chapter 6 as a reference when working with the model.

- Appendix A describes the Airport Emissions Reduction Credit Post-Processor (AERCPP) tool that is bundled with EDMS 4.2.

- Appendix B contains an example study to allow new users to learn the basics of performing an emissions and dispersion analysis with EDMS. **The example uses fictitious data and should not be the basis for any regulatory action.**

- Appendix C describes that import and export formats used by EDMS 4.2. Advanced users can use the import and export utility to bypass most of the EDMS user interface.

- Appendix D provides photographs of the GSE Reference Models used in EDMS 4.2 to allow for a more accurate selection of GSE for a study.

As a companion to this user manual, the *EDMS Technical Manual* provides detailed descriptions of the algorithms and data used by EDMS 4.2. In addition, the answers to Frequently Asked Questions and contact information for receiving additional support are posted to the EDMS web site. A link to the EDMS web site can be found at www.aee.faa.gov.

ACKNOWLEDGEMENTS

Table of Contents

1 Emissions and Dispersion Modeling System (EDMS) Requirements and Installation Procedures

1.1 Hardware Requirements

The EDMS software runs on a PC with the following *minimum* hardware requirements:

- Intel Pentium processor or compatible operating at 500 MHz or greater
- 256 MB RAM (512 MB recommended for dispersion analyses)
- 2 GB free disk space minimum, 10 GB free disk space recommended
- CD-ROM drive
- Mouse or other pointing device

1.2 Operating System Requirements

The EDMS software is a 32-bit Windows™ native application, compatible with the following operating systems:

- Microsoft® Windows™ 98, 2000, or XP

1.3 Installation Procedures

The EDMS software, data files, and example studies are provided on CD-ROM. To install the EDMS software and components:

- Insert the EDMS CD into your CD-ROM drive.
- Run the program Setup.exe on the CD.

The EDMS setup program will then guide you through the installation process. You will have the option of installing the EDMS 4.2 software files complete with bitmaps, sounds and fonts or installing the software files only. A complete installation (software, bitmaps, sounds and fonts) requires about 667 megabytes of hard drive space. The typical installation (software alone) requires about 19 megabytes of hard drive space. When the installation setup is complete, an EDMS folder will be created with icons to launch the model, the on-line help and the un-installer program for removing EDMS from the system.

1.4 A Note for EDMS Users Outside of the United States of America

In order to run dispersion, surface weather data is required in one of the following formats:

- TD-3280
- TD-3505
- CD-144
- HUSWO
- SCRAM
- SAMSON

Surface weather data must be converted to one of those formats to be used in EDMS.

In addition, an early morning upper-air sounding is required in either TD-6201 or FSL format. Typically, these soundings occur at 00:00Z and 12:00Z, which does not provide a sounding at the necessary time for much of the globe. If an appropriate sounding is not available for your location, the Lakes Environmental Upper Air Estimator (available from www.weblakes.com) may be appropriate. Specific guidance regarding the AERMET data requirements are provided in the AERMET User's Guide, available from www.epa.gov/scram001/tt26.htm.

2 BACKGROUND INFORMATION

2.1 History

EDMS is a combined emissions and dispersion model for assessing air quality at civilian airports and military air bases. The model was developed by the Federal Aviation Administration (FAA) in cooperation with the United States Air Force (USAF). The model is used to produce an inventory of emissions generated by sources on and around the airport or air base, and to calculate pollutant concentrations in these environments.

In the early 1970s, the FAA and the USAF recognized the need to analyze and document air quality conditions at and around airports and air bases. Each agency independently developed computer programs to address this need. The USAF developed the Air Quality Assessment Model and the FAA developed the Airport Vicinity Air Pollution Model (AVAP). These models were used to perform limited air quality assessments in the late 1970s. Recognizing the inefficiency of maintaining two non-EPA approved models, the agencies agreed to cooperate in developing a single system that would have regulatory, operational and economic benefits. The result was the EDMS development effort jointly supported by both agencies and leading to a model listed among the EPA's preferred guideline models.

Emissions modeling in the FAA began with the early Simplex A modeling efforts using the HP-97 calculator. The Simplex A algorithms included calculations for aircraft takeoff plume dispersion. In the 1980s, the model was moved to the Apple II computer and the Simplex A algorithm was expanded to include dispersion calculations for roadways, parking lots, and power plant sources. The revised and enhanced Simplex A model became known as the Graphical Input Microcomputer Model (GIMM). GIMM was ported to a PC and further enhanced by improvements in processing speed and refinement of the emissions inventory calculations. This enhanced version of GIMM became known as EDMS. In 1997 EDMS was reengineered for Microsoft® Windows™ and included the algorithms from the Environmental Protection Agency (EPA) dispersion models PAL2 and CALINE3. With the release of version 3.0 in 1997, EDMS became the FAA-preferred model for air quality assessment at the airport and air bases. In 2001 EDMS 4.0 was released which marked the transition to EPA's next generation dispersion model AERMOD, and the introduction of aircraft performance data to allow EDMS to estimate the contribution to concentrations from aircraft up to 1,000 feet above the ground.

Today, the FAA re-engineered EDMS once again to take advantage of new data & algorithm developments and released the software as EDMS Version 4.2. This version of EDMS allows users to select the version of EPA's MOBILE model (5a, 5b, or 6.2) to use for on-road vehicle emissions estimation. An interface to EPA's AERMAP terrain processing module is also provided for the first time in this release. AERMOD version 02222 is bundled with the EDMS software and is the most current version of AERMOD available as of September 30, 2004. For additional information on the changes made between version 4.1 and 4.2 of EDMS, please visit the online help and select "What's New in EDMS 4.2?" from the main page.

2.2 System Architecture

2.2.1 Components and Modules

In offering functionality for performing both an emissions inventory and dispersion modeling, EDMS consists of several layers of interaction as depicted in Figure 2-1. This figure is a high level representation of the interaction between different components within the framework of a single integrated environment.

The back-end for both the emissions inventory and dispersion modeling is the database comprising tables for system data and user-created sources. The front end is the graphical user interface (GUI). The user

interacts with the model and the database through the GUI. At the GUI level, the user performs data entry (with parameter validation), executes commands, and receives visual feedback of both data entered and results generated.

External software that EDMS interfaces with is shown with a dashed border in the figure. These programs include: AERMAP, AERMET, AERMOD, and MOBILE, all of which are maintained by the EPA. For all of these programs, inputs are collected through the GUI and sent to the external program for processing. Once the run is complete, the results and associated messages are interpreted by EDMS and displayed to the user.

Figure 2-1: EDMS System Architecture and Components
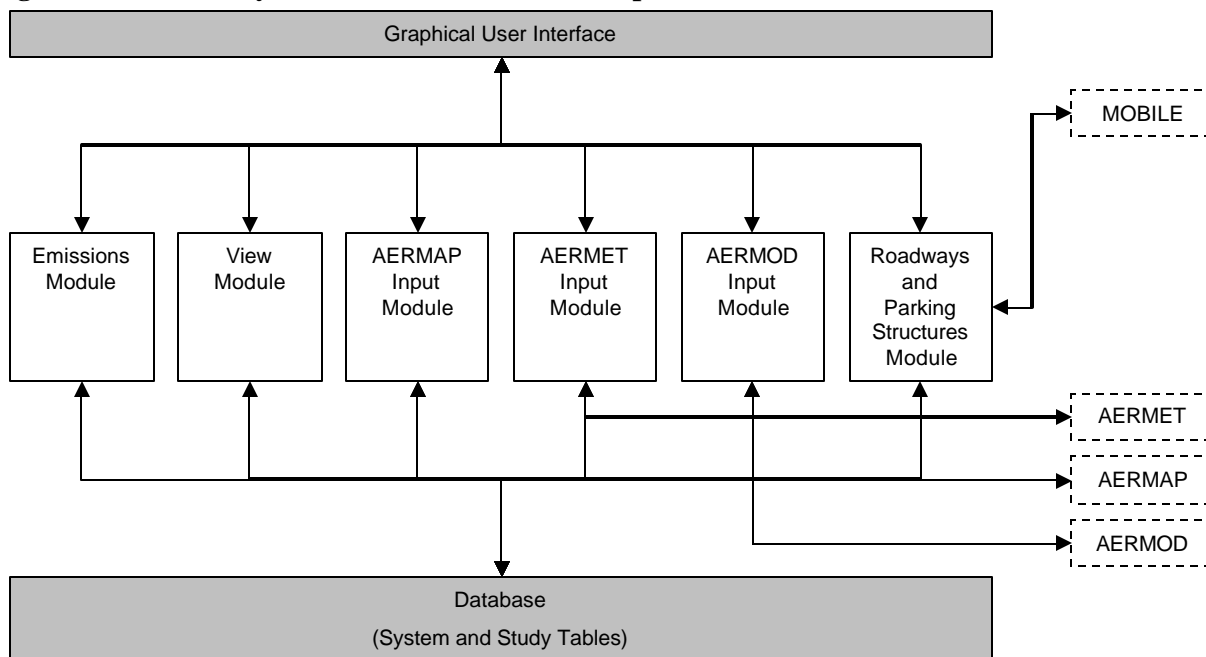
The emissions inventory module incorporates EPA approved methodologies for calculating aircraft emissions, on-road and off-road vehicles emissions, and stationary source emissions. On-road vehicle emissions are calculated by the version of EPA's MOBILE model selected. The dispersion-modeling module generates input for the EPA-developed dispersion model, AERMOD. EDMS offers the flexibility of allowing the user to perform an emissions inventory only or combine it with dispersion modeling.

The view modules permit the user to view output, receptor concentrations and system data stored in the database. They also allow the user to view a graphical representation of the various sources in the database. EDMS contains a reporting component for generating emissions inventory results formatted for the printer. Dispersion results and reports are generated by AERMOD.

2.2.2   Functional Flow

The EDMS functional flow is outlined in the flow diagram (See Figure 2-2). This diagram provides a high-level map of the steps necessary to generate an emissions inventory or to perform dispersion modeling.

At the top level, the user creates a study and specifies global parameters. For both the emissions inventory and dispersion modeling, the user defines the nature and activity of the various emissions sources present

in the study. The creation and specification of operational profiles (duty cycles) for various emissions sources are optional for the emissions inventory but necessary for accurate dispersion modeling.

At this stage the model contains all the data necessary to generate the emissions inventory. Upon completion of the run, the results may be viewed within the model and/or printed to a printer.

Dispersion modeling requires significantly more data than is required to generate an emissions inventory. In calculating dispersion, the user is required to enter the location coordinates, select appropriate operational profiles, and define other source specific parameters for each emissions source included in the dispersion analysis. In the case of aircraft activity, the user may further define distinct runways, runway queues, taxiways, and gates, and assign these entities to each active aircraft. All entities with spatial coordinates may be viewed in relation to each other through an airport layout view. Such entities include buildings, training fires and receptors, which constitute concentration estimation points within the coordinate system. Next, surface and upper-air weather data are processed using AERMET, the EPA Meteorological preprocessor for AERMOD, via the AERMET Wizard. Once that step is complete, EDMS has enough information to generate an input file for AERMOD to complete the dispersion calculations. AERMAP, the terrain preprocessor of AERMOD creates source (.SRC) and receptor (.REC) files for inclusion in AERMOD dispersion analyses. Running AERMAP and generating these files are optional; however without these files, AERMOD will assume a perfectly flat terrain at the elevation specified in the Study Setup window. The AERMOD input file can be passed to AERMOD directly within EDMS, or AERMOD can be run on a different computer. The dispersion results calculated by AERMOD are saved in a text file that can be viewed outside of EDMS.

Figure 2-2: Emissions and Dispersion Flow Diagram
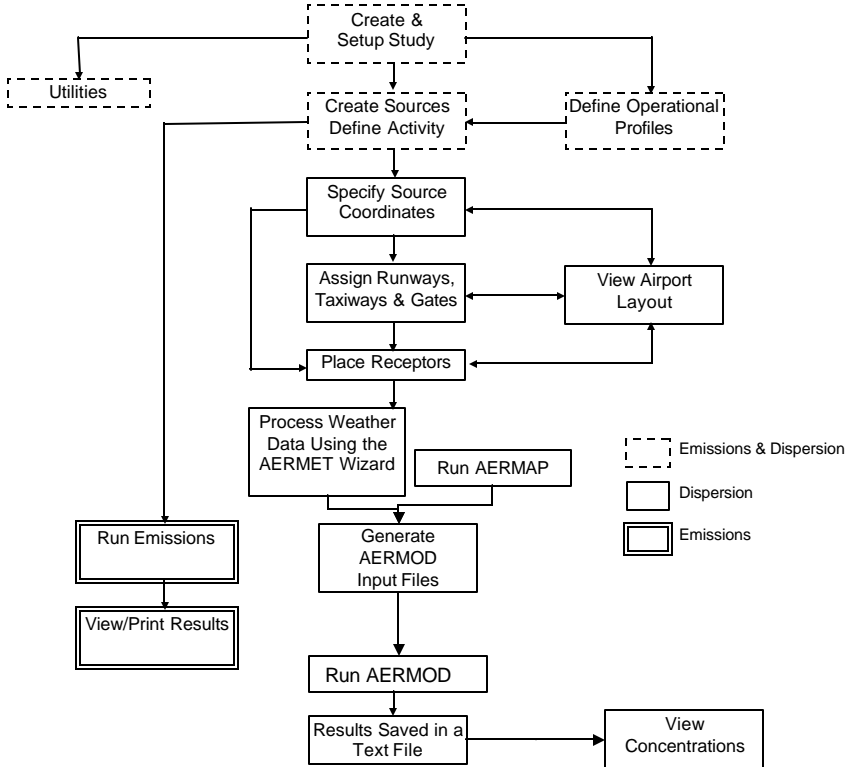
In addition, the model incorporates utilities for importing and exporting some types of data, and allows the user to add customized aircraft types and ground support equipment to the system database. A detailed description of the algorithms and data used by EDMS can be found in the *EDMS Technical Manual*.

2.2.3 Features and Limitations

EDMS incorporates both EPA approved emissions inventory methodologies and dispersion models to insure that analyses performed with the application conform to EPA guidelines. Since EDMS is primarily used in the process of complying with EPA air quality requirements (e.g. through an environmental impact statement) it is imperative that the application uses the most current data available. For this reason, it is the FAA's intention for the database to contain a comprehensive list of aircraft engines, ground support equipment, aerospace ground equipment, auxiliary power units, vehicular, and stationary source emission factor data. However, there may be cases where the database does not contain a specific data element (e.g. a newly available emission factor). In these cases, EDMS tries to make allowances for the user to enter their own data and will perform parameter validation where possible. The pollutants currently included in the emissions inventory are CO, THC, NMHC, VOC, NOx, SOx, PM-2.5[1] and PM-10[1]. Other pollutants such as lead, ozone, and hazard air pollutants have not been included in the application due to several reasons including lack of available data, the lack of approved methodology, or analysis boundary (e.g., EDMS analyzes emissions and dispersion in a local area on the airport but addressing ozone would require a regional analysis).

EDMS performs dispersion analysis by generating input to EPA's AERMOD dispersion model. EDMS 4.2 now provides an interface to the complex terrain module of AERMOD. To use this function, the user can run AERMAP (the AERMOD terrain pre-processor) as a part of EDMS. The pollutants currently included in EDMS for dispersion analysis are CO, THC, NMHC, VOC, NOx, SOx, PM-2.5[1] and PM-10[1]. Concentrations of the included pollutants are generated for comparison with all the Primary NAAQS and most of the Secondary NAAQS.

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[1] PM-10 and PM-2.5 emission factors are only available for ground support equipment, on-road vehicles, stationary sources, and training fires.

3 EMISSIONS CALCULATIONS

3.1   Data Input Overview

The *Study Setup* window allows the user to specify whether the current study will be used to generate only an emissions inventory, or an emissions inventory and a dispersion analysis. By selecting the former option, only the inputs required for conducting an emissions inventory will be shown on each of the windows. This window also allows the user to enter parameters that will influence how various source emissions are computed, including the annual average temperature, mixing height, average taxi and queue time, study year, and version of EPA's MOBILE tool to use.

To enter data for a specific type of source (e.g. aircraft, stationary sources, etc.), select the appropriate source type from the Emissions menu. Each of the menu options is described in more detail in Chapter 6.

The parameter values for individual records are displayed by selecting the record in the In Study list box. These values may then be modified. Changes made to a record are applied before accessing a different record. Parameter validation is built into the interface. In the event of an invalid entry, the user is notified with the range of acceptable values.

Two similar parameters found in all of the emissions sources windows are *Yearly* and *Peak Hour* activity. For most emissions inventory cases, the analyst would obtain annual activity numbers. However, if the activity at peak hour is the only known variable then the user would create a set of operational profiles (see sections 6.1.3, 6.1.4 and 6.1.5), under the *File* menu, that accurately represent the distribution of this activity over an entire year. Upon entering the value for *Peak Hour* and choosing the appropriate *Hourly*, *Daily*, and *Monthly* operational profiles, EDMS automatically computes a corresponding *Yearly* value. The following sections describe the emissions inputs required for aircraft activity, ground support equipment (GSE) populations, vehicles on roadways, vehicles in parking facilities, stationary sources, and training fires.

3.2   Aircraft Activity

Aircraft activity is specified by adding records in the *Aircraft Operations and Assignments* window found under the *Emissions* menu heading. To specify aircraft to be included in the study, choose an airframe and engine type from the *Available Aircraft/Engine* tree and *Add* it to the *In Study* list box. Aircraft activity is expressed in Landing-Takeoff (LTO) Cycles. Each LTO consists of taxiing, queuing, takeoff, climb out, approach, and landing. There is no provision to specify arrival numbers and departure numbers independently of each other. Moreover, Annual touch and go (TGO) operations may be specified. These do not include the taxi and queue portions of the LTO cycle. TGO operations are generally performed for training purposes and usually occur at military bases or smaller civilian airports.

Times in mode (TIMs) are the durations per LTO cycle that an aircraft spends in each of the four modes of aircraft operation: takeoff, climb out, approach and idle. Takeoff, climb out, approach, and the landing roll portion of the idle mode TIMs are aircraft-specific in EDMS.

The TIMs of aircraft are based on either one of two schemas: the International Civil Aviation Organization (ICAO) and Environmental Protection Agency (EPA) default or performance data

(flight profiles) from methodology presented in the Society of Automotive Engineers (SAE) Aerospace Information Report (AIR) 1845. The user selects the schema, in the *Study Setup* window, to be applied to all fixed-wing aircraft in the system database. There is a lack of consistent performance data for helicopters; therefore, helicopters always use ICAO/EPA default times regardless of the schema choice.

NOTE: Performance-base times should be used in airport analyses conducted for FAA approval unless prior authorization is obtained from FAA's Office of Environment and Energy.

TIMs generated using performance data are based on the airframe, engine, takeoff weight, and approach angle to be flown. When user-created aircraft are added to a study, the user can enter aircraft-specific times for the takeoff, climb out, approach and landing idle modes or assign a flight profile from a similar aircraft in the system table.

Of the four modes (takeoff, climb out, approach and idle), the taxi and queue components of the idle mode are the most variable. The sum of these two values is entered and used only for the purposes of the emissions inventory and is not replaced or adjusted by time specifications on any other window. When using the performance-based TIMs, the takeoff mode is the time from the start of the ground roll until the aircraft reaches 1,000 feet above the surface. The idle time used for emissions calculations includes the sum of the landing roll time, the taxi time and the time spent in queue. The approach time in mode for the emissions inventory is the time from the mixing height to the surface. The climb out time in mode for the emissions inventory is the time from 1,000 feet above the surface to the mixing height. The ICAO/EPA TIMs provide more generalized times spent in each of the four modes based on the aircraft category, as opposed to the aircraft and altitude specific performance-based times.

Mixing heights less than 1,000 feet are not allowed in EDMS. The default approach and climb out times in mode of both system and user-created aircraft are based on a mixing height of 3,000 feet but are adjusted to reflect the user-specified local mixing height. When the mixing height on the *Study Setup* window is modified, the times-in-mode for all aircraft are automatically adjusted.

Aircraft engines are the actual source of emissions for an aircraft. EDMS treats each aircraft type as a combination of a specific airframe and engine. For each airframe there may be several different engine types available for use and emission factors may vary from engine to engine. Subsequently, different aircraft may generate identical emissions because they are equipped with identical engines, or older aircraft may be outfitted with newer engines and generate fewer emissions. Default engines (displayed in bold) represent an actual engine type which is the most common or widely used engine type for that particular airframe in the United States fleet, based on the January 2003 BACK aviation database. More information on the data used to determine the default engines is available from www.backaviation.com.

In each of the four modes, the engines operate at correspondingly different power settings. The power settings determine the rate at which fuel is burned which, in turn, determines the quantity and nature of emissions released into the atmosphere.

For most engines the emission factor data was obtained from the ICAO Aircraft Engine Exhaust Databank, a publicly available database which can be downloaded from www.qinetiq.com. These data are supplemented by engine emissions data provided directly from the manufacturer and, for older aircraft, the data provided and methodology in the EPA's AP-42, Part II, Section 1.

3.3 Ground Support Equipment (GSE) and Auxiliary Power Units (APUs)

Emissions are generated by ground support vehicles and auxiliary power units (APUs) while the aircraft is parked at the gate. The following sections cover Ground Support Equipment (GSE) and auxiliary power units (APUs). In the *Study Setup* window, users specify how all GSE in a study are modeled: either by aircraft LTO or by population. If *LTO Based* is specified, GSE are assigned to aircraft and are their operations depend on aircraft activity. If *Population Based* is specified, all GSE are modeled as a population that operates independently from aircraft activity. Since APUs are onboard aircraft, they are only modeled on an aircraft LTO basis.

GSE Emissions are obtained from EPA's NONROAD model and are dependent on the age, fuel, horsepower, and load factor applied to the engine. EDMS 4.2 allows users to select the EPA-derived national fleet average age for a particular vehicle type, or to specify the exact age of an individual piece of equipment.

3.3.1 GSE Assigned to Aircraft

Upon arrival at a gate, aircraft are met by GSE to unload baggage and service the lavatory and cabin. While an aircraft is parked at a gate, mobile generators and air conditioning units may be in operation to provide electricity and conditioned air. Prior to aircraft departure, GSE are present to load baggage, food and fuel. When an aircraft departs from a gate, a tug may be used to push or tow the aircraft away from the gate and to the taxiway. Figure 3-1 depicts aircraft and GSE activity at the gate.

Figure 3-1: Aircraft with GSE.
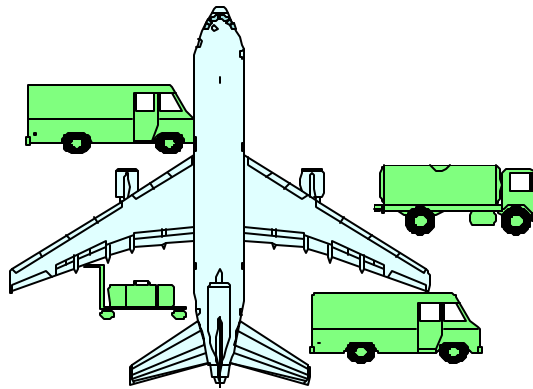
If the user specifies that GSE are to be modeled based on aircraft LTO cycles, GSE are assigned to aircraft based upon the type of service. For example, a fuel truck servicing a large commercial aircraft will have a different operating time than the same fuel truck servicing a commuter aircraft. Tugs are generally used only to move most commercial aircraft away from the gates but no tugs are assigned to general aviation (GA) aircraft.

As system aircraft are added to the study, default GSE assignments are made for each newly added aircraft. Default assumptions are used in EDMS, but the user also has the flexibility to add and remove GSE to and from aircraft and modify the operating time as well as other parameters for assigned GSE. These default assignments are based upon several categories of aircraft types (e.g., wide body jets, cargo planes, commuter aircraft, general aviation, military jets, military transports, business jets, etc.). Each GSE carries a default operational time in minutes associated with one complete LTO cycle of the aircraft.

If site-specific information is available for GSE (assignments and operational times), it is recommended that this data be used in place of the defaults. If the aircraft type is removed from the study, all the GSE assigned to it will also be removed from the study. To modify the assignment and/or the operating time of these sources; select the *GSE Assignment* tab on the *Aircraft Operations and Assignments* window.

GSE emission factors used by EDMS are derived from EPA's draft NONROAD model and are based on the following variables: fuel, brake horsepower and load factor. In addition, a deterioration factor is applied based on the age of the engine. GSE emission factors are given in grams per horsepower-hour. GSE emissions generated per LTO cycle are the product of the emission factor, horsepower, load factor and operating time. For annual emissions this result is multiplied by the number of yearly LTO cycles for the aircraft to which the equipment is assigned. GSE emissions are not calculated for TGO operations.

3.3.2   GSE Populations

GSE emission factors used by EDMS are derived from EPA's draft NONROAD model and are based on the following variables: fuel, brake horsepower and load factor. GSE emission factors are given in grams per horsepower-hour. Annual GSE emissions are the product of the emission factor for the given pollutant, horsepower, load factor, annual usage and population. The analyst can either select "*Use System Emission Factors*", which will cause GSE to be modeled with the same national average GSE emission factors that were developed by the U.S. EPA for EDMS 4.1 using an April 2002 version of NONROAD, or can select "*Use Draft NONROAD Emission Factors*", which will apply the NONROAD2004 emission factors for a specific vehicle. In which case, the fuel, the horsepower and the year of manufacture determine the zero-hour emission factor and the age and GSE type determine the deterioration to be applied.

3.3.3   Auxiliary Power Units (APU)

Auxiliary power units (APUs) are most often on-board generators that provide electrical power to the aircraft while its engines are shut down. Some pilots start the on-board APU while taxiing to the gate but, for the most part, it is started when the aircraft reaches the gate. The on-board APU is, in effect, a small jet engine and the calculations for the emissions generated by it are similar to that of an aircraft engine operating in one power setting only. The methodology for calculating emissions from APUs is adapted from the U.S. *EPA's Procedures for Emission Inventory Preparation*, *Volume IV,* Chapter *5* (Reference 7). Like GSE, APU emissions generated per LTO cycle are the product of the emission factor and operating time, and multiplied by the number of applicable aircraft LTO cycles. For emissions calculations purposes, APUs are assigned to the same category as GSE. External APUs used by an aircraft fall into the category of ground support equipment. In the absence of an APU or applicable GSE, a combination of 400 Hz electric power and preconditioned air (PCA) can be supplied to the aircraft using a fixed system at each gate to allow for normal operation. Fixed systems usually generate little or no emissions at the airport and are not included in EDMS. APU emissions are not calculated for TGO operations.

3.4   On-Road Vehicles

Motor vehicle activity on roadways is specified in the *Roadways* window under the *Emissions* menu heading. The *Number of Vehicles* (*Yearly* or *Peak Hour*) refers to the distinct number of individual vehicles using the roadway. The average speed (in mph) of vehicles traveling on the

roadway (*Speed)* is one of the parameters necessary to determine a MOBILE5a, MOBILE5b or MOBILE 6.2 emission factor (grams/vehicle-mile) for the movement of the vehicles. The other three parameters are the global parameters of *Vehicle Fleet Year*, altitude (*Elevation*), and *Average Yearly Temperature,* as defined in the *Study Setup* window. Additionally, MOBILE6.2 allows the user to choose between the default fleet mix and one of the 16 vehicle types. Selection of a specific vehicle type will cause EDMS to assume that the roadway is used only by vehicles of the specified type.

The *vehicle round-trip distance* (miles) field is used exclusively for emissions inventory purposes to determine the total amounts of pollutants generated by vehicles traveling the length of the roadway on their way to and from the airport. Specify the total distance (in statute miles, regardless of the units set on the Setup window) a vehicle would be expected to travel along the selected roadway. Note that modifications to the x and y coordinates in the lower half of the window automatically compute and display the vehicle round-trip distance as determined by the coordinates. This value is <u>twice the length</u> of the roadway. Access to the roadway emission factors for the active record both for viewing and editing purposes are on the lower right corner of the window. The total emissions for a roadway segment is the product of the emission factor (given in grams per vehicle-mile), the number of annual vehicles, and the round-trip distance traveled.

NOTE: In order to model a one-way roadway in EDMS, one half of the total annual operations should be entered. EDMS assumes that all vehicles travel a given roadway segment once in <u>each direction</u>.

Vehicular emission factors contained in EDMS are obtained from the EPA's MOBILE5a, MOBILE5b or MOBILE6.2, depending on which is specified in the *Study Setup* window. When MOBILE6.2 is not used, EPA's PART5 must be used to obtain SOx and PM emission factors. To accommodate changing and/or varying regulations or the need for a more detailed analysis, the user has the option of entering their own vehicular emission factor data. Frequently, the user would obtain this emission factor data by running MOBILE with customized input.

Once the user has provided EDMS with the study year, temperature, elevation, vehicle speed and class, the selected version of MOBILE will run using the default settings. The control flag settings used by EDMS for MOBILE5 and MOBILE6.2 are summarized in Tables 3-1 and 3-2, respectively. *The EDMS Technical Manual* contains additional information about how EDMS models on-road vehicle emissions along with instructions on viewing the MOBILE input file generated by EDMS and the output received from MOBILE in return. Users should run MOBILE outside of EDMS, if they find that these defaults are not appropriate for their airport.

Table 3-1. MOBILE5 default control flag settings.

Control Flag	Value(s)	Meaning
PROMPT	1	No interactive prompting. One value per line used for remainder of input.
TAMFLG	1	Use default tampering rates.
SPDFLG	1	User supplies one average speed value for all vehicle types.
VMFLAG	1	Use default vehicle miles traveled fleet mix.
MYMRFG	1	Use the national average annual mileage accumulation rates and registration distributions by age.
NEWFLG	1	Use basic exhaust emission rates.
IMFLAG	1	No inspection and maintenance program.
ALHFLG	1	Do not apply additional correction factors (for A/C, humidity, etc.)
ATPFLG	1	No anti-tampering program.
RLFLAG	1	Use uncontrolled refueling emission rates for all gasoline-fueled vehicles and all model years.
LOCFLG	2	Use one local area parameter record to apply to all scenarios.
TEMFLG	2	The ambient temperature is used in calculating the temperature corrections to emissions. The minimum and maximum daily temperature are used to calculate diurnal evaporative emissions.
OUTFMT	4	Output an 80-column descriptive format.
PRTFLG	1	Calculate and output only hydrocarbon (HC, NMHC or VOC) emissions.
	4	Calculate and output emissions for CO, hydrocarbons and NOx.
IDLFLG	1	No idle emission factors calculated or printed.
NMHFLG	1	Reported hydrocarbons are THC.
	2	Reported hydrocarbons are NMHC.
	3	Reported hydrocarbons are VOC.
HCFLAG	2	Print sum and component emission factors in grams per mile.

Table 3-2. MOBILE6.2 control flag settings.

Control Flag	Value(s)
Gasoline fuel Reid Vapor Pressure (RVP)	11.5 psi for study years prior to 2009 8.7 psi for study years 2009 and later
Minimum daily temperature	Average ambient temperature from the study setup screen – 10.35°F
Maximum daily temperature	Average ambient temperature from the study setup screen + 10.35°F
Calendar year	Study year from the study setup screen

Evaluation month	7 (July)
Roadway type	Arterial
Altitude	"1" if the airport elevation is less than 5,000 feet above sea level "2" otherwise

3.5   On-Road Vehicles in Parking Facilities

Motor vehicle activity in parking facilities is specified in the *Parking Facilities* window (under the *Emissions* menu heading). The *Number of Vehicles* (*Yearly* or *Peak Hour*) refers to the distinct number of individual vehicles using the parking facility. An entry and an exit of the parking facility with any idling and vehicle movement together, count as one operation. The average speed of vehicles traveling in the parking facility (*Speed)* is one of the parameters necessary to determine the emission factors for the movement of the vehicles using MOBILE5a, MOBILE5b or MOBILE6.2. The three remaining parameters, *Vehicle Fleet Year*, *Elevation*, and *Average Yearly Temperature* are the global parameters as defined in the *Study Setup* window. MOBILE6.2 does however allow the user to choose between the default fleet mix and one of the 16 vehicle types. Selection of a specific vehicle type will cause EDMS to assume that the parking facility is used only by vehicles of the specified type.

NOTE: In order to define a custom fleet mix of on-road vehicles, users must either run MOBILE outside of EDMS and import the resultant emission factors, or make a copy of the parking facility or roadway for each of the vehicle types.

Idle emission factors (grams/vehicle) are computed by extracting emission factors, as above, with a vehicle speed of 2.5mph and multiplying these factors by the *Avg. Idle Time*. The input for the idle time is an estimate of the average time a vehicle spends idling between entry and exit. The input for *Avg. Distance Traveled in Lot* is an estimate for the average distance a vehicle travels between entry and exit. This field is used to modify the moving emission factors (grams/vehicle-mile). The moving emission factors and the idle emission factors are combined to produce a parking facility emission factor (grams/vehicle).

3.6   Stationary Sources

The EDMS database contains emission factors for several categories of stationary sources. Each broad category is further broken down into several specific types. The ten categories currently included are *Boiler/Space Heaters, Emergency Generators, Incinerators, Aircraft Engine Testing, Fuel Tanks, Deicing Area*, *Solvent Degreasers, Surface Coating/Painting, Sand/Salt Piles* and *Other*.

Users can specify the category specific (and in some cases type specific) emissions parameter values or use the default emissions parameter values. The specific methodologies for computing stationary source emission factors are presented in Appendix H of Air Quality Procedures for Civilian Airports and Air Force Bases (the Air Quality Handbook). The general methodology for calculating emissions from these sources considers the amount of fuel or substance consumed.

The *Stationary Sources* window under the *Emissions* menu heading is used to specify stationary source activity. After the selection of a *Category*, the first type is automatically selected from

Type drop down menu and the *Emission Parameters* list is populated with the appropriate parameters, including the emission factors. Typically the user will then select a *Type* that best matches the source that they wish to include in the study. The *Category* and *Type* fields are keys to retrieve default data from the database.

Based upon the nature of the fuel, the substance consumed, or throughput, emission factors are displayed either as *Kg/Metric Ton Kg/Kiloliter*, *Kg/Thousand Cubic Meters, Kg/Hour or Kg/Test Cycle*. Emission factors and parameters may be modified if the user obtains site-specific data, but there is no validity checking performed to verify that the modified emission factors are actually valid for the selected *Category* and *Type*.

The *Yearly* and Per *Peak Hour* values specify the amount of time, fuel or substance consumed or throughput, and these are specified in *Metric Tons*, *Kiloliters*, *Thousands of Cubic Meters, Hours* or *Test Cycles* as appropriate. EDMS gives the user the flexibility to identify generic stationary sources. For miscellaneous stationary sources, the user has the option of choosing the *Other* category and entering their own emission factors in their choice of units. For such sources, the user is required to provide user-specified emission factors.

3.7   Training Fires

Training fire activity is specified by selecting the *Training Fires* window under the *Emissions* menu heading. Emission factor data for five fuels (*JP-4*, *JP-5, JP-8*, *Tekflame* and *Propane*) are stored in the EDMS database and may be selected from the *Fuel* drop down list. Training fire emission factors are specified in kilograms of pollutant per gallon of fuel used; and hence, the training fire activity values are entered in *Gallons of Fuel Used*. Training fire emission factors may be modified in the lower portion of the window under *Emission Factors*.

3.8   Data Output

The following sections describe the components of the emissions inventory, and the outputs available to the user. EDMS allows the analyst to view the emissions inventory on the window in an interactive manner and to print a formal emissions inventory report. EDMS generates an emissions inventory for the following pollutants: CO, THC, VOC, NMHC, NOx, and SOx for all sources. In addition, PM10 and PM2.5 emissions are inventoried for sources other than aircraft and APU.

3.8.1   Emissions Inventory

An emissions inventory is a summary of the total pollutants generated by all active sources in the study. Using EDMS to perform an emissions inventory requires the user to identify the emission sources, the annual activity for each of these sources and, in the case of user-defined sources, the emission factors. EDMS then calculates the total annual pollutant emissions for each of the identified sources and presents it in both a summarized report and a detailed report.

3.8.2   View Emissions Inventory

The *View Emissions Inventory* window is displayed by selecting the appropriate option under the *View* menu heading. The initial display is the *Summary,* which shows total pollutant emissions by source category in tons, short tons, lbs, or kilograms per year as specified in the *Study Setup*. The source categories are Aircraft by Mode, APU, GSE, stationary sources (including training fires), vehicular sources (both roadways and parking facility), and the total of all categories. The analyst

may also view total pollutant emissions by each source type by clicking on the appropriate buttons at the top of the view window.

The *Vehicular Sources* display lists the total emissions for each roadway and parking facility included in the study while the *Stationary Sources* display lists the total emissions for each stationary source or training fire specified in the study. The *Aircraft by Mode* display lists the total pollutants by the contributions of aircraft type in different mode of operation. The possible modes are approach, climb out, takeoff, taxi (includes idling), and touch-and-go. APU and GSE emissions may be viewed by pressing the *Aircraft/GSE/APU* button. The summarized Aircraft and GSE is the sum of the first five modes due to the aircraft's activity. The GSE and APU totals are displayed separately.

All the displays may be printed by choosing *Print* option from the *File* menu heading. Printing in this case is WYSIWYG (What You See Is What You Get). *Printer Options* may have to be modified to enable complete printing of all the columns and rows.

3.8.3   Print Emissions Report(s)

To print official reports of the emissions inventory choose *Print Emissions Report(s)* from the *Reports* menu heading. Aside from the difference of formatting, EDMS titles, and study information, the content of the emissions reports are exactly the same as described in *View Emissions Inventory*.

4   DISPERSION CALCULATIONS

EDMS 4.2 generates input files for use with EPA's AERMOD dispersion model, its meteorologic al preprocessor, AERMET, and its terrain preprocessor, AERMAP. AERMOD is a steady-state plume model that assumes a Gaussian concentration distribution in both the horizontal and vertical directions in the stable boundary layer. In the convective boundary layer, dispersion is Gaussian in the horizontal direction, with the vertical direction being modeled by a bi-Gaussian probability density function. It is not the intent of this user manual to describe AERMOD or any of its associated preprocessors in detail. Detailed information about AERMOD is available from user guides and additional information contained on the EPA's internet site (www.epa.gov/scram001/tt26.htm). The purpose of this manual is to describe how EDMS is used to generate input files for AERMOD. The algorithms used by EDMS to generate the AERMOD input files are described in the *EDMS Technical Manual.*

4.1   Inputs Required

The amount of data required to perform a dispersion analysis is significantly greater than the data necessary for an emissions inventory (see section 3.1). With a few exceptions, all of the inputs necessary for the emissions inventory are also necessary for dispersion modeling. In addition, the analyst is required to develop accurate operational profiles (see section 6.1.2), load weather data, and place receptors. It is not necessary to generate the emissions inventory to run the dispersion algorithms since the emission rates used in dispersion calculations are derived directly from the emission factors.

The dispersion algorithms use the selected operational profiles (see section 6.1.2) to vary the source activity based upon the hour of the run. It is important that accurate profiles be developed to represent the variation of individual source activity as this can affect the outcome of dispersion significantly. Two similar parameters found in all of the emissions source screens are the values for *Yearly* and *Peak Hour* activity. The dispersion pre-processing routines use the *Peak Hour* value in the computation of an emission rate. If the *Yearly* activity were the only known variable then the user would use operational profiles to derive the *Peak Hour* value. Upon entering the value for *Yearly* activity and choosing the appropriate *Hourly*, *Daily*, and *Monthly* operational profiles (set on the lower half of the screen) the program will automatically compute the corresponding *Peak Hour* value. Even if the *Peak Hour* value is known, and entered directly, accurate operational profiles will still have to be defined and selected for each source in the study.

Since EDMS is a model specifically developed for use at airports and air bases, there are several screens that relate directly to the placement of aircraft and other source activity and movement on the airport. Data input includes the creation and specification of runways, queues, taxiways, buildings, and gates. These inputs are converted into a collection of appropriate sources for modeling dispersion in AERMOD.

4.1.1   Weather Data

AERMOD requires a significant amount of weather data in order to accurately characterize the atmosphere. Surface data for each hour is required, as well as twice-daily upper-air observations, one of which must be an early morning sounding. Historical weather data are available for free from the EPA internet site (www.epa.gov) and other locations, such as www.webmet.com. Additionally, recent weather data are available from the National Climactic Data Center (NCDC) internet site (www.ncdc.noaa.gov) for a fee.   The surface and upper-air observations are processed with the meteorological preprocessor, AERMET. The *AERMET Wizard*, under the

Dispersion menu heading, steps the user through loading the two types of weather data and then merges them into a format that AERMOD can use. Weather data must be provided in one of the formats listed in Table 4-1, this may require converting the weather data into one of the formats listed. If weather for your specific location is not available, an appropriate substitution should be used.

Table 4-1. Acceptable weather data formats.

File Format	Use	Description Source
TD-3280	Surface	National Climactic Data Center (NCDC). www.ncdc.noaa.gov
TD-3505	Surface	National Climactic Data Center (NCDC). www.ncdc.noaa.gov
CD144	Surface	National Climactic Data Center (NCDC). www.ncdc.noaa.gov
HUSWO	Surface	National Climactic Data Center (NCDC). www.ncdc.noaa.gov
SCRAM	Surface	Environmental Protection Agency. www.epa.gov
SAMSON	Surface	National Climactic Data Center (NCDC). www.ncdc.noaa.gov
TD-6201	Upper-Air	National Climactic Data Center (NCDC). www.ncdc.noaa.gov
Radiosonde Data of North America – FSL format	Upper-Air	National Climactic Data Center (NCDC). www.ncdc.noaa.gov

4.1.2   Receptor Locations

The locations at which concentrations are estimated are known as receptors. EDMS allows the placement of receptors in the Cartesian or Polar coordinate system with the ability to also specify

the height of the receptors. EDMS does not perform any checking on the reasonableness or accuracy of the placement of receptors, it is left to the analysts to verify this for themselves.

As a general rule, receptors should be located where the maximum total projected concentration is likely to occur and where the general public is likely to have access. General guidance is given in Volume 9 guidance (EPA, 1978b) for receptor siting:

- Places of expected maximum concentrations;

- Places where the general public has access over the time periods specified by the NAAQS; and

- Reasonableness.

Examples of reasonable receptor sites might be:

- Sidewalks to which the general public has access on a more-or-less continuous basis;

- On the property lines of all residences, hospitals, rest homes, schools, playgrounds, and the entrances and air intakes to all other buildings;

- Portions of a nearby parking lot to which pedestrians have continuous access.

Examples of unreasonable receptor sites might be:

- Median strips of roadways;

- On or close to an aircraft runway or taxiway;

- Within intersections or on crosswalks at intersections;

- Tunnel approaches;

- Within tollbooths; and

- A location far from the breathing height (1.8 m) at which the general public will not have access.

The *Discrete Receptors* dialog box, found under the *Dispersion* menu heading, allows the user to place individual receptors in the EDMS coordinate system for concentration estimation. Dispersion calculations will include all receptors in the *In Study* list box. The EPA recommended height for receptor placement is breathing height (approximately 1.8 meters or 5.9 feet).

The *Receptor Networks* tab on the *Receptors* dialog box allows the user to define two-dimensional grids of individual receptors over an area of the airport or study area. Due to the increased computational time required for a large number of receptors, the primary use of grids has typically been in screening dispersion estimates.

4.2   Dispersion Modeling Calculation

The intent of dispersion modeling is to assess the air pollutant concentrations at or near the airport or air base resulting from identified emissions sources. These pollutant concentrations are calculated to determine whether emissions from the site result in unacceptably high air pollution levels downwind by comparison with the National Ambient Air Quality Standards (NAAQS) or other relevant air quality standards. To perform dispersion modeling EDMS requires that coordinates (in meters or feet) be identified for each emissions source, the specification of an emissions rate (derived from emission factors) and its variation through time. For some sources,

the release height, temperature and gas velocity are also required. The identification of spatial points in the coordinate system for concentration estimation (receptors), and the availability of weather data for individual hours are also required.

The basic Gaussian equation, a mathematical approximation that simulates the steady-state dispersion of pollutants from a continuous point source is given below: Where:

Equation 4-1: Gaussian Approximation[2]

$$C(x,y,z,H) = \frac{Q}{2\pi\sigma_y\sigma_z u} \exp\left[-\frac{1}{2}\left(\frac{y}{\sigma_y}\right)^2\right] \left\{ \exp\left[-\frac{1}{2}\left(\frac{z-H}{\sigma_z}\right)^2\right] + \exp\left[-\frac{1}{2}\left(\frac{z+H}{\sigma_z}\right)^2\right] \right\}, \text{ where:}$$

C   =   point concentration at receptor, in $\mu g/m^3$

H   =   effective height of emissions, in meters (m)

Q   =   mass flow of contaminants from receptor, in $\mu g/s$

u   =   wind speed, in m/s

(x,y,z)   =   ground level coordinates of receptor, in meters (m)

σ_y =   standard deviation of plume concentration distribution in y plane, in m

σ_z =   standard deviation of plume concentration distribution in z plane, in m

The results of the AERMOD dispersion calculations are the concentrations, given in micrograms per cubic meter ($\mu g/m^3$), at receptors for each hour. The following describes dispersion data inputs and outputs.

4.2.1 Point, Area, and Volume Sources

Just as the emissions inventory breaks down airport operations into source categories, the same applies to dispersion calculations. For dispersion modeling purposes, each source category is assigned 1 of 3 source type categories: point, area or volume. EDMS 4.2 uses all 3 source types in AERMOD.

Stationary sources such as power plants release pollutants into the atmosphere through a point source discharge mechanism such as a stack (training fires are also treated as point sources). The AERMOD point source module is used to model dispersion for all point sources in EDMS. Point source emission rates are generally given in grams per second (gm/sec).

Area sources are generally defined as an area with a uniform rate of emissions over the entire surface. Parking facilities are classified as area sources in the model. Airport parking facilities generate emissions due to on-road vehicles operations and vehicle idling. Area source emission rates are generally given in grams per second per square meter (gm/sec-m^2). In the case of a multi-level parking facility, area sources are stacked at a defined increment to characterize the structure.

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[2] Source: Air Quality Procedures for Civilian Airports and Air Force Bases, FAA/USAF, Washington, DC, 1997.

Aircraft taxiing, aircraft queuing, aircraft accelerating on the runway, and on-road vehicle operations are considered to be a series of area sources, since their movement along a path approximates a line of continuous emissions. Similarly, aircraft after takeoff and during the landing approach are also represented as a series of area sources. The area source was selected, as opposed to using a series of volume sources based on recommendations from the American Meteorological Society/EPA Regulatory Model Improvement Committee (AERMIC).

In EDMS the activity at gates are considered to be volume sources when the emissions from GSE and APUs are estimated to originate from a single point of discharge, and area sources when multiple points are used to model the gate. The latter case is typically used when a terminal or part of a terminal is represented as an EDMS "gate."

4.2.2   Aircraft GSE and APU

Aircraft activity is specified in the *Aircraft Operations and Assignments* dialog box as described in section 3.2. The additional data required for dispersion analysis (other than operational profiles) are assigned in the *Operations APU & Gate, Taxiway Assignment, and Runway Assignment* tabs in the Aircraft Operations and Assignments dialog box. The *Total Taxi and Queue Time* field is not used in dispersion calculations; it is used solely for the emissions inventory. This permits users only interested in generating an emissions inventory to avoid having to define the airport layout. Dispersion is calculated for aircraft in the modes of taxi (on taxiways), idle (in queues), ground support equipment and APU activity (at gates), takeoff (on runways), takeoff (from the surface to 1,000 feet above the ground), approach (from 1,000 feet above the ground to touchdown, and landing (on runways).

4.2.3   Runways

Aircraft runways are defined using the *Runways* dialog box found under the *Airport* menu heading. Runways are named based on their magnetic orientation. For example, runway 9-27 is a runway oriented east-west, with runway 9 defining aircraft moving west to east, and runway 27 defining aircraft moving east to west. The *Runways* dialog allows the user to create runways with distinct endpoints (End 1 and End 2). This, in turn, allows the user to assign aircraft to specific runway ends in the *Runway Assignment* tab on the *Aircraft Operations and Assignments* dialog box.

In conjunction with each runway endpoint, the user may define a *Runway Queue* that defines the area where aircraft wait for takeoff. The two queues assigned to the runway may be of different lengths, but the peak *Queue Time*, is the same for both queues. An aircraft assigned to a specified runway endpoint will, by default, use the queue attached to that endpoint. Queues with a peak time of 0 or a length of less than 20 m will be ignored. Runways must have a length greater than or equal to 100 meters (328 feet).

4.2.4   Buildings

Airport buildings are defined using the *Buildings* dialog box found under the *Airport* menu heading. Airport building sources can have up to 20 points, can stand 328 feet high and affect the emitted point source plumes, therefore having a significant impact on concentrations resulting from stationary source emissions. Buildings have no effect on the concentrations estimated from volume and area sources.

4.2.5 Taxiways

Aircraft taxiways are defined through the *Taxiways* dialog box found under the *Airport* menu heading. The *Coordinates* of the taxiway identify a series of area sources for the placement of aircraft movement while the aircraft is taxiing to and from a gate, a queue, or a runway. The default taxi speed for aircraft in EDMS are is 30 MPH. The speed however can be changed and the *Taxi Time* shown on the *Taxiways* dialog box represents how long it would take for an aircraft to taxi along the entire length of the taxiway at the specified speed. Taxiways must have a length greater than 20 meters (65.6 feet).

EDMS only allows aircraft to traverse a taxiway once per LTO. Taxiway segments that are used both from the gate to the runway and during the return trip from the runway to the gate should be defined twice. A common method for defining those taxiways would be to include "-inbound" and "-outbound" after the taxiway name (e.g. "A-inbound," "A-outbound").

4.2.6 Gates

A gate is a physical point of arrival and departure for an aircraft. For the purposes of dispersion modeling the emissions contributions due to GSE and APUs are localized at the gate to which the aircraft is assigned. The gate *Coordinates* provide the spatial point in the coordinate system from which all the relevant GSE and APU emissions are considered to emanate. The dispersion from the sources at the gate is represented by a single volume source for each gate if only one point is specified to define the gate; otherwise an area source is used to represent the gate. For larger airports, many users represent a series of gates or part of a terminal as an individual gate in their EDMS study.

4.2.7 Configurations

It is recognized that airports operate under different configurations - the pattern of aircraft arrivals and departures on specific runways - over the course of a year depending on the direction and speed of the wind, capacity, and noise abatement issues. Whereas it is impossible to account for all the various factors that might influence the definition of configurations at specific airports, it has been determined that most often configurations are defined based on the wind parameters of direction and speed.

The *Configurations* dialog (under the *Dispersion* menu heading) provides a way for the analyst to dynamically assign aircraft to different combinations of runways, queues and taxiways at dispersion run-time based upon surface wind parameters. For a specific configuration the *Wind Angle Range* specifies the range of wind directions under which the configuration is active. The wind angle ranges must be mutually exclusive among configurations (i.e., any two configurations cannot have conflicting wind angle ranges). The *Minimum* (wind) *Speed* is a value for the lower limit under which the configuration is still defined to be active.

4.2.8 Parking Facilities

Parking lot and parking garage activity is specified in the *Parking Facilities* dialog box as described in section 3.6. The additional data required for dispersion analysis is found in the *Dispersion* tab of the *Parking Facilities* dialog box. The parking structure must be defined as a series of up to 20 points. The parking facility *Height* is specified to represent the height at which emissions are released. Each parking facility may also have up to 20 levels. Facilities with multiple parking levels are modeled using stacked area sources.

4.2.9   Roadways

Vehicle activity on roadways is specified in the *Roadways* dialog as described in section 3.5. The additional data required for dispersion analysis is found in the lower half of the screen. Aside from the coordinates of the endpoints of the roadway, the *height and width* of the roadway must also be specified. These values correspond to the release height and width of the emissions and not the physical dimensions of the roadway. Roadways are modeled as a series of area sources by AERMOD.

4.2.10 Stationary Sources

The *Stationary Sources* dialog described in section 3.6 offers the capability of specifying the activity of several different categories of stationary sources for dispersion analysis. Performing a dispersion analysis requires the analyst to specify the dimensions of the stationary source. The additional data required for dispersion analysis is category dependent and is found in the lower left corner of the dialog. Users can specify the category specific (and in some cases type specific) emissions parameter values or use the default emissions parameter values. The specific methodologies for computing stationary source emission factors and the associated data requirements are presented in Appendix H of Air Quality Procedures for Civilian Airports and Air Force Bases (the Air Quality Handbook). The general methodology for calculating emissions from these sources considers the amount of fuel or substance consumed.

Users are permitted to select the type of AERMOD source (point, area, or volume) used to model each stationary source in the EDMS study to better characterize the sources at their airport. Default values are also provided for all source types.

4.2.11 Training Fires

Training fire data are used by EDMS in both emissions and dispersion analyses. For emissions purposes, calculations are based upon the amount of fuel burned, as well as the *Height*, *Temperature*, *Diameter*, and *Gas Velocity* of each fire. For dispersion analyses, training fire emissions are treated as point sources by EDMS. Training fire emissions are located spatially within the airport using the (x, y) coordinates.

4.3   Airport Graphical Display

The *Airport Graphical Display*, under the *View* menu, provides the analyst the capability to visualize their source and receptor placements in relation to each other. Runways are indicated by a thick gray line with a solid blue centerline, taxiways and queues are identified by a thick, gray line, roadways are indicated by a solid red line and receptors are indicated by a flag pole. The ability to import an airport "wallpaper" is also provided. The wallpaper can be any bitmap image, and is typically the airport layout diagram or a map of the airport and the surrounding area.

The *Airport Graphical Display* screen is a non-modal screen and hence the analyst may continue to add sources and receptors in dialogs and view their placement in the display upon closing each dialog. All sources can be dragged to their desired destination and modified from the Airport view by double-clicking the source and making changes through the sources dialog box. To further aid the analyst in verifying the coordinates and placement of components the position of the crossbar cursor, in the coordinate system, is displayed in the status bar at the bottom of the display screen, and a *Scale* is displayed in both the status bar and the legend. A limited zoom

capability is also provided. Section 6.5.1 provides detailed information on how to interact with the airport graphical display.

4.4   Data Output

Modeling concentrations is a three-step process in EDMS. First, the user must select the meteorological data to be used via the AERMET Wizard. EDMS 4.2 includes the optional use of AERMAP, which is the terrain preprocessor of AERMOD. AERMAP creates source (.SRC) and receptor (.REC) files for inclusion in AERMOD dispersion analyses. Next, the user must *Generate AERMOD Input Files,* under the Dispersion menu heading. This step pre-processes the emissions for every source for every hour in the weather data. The user also has the opportunity to select different averaging periods as well as the desired pollutant at this time. Finally, the dispersion calculations may be run by selecting *Run AERMOD* under the *Dispersion* menu heading. Alternatively, the user may choose to run AERMOD with the input files generated by EDMS on a different computer. Step-by-step instructions for generating the AERMOD input files are provided in section 6.4.6.

As the dispersion algorithms execute, AERMOD displays its current status on the screen. Once AERMOD has finished, the AERMOD window will close and the user will be returned to EDMS. After AERMOD has run, a file with the .out extension will be created in the study directory. This file contains both the list of inputs to AERMOD along with the concentrations. These results can be viewed and printed in any text editor, but *TextPad* is recommended. Concentration (.con) files can be viewed in the *Concentrations View*. Instructions for using the view concentrations option are provided in section 6.5.3.

5 UTILITIES

5.1 User-Created Aircraft

In recognition of an analyst's need to include their own aircraft data (type, modes, and emission factors), the model provides a utility for the analyst to add aircraft to the EDMS system database tables.

The *User-Created Aircraft* dialog box (see section 6.6.1) is displayed under the *Utilities* menu heading. In this screen the user may specify an aircraft name, the number of engines on the airframe, the *Category* (size, engine, designation, and usage), the *flight profile*, the *Times in Mode Data Source* and the performance-based *Time In Mode* for the takeoff roll and climb to 1,000 feet, landing roll, climb out from 1,000 feet to 3,000 feet, and approach from 3,000 feet to the surface. Emission factors for the takeoff, climb out, approach, and idle power settings for *CO, HC, NOx*, and *SOx*. Since PM-10 emission factors are generally not available for aircraft engines this field is not displayed. The times-in-mode entered on this screen will be used for emission inventory purposes only. For dispersion modeling purposes, the analyst must also select a system aircraft-engine combination that most closely matches the newly added aircraft. Selecting this combination will assign the system aircraft's flight profile data to the new aircraft in order to determine time and location for dispersion analysis.

To avoid having to repeat the process of defining the same user-created aircraft for each study, the data for those aircraft are stored with the system tables for the installation of EDMS used to create them. This allows the user-created aircraft to be defined once, and then always be available on that user's computer. If the study containing user-create aircraft is to be shared with another user, you must use the export utility to save a copy of the user-created aircraft data along with your study data. If the user-created aircraft are not exported from the machine where the study was created, they will not be available in the study when it is opened on a new computer.

5.2 User-Created GSE

In addition to being able to create user-defined aircraft, EDMS also allows the analyst to define GSE. The *User-Created GSE* dialog box (see section 6.6.2) is displayed under the *Utilities* menu heading. The user can specify emission factors (in grams per horsepower-hour) for one or more of the fuels in the *Emission Factors* box, at the bottom of the screen. Only emission factors for CO, Total HC, NOx, SOx and PM-10 need to be specified because values for NMHC and VOC are derived from Total HC, and PM-2.5 is derived from PM-10. However, these values can be obtained from a system GSE. In the *Emission Factor Data Source* box, select *System Tables* and the values in the *Emission Factors* box will automatically update to reflect the chosen data source. Choose the system GSE and year whose emissions data is desired from the drop down lists. As with the user-created aircraft, user-created GSE will only be available for use in studies performed with the installed copy of EDMS.

5.3 User-Created APU

In addition to being able to create user-defined APU, EDMS also allows the analyst to define APU. The *User-Created APU* dialog box (see section 6.6.3) is displayed under the *Utilities* menu heading. For each piece of equipment, the user must specify emission factors for CO, Total

HC, NOx, SOx and PM-10 need to be specified because values for NMHC and VOC are derived from Total HC, and PM-2.5 is derived from PM-10. However, much like the user-created GSE, these values can be obtained from a system APU. In the *Emission Factor Data Source* box, select *System Tables* and the values in the *Emission Factors* box and the default operation time parameter will automatically update to reflect the chosen data source. Choose a system APU whose emissions data is desired from the drop down list. As with the user-defined aircraft and GSE, user-defined APU will only be available for use in studies performed with the installed copy of EDMS.

5.4   Import and Export

EDMS 4.2 provides analysts with the capability of building sources outside of EDMS and importing them into the model. This is done through the Import Utility located under *Utilities* from the main menu. The import utility is used to read a comma-separated (CSV) text file that contains data for importing. Comma-separated text files usually use the ".csv" extension, but ".txt" is also appropriate. The files can be created and edited by Microsoft Excel or any text editor (e.g., TextPad). The user can import the contents of the entire file or only selected parameters and tables. The import utility does not overwrite any values for any sources in the study and only appends unique records to the study. Therefore, records that have the same identifier as existing records in the study will be skipped. If the intent is to import new values into the study, old records to be replaced should be deleted before running the import utility.

Users may also be interested in exporting data as a means of backup or to import specific parts of one study into another. For these reasons EDMS offers a utility module to export data from the current study. The *Export* dialog is also selected under the *Utilities* menu heading. The utility contains 3 steps which consist of: selecting the items to export by checking the boxes in the tree to mark which items in the study are to be exported, naming the export file, and the export report window which details the outcome of the export. Detailed instructions for using the import and export utilities are found in sections 6.6.4, 6.6.5.

NOTE: EDMS 4.2 only recognizes the import format specified in Appendix C. Any data exported from a previous version of EDMS should be converted to match the format in Appendix C before attempting to import it into EDMS 4.2

6. MENU AND OPTIONS

This chapter describes the contents of every menu in EDMS and the options available in each of the dialog boxes. EDMS has 8 menus: File, Emissions, Airport, Dispersion, View, Utilities, Window, and Help.

6.1 The File Menu

The File Menu provides the user with the ability to specify study information, define operational profiles, close or copy the study, print the current window, or exit EDMS. The contents of the file menu are listed below:
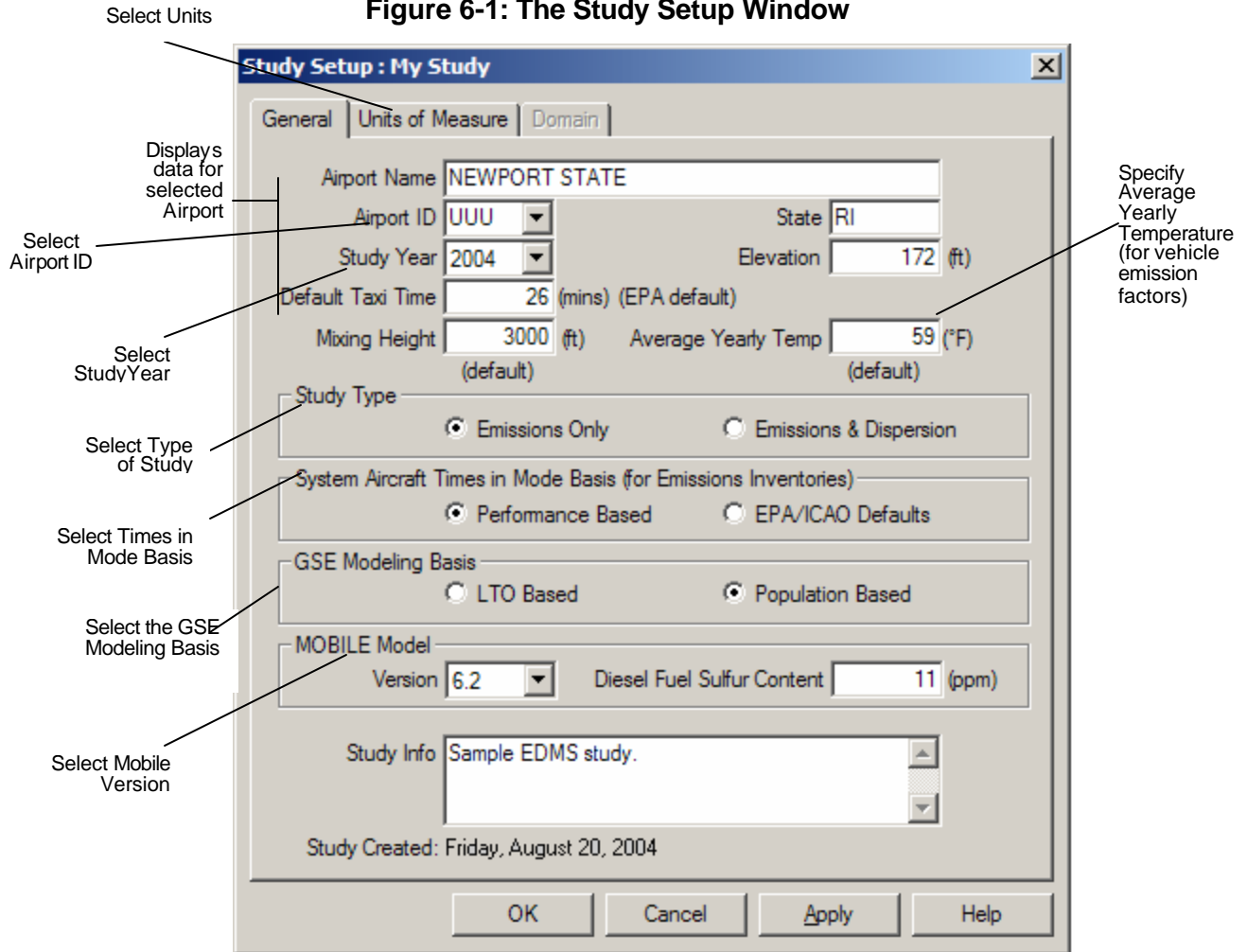
- Setup

- Operational Profiles

  □ Hourly

  □ Daily

  □ Monthly

- New Study

- Open Study

- Close Study

- Save Study As

- Delete Study

- Print All Model Inputs

- Print Preview

- Print Setup

6.1.1   Study Setup

The Study Setup window (Figure 6-1) allows the analyst to specify several important parameters. Some of these parameters (altitude, temperature, and year) contribute to the calculation of the vehicle, roadway, and parking facility emissions and performance of dispersion analysis. This is where the user selects or types airport identification in the *Airport ID* drop-down list. EDMS will locate the airport ID and populate the default airport data if it is available. If the default data is not available, the user must enter these values manually. In addition to providing modifiable default airport data for the study airport, the Study Setup window allows the user to select the Airport Layout under the *Units of Measure* tab. The user can select the measurement system to be used throughout the EDMS study. Selecting "Metric" displays airport layout units in *meters* and allows users to display emissions in metric tons or kilograms, while selecting "English" displays airport layout units in feet and allows users to display emissions in short tons or pounds. The Domain tab displays the geographic region considered when generating elevations and receptor hill heights. It is only applicable to dispersion analyses that include terrain data. This is also where users can change units from latitude/longitude to UTM's. Users can also specify the Study Year (1988 to 2020), and enter a short description of the study in the Study Info field. EDMS automatically assigns a Study Created date for each new study.

To save any changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

Figure 6-1: The Study Setup Window

Select Units

Displays data for selected Airport

Select Airport ID

Select StudyYear

Select Type of Study

Select Times in Mode Basis

Select the GSE Modeling Basis

Select Mobile Version

Specify Average Yearly Temperature (for vehicle emission factors)

```
Study Setup : My Study                                              [X]

 General | Units of Measure | Domain

       Airport Name  NEWPORT STATE

         Airport ID  UUU  [v]              State  RI
         Study Year  2004 [v]          Elevation       172 (ft)
   Default Taxi Time        26 (mins) (EPA default)
      Mixing Height       3000 (ft)   Average Yearly Temp       59 (°F)
                         (default)                       (default)
   ┌ Study Type ─────────────────────────────────────────┐
   │         (•) Emissions Only      ( ) Emissions & Dispersion │
   └──────────────────────────────────────────────────────┘
   ┌ System Aircraft Times in Mode Basis (for Emissions Inventories) ┐
   │         (•) Performance Based    ( ) EPA/ICAO Defaults │
   └──────────────────────────────────────────────────────┘
   ┌ GSE Modeling Basis ─────────────────────────────────┐
   │         ( ) LTO Based            (•) Population Based │
   └──────────────────────────────────────────────────────┘
   ┌ MOBILE Model ───────────────────────────────────────┐
   │      Version  6.2 [v]    Diesel Fuel Sulfur Content       11 (ppm) │
   └──────────────────────────────────────────────────────┘

         Study Info  Sample EDMS study.                    [▲]
                                                           [▼]
       Study Created: Friday, August 20, 2004

         [  OK  ]   [ Cancel ]   [ Apply ]   [ Help ]
```

Adding Study Information

Study information is based on the characteristics of the specific airport (or projected airport) the analyst is modeling. If the airport currently exists, the user should choose the 3 or 4 character airport designator from the Airport ID drop down list. Information such as Airport Name, State, Elevation will be displayed for the selected airport. The latitude and longitude will also be updated under the *Domain* tab if modeling Emissions and Dispersion.

Editing Study Information

The current Study Type, Units, Mixing Height, Avg. Yearly Temp, and Vehicle Fleet Year fields contain default data that are not specific to the airport that is selected, but can be modified by the user for the specific airport. In addition, if a non-US airport is selected, the *State* field will be blanked out.

Enter the appropriate data in the above-mentioned fields. Changing the Mixing Height will affect Aircraft Time in Mode. Changing the Average Yearly Temperature will affect Vehicle Emission Factors.

Type of Study

In EDMS 4.2, the analyst must choose if an emissions inventory only will be conducted, or if a dispersion analysis to determine pollutant concentrations at receptor locations is required. When the

Emissions Only radio button is selected, only the input fields and menu items related to an emissions inventory will be displayed. With the Emissions & Dispersion radio button selected, the input fields and menu items for dispersion calculations will also be available. The type of study can be changed at any time, and no data will be lost by changing study types.

6.1.2   Operational Profiles

Source Strength Variation

EDMS 4.2 generates input files for EPA's AERMOD dispersion model. AERMOD calculates concentrations for 1-hour periods, and all source types can vary hour by hour in their activity or strength. For example, for the afternoon hours on a busy weekday a certain roadway may experience a high volume of traffic. Conversely, the same roadway may experience very little or no traffic during early morning hours on a weekend day. Operational profiles are hence used to profile the activity/strength of any source over the course of an entire year (8760 hours) hour by hour providing accuracy yet eliminating a brute force approach to obtain the actual activity/strength for each hour of the year.

Peak Activity Methodology

Operational profiles are based on the concept of peak activity. A peak hour, day, or month is defined as that at which the most or maximum activity occurs. There can be one or more such peaks among the hours in a 24-hour period, among the days in a 7-day period, and among the months in a 12-month year. Peak activity (no matter how high or low in real figures) is always represented by a proportional factor of 1 (signifying maximum activity). Anything other than a peak is represented as a percentage of that activity by a ratio between 0 and 1. This concept of operational profiles, based on peak activity, requires that there be at least one identified peak, in each of the hour, day and month categories.

Dispersion Calculation

At run time, for each hour, the source activity and strength is modified by multiplying it by the 3 proportional factors (hour, day, month) that represent that particular hour in the sequence of 8760 hours in a year (hour 1 being the first hour of January 1 and hour 8760 being the 24th hour of December 31). Dispersion is then calculated based on this modified source activity and strength.

$$S_i = S_p \ x \ HF_i \ x \ DF_i \ x \ MF_i$$

Where:

i *is a specific hour in the sequence of 8760 hours in a year*
S_i *is the source strength at hour* i
S_p *is the source strength at peak hour*
HF_i *is the factor for the hour (1-24) in which the hour* i *falls*
DF_i *is the factor for the day (Mon - Sun) in which the hour* i *falls*
MF_i *is the factor for the month (Jan - Dec) in which the hour* i *falls*

Example: Consider a source emitting 100 kg, at peak hour. Hour # 46 corresponds to the 22nd hour on January 2nd. Say that the factor in the hourly profiles for the 22nd hour is 0.7, the factor in the daily profiles is 0.9, and the factor in the monthly profiles for January is 0.6. Then the source strength at hour # 46 is given by:

$$Strength_{46} = 100 \ kg \ (peak \ hr \ strength) \ x \ 0.7 \ x \ 0.9 \ x \ 0.6 = 37.8 \ kg$$

Relation between Peak Hour Activity and Annual Activity

For each source the user is required to specify either a peak activity or an annual activity and then operational profiles in each of the three categories (hourly, daily, monthly).

If peak activity is specified then the yearly activity is modified based on the following formula:

$$Annual \ Activity = Peak \ Hour \ Activity \ x \ 8760 \ x \ Month \ Factor \ Avg. \ x \ Day \ Factor \ Avg. \ x \ Hour \ Factor \ Avg.$$

If yearly activity is specified then the peak hour activity is modified based on the following formula:

Peak Hour Activity = Annual Activity / 8760 / Month Factor Avg. / Day Factor Avg. / Hour Factor Avg.

The factor averages are simply averages of the respective factors in each category. The above approach ensures that the peak activity and the annual activity are always reflective of each other based on the specified operational profiles.

6.1.2.1 *The Hourly Profiles Window*

The Hourly Profiles window (Figure 6-2) allows the analyst to specify the proportion factor of operations at peak hour that take place in each of the 24 hours in a given day. This hour factor is expressed as any ratio between 0 and 1 such that 0 is equal to 0% and 1 is equal to 100%.

Figure 6-2: The Hourly Profiles Window
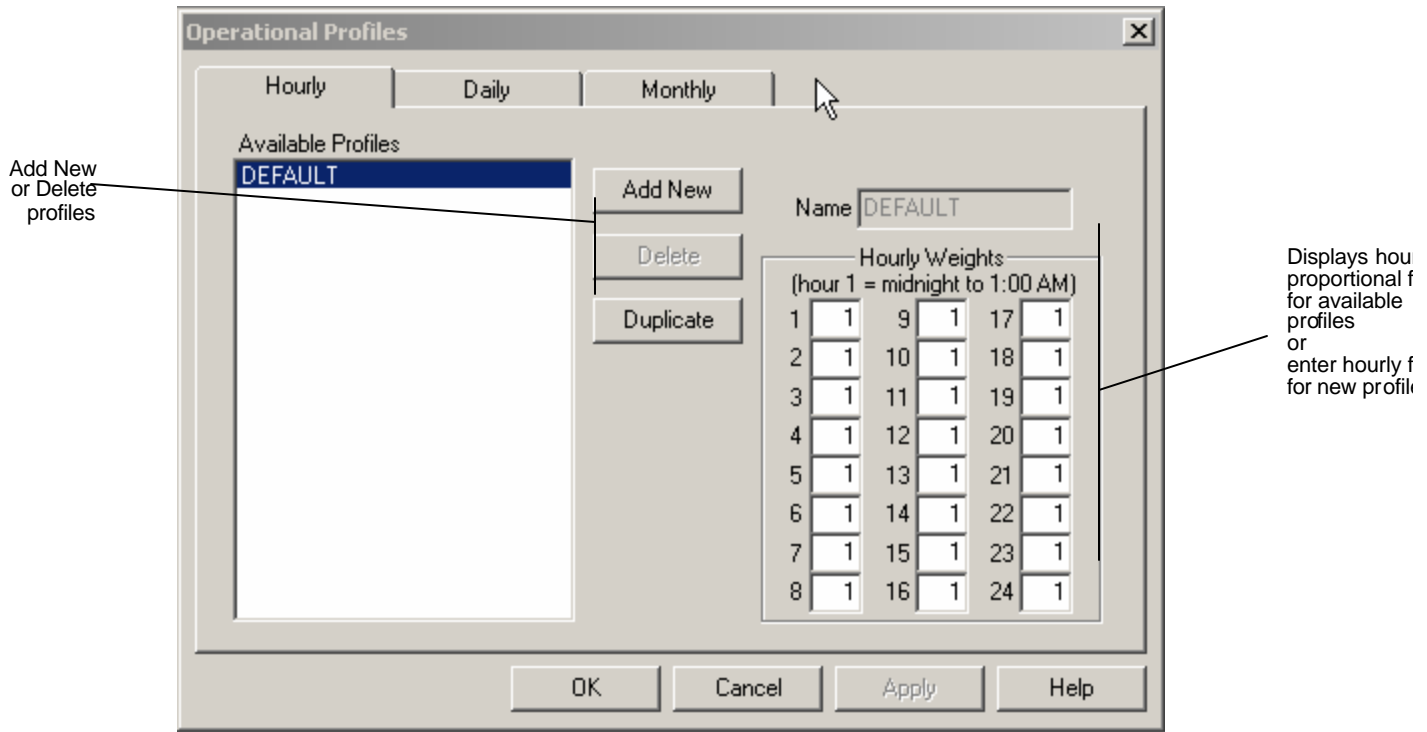
For example the peak hour operations for an aircraft in a 24-hour period could be 10, and that same 24-hour period might have a total of 6 hours that experience the peak number of operations. Those 6 hours might be 7-8, 8-9, and 9-10 a.m., and 4-5, 5-6, and 6-7 p.m. The hourly profile would have a factor of 1 in the fields for hours 8, 9, 10, 17, 18, and 19 signifying that those hours experienced the maximum number of operations in an hour. Other hours experiencing fewer than the peak number of operations would express those operations as a proportion of the maximum (1). For example, an hour (say 2-3 p.m.) experiencing 5 operations would be expressed as factor of .5 in hour 15 of the hourly operational profile. Note: Since the hourly factors are expressed as a proportion of a peak hour figure (1), at least one of the 24 hours must have a peak hour designation of 1.

As in all EDMS windows, pressing the Apply button records any changes without exiting the window. To save the changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

Adding Hourly Operational Profiles
To add a new hourly profile, press Add New, type in a name for the new profile in the Name field, and type in the proportion factors for each of the 24 hours. Once added, a new hourly profile becomes available for selection in other EDMS modules under Available Profiles.

Editing Hourly Operational Profiles

To remove a profile from the list of available profiles, select the profile name and press Delete. If the user modifies an existing hourly operational profile that is in use in other EDMS modules (e.g., aircraft activity) they must reselect that profile in each of the modules to record the modifications. Note: EDMS contains a "default" hourly profile with a value of 1 in each hour and is used if the user does not select an alternative profile. The Default profile can be modified, but cannot be deleted. Daily Operational Profiles

Figure 6-3 The Daily Profiles Window
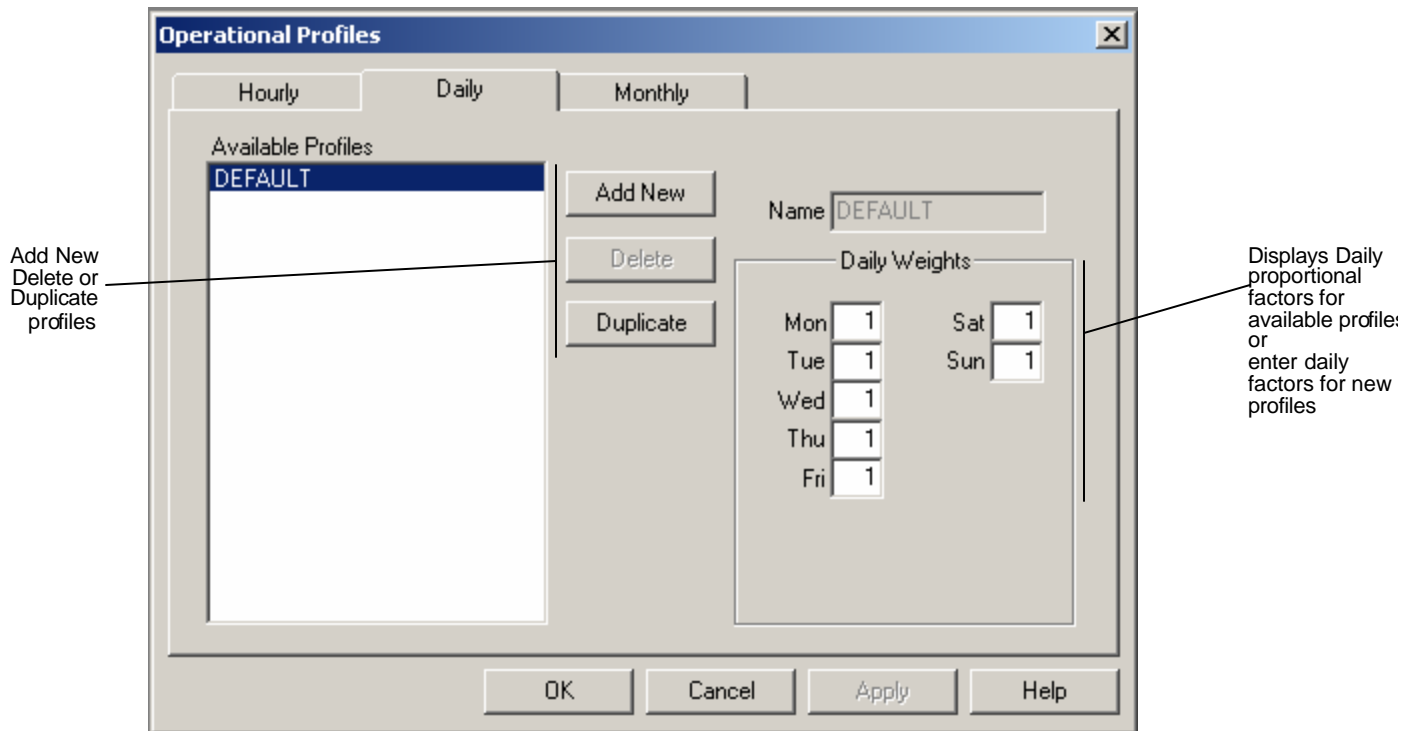
6.1.2.2 The Daily Profiles Window

The Daily Profiles window (Figure 6-3) allows the user to specify the proportion factor of peak day operations that take place in each of the 7 days in a given week. This proportion factor is expressed as any ratio between 0 and 1 such that 0 is equal to 0% and 1 is equal to 100%.

For example the peak day operations for an aircraft could be 100, and there might be 3 days in a given week that typically experience the peak number of operations. Those 3 days might be Monday, Tuesday, and Friday. The daily profile would have a proportion factor of 1 in the fields for Monday, Tuesday, and Friday signifying that those days experienced the maximum number of operations in a week. Other days experiencing fewer than the peak number of operations would express those operations as a proportion of the maximum. For example, a day (say Thursday) experiencing 70 operations would be expressed as a proportion factor of .7 on Thursday in the daily operational profile. Note: Since the weekly distribution is expressed as a proportion of a peak day figure (1), at least one of the 7 days must have a peak day designation of 1.

As in all EDMS windows, pressing the Apply button allows the analyst to record any changes without exiting the window but does not save them. To save any changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

Adding Daily Operational Profiles

To add a new daily profile, press Add New, type in a name for the new profile in the Name field, and type in the proportion for each of the 7 days. Once added, a new daily profile becomes available for selection in other EDMS modules under Available Profiles.

Editing Daily Operational Profiles

To remove a profile from the list of available profiles, select the profile name and press Delete. If the analyst modifies an existing daily operational profile that is in use in other EDMS modules, they must reselect that profile in each of the modules to record the modifications. Note: See hourly profile in section 6.1.2.1. The Default profile can be modified, but cannot be deleted.

6.1.2.3   The Monthly Profiles Window

The Monthly Profiles window (Figure 6-4) allows the user to specify the proportion of peak month operations that take place in each of the 12 months in a given year. This proportion is expressed as any real number between 0 and 1 such that 0 is equal to 0% and 1 is equal to 100% known as the Proportion Factor.

Figure 6-4: The Monthly Operational Profiles Window
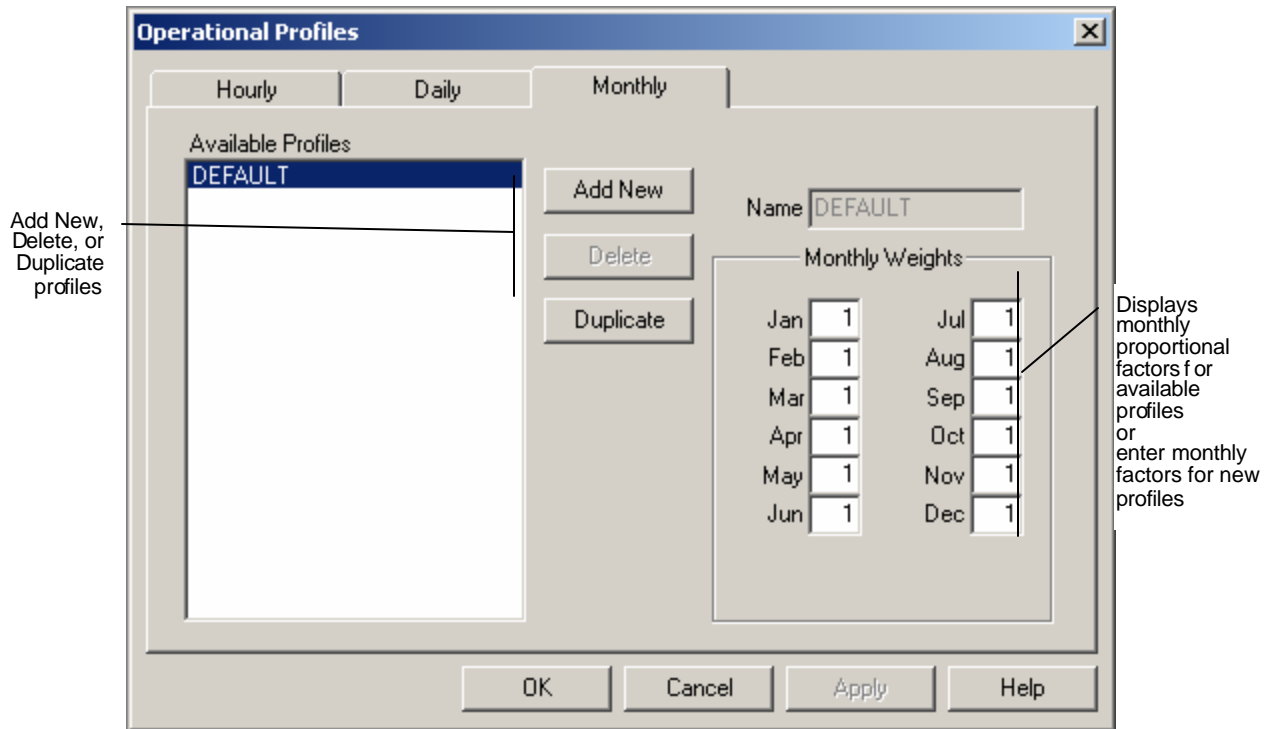
For example the peak month operations for an aircraft could be 1000, and there might be 4 months in a given year that typically experience the peak number of operations. Those 4 months might be May, August, November, and December. The monthly profile would have a proportion factor of 1 in the fields May, August, November, and December signifying that those months experienced the maximum number of operations in a month. Other months experiencing fewer than the peak number of operations would express those operations as a proportion of the maximum. For example, a month (say October) experiencing 650 operations would be expressed as factor of .65

for October in the monthly operational profile. Note: Since the monthly distribution is expressed as a proportion of a peak month figure, at least one of the 12 months must have a peak day designation of 1.

As in all EDMS windows, pressing the Apply button records any changes without exiting the window. To save the changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

Adding Monthly Operational Profiles
To add a new monthly profile, press Add New, type in a name for the new profile in the Name field, and type in the proportion factor for each of the 12 months. Once added, a new monthly profile becomes available for selection in other EDMS modules in Available Profiles.

Editing Monthly Operational Profiles
To remove a profile from the list of Available Profiles, select the profile name and press Delete. If the user modifies an existing monthly operational profile that is in use in other EDMS modules, they must reselect that profile in each of the modules to record the modifications. Note: the Default profile can be modified, but cannot be deleted.

6.1.3 New Study

To create a new study, select *File/New Study* from the pull-down menu. When the *New Study* window appears, type in the name of the study in the File Name field. Then, browse through the list of directories in the "Name The New Study" window and choose the location where the new study will be created. To create the new study press Open. To exit this window without creating a new study, press Cancel. Note: EDMS will store all user tables in the directory when the study has been created.

6.1.4 Open Study

To open an existing study, select File/Open Study from the pull-down menu. When the Open window appears, locate the study (with .edm extension) in the directory or drive in which it has been stored, select the study name, and press OK. To exit the Open window without opening a study, press Cancel.

6.1.5 Close Study

To close a study, select *File/Close Study* from the pull-down menu. EDMS will continue running, but a new study must be created or another study opened to model an airport.

6.1.6 Save Study As

To save a copy of the current study under another name, select *File/Save Study As* from the pull-down menu. When the *Save As* window appears, type the name to save the study as, choose a directory and drive, and press OK. To exit this window without saving, press Cancel.

6.1.7 Delete Study

To delete an open study, select *File/Delete Study* from the pull-down menu. To delete a previously saved study, first open the study using the *File/Open* pull-down menu, then select *File/Delete Study* from the pull-down menu.

6.1.8 Print

The Print option is available for the following EDMS windows: *View/Airport, View/Emissions Inventory*, and *View System Tables*. In the case of the *View/Airport* window, Airport Zoom In, Airport Zoom Out and Airport Zoom Home are additional functions on the View menu.

With any of the View windows displayed, select *File/Print* from the pull-down menu. When the Print window appears, the analyst will be able to select the print range, number of copies, and printer setup. To print, press OK. To leave this window without printing, press Cancel.

When printing the Emissions Inventory, the analyst can choose to print the Summary and detailed reports or to print the selected table. When printing the emissions report, printing commences to the specified default printer as soon as Print Emissions Reports is selected. To change the default printer or page setup, select File/Print Setup from the pull-down menu.

6.1.9   Print All Model Inputs

The ability to Print All Model Inputs is available only when any View remains open or when all dialogs are closed. Selecting *File/Print All Model Inputs* will enable the analyst to select the print range, the number of copies and the printer setup. To print, press OK. To leave this window without printing, press Cancel.

6.1.10 Print Preview

The Print Preview option is available from the main menu when all dialogs are closed from the following EDMS windows: *View/Airport, View/Emissions Inventory, View System Tables, View Emissions Inventory*, and *View Concentrations*.

Select File/Print Preview from the pull-down menu. When the preview window appears, the user will have a variety of pushbutton viewing options to choose from, including zoom, multi-page viewing, and printing. To print the document, press *Print*. To leave this window without printing, press Close.

6.1.11 Print Setup

The *Print Setup* option under the File pull-down menu allows the user to specify a printer other than the default printer, and to set other print parameters such as page orientation, and paper size and source. To specify a non-default printer, use the drop-down list to select the new printer. Use the radio buttons to select the paper orientation (portrait or landscape). To change the paper size and paper source, use the drop-down list and choose from the list. Additional printer setup features are available by pressing the Option button. When the analyst has completed the print setup operations, press OK. To exit the Print Setup window and return to the previously saved setup, press Cancel.

6.2 The Emissions Menu

The Emissions menu provides the user with access to dialog boxes used to specify emission sources at the airport. Information about aircraft, parking facilities, roadways, stationary sources, and training fires can be entered here. The Emissions menu has the following options:

- Aircraft & Operations

    □ Operations, APU, & Gate Tab (Gate for Dispersion)

    □ Time in Mode Tab

    □ GSE Assignment Tab

    □ Taxiway Assignment Tab

    □ Runway Assignment Tab

    □ Engine Emissions

- GSE Population (Population Based)

- Parking Facility

- Roadways

- Stationary Sources

- Training Fires

- Run Emissions Inventory

6.2.1 Aircraft Operations & Assignments Window

The *Aircraft Operations & Assignments* window (Figure 6-5) allows the user to choose from a list of Available Aircraft types and Engine Types to be included in the study. This list includes both system aircraft and user-created aircraft. Once selected, the analyst can specify Operations, Time In Mode, Gate/Equipment Assignments, Taxiway Assignments and Runway Assignment parameters for each airframe/engine configuration. Together, these fields allow for a high level of precision in specifying airframe/engine and operational configurations for a given airport.

Figure 6-5: Aircraft Operations & Assignments Window
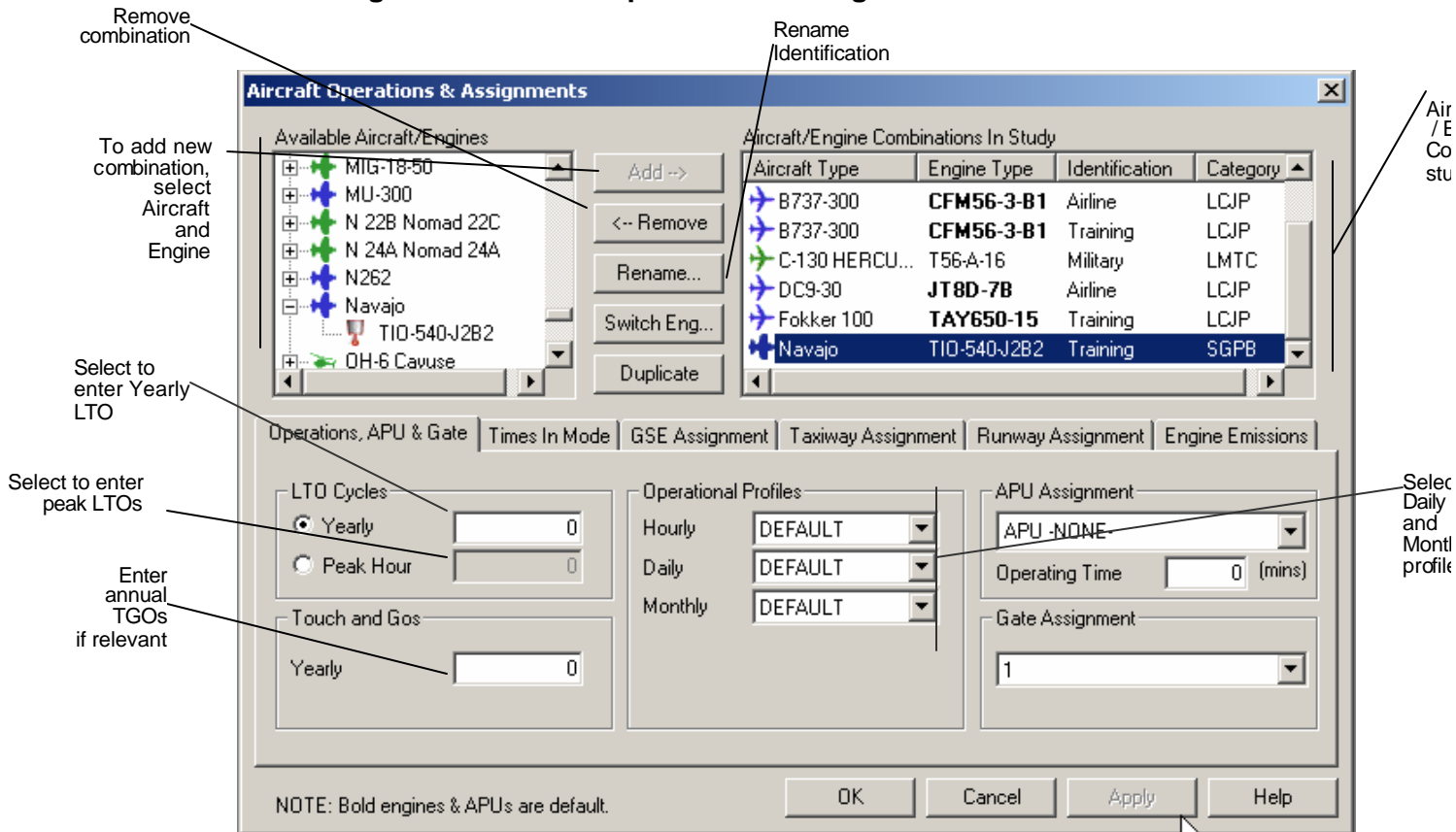
Adding and Removing Aircraft

To consider aircraft in the study, an airframe and engine type must be selected. First, choose from the list of available airframes. Once an airframe has been chosen, but before pressing Add, select an engine type from the engine drop-down list or utilize the bolded default engine. The engine types listed are those currently utilized with the airframe that is selected. When the appropriate engine type is chosen, press Add. EDMS 4.2 allows the analyst to enter the same aircraft-engine combination more than once in a study so that operations of the same aircraft can be divided among different gates, taxiways, and runways. To distinguish between different instances of the same aircraft-engine combination a unique identification for each combination must be specified. After the user adds an aircraft-engine combination to a study, the user must accept the EDMS-generated identification, which is numerically based, or provide an alternative identification. To remove an aircraft type previously added, select the aircraft type and press Remove.

Renaming the Identification
To rename the identification for an aircraft-engine combination, press the "Rename..." button, or double-click the identification.

As in all EDMS windows, pressing the Apply button records any changes without exiting the window. To save the changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

6.2.1.1 Operations , APU, & Gate Tab (See Figure 6-5)

Operational Profiles
Operational Profiles can be defined at the Hourly, Daily, or Monthly levels. These profiles are named and defined using the Operational Profiles window under the File menu. New or renamed operational profiles will appear under the appropriate drop-down list and may be selected. It is important to note that modifications to any one of the hourly, daily, or monthly default settings will affect the operational figures.

LTO Operations and TGOs
Under LTO Cycles, the user can choose between Yearly and Peak Hour Landing and Takeoff (LTO) cycles depending on what data are available.

The emissions inventory relies on the Yearly LTO cycle information. If the yearly LTO cycles figure is known, press the Yearly button and enter the number. If a yearly LTO cycle figure is not available, EDMS can derive it based on a peak hour figure and operational profiles that accurately describe the distribution of aircraft activity.

Calculation of dispersion relies on Peak Hour LTO cycles. If the peak hour LTO cycle figure is known, press the "Peak Hour" button and enter the number. If a peak hour operations figure is not available, EDMS can derive it based on a yearly LTO cycles figure and operational profiles that accurately describe the distribution of aircraft activity.

If Touch and Go (TGO) operations are relevant to the study, enter the number in the TGO Per Year box. Aircraft taxi, queue and ground support equipment operations are not included for touch and gos.

As in all EDMS windows, pressing the Apply button records any changes without exiting the window. To save the changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

Assigned Gate and APU
Dispersion of ground support equipment and auxiliary power units takes place at the assigned gate. By default, an appropriate APU is assigned to the aircraft when it is added to the study. The user is able to select a different APU, or to disable modeling of APU emissions on this screen. For dispersion analyses, gate emissions are treated either as volume or area sources depending on the user-specified gate dimensions

6.2.1.2 Time In Mode Tab

Figure 6-6: Time In Mode Tab
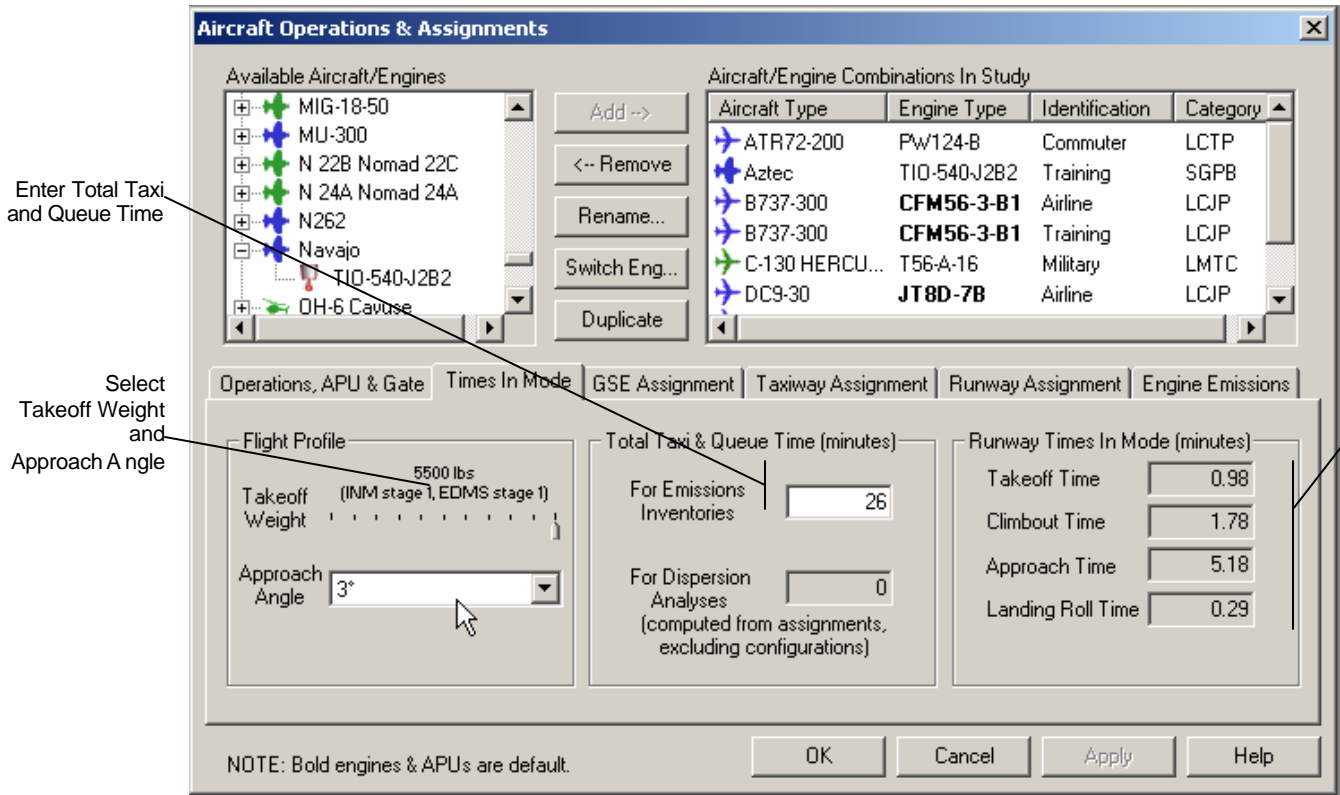
**Flight Profiles (See Figure 6-6)**
EDMS 4.2 now uses Flight Profiles based on the performance of the specific aircraft type to determine times in mode. The analyst must select a Takeoff Weight for the aircraft and an Approach Angle to be flown. Based on these parameters and the mixing height specified in the study setup screen the Takeoff, Climb Out, and Approach Times are calculated. Once the takeoff weight and approach angles have been selected, the performance-based times-in-mode are shown on the right side of the window.

Annual Average Taxi & Queue Times
The total Taxi and Queue time must be specified for each aircraft in the study for emissions inventory purposes. The default value to appear on this window is specified on the *Study Setup* screen. Airport-specific average taxi and queue times are automatically loaded when an airport is selected on the *Study Setup* screen, if they are available. EDMS 4.2 has average taxi and queue times for a select number of airports for the years 1998 through 2004. The taxi and queue times for dispersion are captured in the definition of those items, the value entered on this screen is only used for emissions inventory purposes.

6.2.1.3 GSE Assignment Tab

Figure 6-7 GSE Assignment
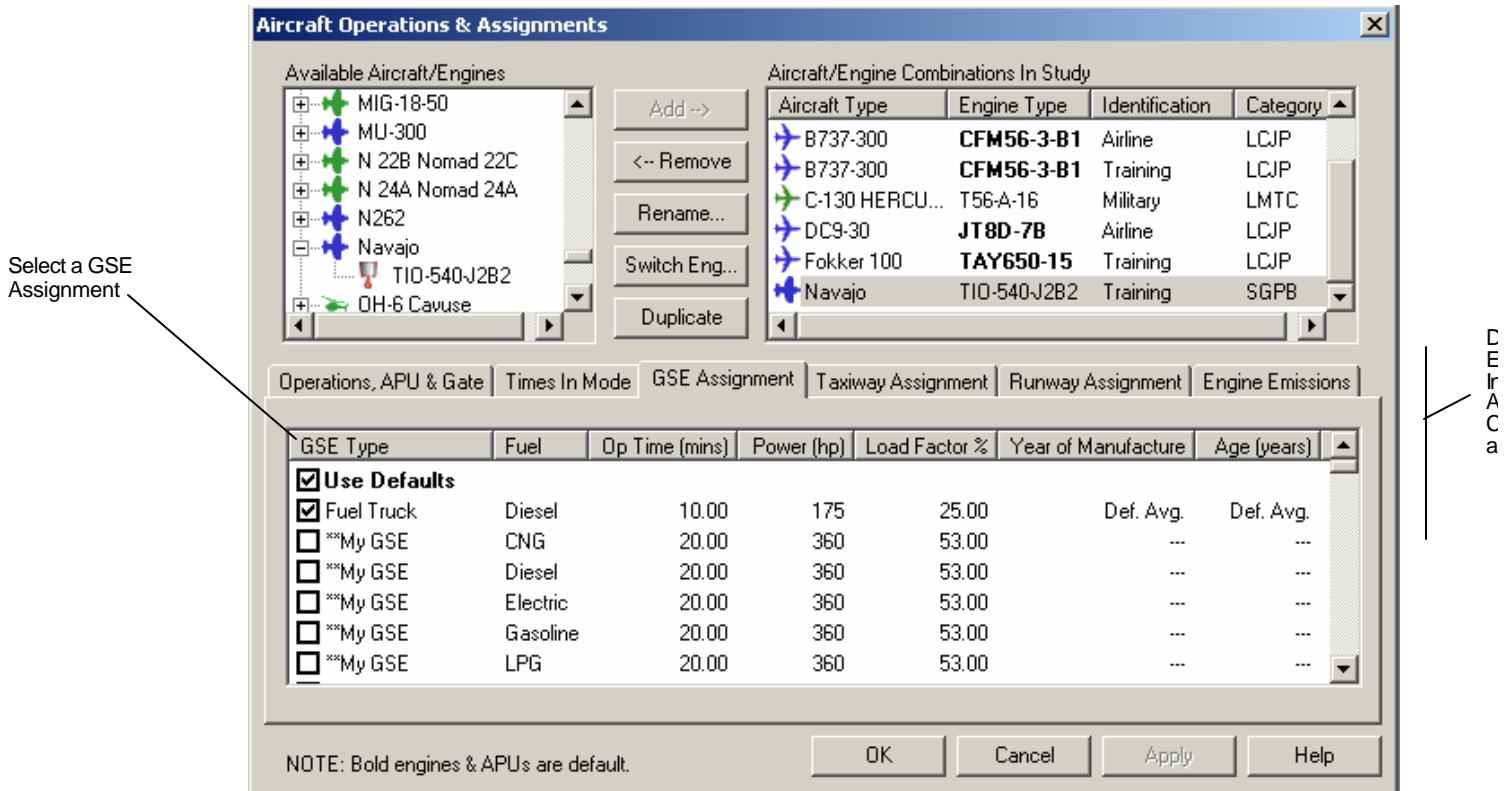
The GSE Assignments tab (See Figure 6-7) allows the user to specify the Ground Support Equipment (GSE) associated with each aircraft type used in the study. GSE emissions data are utilized in EDMS emissions and dispersion analyses. For emissions purposes, Equipment assignments are made to specific aircraft types and have an operational duration (Operation Time) associated with each aircraft LTO cycle. For dispersion analyses, Gate/Equipment emissions are treated as volume sources 1.5 m high with an initial lateral dispersion coefficient (σ_{Y_0}) of 16 m and an initial vertical dispersion coefficient (σ_{Z_0}) of 3 m.

Ground Support Equipment
GSE emissions data are utilized in EDMS emissions and dispersion analyses. For emissions inventory purposes, default equipment assignments are made to be based on aircraft type with an operating time associated with each aircraft LTO cycle. For dispersion analyses, gate emissions are treated either as volume or area sources depending on the user-specified gate dimensions.

Editing GSE
The default ground support equipment for the current aircraft is shown at the top of the list. Their assignment to the aircraft is indicated by a "checked" box (versus an empty box). The GSE assigned to the aircraft can be changed by checking the box next to the desired equipment. Default

operating times are provided to each piece of equipment. These times can be overridden by clicking on the operating time and entering a new value.

The year manufactured and age can also be edited in the same manner as previously described. Editing one automatically updates the other, based on the study year being modeled. By default, both fields indicate "Def. Avg." which stands for "default average". Neither field is applicable to user-created GSE, in which case both fields are blank. The default average year of manufacture and age will cause GSE to be modeled with same national average GSE emission factors that were developed by EPA for EDMS 4.1 based on an April 2002 version of NONROAD. If a specific year of manufacture or age is given for a GSE, NONROAD2004 emission factors will be applied. In which case, the fuel, the horsepower and the year of manufacture determine the zero-hour emission factor and the age and GSE type determine the deterioration to be applied. To restore the age or year of manufacture to their default value, blank out either value while editing or enter an invalid value. To add new GSE from this dialog, right click on the checklist and select the "Add New" option to go to the *user-created GSE* window to add more GSE. To edit a specific GSE from this dialog, make sure the GSE is unchecked, then right-click on a user-created GSE name and select the "Edit" option to go to the user-created GSE window to edit the selected GSE.

6.2.1.4 Taxiway Assignment Tab

Figure 6-8 Taxiway Assignment Tab
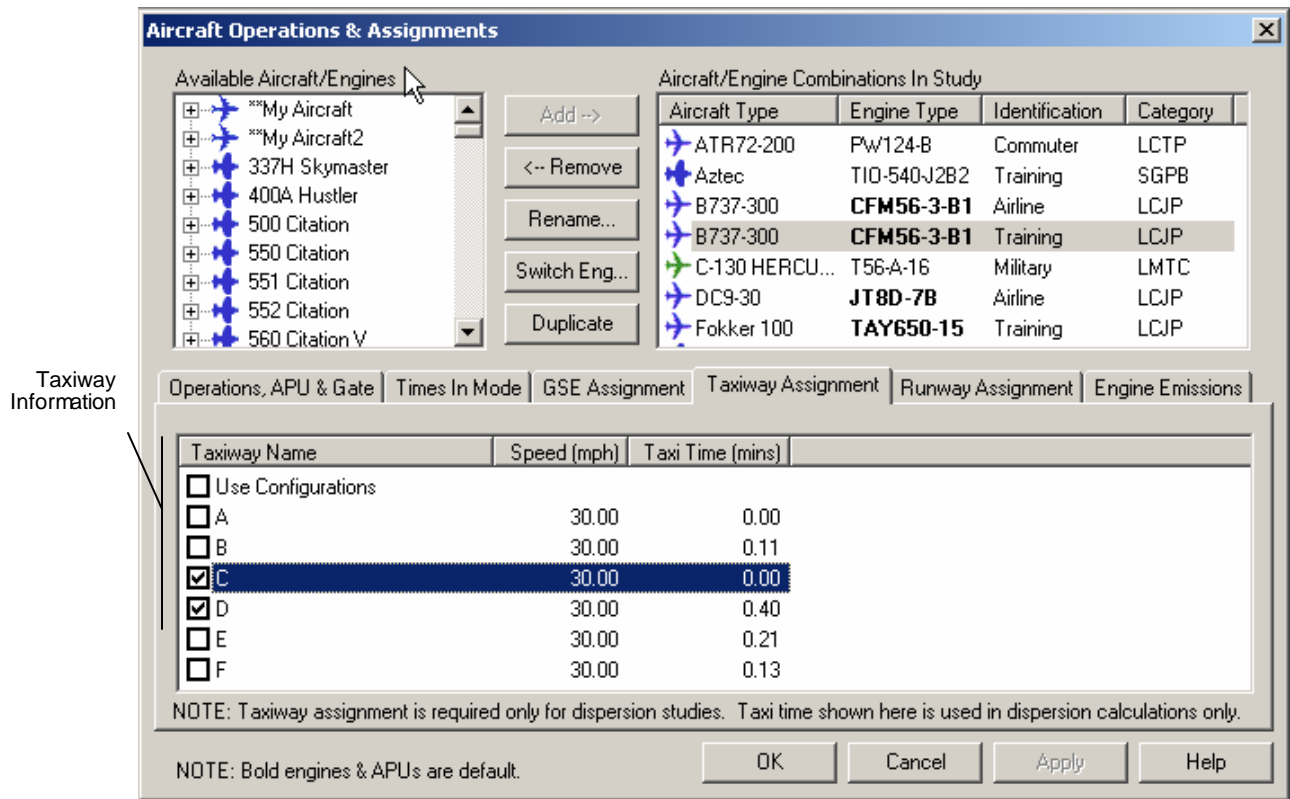
With this tab (See Figure 6-8), the user can assign an aircraft to an unlimited number of taxiways for dispersion purposes. Select the taxiways used by this aircraft by checking the box next to the name of the taxiway.

Taxiway information appears next to the name. To change the coordinates for the taxiway, select *Aircraft Taxiways* from the airport menu. Alternatively, the "use configurations" box may be selected to have the aircraft use the defined configurations to determine its runway and taxiway assignments.

6.2.1.5 Runway Assignment Tab

Figure 6-9: The Runway Assignment Tab

This is a powerful feature in EDMS (See Figure 6-9) that will allow the analyst to adjust the percentage of operations of a specific aircraft in the study for separate arrival and departure runways. Each runway in the study is shown in the list to the right. Simply click in the columns to the right of the runway name to adjust the percentage of operations. Alternatively, the aircraft can be assigned to use the configurations defined on the configurations screen. This information is used for dispersion analyses only.

6.2.1.6 Engine Emissions Tab

The Engine Emissions Tab (see Figure 6-10) allows the user to view the emission factors for the selected aircraft. This provides a quick way for the analyst to check the values that are being used. The user is not able to modify these values.

Figure 6-10. The Engine Emissions Tab.
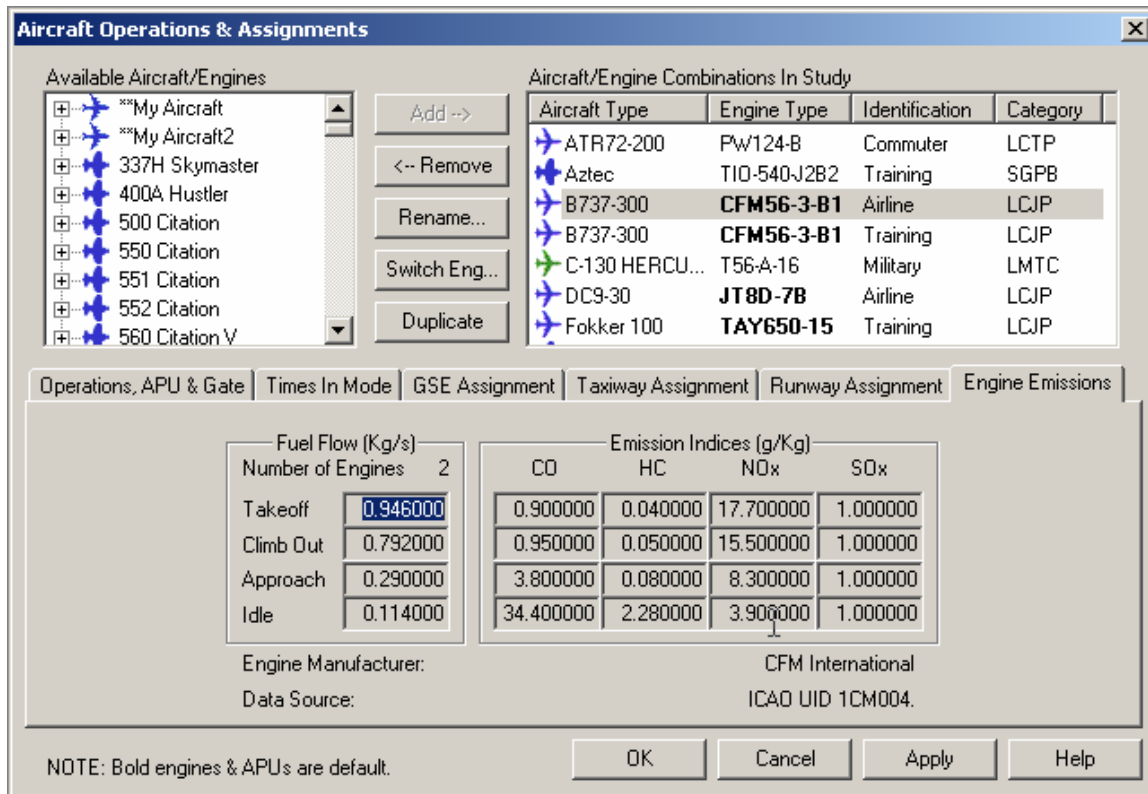
6.2.2   GSE Population (see Figure 6-11)

The GSE Population dialog allows the analyst to choose from a list of available GSE types to be included in the study. This list includes both system and user-created GSE. Once added, the user can specify the airport population, operating time and profiles, fuel used, power rating, load factor and gate assignments. Together, these fields allow for a high level of precision in specifying a GSE population for a given airport. This dialog box is only available if "Population Based" is chosen as the GSE Modeling Basis in the study setup dialog box.

Adding GSE

To add a GSE population to a study, a GSE type must be selected. First, choose a type from the Available Equipment tree. To expand a type to see the list of available fuels, press the "+" to the left of the GSE type (or use the right arrow key). The fuels listed are those currently utilized with the selected GSE type. If there is more than one reference model (make and model of a typical GSE in use today) for a particular fuel, the fuel must also be expanded and a reference model selected.

When the appropriate reference model is highlighted, press the *Add* button. If there is no choice of reference model, simply select the fuel only and press the *Add* button. Alternatively, right-click on the reference model (or fuel) and select *Add* from the popup menu that appears. Double-clicking will also add a GSE to the study.

Editing GSE Population

For the population field, enter the number of the selected GSE that are present at the airport. However, the average piece of equipment realistically does not run continuously, so the user should specify an operating time and operational profiles.

If the average annual usage of each piece of equipment is known, select the *Yearly* radio button and enter in the number hours of annual use. Otherwise, if the number of minutes an average piece of equipment is known to be used during an hour of peak activity, select *Peak Hour* and enter the number of minutes per peak hour.

Selecting "*Use System Emission Factors*" will cause GSE to be modeled with the same national average GSE emission factors that were developed by the U.S. EPA for previous versions of EDMS. However, if "*Use Draft NONROAD Emission Factors*" is selected, the latest (May 2004) draft NON-ROAD emission factors will be applied. In which case, the fuel, the horsepower and the year of manufacture determine the zero-hour emission factor and the age and GSE type determine the deterioration to be applied.

The Rated Power and Load Factor are multipliers for the emission factors. GSE emission factors are in units of grams-per-hour-per-horsepower. When the rated power and load factor are multiplied by the emission factors, the results are quantities of grams-per-hour. Multiplying this by the population gets grams-per-hour of the entire population, if every piece of equipment in the population was running simultaneously and continuously over an entire hour.

The user has the option of using the System Emission Factors or to use the Draft Non-Road Emission Factors. If "*Use Draft Nonroad Emission Factors*" is selected, the user may edit the year of manufacture for the GSE population or the age. Editing one value automatically adjusts the other according to the study year. New equipment is modeled as being of age "0" years. The year of manufacture cannot be later than the study year, nor can the GSE be more than 100 years old.

Figure 6-11 GSE Population

6-18

6.2.3 Parking Facilities

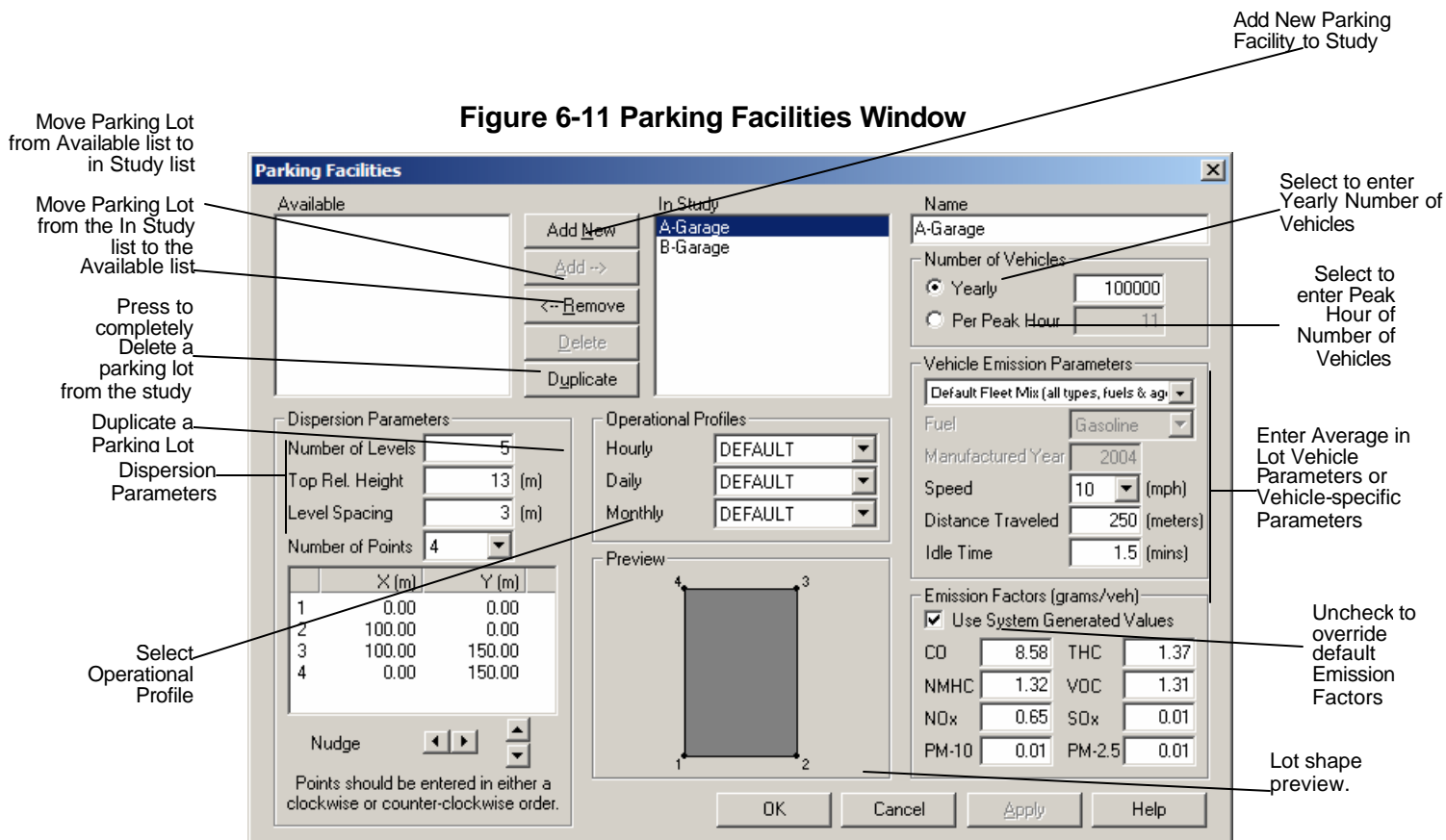**The Parking Facilities Window (see Figure 6-12).**

The Parking Facilities window allows the user to specify the parking facility information relevant to the study. Parking Facilities data are used by EDMS in both emissions and dispersion analyses. For emissions purposes, calculations are based upon the Number of Vehicles in each lot, as well as the Speed in Lot, Average Idle Time, and Average Distance Traveled in Lot for those vehicles. If using MOBILE6, emissions are also a function of vehicle fleet mix or vehicle type, *Fuel* and *Manufactured Year*. If using MOBILE6, use the first drop down list to select either "Default Fleet Mix" or one of 16 vehicle types:

1. Light Duty Vehicles (Passenger Cars)

2. Light Duty Trucks 1 (0-6,000 lbs. GVWR, 0-3750 lbs. LVW)

3. Light Duty Trucks 2 (0-6,000 lbs. GVWR, 3751-5750 lbs. LVW)

4. Light Duty Trucks 3 (6,001-8500 lbs. GVWR, 0-3750 lbs. LVW)

5. Light Duty Trucks 4 (6,001-8500 lbs. GVWR, 3751-5750 lbs. LVW)

6. Class 2b Heavy Duty Vehicles (8501-10,000 lbs. GVWR)

7. Class 3 Heavy Duty Vehicles (10,001-14,000 lbs. GVWR)

8. Class 4 Heavy Duty Vehicles (14,001-16,000 lbs. GVWR)

9. Class 5 Heavy Duty Vehicles (16,001-19,500 lbs. GVWR)

10. Class 6 Heavy Duty Vehicles (19,501-26,000 lbs. GVWR)

11. Class 7 Heavy Duty Vehicles (26,001-33,000 lbs. GVWR)

12. Class 8a Heavy Duty Vehicles (33,001-60,000 lbs. GVWR)

13. Class 8b Heavy Duty Vehicles (>60,000 lbs. GVWR)

14. School Busses

15. Transit and Urban Busses

16. Motorcycles

For dispersion analyses, *Parking Facilities* emissions are treated as area sources by EDMS. Parking facilities emissions are located spatially within the airport using the (x,y) coordinates. In EDMS 4.2 a polygon of up to 20 sides can be used to define the shape of the parking lot. The number of parking levels can also be specified as well, which represent the number of area sources to be vertically stacked one on top of the other.

As in all EDMS windows, pressing the Apply button records any changes without exiting the window. To save the changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

Figure 6-11 Parking Facilities Window

Move Parking Lot from Available list to in Study list

Move Parking Lot from the In Study list to the Available list

Press to completely Delete a parking lot from the study

Duplicate a Parking Lot

Dispersion Parameters

Select Operational Profile

Add New Parking Facility to Study

Select to enter Yearly Number of Vehicles

Select to enter Peak Hour of Number of Vehicles

Enter Average in Lot Vehicle Parameters or Vehicle-specific Parameters

Uncheck to override default Emission Factors

Lot shape preview.

Adding Parking Facilities Information

To add a parking facility, press the Add New button at the top of the window and type in the parking facility name. Once added, parking facilities can remain in the current study, or be moved to a list of available facilities.

Once the user has added a parking facility to the study, additional information will be required depending on whether the analyst is conducting an emissions or dispersion analysis. Emissions information such as number of vehicles, speed, idle time, operational profiles and distance traveled are located in emissions tab. Dispersion information including coordinates and source height are located in dispersion tab.

Editing Parking Facilities Information

To move a parking facility from the In Study list to the Available list, select the parking facility name and press Remove. To move a parking facilities from the Available list to the In Study list, select the parking facility name and press Add.

Graphical Display

Parking facilities that are part of the In Study list are displayed in the Airport Graphical Display. Parking facilities in the Available list are not displayed.

Parking Facilities Emissions

An emissions study (see Figure 6-11) requires the user to provide specific information on Number of Vehicles, Speed in Lot, Average Idle Time, and Average Distance Traveled, or entering aircraft-specific information. The user has the option of using default values.

The Number of Vehicles is expressed either in yearly operations or peak hour operations. The emissions inventory relies on yearly operations. If the yearly operations figure is known, press the Yearly radio button and enter the number. If a yearly operations figure is not available, EDMS can derive it based on a peak hour operations figure and operational profiles that accurately describe the distribution of vehicle activity.

Depending on the version of MOBILE in use, vehicle emission factors are a function of speed in lot, idle time, fuel, manufactured year and distance traveled (as well as altitude, temperature, and year as entered in the Study Setup window). Specify the speed for vehicles traveling in the parking facility by selecting from the drop-down list. Specify the idle time in minutes and the distance a vehicle would be expected to travel in the lot by typing the information into the appropriate field.

Finally the analyst can choose to override the MOBILE-based vehicle emission factors. In the lower right corner there is a window displaying the emission factors (in grams per vehicle) for CO, THC, NMHC, VOC, NOx, SOx, PM-2.5 and PM-10, as calculated by the version of MOBILE specified in the study setup based on the aforementioned factors. To override these figures, simply uncheck the "Use System Generated Values", type in the new emission factors and press Apply. To exit without recording changes, press Cancel.

Parking Facilities Dispersion
The dispersion analysis (See Figure 6-11) relies on Peak Hour operations. If the peak hour operations figure is known, press the Peak Hour radio button and enter the number. If a peak hour operations figure is not available, EDMS will derive it from a yearly operations figure and operational profiles that accurately describe the distribution of vehicle activity.

Most fields may be edited by simply selecting the field and typing in the new information. Yearly and Peak Hour figures are activated using the radio buttons and then modified by typing in the new information in the text fields. Speed in Lot and Operational Profiles are modified using the drop down menus.

Performing a dispersion analysis requires the analyst to specify dimensions of the parking facility. The parking facility dimensions fields locate the parking facility spatially in the airport configuration and provide information on parking facility width and height. First type in the number of points, then type in the (x, y) coordinates for each of the parking facility points as well as the parking facility height. The (x, y) coordinates are used to specify a polygon of up to 20 sides. A preview of the parking facility is provided to the right of the coordinates.

6.2.4   Roadways

The Roadways Window
The *Roadways* window (Figure 6-13) allows the user to specify the roadway information relevant to the study. Roadways data are used by EDMS in both emissions and dispersion analyses. For emissions purposes, calculations are based upon the Number of Vehicles on the roadway, as well as the Speed and Vehicle Round-Trip Distance for those vehicles. For dispersion analyses, Roadway emissions are treated as a series of area sources 20 m wide by EDMS. Roadway emissions sources are located spatially within the airport using the (x, y) coordinates. Once the user has added a roadway to the study, additional information will be required depending on whether the analyst is conducting an emissions or dispersion analysis. Emissions information such as vehicle activity and Vehicle Round-Trip Distance are located in the top half of the window. Dispersion information including coordinates and operational profiles are located in the lower half of the window.

As in all EDMS windows, pressing the Apply button records any changes without exiting the window. To save the changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

Adding a Roadway

To add a roadway, press the Add New, button at the bottom of the window and type in the roadway name. Once added, roadways can remain in the current study, or be moved to a list of available roadways.

Figure 6-12 The Roadways Window
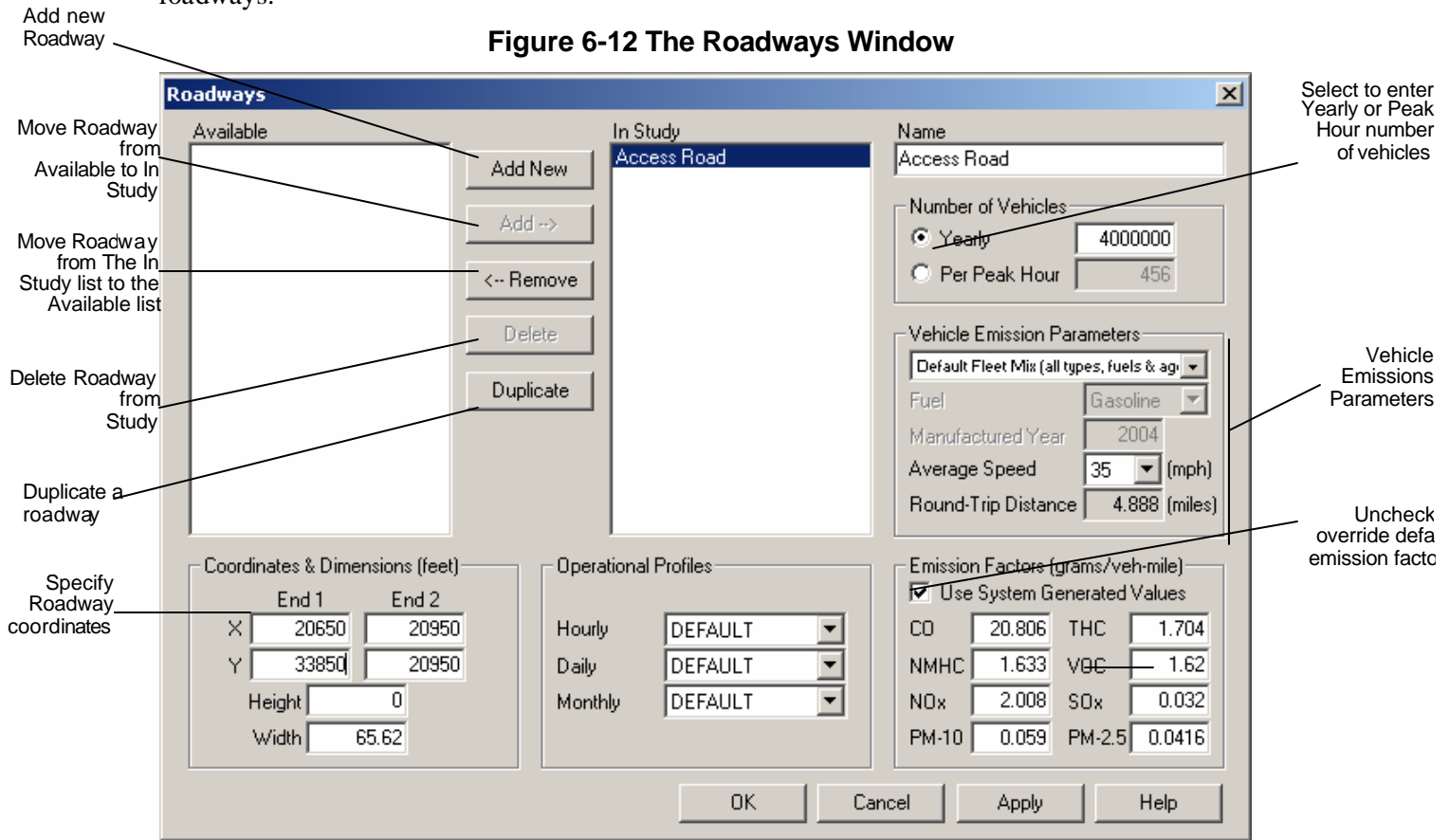
Editing a Roadway

To move a roadway from the In Study list to the Available list, select the roadway name and press Remove. To move a roadway from the Available list to the In Study list, select the roadway name and press Add.

Operational Profiles

Operational Profiles can be defined at the Hourly, Daily, or Monthly levels. These profiles are named and defined using the Operational Profiles window under the File menu. New or renamed operational profiles will appear under the appropriate drop-down list and may be selected. It is important to note that modifications to any one of the hourly, daily, or monthly default settings will affect the operational figures.

Graphical Display

Roadways that are part of the In Study list are displayed in the Airport Graphical Display (View/Airport). Roadways in the Available list are not displayed.

Roadway Emissions

An emissions study requires the user to provide specific information on Number of Vehicles, Speed, and Vehicle Round-Trip Distance.

Number of Vehicles is expressed either in yearly operations or peak hour operations. The emissions inventory relies on yearly operations. If the yearly operations figure is known, press the Yearly radio button and enter the number. If a yearly operations figure is not available, EDMS can derive it based on a peak hour operations figure and operational profiles that accurately describe the distribution of roadway activity.

Depending on the version of MOBILE in use, vehicle emissions are a function of speed, fuel, manufactured year (as well as altitude, temperature, and vehicle fleet year as entered in the Study Setup window). Specify the speed for the roadway by selecting from the drop-down list. Vehicle Round-Trip Distance is utilized in emissions calculations. *Note: Vehicle Round-Trip Distance can also be specified using the coordinates fields under dispersion input. The value will be twice the length of the roadway, since EDMS assumes all roadways have two-way traffic and that all vehicles traverse the length of the roadway twice (once on the way to the terminal building and one on the way out).*

Finally, the Edit Factors check box allows the analyst to override the MOBILE based vehicle emission factors. After pressing this check box in the lower right corner, the analyst can edit the emissions factors (in grams per vehicle) for CO, THC, NMHC, VOC, NOx, SOx, and PM-2.5, PM-10, by simply typing in the new emission factors and pressing Apply. To exit the without recording changes, press Cancel

Roadway Dispersion

The dispersion analysis relies on Peak Hour operations. If the peak hour operations figure is known, press the Peak Hour radio button and enter the number. If a peak hour operations figure is not available, EDMS will derive it from a yearly operations figure and operational profiles that accurately describe the distribution of roadway activity.

In addition, performing a dispersion analysis requires the user to specify Coordinates and Operational Profiles.

The roadway coordinates locate the roadway spatially in the airport configuration and provide information on roadway dimensions. Type in the (x,y) coordinates for the roadway in the coordinates text fields.

6.2.5 Stationary Sources

The Stationary Sources Window

The Stationary Sources window (Figure 6-14) allows the analyst to specify the stationary source information relevant to the study. Stationary Source data are used by EDMS in both emissions and dispersion analyses. For emissions inventory purposes, calculations are based upon the amount of material used or consumed, as well as several other parameters based on the Category and Type of the stationary source. For dispersion analyses, stationary source emissions are treated as a series of rectangular area sources. Stationary source emissions are located spatially within the airport using the (x,y) coordinates, and dispersion takes into account Source Height, Source Diameter, Gas Velocity, and Temperature.

Figure 6-14: The Stationary Sources Window
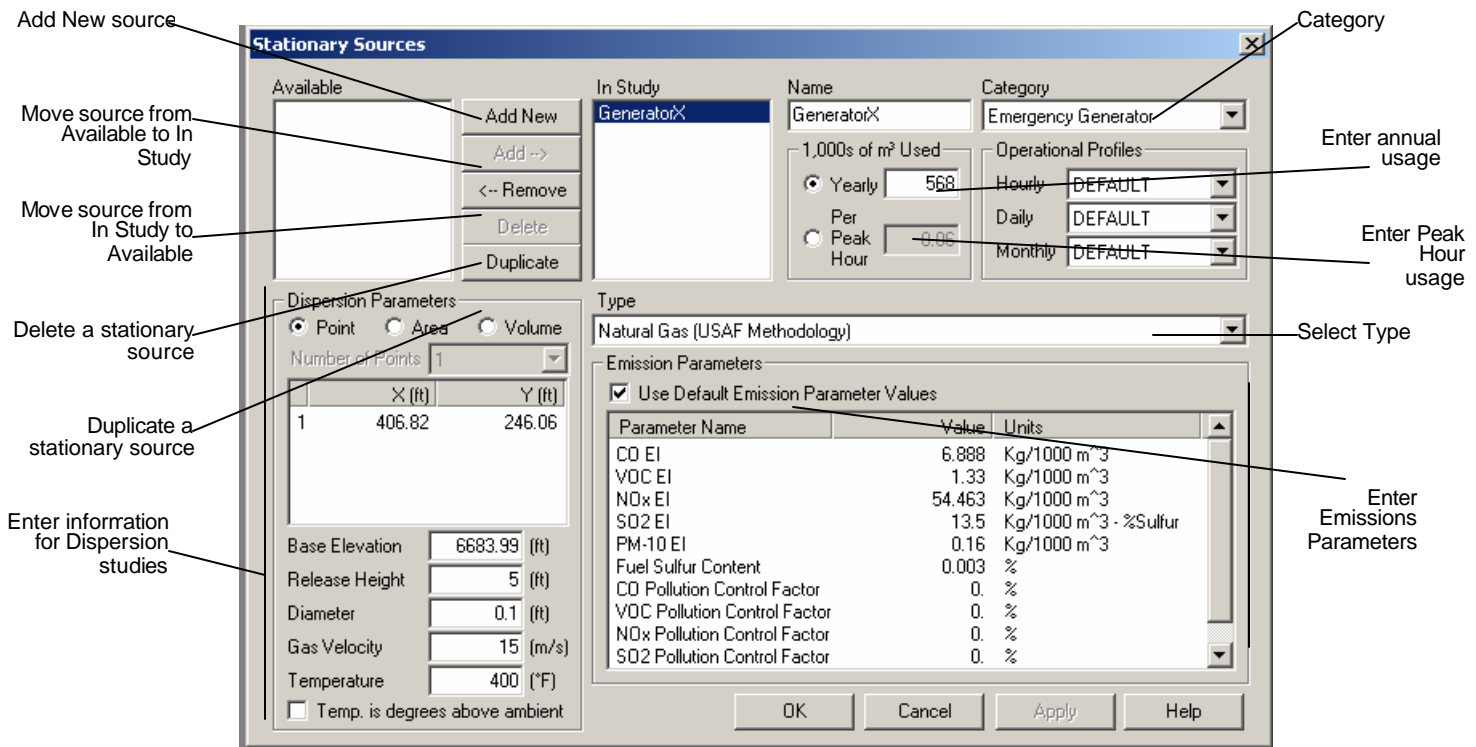
As in all EDMS windows, pressing the Apply button records any changes without exiting the window. To save the changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

Adding a Stationary source
To add a stationary source, press the Add New button at the top of the window and type in the name for the stationary source. Next, choose the category of stationary source and, if applicable, the type. Once added, Stationary Sources can remain in the current study, be moved to a list of available Stationary Sources, or deleted from the study entirely.

Once a stationary source has been added to the study, additional information will be required depending on whether the analyst is conducting an emissions or dispersion analysis. Emissions information such as emission factors and quantity used are located in the lower half of the window. Dispersion information such as coordinates, release height, source diameter, gas velocity, gas temperature (if applicable), are located in the lower left corner of the window.

Editing a Stationary source
To move a stationary source from the In Study list to the Available list, select the stationary source name and press Remove. To move a stationary source from the Available list to the In Study list, select the stationary source name and press Add.

Emissions
Based upon the nature of the fuel, the substance consumed, or throughput, emission factors are displayed either as *Kg/Metric Ton Kg/Kiloliter*, *Kg/Thousand Cubic Meters, Kg/Hour or Kg/Test Cycle*. Emission factors and parameters may be modified if the user obtains site-specific data, but there is no validity checking performed to verify that the modified emission factors are actually valid for the selected *Category* and *Type*.

The *Yearly* and Per *Peak Hour* values specify the amount of time, fuel or substance consumed or throughput, and these are specified in *Metric Tons*, *Kiloliters*, *Thousands of Cubic Meters, Hours* or *Test Cycles* as appropriate. EDMS gives the user the flexibility to identify generic stationary sources. For miscellaneous stationary sources, the user has the option of choosing the *Other* category and entering their own emission factors in their choice of units. For such sources, the user is required to provide user-specified emission factors. Stationary source emissions are also a function of emission factors for the particular source type the user is analyzing.

Dispersion
Performing a dispersion analysis requires the analyst to specify the dimensions of the stationary source and to select how AERMOD should model the stationary source: as a Point, Area or Volume. For area sources, select the *Number of Points* from the drop down list. Then, type in the (*x, y*) coordinates for each of the stationary source points as well as the base elevation and release height. For area sources, the (*x, y*) coordinates are used to specify a polygon of up to 20 sides and can be edited by double-clicking on a value. The coordinates must be entered in either clockwise or counter clockwise order. For points and volumes, only one (*x, y*) coordinate pair is entered. For point sources, specify the *Diameter*, *Gas Velocity* and *Temperature*. For area and volume sources, enter the initial vertical dispersion parameter, *Sigma-Z0*. For volume sources, also enter the initial horizontal dispersion parameter, *Sigma-Y0*.

Operational Profiles
Operational Profiles can be defined at the Hourly, Daily, or Monthly levels. These profiles are named and defined using the Operational Profiles window under the File menu. New or renamed operational profiles will appear under the appropriate drop-down list and may be selected. It is important to note that modifications to any one of the hourly, daily, or monthly default settings will affect the operational figures.

Graphical Display
Stationary Sources that are part of the In Study list are displayed in the Airport Graphical Display (View/Airport). Stationary Sources in the Available list are not displayed.
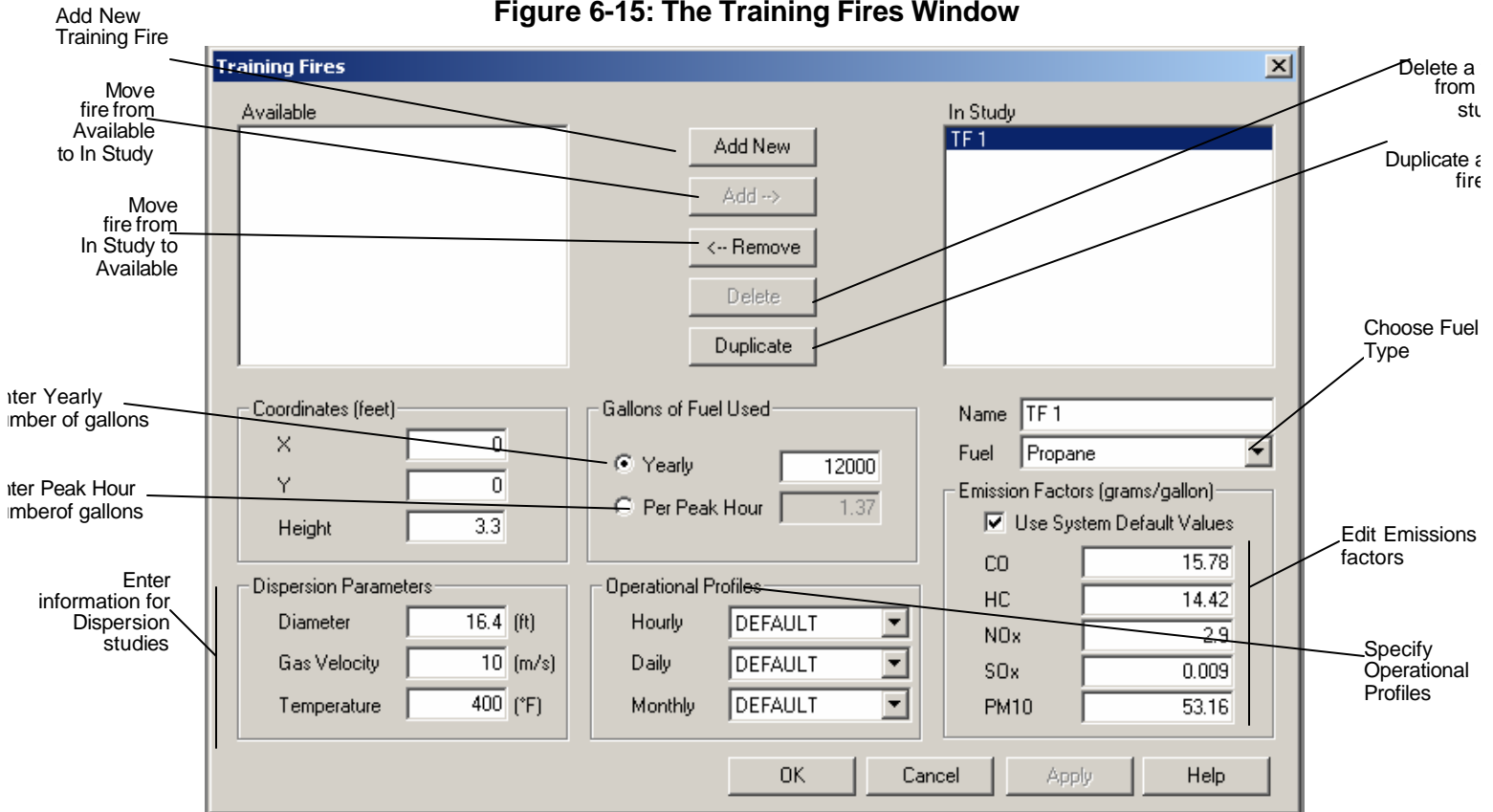
6.2.6   Training Fires

The Training Fires Window
The *Training Fires* window (Figure 6-15) allows the user to specify the training fire information relevant to the study. Training Fires data are used by EDMS in calculating an emissions inventory and in performing a dispersion analysis. For emissions purposes, calculations are based upon the Fuel Type and Gallons of Fuel Used for those fires. For dispersion analyses, Training Fire emissions are treated as point sources by EDMS. Training fire emissions are located spatially within the airport using the (x,y) coordinates, and take into account the Source Height, Temperature, Source Diameter, and Gas Velocity of each fire.

As in all EDMS windows, pressing the Apply button records any changes without exiting the window. To save the changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

Figure 6-15: The Training Fires Window

Add New
Training Fire

Move
fire from
Available
to In Study

Move
fire from
In Study to
Available

nter Yearly
mber of gallons

nter Peak Hour
mberof gallons

Enter
information for
Dispersion
studies

Delete a
from
stu

Duplicate a
fire

Choose Fuel
Type

Edit Emissions
factors

Specify
Operational
Profiles

Training Fires

Available

In Study
TF 1

Add New

Add -->

<-- Remove

Delete

Duplicate

Coordinates (feet)
X   0
Y   0
Height   3.3

Gallons of Fuel Used
● Yearly   12000
○ Per Peak Hour 1.37

Name TF 1
Fuel Propane

Emission Factors (grams/gallon)
☑ Use System Default Values
CO   15.78
HC   14.42
NOx   2.9
SOx   0.009
PM10   53.16

Dispersion Parameters
Diameter   16.4 (ft)
Gas Velocity   10 (m/s)
Temperature   400 (°F)

Operational Profiles
Hourly   DEFAULT
Daily   DEFAULT
Monthly DEFAULT

OK   Cancel   Apply   Help

Adding a Training Fire
To add a training fire, press the Add New button and type in the training fire name. Once added, training fires can remain in the current study, or be moved to a list of available training fires.

Once the user has added a training fire to the study, additional information will be required depending on whether the analyst is conducting an emissions inventory or performing dispersion analysis. Emissions information such as fuel type and gallons of fuel used are located on the right side in the center of the window. Dispersion information including coordinates, training fire height, combustion temperature, diameter, gas velocity, and operational profiles are located on the left side towards the lower half of the window.

Editing a Training Fire
To move a training fire from the In Study list to the Available list, select the training fire name and press Remove. To move a training fire from the Available list to the In Study list, select the training fire name and press Add.

Emissions
An emissions study that includes training fires will require the user to provide specific information on Fuel Type, and Gallons of Fuel Used.

Training Fire activity is expressed either in gallons of fuel used per year or gallons of fuel used at peak hour. The emissions inventory relies on yearly operations. If the yearly operations figure is known, press the *"Yearly"* button and enter the number. If a yearly operations figure is not available, EDMS will derive it from a peak hour operations figure and operational profiles that accurately describe the distribution of training fire activity.

Training fire emissions are also a function of fuel type. Specify the fuel type for the training fire by selecting from the drop-down list.

Dispersion

The dispersion calculations rely on Peak Hour operations. If the peak hour activity figure is known, press the "Peak Hour" radio button and enter the number. If a peak hour operations figure is not available, EDMS will derive it from a yearly activity figure and operational profiles that accurately describe the distribution of training fire activity.

In addition, performing a dispersion analysis requires the user to specify Coordinates, Source Height, Temperature, Diameter, and Gas Velocity figures.

The training fire coordinates and source height locate the training fire spatially in the airport configuration. Type in the (x,y) coordinates and height for the training fire in their respective text fields.

Training fire dimensions and exhaust characteristics are also required for dispersion analysis. Enter the exhaust temperature, diameter, and gas velocity relevant to the type of training fire being analyzed.

Operational Profiles

Operational Profiles can be defined at the Hourly, Daily, or Monthly levels. These profiles are named and defined using the Operational Profiles window under the File menu. New or renamed operational profiles will appear under the appropriate drop-down list and may be selected. It is important to note that modifications to any one of the hourly, daily, or monthly default settings will affect the operational figures.

Graphical Display

Training Fires that are part of the In Study list are displayed in the Airport Graphical Display (View/Airport). Training Fires in the Available list are not displayed.

6.2.7   Run Emissions Inventory

Run Emissions Inventory

When all emissions data have been entered, an emissions inventory can be run by selecting *Run Emissions Inventory* from the *Emissions* pull-down menu. When the emissions inventory is completed, the Emissions Inventory summary window will appear displaying the emissions totals for the emissions categories in the study.

6.3 The Airport Menu

The Airport Menu consists of the following options:
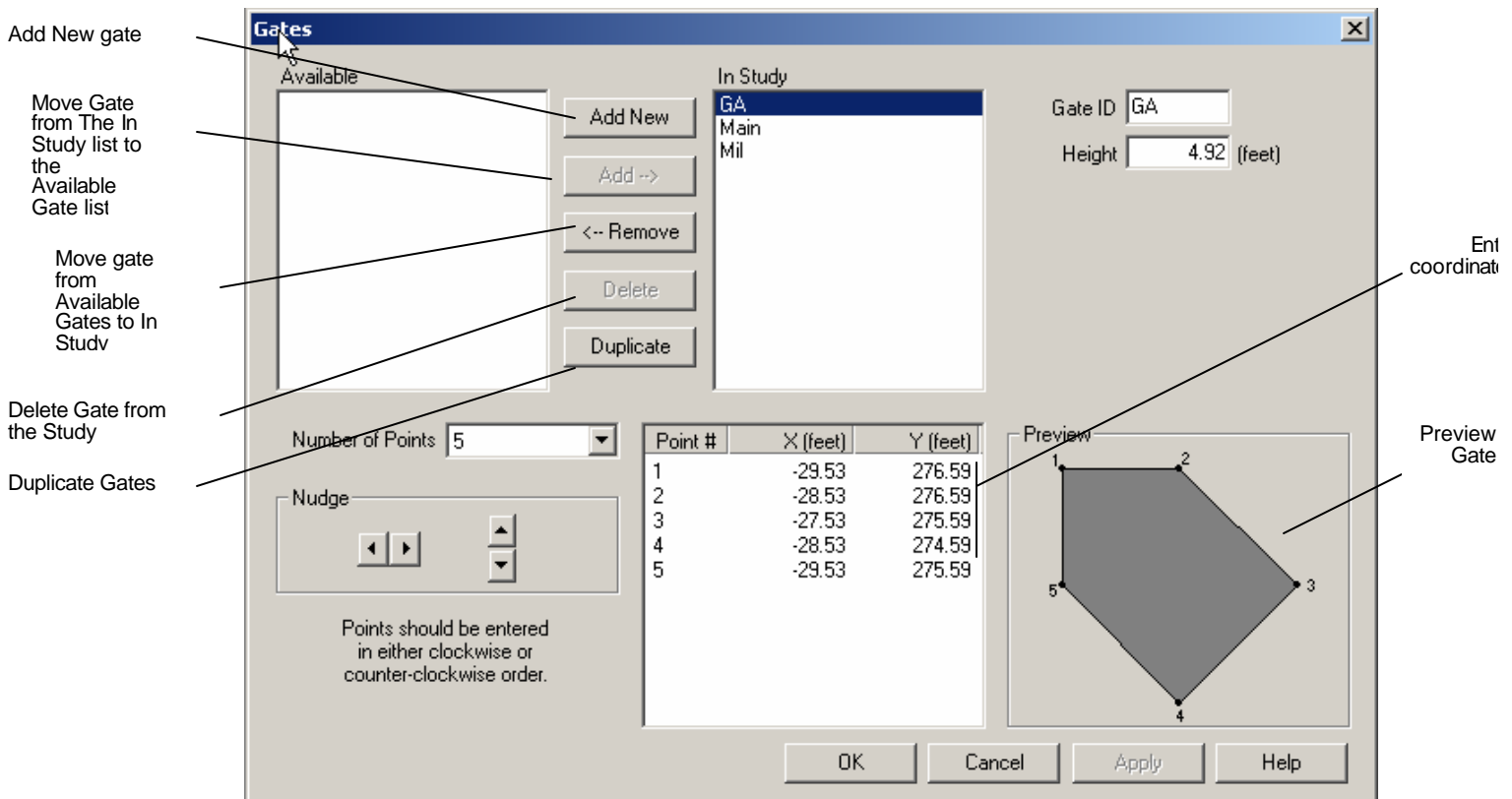
- Gates

- Aircraft Taxiways

- Runways

- Buildings

6.3.1 Gates

The Airport Gates Window

The Airport Gates window (Figure 6-16) allows the analyst to specify the ID and location of each gate in the airport. In the context of EDMS dispersion analyses, GSE and APU emissions are considered to originate from the airport gate locations specified in this module. Aircraft are assigned to specific gates on the Aircraft & Operational Assignments window under the Emissions menu.

As in all EDMS windows, pressing the Apply button records any changes without exiting the window. To save the changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

Figure 6-16: The Airport Gates Window

Adding Airport Gates

To add a gate, press Add New, and type in the gate ID and coordinates in the appropriate fields. Once added, gates can remain in the current study, or be moved to a list of available gates.

Editing Airport Gates

To move a gate from the In Study list to the Available list, select the gate name and press Remove. To move a gate from the Available list to the In Study list, select the gate name and press Add.

Graphical Display

Gates that are part of the In Study list are displayed in the Airport Graphical Display. Gates in the Available list are not displayed.

6.3.2 Aircraft Taxiways

The Aircraft Taxiways Window

The Aircraft Taxiways window (Figure 6-17) allows the user to specify the names and location of taxiways for the airport. Emissions data associated with aircraft taxiways are utilized by EDMS for calculation of dispersion analysis. To calculate dispersion, aircraft assignments are made to specific taxiways having an operational duration (taxi time), and a spatial location within the airport (x,y) coordinates. EDMS treats taxiways as a series of area sources for purposes of dispersion analysis.

As in all EDMS windows, pressing the Apply button records any changes without exiting the window. To save the changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

Adding Aircraft Taxiways

To add a taxiway, press Add New, and then enter the taxiway name and coordinates in the appropriate fields. Once added, taxiways can remain in the current study, or be moved to a list of available taxiways. The amount of time aircraft spend on the taxiway is automatically calculated based on the taxiway coordinates (i.e., taxiway length) and a taxi speed of 30 MPH.

Figure 6-17: The Aircraft Taxiways Window
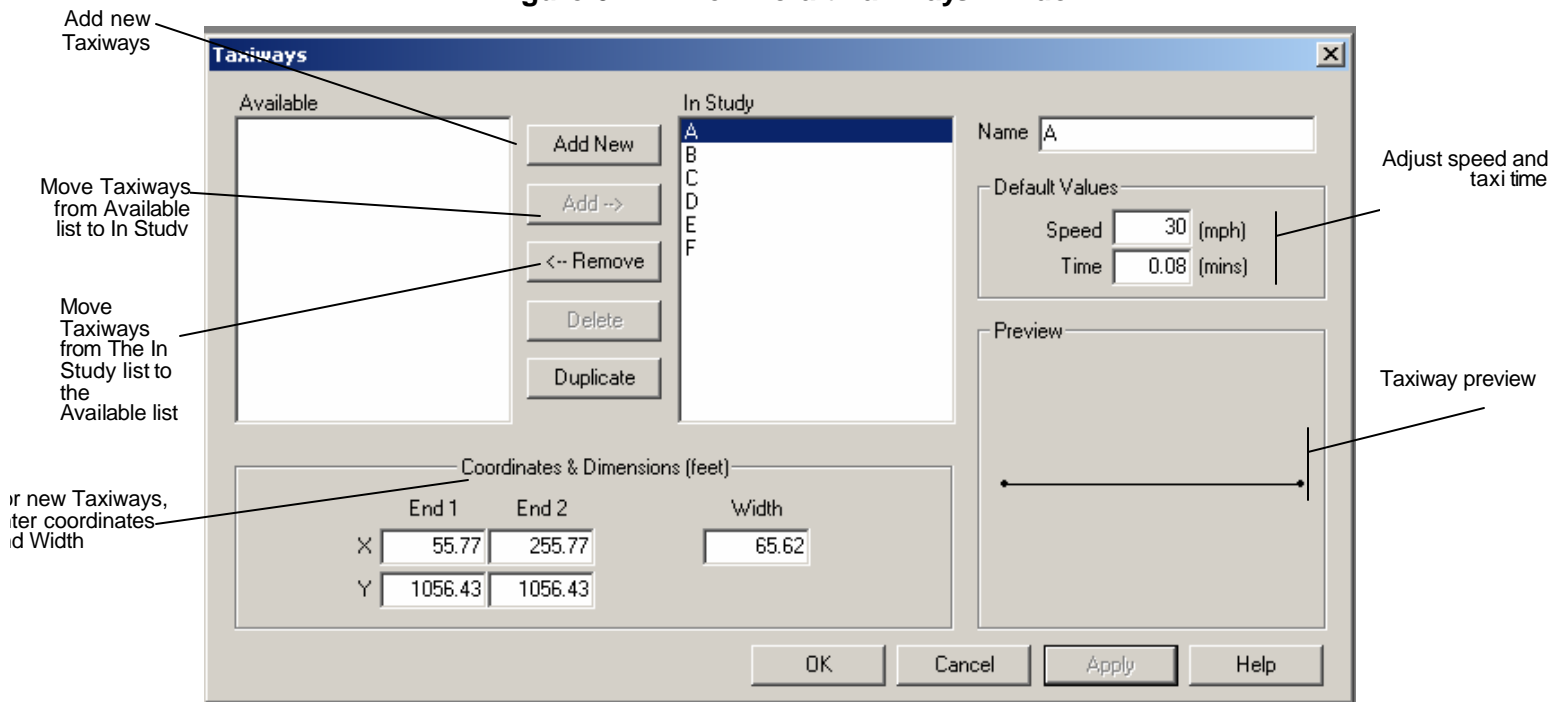
Editing Aircraft Taxiways

To move a taxiway from the In Study list to the Available list, select the taxiway name and press Remove. To move a taxiway from the Available list to the In Study list, select the taxiway name and press Add. *Note: If a taxiway has been specified in a Configuration, the taxiway cannot be removed from the study without first changing the configuration's taxiway selection, or deleting the configuration from the study. Taxiway* coordinates, width, speed, and taxi time for a taxiway can be modified by adding the taxiway to the In Study list. Then, select the taxiway name and type in the new figures.

Graphical Display
Taxiways that are part of the In Study list are displayed in the Airport Graphical Display. Taxiways in the Available list are not displayed

6.3.3 The Runways and Runway Queues Window

The *Runways and Runway Queues* window (Figure 6-18) allows the user to specify the names and locations of runways for the airport and associated queues with those runways. Emissions data associated with runways are utilized by EDMS for dispersion analyses. To calculate dispersion, aircraft assignments are made to specific runways having a spatial location within the airport (x,y) coordinates. EDMS treats runways as a series of area sources for purposes of dispersion analysis.

As in all EDMS windows containing an Apply button, pressing Apply allows the analyst to record any changes without exiting the window but does not save them. To save the changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

Figure 6-18: The Runways and Runway Queues Window
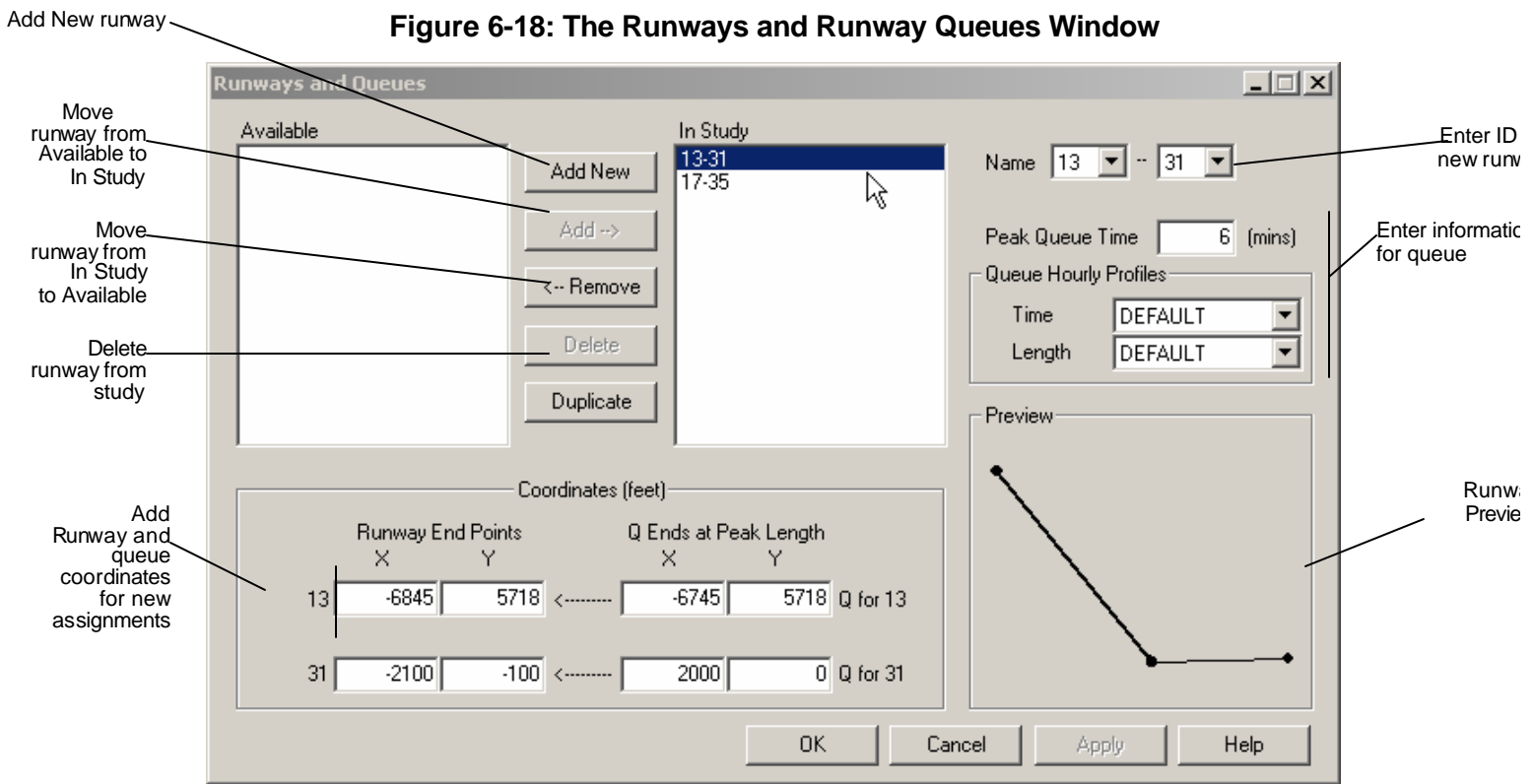
Adding Runways and Runway Queues
To add a runway, press Add New, and then enter the names and coordinates of the runway end points (End 1 and End 2) and the associated queue coordinates in the appropriate fields. Naming the runway endpoints gives the user the option of following the runway naming convention currently employed world wide (e.g., 9-27), or of using a customized runway name (no more than 3 characters for each endpoint). The direction of travel on a given runway for a given aircraft is specified in the Runway Assignments window (and in the Configurations window if configurations have been specified and assigned) by selecting a specific runway end. Once added, runways can remain in the current study or be moved to a list of available runways. Next, enter the peak queue duration by entering the Peak Time in Queue. Select the desired hourly profiles to be used for the time in queue and queue length *Note: A queue with a Peak Length of less than 20 meters or a Peak Time in Queue of 0 will not be included in the dispersion analysis.*

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Editing Runways and Runway Queues

To move a runway from the In Study list to the Available list, select the runway name and press Remove. Note: Removing a runway from the study will result in all dispersions from that runway being removed. If a runway has been specified in a Configuration, the runway cannot be removed from the study without first changing the configuration's runway selection, or deleting the configuration from the study. To move a runway from the Available list to the In Study list, select the runway name and press Add. To adjust the Time in Queue, runway coordinates, and queue coordinates for a runway, select the runway, type in the new information, and press Apply.

Graphical Display

Runways and runway queues that are part of the In Study list are displayed in the Airport Graphical Display. Runways and runway queues in the Available list are not displayed.

6.3.4   Buildings

The buildings window (Figure 6-19) enables the user to specify the identification and location of each building at the airport. In dispersion analyses, buildings affect the emitted point source plumes, and therefore can have a significant impact on concentrations.

Figure 6-19: The Buildings Window
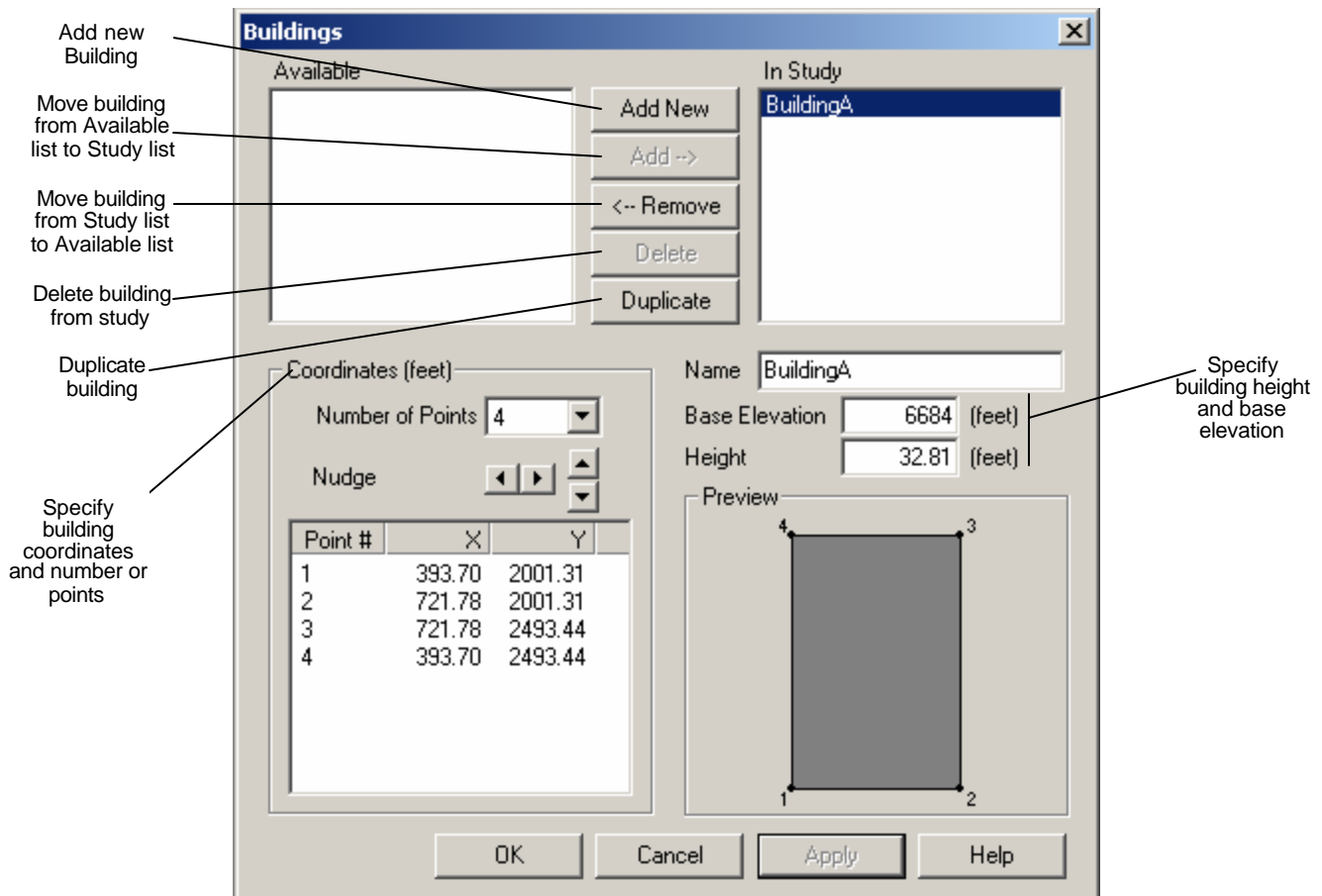
Adding Buildings

To add a building, press Add New, and then enter the name of the building and its coordinates in the appropriate fields. Specify the number of points, the Base elevation and the Height.

Editing Buildings

Once added, buildings can remain in the current study or be moved to a list of available buildings by selecting the building and press the Remove button. To move a building from the Available list to the In Study list, select the building name and press Add.

Graphical Display

Buildings that are part of the In Study list are displayed in the Airport Graphical Display. Buildings in the Available list are not displayed.

6.4 The Dispersion Menu

The Dispersion Menu provides the user with access to the AERMOD input file generation functions. These include: configurations, the ability to define receptor locations, The AERMET Wizard, AERMAP (the terrain pre-processor for AERMOD), generating the AERMOD input files, and running AERMOD. The menu items are shown below.

- Configurations

- Receptors

  - Networks

    - Cartesian Coordinates

    - Polar Coordinates

  - Discrete

- AERMET Wizard

  - AERMET Step 1 – Extract Surface Data

  - AERMET Step 2 – Extract Upper Air Data

  - AERMET Step 3 – Merge Data & Create AERMOD Weather Files

- Run AERMAP

- Generate AERMOD Input Files

  - AERMOD Step 1 – Processing Control

  - AERMOD Step 2 – Sources and Receptors

  - AERMOD Step 3 – Meteorology

  - AERMOD Step 4 – Output Reporting

- Run AERMOD

  - Select AERMOD Input File

6.4.1 Configurations

The Runway/Taxiway Configurations Window

The *Runway/Taxiway Configurations* window (Figure 6-19) allows the analyst to specify certain weather-based conditions under which particular runway and taxiway assignments will be made for active aircraft. These conditions consist of a wind angle range and a minimum wind speed. Specifying configurations allows the user to assign aircraft to runways and taxiways using criteria similar to those employed in an actual airport operating environment (i.e., wind speed and direction).

EDMS makes use of the conditions specified under each Configuration Name by checking the specified configuration parameters (Wind Angle and Wind Speed) against those supplied in the surface weather data for each hour of the dispersion analysis. If, in a given hour, the weather files include a wind angle within the specified range and a wind speed not exceeding the specified maximum, EDMS will use the runway and taxiway assignments specified in that configuration. If either of the configuration criteria is not met, the default runway and taxiway assignments will be used instead.

As in all EDMS windows, pressing the Apply button records any changes without exiting the window. To save the changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

Adding a Configuration

To add a configuration, press the Add New button and type in a Configuration Name. Specify a Wind Angle Range by entering the lower number of the range in the first text box and the higher number in the second text box. Next, specify the Maximum Speed (wind speed in knots) for the configuration.

Once added, a Configuration Name will be listed among the Available Configurations in the study and can be utilized in the calculation of dispersion for any active aircraft.

Figure 6-19: The Runway/Taxiway Configurations Window –Taxiway Tab

Add new Configuration

Move from Available Configurations to Configurations In Study

Move from Configurations In Study to Available Configurations

Delete configuration

Duplicate Configurations

Select Taxiway

Total Taxi and Queue Time

Enter va for Configura

Runway/Taxiway Configurations

Available Configurations

Configurations In Study
Winds from northeast
Winds from southeast

Configuration Name
Winds from northeast

Add New

Add -->

<-- Remove

Delete

Duplicate

Wind Angle Range
1 -- 90 (°)

Minimum Wind Speed
2 (knots)

Taxiway Assignment | Runway Assignment

Taxiway Name	Speed (mph)	Taxi Time (mins)
☐ A	30.00	0.08
☑ B	30.00	0.11
☑ C	0.01	0.00
☐ D	30.00	0.40
☐ E	30.00	0.21
☐ F	30.00	0.13

NOTE: Taxiway assignment is required only for dispersion studies. Taxi time shown here is used in dispersion calculations only.

Total Taxi & Queue Time   0.11 (minutes)   OK   Cancel   Apply   Help

Editing a Configuration

Most fields may be edited by simply selecting the field and typing in the new information, and pressing OK. To delete a configuration from the study, select the Configuration Name to delete from the list of Available Configurations and press the Delete button.

6.4.1.1 Taxiway Assignment Tab

To assign aircraft to taxiways for the above wind conditions, simply check the box (See Figure 6-19) next to the name of the taxiway. Information about the taxiway is shown to the right of the name. To change the location of the taxiway, choose Aircraft Taxiways from the airport menu.

6.4.1.2 Runway Assignment Tab

Aircraft can be assigned to multiple runways for the above wind conditions. Click the box next to the name for each runway (See Figure 6-20) that aircraft should be assigned to. The user must also specify the percentage of operations for each runway selected. This option allows the analyst to define configurations for more complex scenarios involving separate departure and arrival runways.

Figure 6-20: The Runway/Taxiway Configurations Window – Runway Tab

6-36
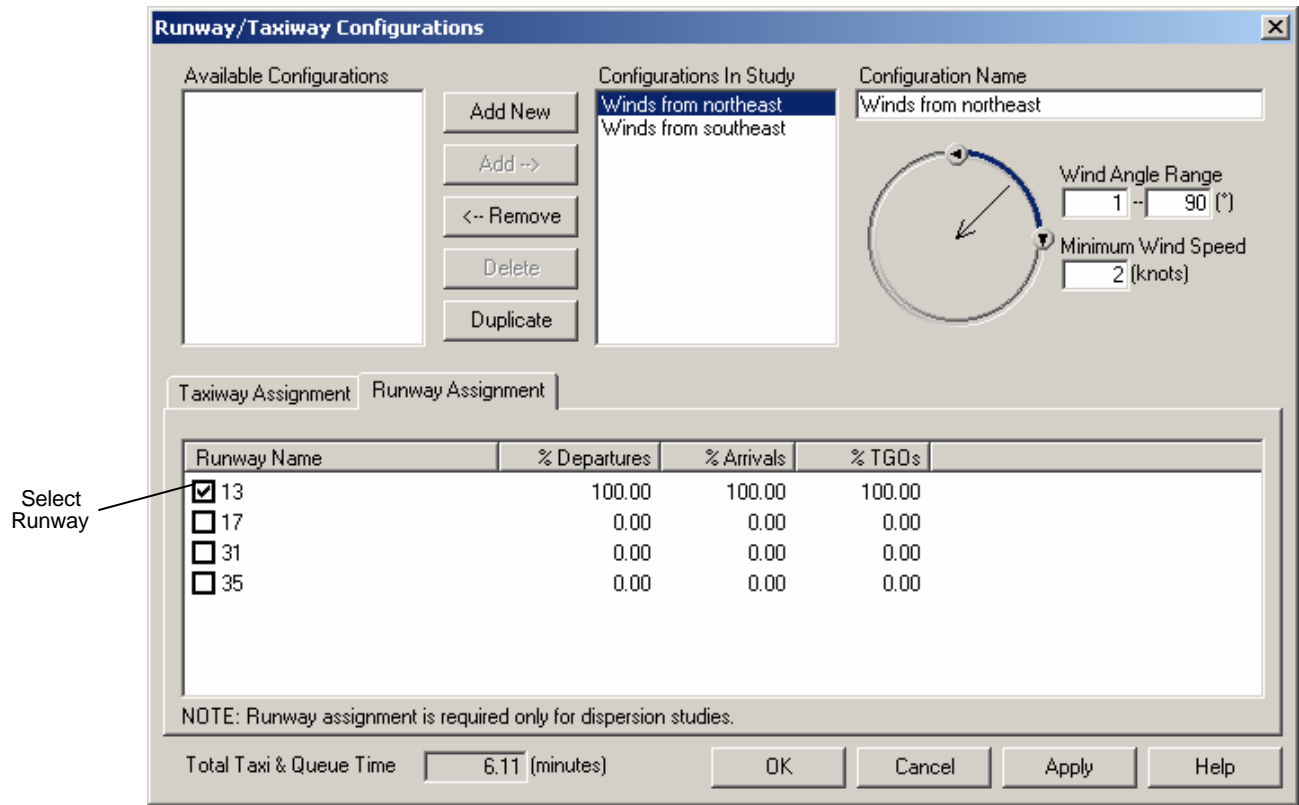
6.4.2 Receptors

6.4.2.1 The Receptor Networks Window

The *Receptor Networks* window (See Figure 21) allows the user to specify the Network Name and define the location, area, height and density of a grid of receptors at the airport in groups rather than singly (as in the Discrete Receptors module). In EDMS 4.2 the analyst has the choice of using either Cartesian or Polar coordinates to define the network. In a dispersion analysis, the receptor locations specified in this module constitute theoretical measuring points for the dispersion of pollutants generated by the sources specified in the study. The calculation of dispersion is based on a combination of receptor placement, pollutants generated, and factors such as source locations, temperature, wind speed, wind direction, and the stability of the atmosphere. Note: There is a significant increase in dispersion run time as the number of receptors increases.

As in all EDMS windows, pressing the Apply button records any changes without exiting the window. To save the changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

Adding Cartesian Receptor Networks
To add a network of receptors, first select the type of coordinates for the network by choosing the appropriate tab. Next, press Add New, then enter the Network Name and (x,y) coordinates defining the origin of the network.

If Cartesian Coordinates have been selected (See Figure 6-21), specify the spacing along the x and y axes along with the number of receptors to be placed along those axes.

Figure 6-21: Receptor Networks Window – Cartesian Coordinates
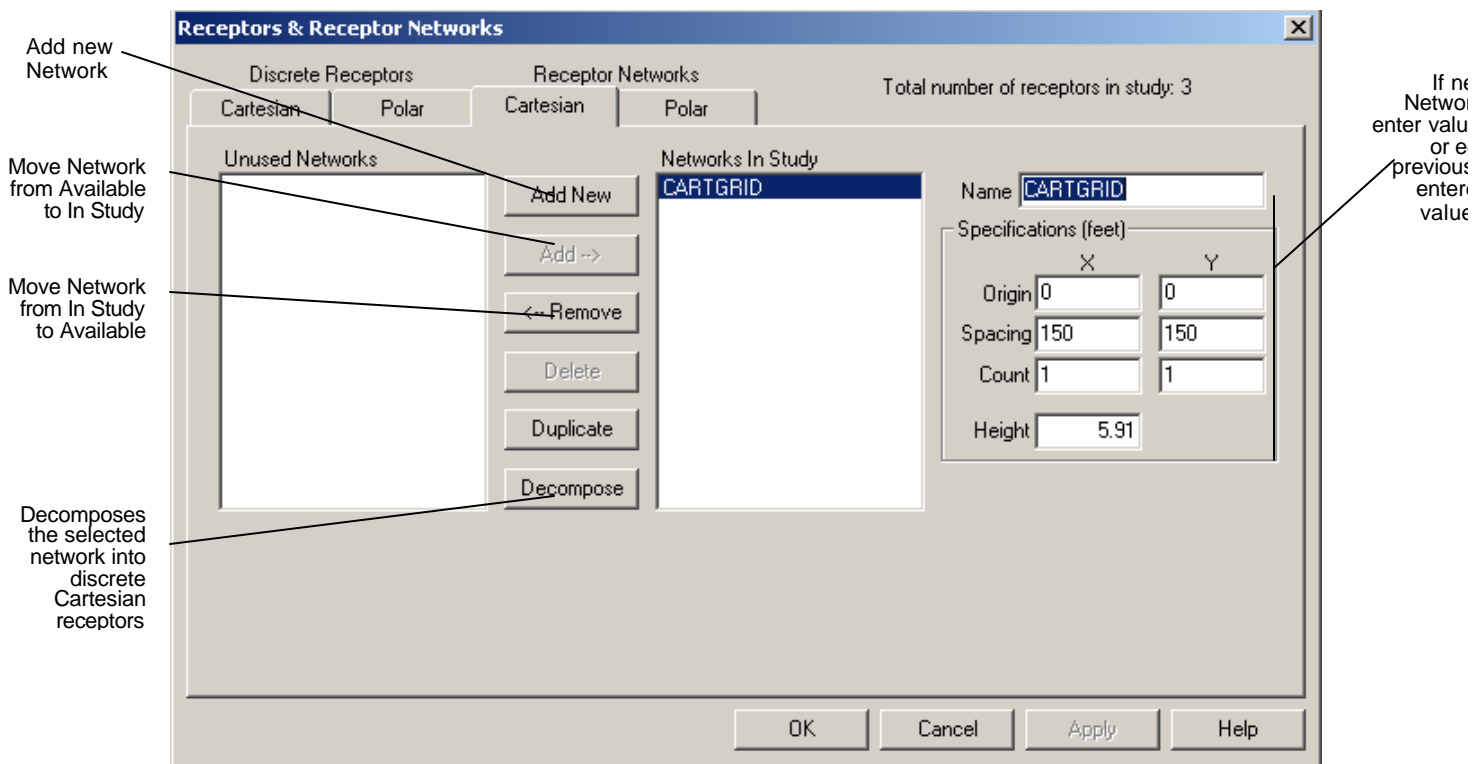
Pressing the decompose button decomposes the selected networks into discrete Cartesian receptors. This allows users to remove unwanted receptors from the study. However, this process cannot be undone.

Polar Receptor Networks

If Polar Coordinates have been selected (See Figure 6-22), specify the radius for the first ring, the spacing of the subsequent rings and the number of rings to generate in the left column under "Rings". In the right column under "Vectors", choose the angle for the first vector, the spacing in degrees for each subsequent vector and the number of vectors to generate.

Select "Origin Source" to center the network on an emissions source in the study. From the "Type" drop down list, select the type of source which is to serve as the origin for the network's polar coordinate system. After selecting a source type, the "Name" drop down list is populated with the names of all of the emission sources of the selected type that are in the study. Select the name of the source that is to serve as the origin for the network's polar coordinate system.

Figure 6-22 Receptor Networks Window – Polar Coordinates
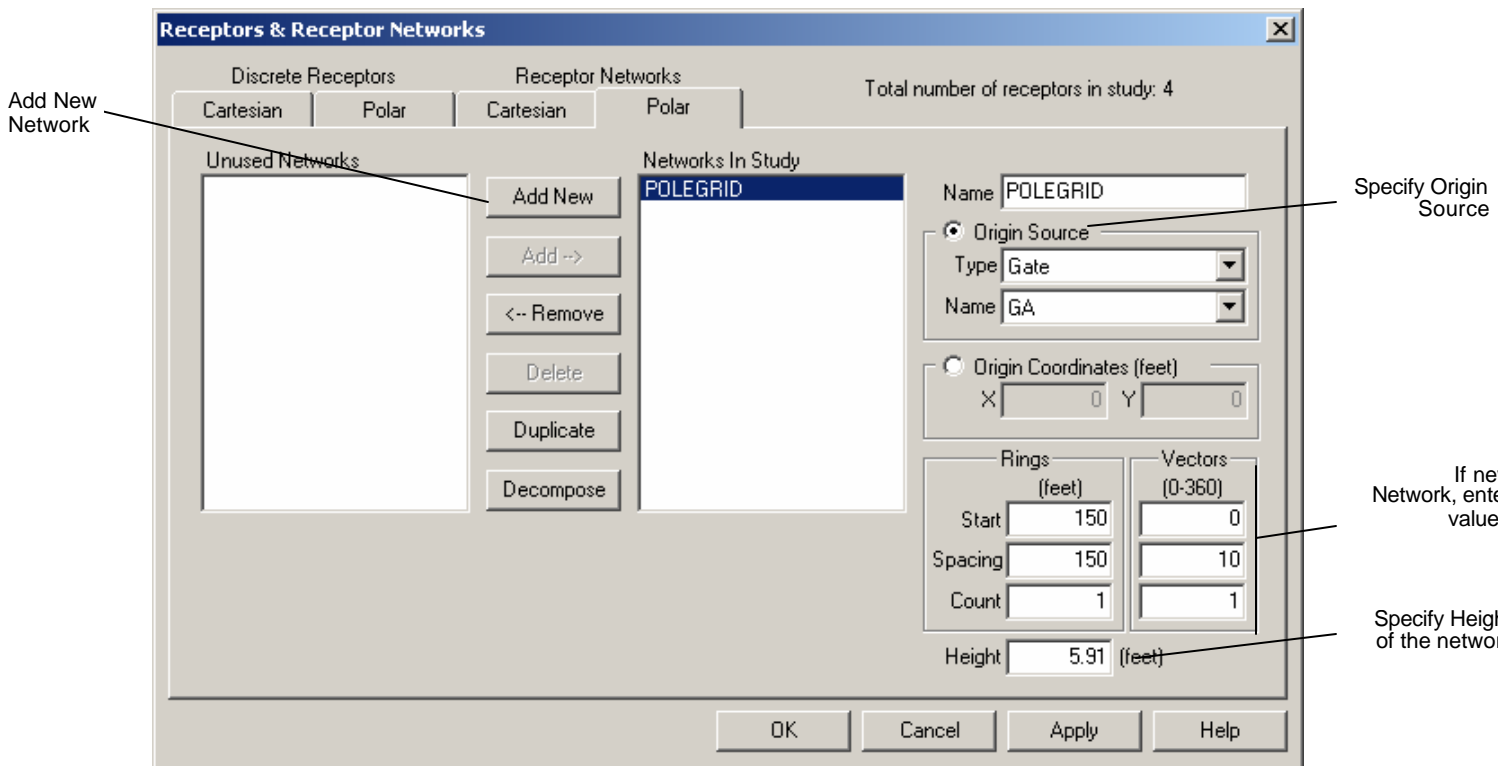
Editing Network Receptors
To move a receptor network from In Study list to the Available list, select the receptor name and press Remove. To move a receptor network from the Available list to the In Study list, select the receptor name and press Add. To delete a receptor network, remove the grid receptor from the study and then press Delete. AERMOD version 02222 that ships with EDMS 4.2 is limited to a maximum of 1500 receptors. It is important to keep this in mind when generating receptor networks. Future releases of AERMOD may increase this value. Advanced users should consult the AERMOD user's guides and source code available from the EPA internet site for information on how to recompile AERMOD to increase this limit.

Graphical Display

Receptor Networks that are part of the In Study list are displayed in the Airport Graphical Display. Those in the Available list are not.

6.4.3 Discrete Receptors

The Discrete Cartesian Receptors Window

The Discrete Receptors window (See Figure 6-23) allows the user to specify the location and height of discrete, individual receptors at the airport. In a dispersion analysis, the receptor locations specified in this module constitute theoretical measuring points for the dispersion of pollutants generated by the emissions sources specified in the study. The calculation of dispersion is based on a combination of receptor placement, pollutants generated, and factors such as source locations, temperature, wind speed, wind direction and upper-air readings. *Note: There is a significant increase in dispersion run time as the number of receptors increases.*

As in all EDMS windows, pressing the Apply button records any changes without exiting the window. To save the changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

Adding Discrete Cartesian Receptors

To add a receptor, press Add New. Then enter the receptor Name, the (x, y) coordinates, and receptor height in the appropriate fields. Once added, receptors can remain in the current study, or be moved to a list of available receptors.

Editing Discrete Cartesian Receptors

To move a receptor from the In Study list to the Available list, select the receptor ID and press Remove. To move a receptor from the Available list to the In Study list, select the receptor ID and press Add. To delete a receptor, remove the receptor ID from the study and then press Delete.

Figure 6-23: The Discrete Cartesian Receptors Window
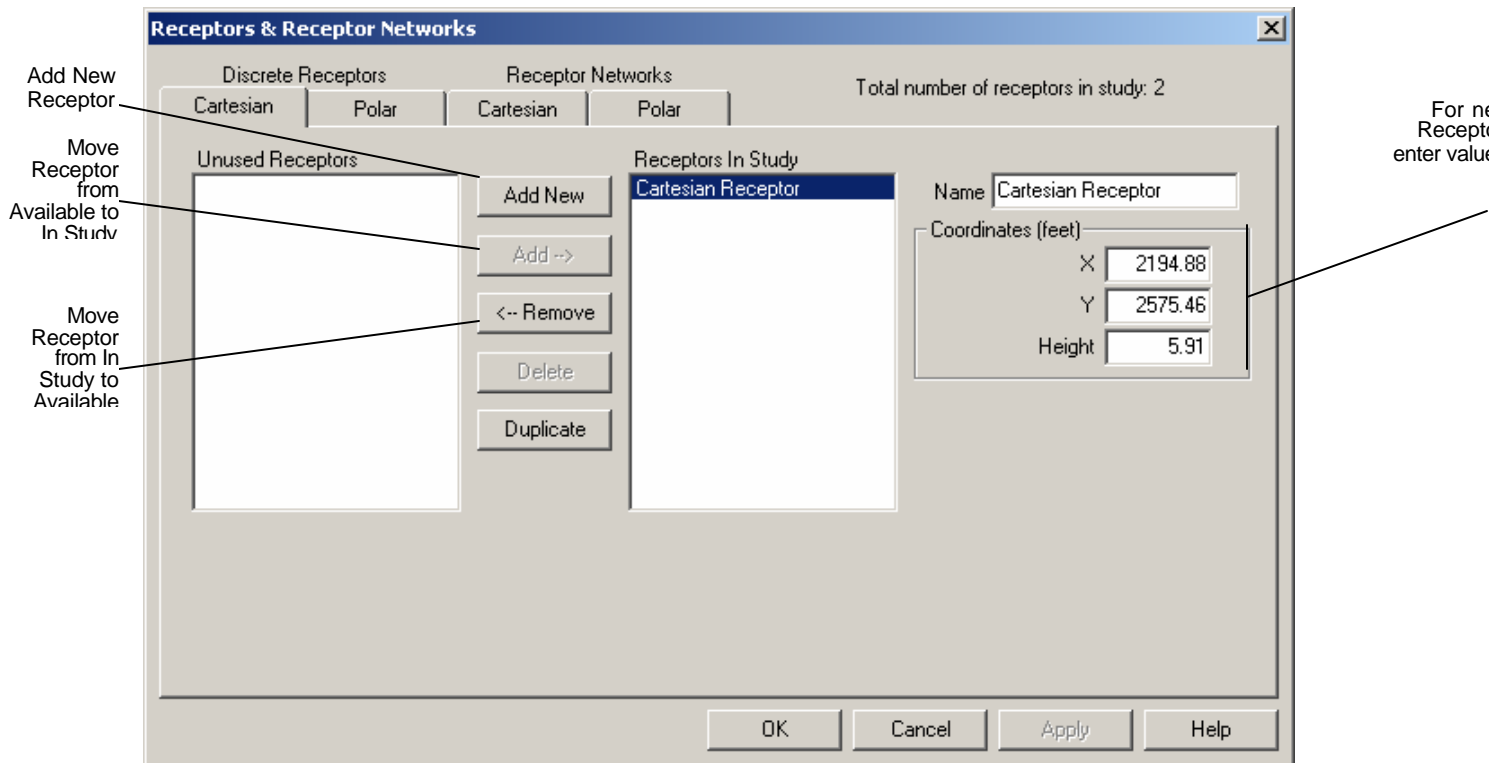
Discrete Polar Receptors

If Polar Coordinates have been selected, (See Figure 6-24) select "Origin Source" to center the network on an emissions source in the study. From the "Type" drop down list, select the type of source which is to serve as the origin for the network's polar coordinate system. After selecting a source type, the "Name" drop down list is populated with the names of all of the emission sources of the selected type that are in the study. Select the name of the source that is to serve as the origin for the network's polar coordinate system. Then specify the direction, distance and height of the source

Figure 6-24: The Discrete Polar Receptors Window
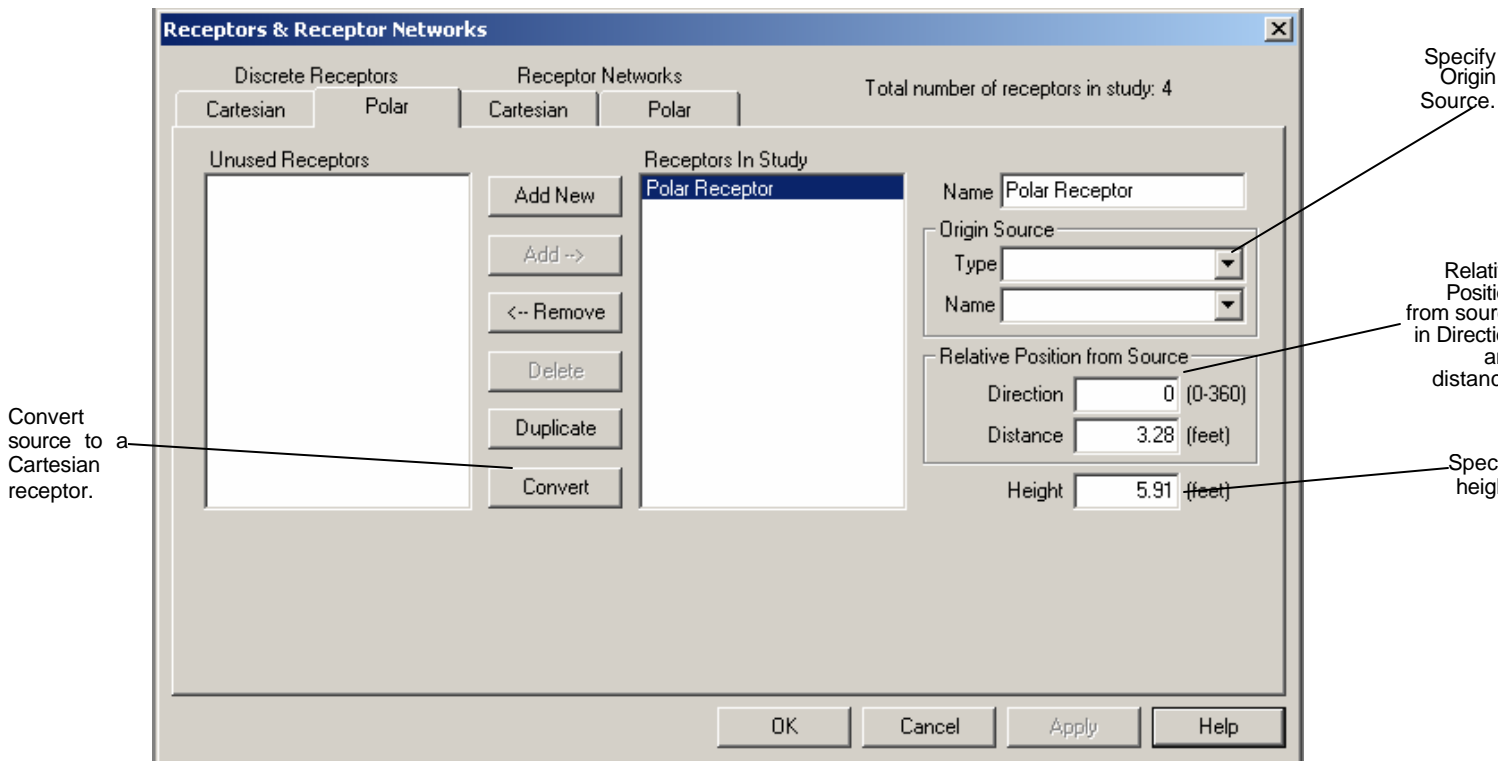
Graphical Display

Receptors that are part of the In Study list are displayed in the Airport Graphical Display. Receptors in the Available list are not displayed.

6.4.4 AERMET Wizard

The *AERMET* **wizard** is used to process surface and upper air weather data for AERMOD input. This process is divided into 3 steps: extracting surface data, extracting upper air data, merging and creating AERMOD weather files.

The three steps do not need to be completed all at once, by pressing the "skip" button, the user can skip any steps that are already complete, or that will be completed at a later time.

6.4.4.1 Step 1. Extract & QA NWS Surface Data

Figure 6-24: AERMET Wizard Step 1 Window

First a surface data file must be selected (See Figure 6-24). The analyst can either enter the full path name for the file in the text box at the top of the screen, or press the "..." button to find the file using a file selection box.
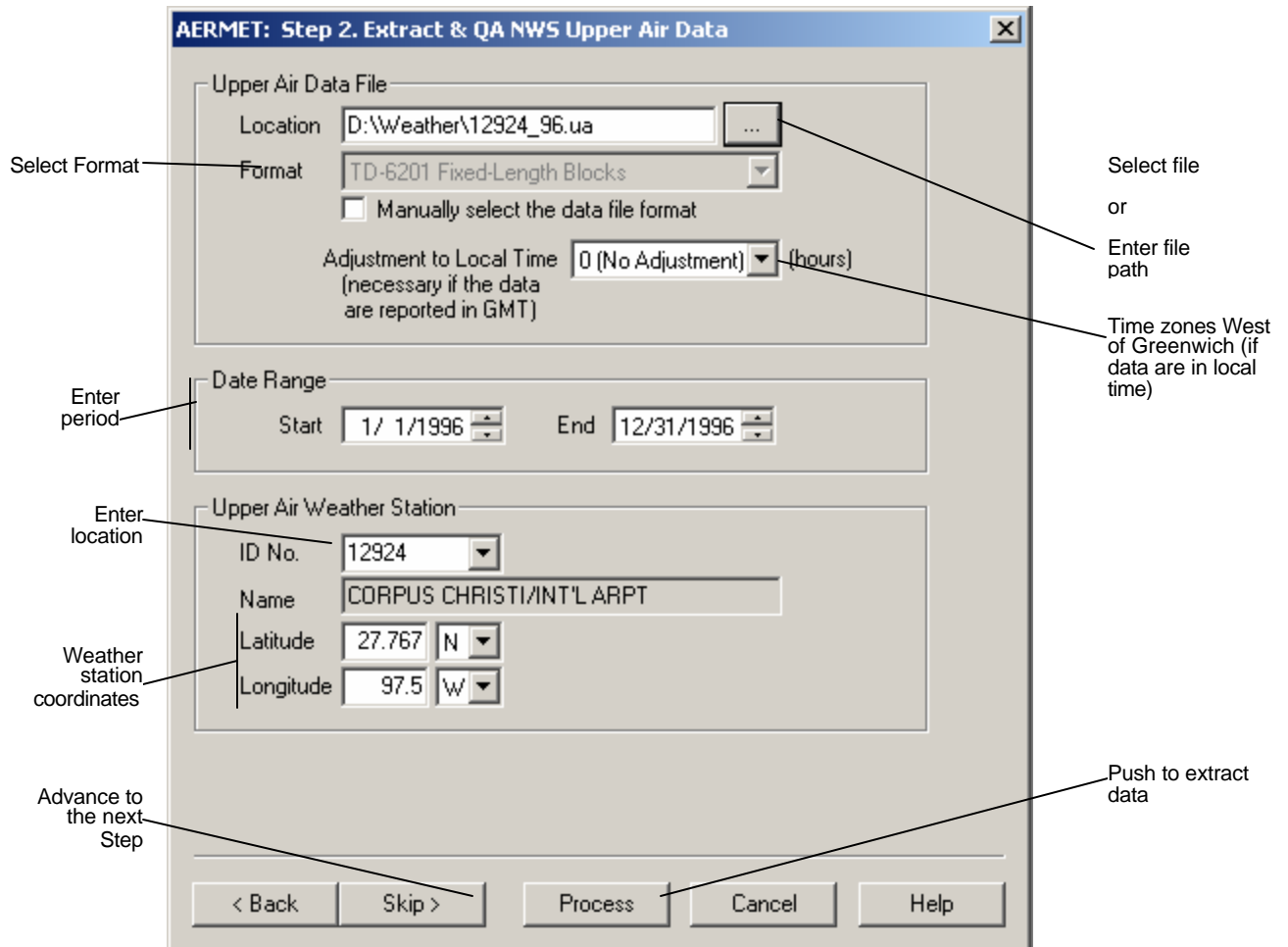
If the surface data file is valid, AERMET will automatically determine the format of the file, the start date, the ID No., the name of the weather station and the coordinates. The end date defaults to the last day of the start year.

Since the surface data the user has received may contain data for more than one location, the station ID, time zone conversion, latitude and longitude for the site must be specified.

Once all of the required information has been input, press the Process button to extract the surface data and generate the file sfqafile.met, which will be ready for merging in step 3.

6.4.4.2 Step 2. Extract and QA NWA Upper Air Data

Figure 6-25: AERMET Wizard Step 2 Window

This step is very similar to step 1.

First, the analyst must select a file containing TD-6201 upper air data (See Figure 6-25). The user can either type the full path name in the text box at the top of the window, or press the button labeled "..." to choose the file using a file selection box.

If the upper air surface data file is valid, AERMET will automatically determine the format of the file, the start date, the ID No., the name of the weather station and the coordinates. The end date defaults to the last day of the start year.

Since the upper air data file the user provides may contain data for more than one location, the station ID, local time adjustment, and coordinates of the site must be provided if AERMET is unable to determine these values. Weather station data in various data formats can be obtained from the WebMet web site: www.webmet.com.

.

When all of the above information has been entered, press the Process button to extract the upper air data and generate the file uaqafile.met, which will be ready for merging in step 3.

6.4.4.3 Step 3. Merge Data & Create AERMOD input files.

Figure 6-26: AERMET Wizard Step 3 Window
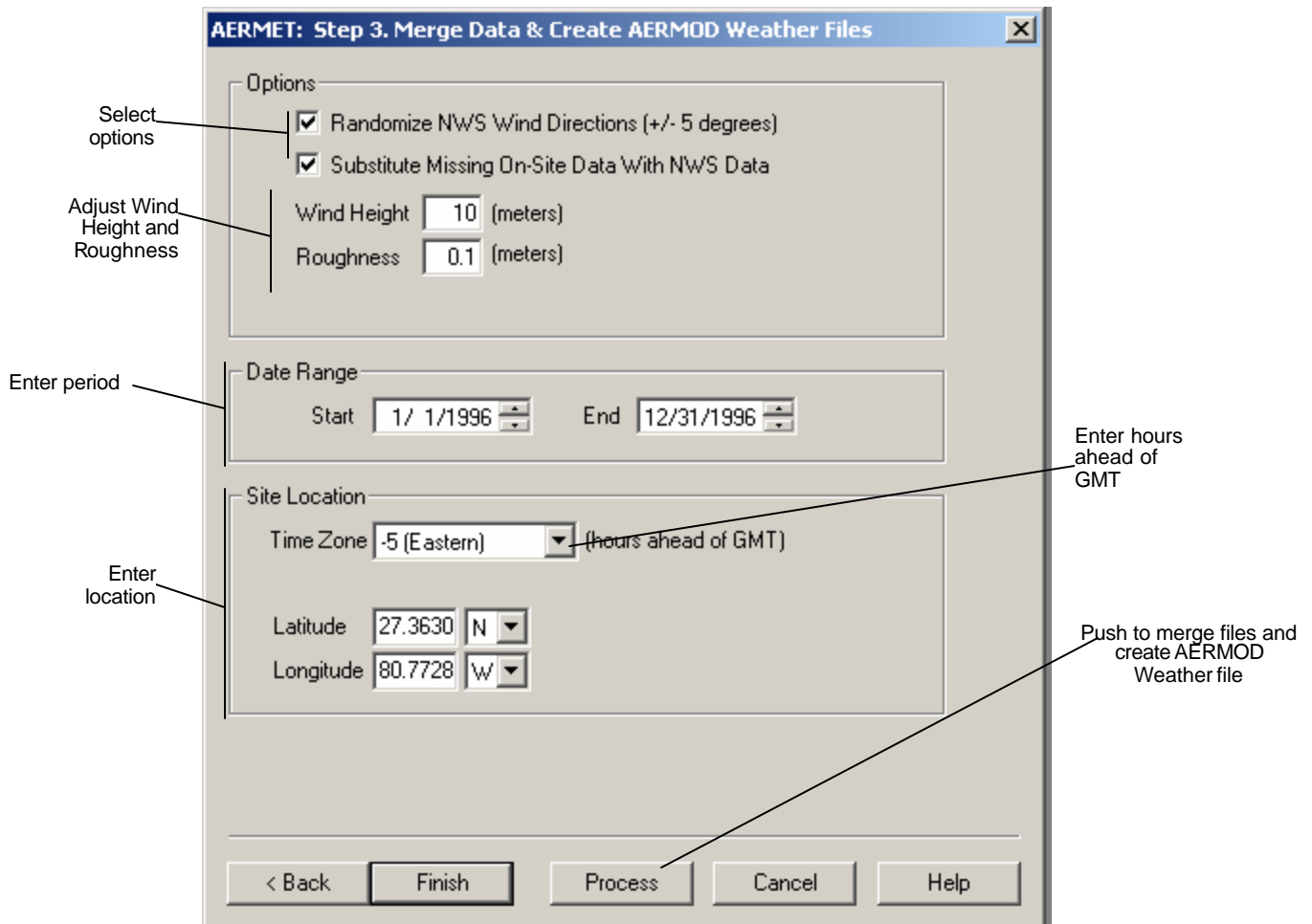
This step generates a merged surface and upper air readings file ready to be processed by AERMET, followed by the generation of the weather files in the format for AERMOD use. (See Figure 6-26),

Again the user is able to choose the start and end dates for the merged file. Default start and end dates are provided from dates entered in step 1 and step 2.

Additionally, for advanced users, additional weather data can be merged manually by running AERMET independently of AERMOD. For more information, please see the AERMET User's Guide.

Options

There are two options available for processing the weather data before AERMOD uses it. The first, "Randomize NWS Wind Directions," instructs AERMET to vary the wind directions randomly between +/- 5° of the reported wind value. This option is available because most surface data has been previously rounded to the nearest 10° direction.

The second option is to allow AERMET to substitute missing on-site data with NWS data. This will instruct AERMET to substitute missing on-site data from the database with the loaded NWS surface data. Additionally, if upper-air data is missing for a given hour, this option allows AERMET to create a single profile level based on the surface observation. Checking this box is mandatory if only surface and profile data are used (i.e. no on-site database of observations).

Wind Height
The height above ground of the surface wind observations.

Surface Roughness
The surface roughness is related to the height of obstacles to the wind flow. In theory this is the height where the mean horizontal wind speed is zero. Reasonable values range from 0.001 m over calm water, to 1 m or more over a forest or urban area.

Site ID, Latitude, Longitude
Since the data set may contain weather data for multiple locations, the site ID, latitude and longitude must be supplied if the station is not found in the database.

Hours ahead of GMT (Greenwich Mean Time)
In order to properly convert the times of the observations in the weather data to local time, the number of hours ahead of Greenwich Mean Time must be provided. Eastern Standard Time is 5 hours ahead; Pacific Standard Time is 8 hours ahead. During daylight savings time, subtract one hour from these values.

6.4.5   Run AERMAP

AERMAP, (Figure 6‑27) the terrain preprocessor of AERMOD creates source (.SRC) and receptor (.REC) files for inclusion in AERMOD dispersion analyses. Running AERMAP and generating these are optional; however without these files, AERMOD will assume a perfectly flat terrain at the elevation specified in the Study Setup window.

The analyst must specify the domain dimensions and origin coordinates in the Study Setup window prior to running AERMAP. The domain is the geographic region considered when generating elevations and receptor hill heights. The origin is the geographic location that corresponds to point (0, 0) in user-entered coordinates. Technically, the origin can lie outside of the domain; however, all sources and receptors must fall within the borders of the domain.

AERMAP accepts one or more USGS DEM Data Files of the same format as input. Press *Add Files* to browse for more files to add to the data file list.   Press *Remove Files* to remove the selected files from the list. The selected data files must completely cover the geographic area of the domain. EDMS will automatically detect the appropriate Data Format. Adjust the file format only if necessary. AERMAP will report an error for every corner point of the domain that falls outside of the data files' coverage.

Figure 6-27: Run AERMAP Window
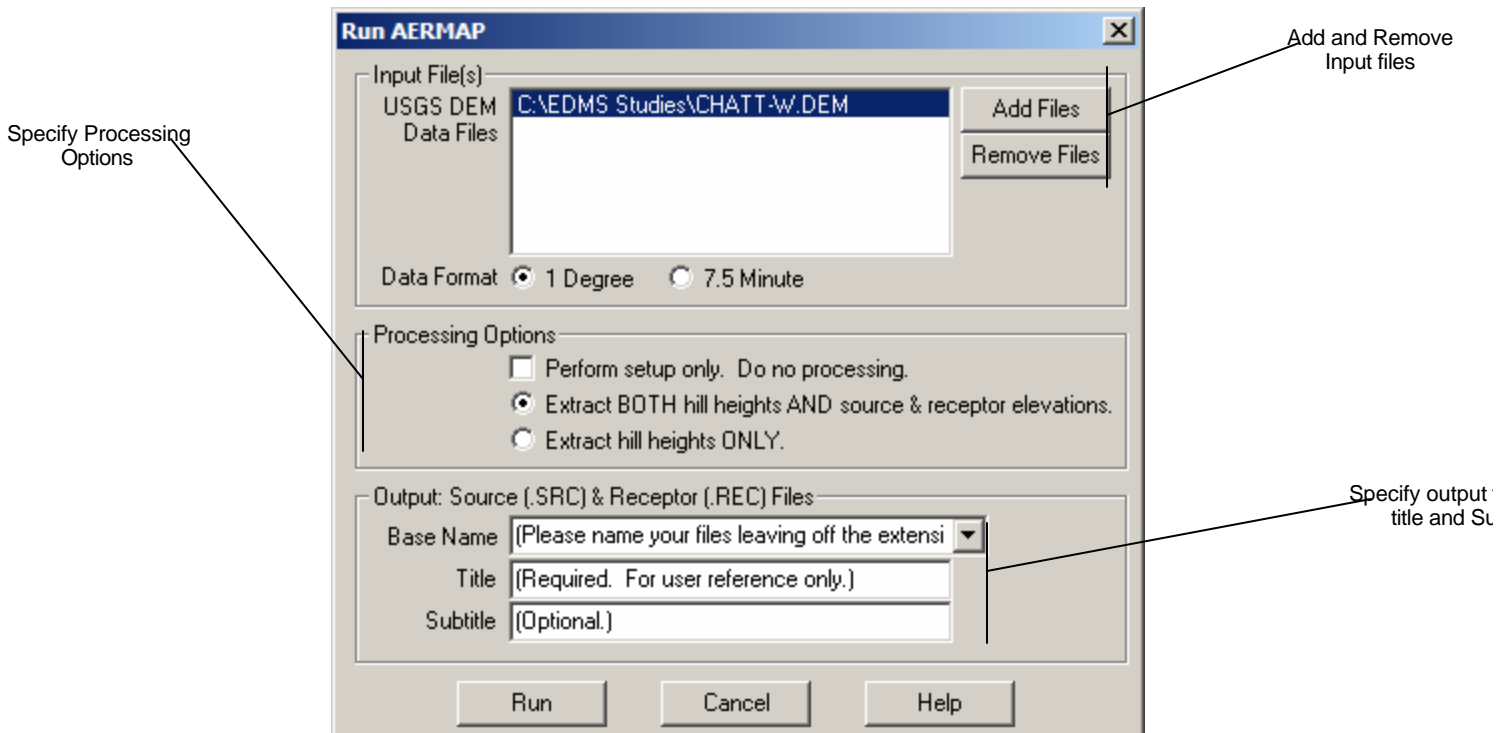
6.4.6   Generate AERMOD Input File

6.4.6.1   Step 1. Extract & QA NWS Surface Data

All dispersion calculations in EDMS 4.2 are handled by EPA's AERMOD program. This process is divided into 4 steps: *"Processing Control", "Sources and Receptors", "Meteorology",* and *"Output Reporting"*. All that is required for the dispersion run is the AERMOD input file, along with the previously processed weather data. For more information on weather data processing see the AERMET Wizard.

The AERMOD input file generated by EDMS can be edited in a text editor for advanced users who want to change specific AERMOD parameters not addressed by the EDMS interface.

Processing Control (See Figure 6-28).

In this portion of the dialog box the user is able to specify a title and subtitle for the study. The user can put anything in these fields. These titles will be listed in the AERMOD dispersion report.

Figure 6-28: Step 1. AERMOD Processing Control Window

From the pollutant drop-down box, the analyst can choose which pollutant to disperse: CO, THC, NMHC, VOC, SOx, NOx, PM-10 or PM-2.5. Concentrations will be reported for this pollutant only in the .out file after AERMOD runs.

The analyst must also specify the averaging period to be considered in order to move to the next step. The choices are: 1, 2, 3, 4, 6, 8, 12, 24 hour, monthly averages, annual averages, or the entire period of the study. The check box option to include average data for the entire study period allows an annual average to be considered (if a year's worth of weather data is also provided). Advanced users can modify the AERMOD input file that has been generated to investigate additional averaging periods.

The option to "*Apply Exponential Decay*" applies exponential decay to the pollutant being modeled. If selected, the decay can be entered one of two ways, by either specifying the half-life (in seconds) or the decay coefficient. The reciprocal relationship between these parameters is DECAY COEFFICIENT = 0.693 / HALF-LIFE.

The option to stop AERMOD before dispersion processing allows the advanced user to review the .out file after running AERMOD in a diagnostic mode. AERMOD will provide a list of the inputs passed to the model without running dispersion. This step runs very quickly, and provides the opportunity to double-check the input before committing to running dispersion.

6.4.6.2 Step 2. Sources & Receptors (See Figure 6-29).

Step 2 gives the analyst the option to include AERMAP generated files in the dispersion analysis. Then, select the files to be included from the drop down lists. Use the AERMAP window to run AERMAP which generates source (.SRC) and receptor (.REC) files.

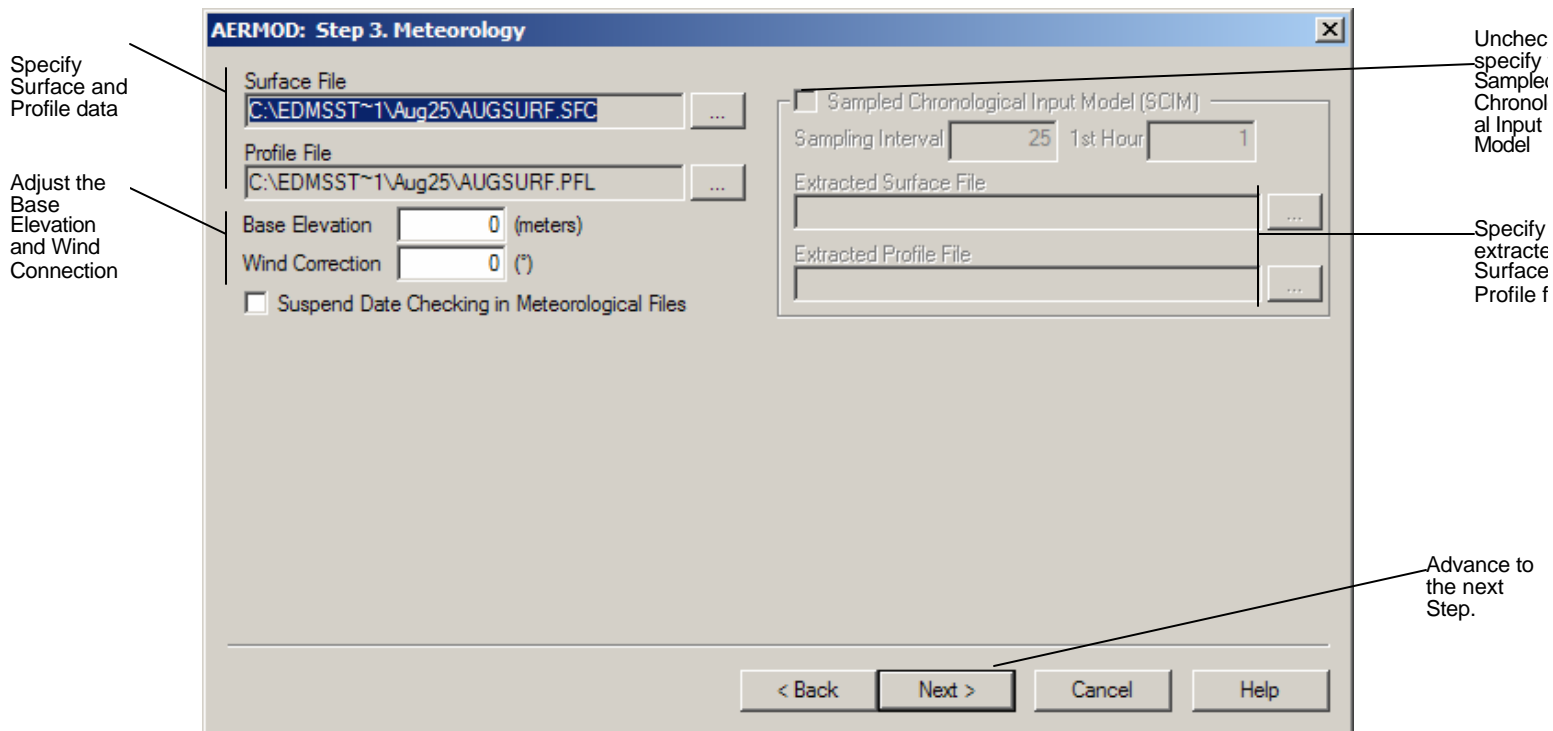**Figure 6-29: Step 2. AERMOD Sources & Receptors Window**
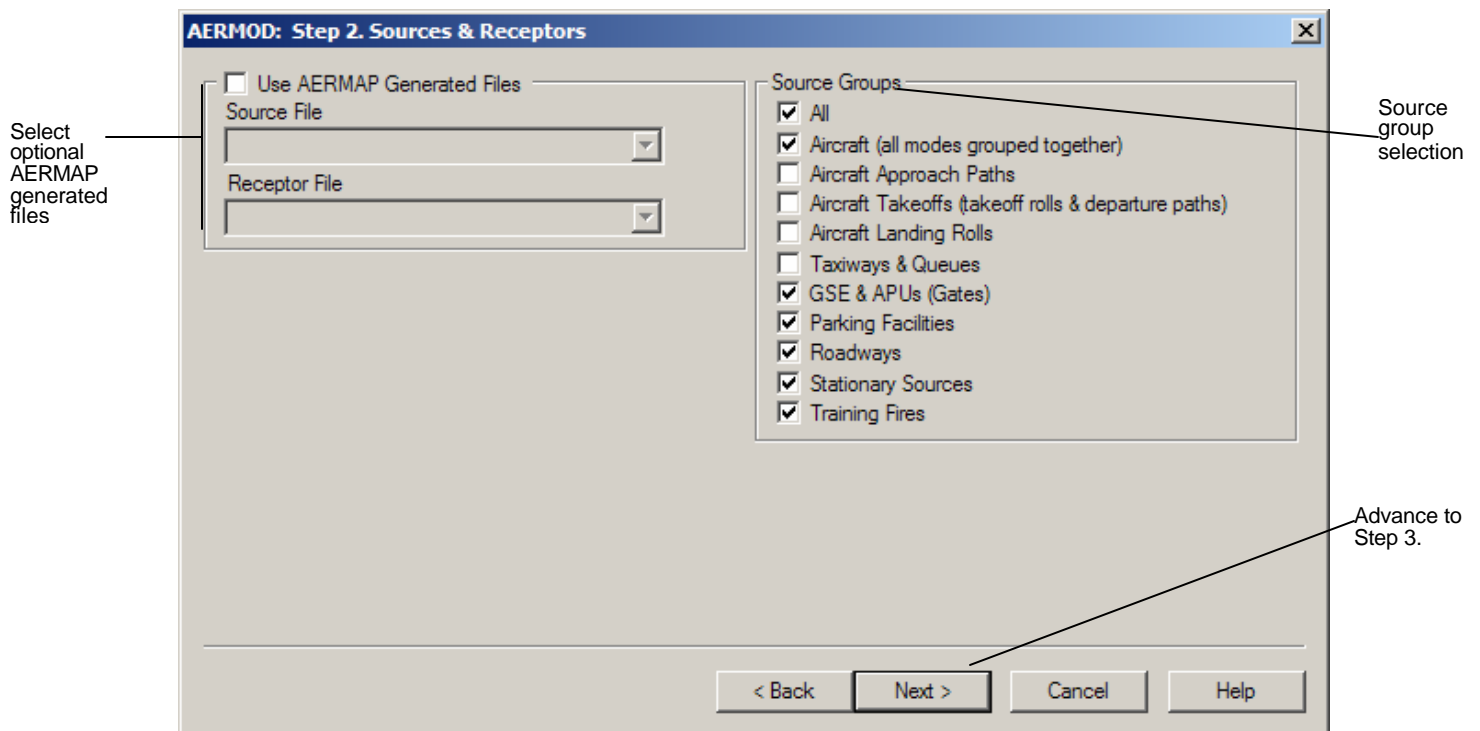
AERMOD allows users to group contributions from particular sources together, for example: "Aircraft", "Roadways", "Training Fires", etc.. Several source groups may be included in a single run. Check the boxes corresponding to the source groups to be included in the dispersion analysis. At least one group must be selected.

6.4.6.3 Step 3. Meteorology (See Figure 6-30).

The user must select both a surface (.sfc) and a profile (.pfl) weather file for AERMOD to use. These can be generating by providing the appropriate surface and upper-air weather data to the AERMET Wizard, or by running AERMET outside of EDMS. Simply click the button labeled "..." next to the text boxes to select the appropriate files.

Figure 6-30: Step 3. AERMOD Meteorology Window

Specify Surface and Profile data

Adjust the Base Elevation and Wind Connection

Unchec specify Sampled Chronol al Input Model

Specify extracte Surface Profile f

Advance to the next Step.

The Base Elevation parameter is the height above mean sea level (MSL) for base elevation of the potential temperature profile.

The Wind Correction is the number of degrees to subtract from the wind direction measurements. This allows the user to correct the input meteorological data for wind direction alignment problems. Since the model results at particular receptor locations are often quite sensitive to the transport wind direction, this should be used only with extreme caution and with clear justification. It may be done to correct for known (and documented) calibration errors, or to adjust for the alignment of a valley if the meteorological station is located in a valley with a different alignment than the source location.

The Sampled Chronological Input Model (SCIM) option is only available if, in step 1, *Optimize Area Sources & Allow Use of SCIM* is selected and only the *Annual* averaging period is selected. SCIM works exclusively with Annual averages. The *Sampling Interval* determines the number of

hours to skip between samples. For example, entering "25" skips over 24 hours of weather before using another hour of weather data. The sampling interval must be greater than 1; moreover, it could be based on the formula (24n+1), where "n" is the number of days to skip between samples, in order to ensure a regular diurnal cycle to the sampled hours (e.g., 25 or 49).

The 1st Hour is the first hour for which weather data is taken. It must be between 1 and 24, inclusive -- some hour during the first day of weather data.

Specify the *Extracted Surface File* and *Extracted Profile File* by clicking on the "**...**" button. This saves the sampled hours of weather data to files in the same format as the AERMET generated files. However, this is optional.

6.4.6.4 Step 4. Output Reporting (See Figure 6-31).

First Specify a base name to be used for the output file(s). This name will also be used for the main input (.inp) and hourly emission (.hre) files. The main output file will use the (.out) extension. The other output files are described below. All input and output files are located in the study directory.

Figure 6-31: Step 4. Output Reporting Window
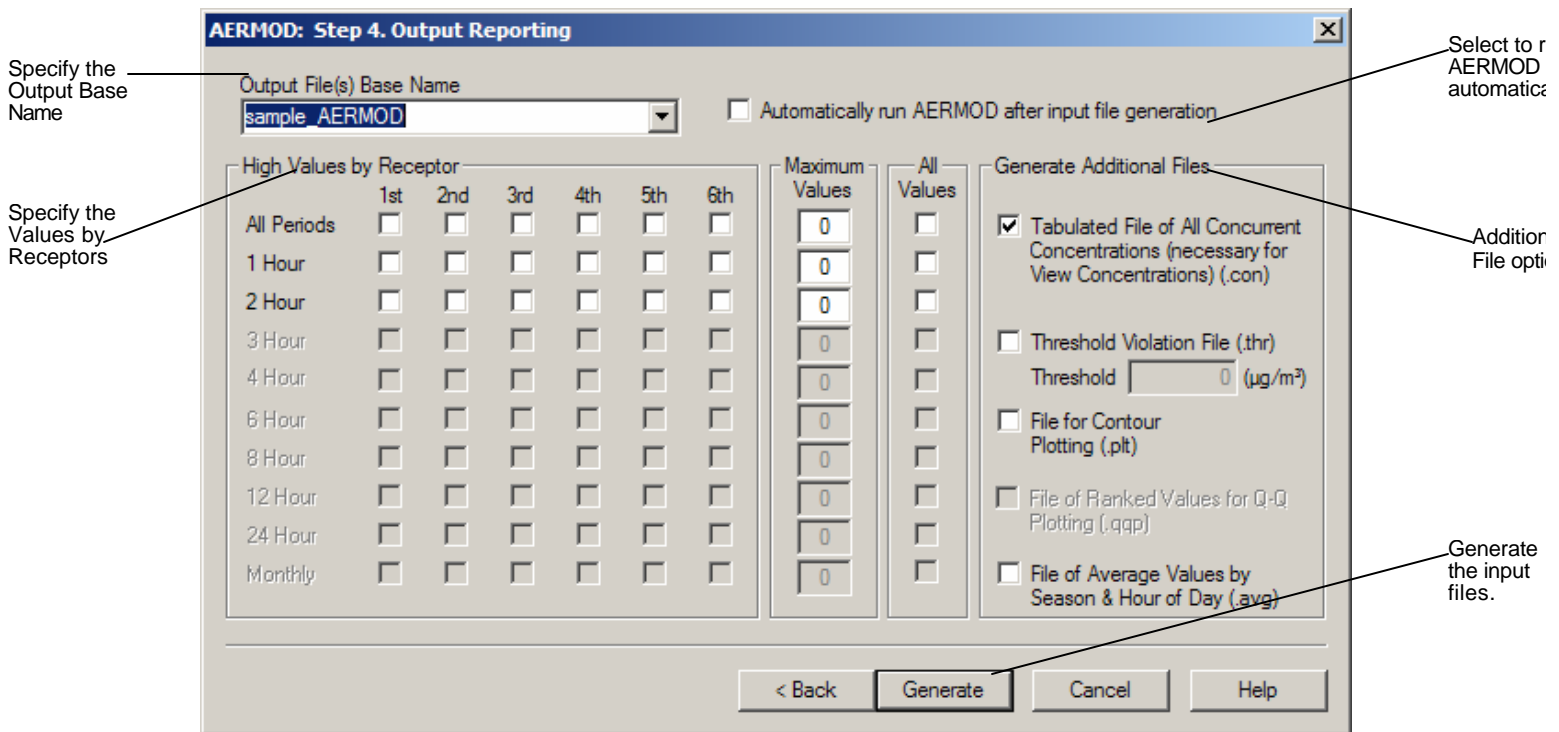
The "High Values by Receptor" option instructs AERMOD to include high value summary tables by receptor in the main output (.out) file. For example, if the 2nd checkbox is checked for the 3 Hour averages, then AERMOD will report the second highest 3-hour averages modeled at every receptor. Only the checkboxes for selected averaging periods are activated. Toggling a checkbox in the *All Periods* row, toggles all checkboxes below it for selected averaging periods.

The "Maximum Value*s*" option instructs AERMOD to include a summary table of the top *n* overall (including all receptors and hours) values in the main output (.out) file, where *n* is the number of values entered in the edit box (from 1 to 100, inclusive). For example, if "10" is entered for the *24 Hour* averages, then AERMOD will report the top ten 24-hour averages modeled over the entire dispersion analysis. Only the edit boxes for selected averaging periods are activated. Editing a value in the *All Periods* row, sets all of the values below it for selected averaging periods.

The "All Values" option instructs AERMOD to include a table of all of the modeled values in the main output (.out) file. This option is <u>not</u> recommended because of the very large output files it can produce. Toggling a checkbox in the *All Periods* row, toggles all checkboxes below it for selected averaging periods.

The analyst can also generate a number of additional files including:

The Tabulated File of all Concurrent Concentrations

This option is required to view concentrations in the *Concentrations View* and is a much better alternative to using the *All Values* option (described above) in that it yields the same information but in a far more organized manner. This checkbox instructs AERMOD to output a concentration (.con) file which contains all of the modeled values for the entire dispersion analysis.

The Threshold Violation File

This option instructs AERMOD to output a threshold violation (.thr) file which contains all of the modeled values for the entire dispersion analysis which meet or exceed the value specified in the *Threshold* edit box.

The File for Contour Plotting

This option instructs AERMOD to output a plot (.plt) file which uses all of the high-values selected in the *High Values by Receptor* box as well as the annual (or entire period of study) averages. Contour plotting is only done for networked receptors; therefore, the study is required to include at least one receptor network for this option to be available.

File of Ranked Values for Q-Q Plotting

This option instructs AERMOD to output a ranked (.qqp) file which uses the top *n* values specified in the *Maximum Values* edit boxes.

File of Average Values for Season and Hour of Day

This option instructs AERMOD to output an average value (.avg) file which lists 96 average values for each receptor in the study. There is one average value for every combination of season and hour of day, for a total of 96 (4 x 24) values.

6.4.7   Run AERMOD

To run the AERMOD program,(See Figure 6-32) select the AERMOD Input File and click the OK button.

Figure 6-32: AERMOD Input File Window
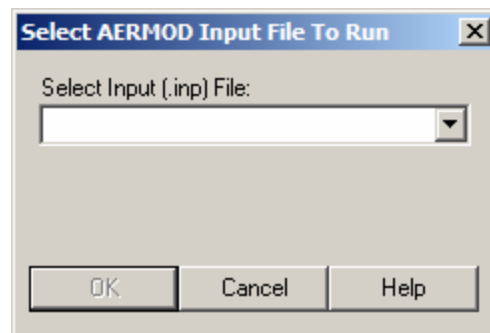
6.5 The View Menu

The *View* Menu provides access to the emissions inventory results, the airport graphical display, concentrations, the system tables, the General Conformity Rule, the National Ambient Air Quality Standards and the EDMS Homepage. The menu items available under the View menu are listed below.

- Emissions Inventory
    - Summary Button
    - Aircraft by Mode Button
    - Aircraft/GSE/APU Button
    - GSE Population
    - Vehicle Sources Button
    - Stationary Sources Button
- Airport
    - Airport Graphical Display
- Concentrations
- System Tables
- General Conformity Rule
- Standards (NAAQS)
- EDMS Homepage

6.5.1 Airport

View Airport Graphical Display

The airport layout (See Figure 6-33) can be viewed graphically at any time by selecting *View/Airport* from the pull-down menu. The airport name and legend are displayed at the top of the screen. The airport layout is displayed against (x,y) coordinates such that the y-axis runs North/South and the x-axis runs East/West. The user can locate the coordinates of the position anywhere on the view screen by placing the cursor and noting the coordinates displayed in the status bar at the bottom of the screen. EDMS automatically selects the best scale (also displayed on the lower screen border) to fit the airport layout on the view screen. The analyst can also use the zoom-in and zoom-out buttons or the zoom pull-down options under View to obtain the perspective that is desired. The home button returns the view to the original scale computed by EDMS.

Scaling and placing of the wallpaper bitmap should be done **prior to** the layout of all sources and receptors to be based off of it. Once the bitmap scale and origin parameters have been set, you are advised to not make any further adjustments! Doing so may force you to reposition all of your previously laid out sources and receptors.

The scaling of the selected bitmap's pixels into real-world coordinates requires knowledge of a real-world distance between two points represented on the bitmap. On maps of U.S. airports, runways typically have their lengths (in feet) noted along side them. The user should select **feet** for the layout units from the study setup screen if this is the case. Entering a known runway length is perfect for scaling. The known real-world length should be entered in the "Distance" box. To capture the length between two pixels in the bitmap, click the "Capture" button next to the "Length" box. Proceed by clicking and dragging with the mouse on the preview of the bitmap. The values in the "Length" and "Scale" boxes will automatically update. The locations of the selected endpoints will appear as crosshairs on two separate zoomed-in views in the scaling box. Using the little arrow controls, you can make fine adjustments to the captured length.

Once this has been set, you are advised to not make any further adjustments! Doing so may force you to reposition all of your previously laid out sources and receptors.

The origin is the bitmap pixel to be placed at the user-defined real-world coordinates of (0,0). It can be captured with the mouse, or simply typed into the appropriate boxes. To use the mouse, click "Capture" and then click on the desired point within the bitmap preview box. Using the little arrow controls, you can make fine adjustments to the captured point. Once this has been set, you are advised to not make any further adjustments! Doing so may force you to reposition all of your previously laid out sources and receptors.

Figure 6-33: The Airport Graphical Display Window
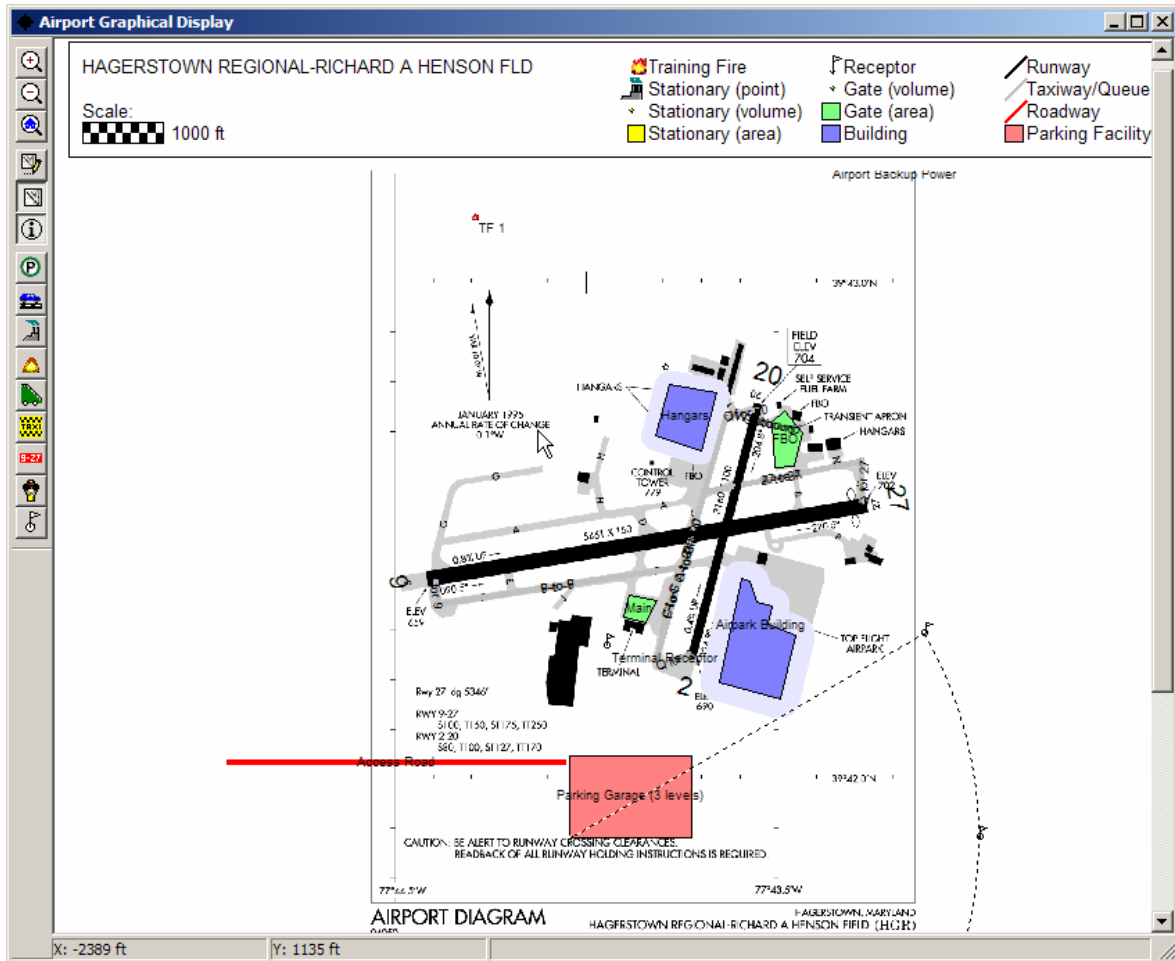
6.5.2   Emissions Inventory

The emissions inventory results can be viewed by selecting *View/Emissions Inventory* from the pull-down menu. When the emissions inventory window (See Figure 6-31) appears, summary information on all categories of emissions sources currently in the study will be displayed. In addition, the user can choose to view emissions by Aircraft by Mode, Aircraft/GSE/APU, GSE Population, Vehicle Sources, and Stationary Sources by pushing the button corresponding to these categories at the top of the screen. For example, while the summary screen displays total emissions for all roadways in the study, clicking on the Vehicle Sources button will display emissions for each roadway in the study. To return to the Summary information screen, press the Summary button.

Figure 6-34: The View Emissions Inventory Window

Category	CO	THC	NMHC	VOC	NOx	SOx	PM-10	PM-2.5
Aircraft	193,960	23,347	23,347	25,452	41,943	5,935	0	0
GSE/APU	113,750	34,798	4,180	4,359	9,321	1,016	152	1,164
Roadways	49,562	3,732	3,556	3,523	4,725	192	134	99
Parking Facilities	12,778	1,786	1,706	1,693	966	26	13	13
Stationary Sources	587,885	27,758	24,983	25,898	14,771	791	966	966
Fires	417	381	381	381	77	0	1,407	1,407
Total	958,352	91,803	58,154	61,306	71,802	7,961	2,672	3,649

UNITS: (Lbs/Year)

Emissions Inventory : Summary — tabs: Summary | Aircraft by Mode | Aircraft/GSE/APU | GSE Population | Vehicular | Stationary

6.5.3 System Tables

The View System Tables Window

The *View System Tables* window (Figure 6-35) allows the analyst to retrieve emission factor or aircraft-engine combination data for emission sources in the following categories:

- Airports
- Airport Taxi Times
- Aircraft
- Aircraft Categories & ICAO Times in Mode
- Aircraft-Engine Combinations
- Aircraft Performance Data: Departures
- Aircraft Engines Emissions Data
- APU Emissions Data
- GSE Default Aircraft Assignments
- GSE Types & Default Values
- GSE Default Emissions Data
- GSE NON-ROAD (May 2004 Draft) Emissions Data
- Stationary Source Parameters

- Fuels Emissions Data

- Additional Conversion Factors

- Weather Stations

Within each emission factor category is a listing of equipment/source types with corresponding emission factor data for each of the relevant criteria pollutants.

Figure 6-35: The View System Tables Window

Engine Name	Mode	CO EI	HC EI	NOx EI	SOx EI	PM-10 EI	Fuel Flow (kg/s)	Manufacturer	Reference Source
250B17B	1	47.200000	5.200000	2.200000	0.540000	0.000000	0.011000	Allison	AP-42 Table II-1-7
250B17B	2	9.020000	0.400000	5.960000	0.540000	0.000000	0.030900	Allison	AP-42 Table II-1-7
250B17B	3	7.810000	0.300000	6.600000	0.540000	0.000000	0.033400	Allison	AP-42 Table II-1-7
250B17B	4	97.000000	20.000000	1.000000	0.540000	0.000000	0.007900	Allison	AP-42 Table II-1-7
501D22A	1	5.100000	1.960000	7.490000	1.000000	0.000000	0.143600	Allison	AP-42 Table II-1-7
501D22A	2	2.060000	0.892000	9.220000	1.000000	0.000000	0.276900	Allison	AP-42 Table II-1-7
501D22A	3	2.040000	0.280000	8.880000	1.000000	0.000000	0.299400	Allison	AP-42 Table II-1-7
501D22A	4	43.600000	17.610000	3.520000	1.000000	0.000000	0.076900	Allison	AP-42 Table II-1-7
6-285-B	1	1020.000000	16.100000	4.720000	0.110000	0.000000	0.010500	Teledyne Continental	AP-42 Table II-1-7
6-285-B	2	668.100000	8.370000	5.500000	0.110000	0.000000	0.020920	Teledyne Continental	AP-42 Table II-1-7
6-285-B	3	998.000000	11.600000	5.880000	0.110000	0.000000	0.019280	Teledyne Continental	AP-42 Table II-1-7
6-285-B	4	363.700000	10.700000	0.463000	0.110000	0.000000	0.009080	Teledyne Continental	AP-42 Table II-1-7
AE3007A	1	3.280000	0.640000	7.790000	1.000000	0.000000	0.117000	Allison	ICAO UID 4AL003. Tested 3
AE3007A	2	0.920000	0.290000	17.470000	1.000000	0.000000	0.315000	Allison	ICAO UID 4AL003. Tested 3
AE3007A	3	0.750000	0.250000	20.540000	1.000000	0.000000	0.377000	Allison	ICAO UID 4AL003. Tested 3
AE3007A	4	17.350000	2.510000	3.830000	1.000000	0.000000	0.049000	Allison	ICAO UID 4AL003. Tested 3
AE3007A1	1	3.800000	0.720000	7.220000	1.000000	0.000000	0.117000	Allison	ICAO UID 4AL002. Tested 3
AE3007A1	2	0.970000	0.300000	16.840000	1.000000	0.000000	0.319000	Allison	ICAO UID 4AL002. Tested 3
AE3007A1	3	0.790000	0.260000	19.780000	1.000000	0.000000	0.380000	Allison	ICAO UID 4AL002. Tested 3
AE3007A1	4	22.430000	3.100000	3.520000	1.000000	0.000000	0.050000	Allison	ICAO UID 4AL002. Tested 3
AE3007A1 (Type 1)	1	3.910000	0.655000	7.100000	1.000000	0.000000	0.113000	Rolls Royce	ICAO UID 6AL005.
AE3007A1 (Type 1)	2	0.960000	0.257000	16.630000	1.000000	0.000000	0.318000	Rolls Royce	ICAO UID 6AL005.
AE3007A1 (Type 1)	3	0.770000	0.221000	19.660000	1.000000	0.000000	0.382600	Rolls Royce	ICAO UID 6AL005.
AE3007A1 (Type 1)	4	23.730000	3.818000	3.470000	1.000000	0.000000	0.046100	Rolls Royce	ICAO UID 6AL005.
AE3007A1 (Type 2)	1	1.360000	0.180000	7.200000	1.000000	0.000000	0.113000	Rolls Royce	ICAO UID 6AL006.
AE3007A1 (Type 2)	2	0.010000	0.000000	19.580000	1.000000	0.000000	0.318000	Rolls Royce	ICAO UID 6AL006.
AE3007A1 (Type 2)	3	0.120000	0.000000	22.410000	1.000000	0.000000	0.382600	Rolls Royce	ICAO UID 6AL006.
AE3007A1 (Type 2)	4	32.590000	5.040000	3.190000	1.000000	0.000000	0.046100	Rolls Royce	ICAO UID 6AL006.

2040 records found.

Viewing System Tables
To view emission factor data for a category, select the category to view using the drop-down list. Once the category has been selected, (highlighted) a list of equipment/source types will appear along with emission factor data for some criteria pollutants. Use the scroll bars if necessary to view the entire list of equipment/source types, emission factors and source of emissions data.

Printing System Tables
The user can print the emission factor data for the category by selecting *File/Print* from the pull down menu.

6.5.4   Concentrations

The Concentrations window (Figure 6-36) displays the concentrations generated by AERMOD. Select from or type in the "File Name" drop down list a concentration (.con) file name. The window's status bar displays the selected file's size, number of records and date of last modification. Press "Query" to read the file's contents and populate the view's list of concentrations. To filter the query, select an averaging period from the "Averaging Period" and/or a source group from the "Group" drop down lists. Press "Query" again to update the view. Filtering the data can greatly accelerate the query process.

Figure 6-36: The View Concentrations Window

6.5.5   The General Conformity Rule

The General Conformity Rule simply displays the threshold level for Non-Attainment Areas(NAAs), and the threshold level for Maintenance Areas (MAs).

6.5.6   Standards (NAAQS)

The National Ambient Air Quality Standards (NAAQS) are composed of primary and secondary standards, and short term and long-term standards. The EPA Office of Air Quality Planning and Standards (OAQPS) may be contacted to obtain further information on any of the standards. With the exception of the standards for Ozone and Lead and the 3-hour Sulfur Dioxide secondary standard, EDMS will generate concentrations that can be compared against the NAAQS.

Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly.

Secondary standards set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings.

Short and Long Term Standards are designed to provide for the fact that humans can tolerate brief exposures to higher levels of pollutant concentrations, but can suffer adverse health impacts from prolonged exposure to lower concentrations of pollutants.

Short Term Standards set limits for concentrations over one-hour, 8-hour, and 24-hour periods.

Long Term Standards set limits for concentrations on an annual basis (*AAM*).

National Ambient Air Quality Standards

| POLLUTANT	Primary Standards	Averaging Period	Secondary Standards.
Ozone			
	0.08 ppm	8-hour[5]	Same As Primary
	0.12 ppm	1-hour[6]	Same As Primary
Carbon Monoxide			
	9 ppm (10 mg/m³)	8-hour[1]	None
	35 ppm (40 mg/m³)	1-hour[1]	None
Particulate Matter (PM-10)			
	150 µg/m³	24-hour average	N/A
	50 µg/m³	Annual[2] arithmetic mean	Same As Primary
Particulate Matter (PM-2.5)			
	15 µg/m³	Annual[3] arithmetic mean	Same As Primary
	65 µg/m³	24-hour[1]	N/A
Sulfur Oxides			
	0.140 ppm	24-hour[1]	Same As Primary
	0.03 ppm	Annual[2] arithmetic mean	
	----	3-hour average	0.55ppm(1300ug/m3)
Nitrogen Dioxide			
	0.053 ppm (100 µg/m³)	Annual arithmetic mean	Same As Primary
Lead			
Quarterly average	1.5 µg/m³	Quarterly Average	Same As Primary

6.6 The Utilities Menu

The *Utilities* Menu allows the user to define their aircraft and GSE, as well as import and export operational profile data. The items under the Utilities menu are listed below.

- Add/Create Aircraft
- Add/Create GSE
- Export/Import Profiles

6.6.1   User-Created Aircraft

The User-Created Aircraft Window

Figure 6-37: The User-Created Aircraft Window
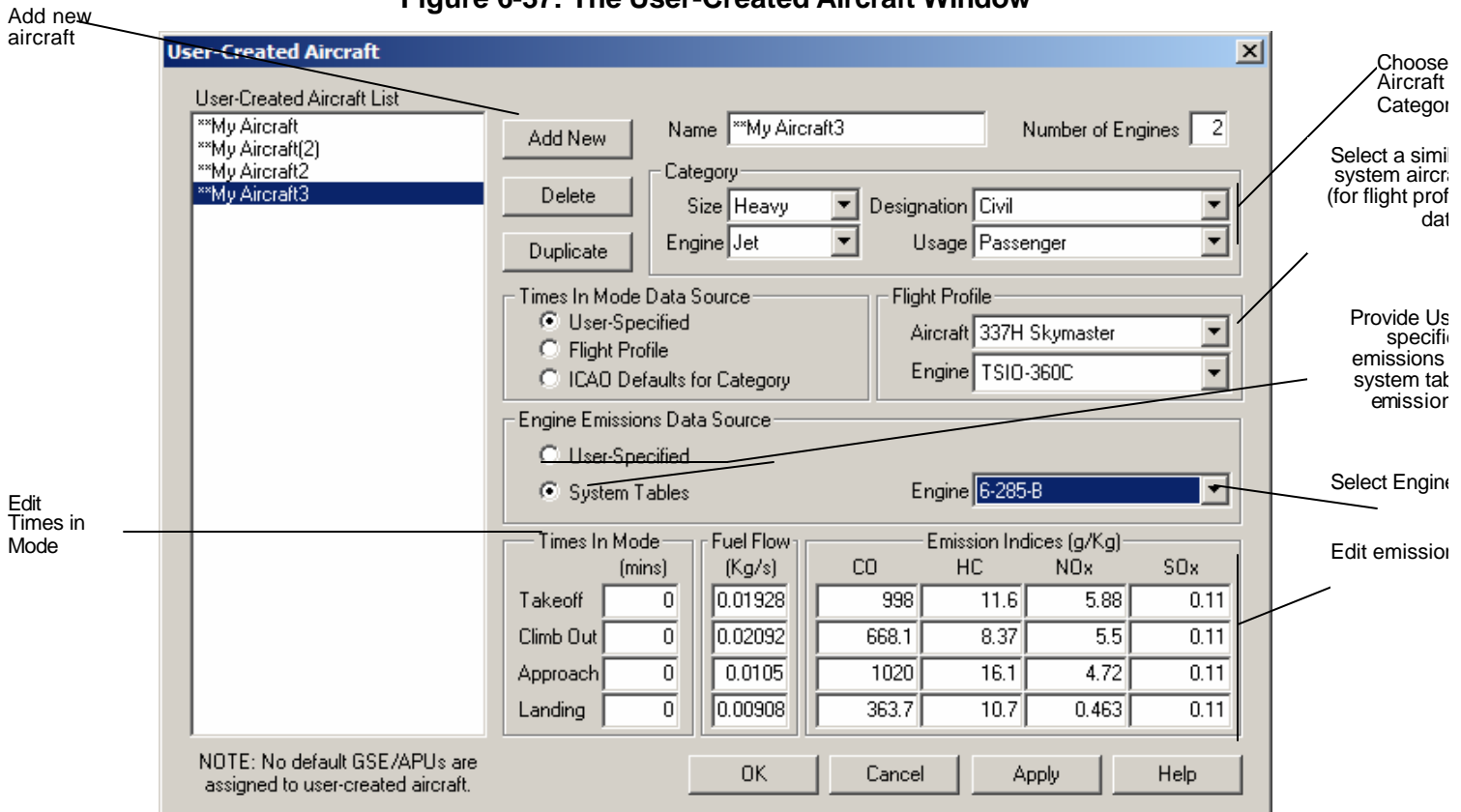
The User-Created Aircraft Window

The User-Create Aircraft dialog window (See Figure 6-37) allows the user to create custom aircraft types to supplement the conventional types currently available as part of the EDMS database. In creating a custom aircraft type, the analyst will need to specify certain characteristics of the custom aircraft type for use in emissions and dispersion analyses. These characteristics include the *Number of Engines*, *Time In Mode*, *Engine Emission Factors*, and *Aircraft Category*. Once created, the custom aircraft type will be available for selection under the Emissions/Aircraft dialog. User-defined aircraft are prefixed with "**" to distinguish them from system data.

As in all EDMS windows, pressing the Apply button records any changes without exiting the window. To save the changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

Adding/Creating a New Aircraft Type

To add a new aircraft type to the list of aircraft types available for use in the study, press the Add New button and type in the name of the new aircraft. Next, enter the number of engines for the new aircraft type. The user will need to specify Time in Mode information (Takeoff roll and climb to 1000 feet above the ground, Climb out from 1000 feet to 3000 feet above the surface, Approach from 3000 feet to ground, and landing roll) for the new aircraft type, as well as Engine Emission Factors (CO, HC, NOx, and SOx) and a category. The approach and climb out times in mode are based on the time to and from 3000 feet above the ground. If the mixing height for the airport is changed, the climb out and approach times in mode will be scaled as described in chapter 3. The times in mode provided are only used for emissions inventories. Each user-created aircraft must also be associated with a corresponding system aircraft-engine combination. This assigns the flight profile to be used for a dispersion analysis. Dispersion calculations for aircraft use the specified flight profile to calculate Times-In Mode. Emission Factors for many engine types are displayed under the View/System Tables pull-down menu

Aircraft categories are defined by the following criteria:

Criteria	Categories	Category Abbreviation
Size	Heavy (Over 255,000 lbs)	H
	Large (41,001 to 255,000 lbs)	L
	Small (41,000 lbs or less)	S
Designation	Civil	C
	Military	M
	General Aviation	G
Engine Type	Jet	J
	Turboprop/Turboshaft	T
	Piston	P
Usage	Passenger or VIP Transport	P
	Cargo or General Transport	C
	Business	B
	Helicopter	H
	Combat or Attack	A

Note: Aircraft categories were assigned based on information in the FAA Integrated Noise Model (INM) aircraft table and the latest revision to aircraft weight class definitions. Weight classes are based on definitions in Appendix A of FAA's Air Traffic Control, FAA-7110.65M, which were last revised on August 10, 2000. If an aircraft changed weight classes since its listing in the INM aircraft table due to the revision of FAA's Air Traffic Control, the new weight class was used. Aircraft category assignments were verified using two references: The International Directory of Civil Aircraft (Frawley, Gerard and Jim Thorn. Weston Creek: Aerospace Publications Pty Ltd., 1995) and The International Directory of Military Aircraft (Frawley, Gerard and Jim Thorn. Weston Creek: Aerospace Publications Pty Ltd., 1996).

Editing a New Aircraft Type

Most fields may be edited by simply selecting the field and typing in the new information, and pressing OK. This is true for editing the Number of Engines, Time in Mode, or Engine Emission Factors information. .

Once added, a new aircraft type will be listed among the available aircraft and can be used in the study like any other available aircraft type.

6.6.2   User- Created GSE

Figure 6-38: The User- Created GSE window
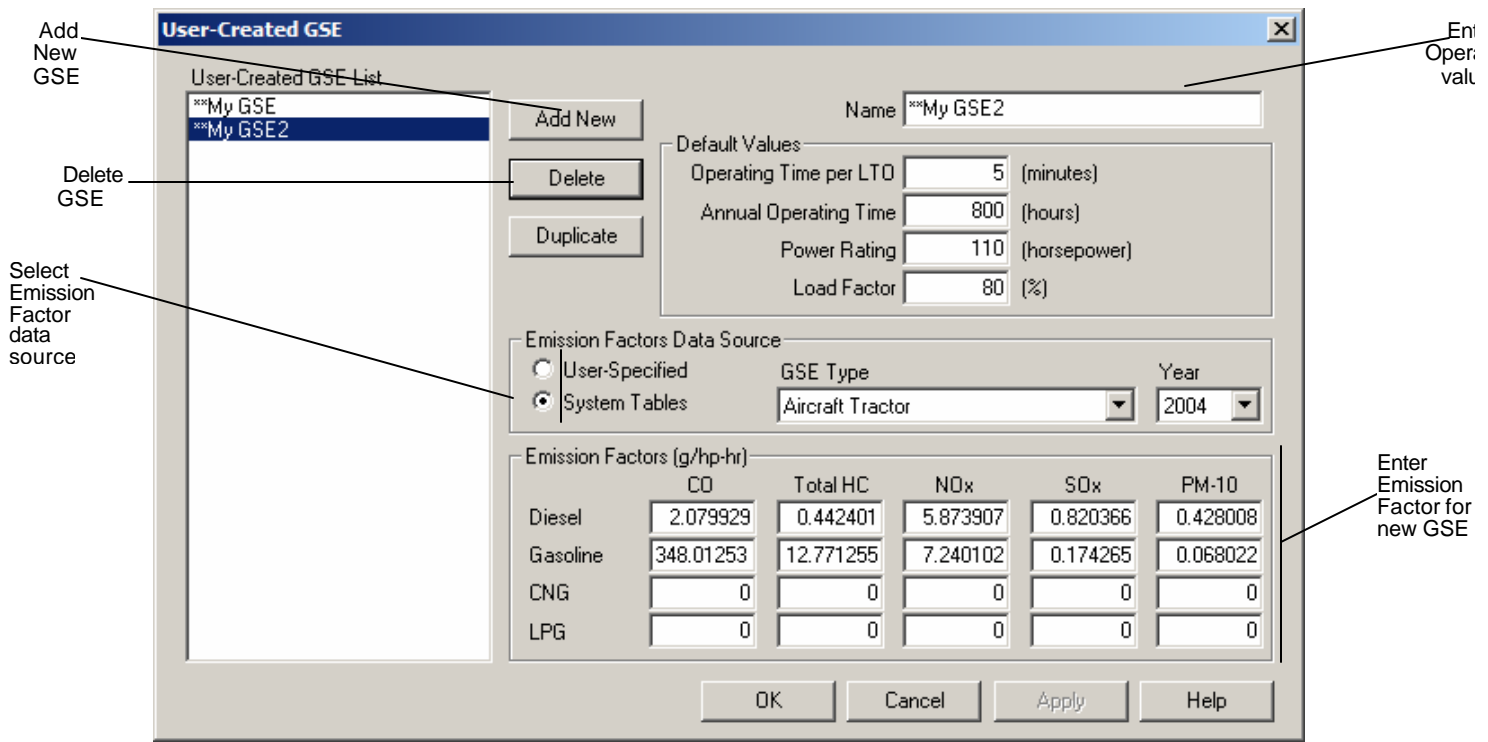
The User- Created GSE (Figure 6-38) window allows the analyst to define ground support equipment, which does not exist within the EDMS database. The user must provide the model with a default operating time, and CO, Total HC, NOx, SOx, and PM-10 emission factors.

Adding/Creating a New GSE

To create the GSE, as with other EDMS windows, press the Add New button and provide a name for the equipment, along with the information listed above. Press Apply to add the GSE to the database. Once the analyst has added a new piece of GSE, they will be able to include it within any of the studies, just as they would with GSE from the EDMS database. User-defined GSE are prefixed with "**" to distinguish them from system data. The analyst may change the operating time or emission factors at any time by selecting the GSE, making a change, then pressing Apply.

6.6.3 User- Created APU

Figure 6-38: The User- Created APU window

Add new
APU

Select
Emission
Factor
data
source

Enter
Emission
Factor for
new APU
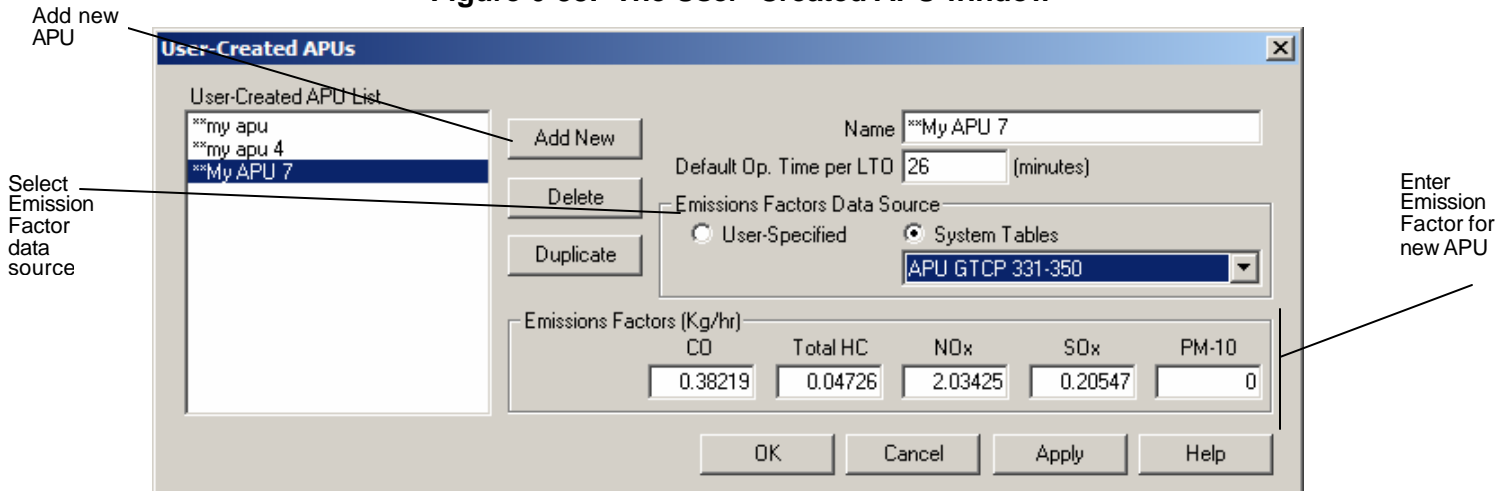
The User- Created APU (Figure 6-38) window allows the analyst to define Auxiliary Power Units that does not exist in the EDMS database. The user must provide the model with a default operating time, and CO, Total HC, NOx, SOx, and PM-10 emission factors.

Adding/Creating a New APU

To create the APU, as with other EDMS windows, press the Add New button and provide a name for the Unit, along with the information listed above. Press Apply to add the APU to the database. Once the analyst has added a new piece of APU, they will be able to include it within any of the studies, just as they would with GSE from the EDMS database. User-defined APU are also prefixed with "**" to distinguish them from system data. The analyst may change the default operating time or emission factors at any time by selecting the APU, making a change, and then pressing Apply.

6.6.4 Export

EDMS allows analysts to export data from the current study. The export utility contains three steps which consist of: selecting the items to export by checking the boxes in the tree to mark which items in the study are to be exported (Figure 6-39), Step 2, naming the export file (Figure 6-40), and Step 3 the export report window which details the outcome of the export. (Figure 6-41).

Figure 6-39: Export Step 1
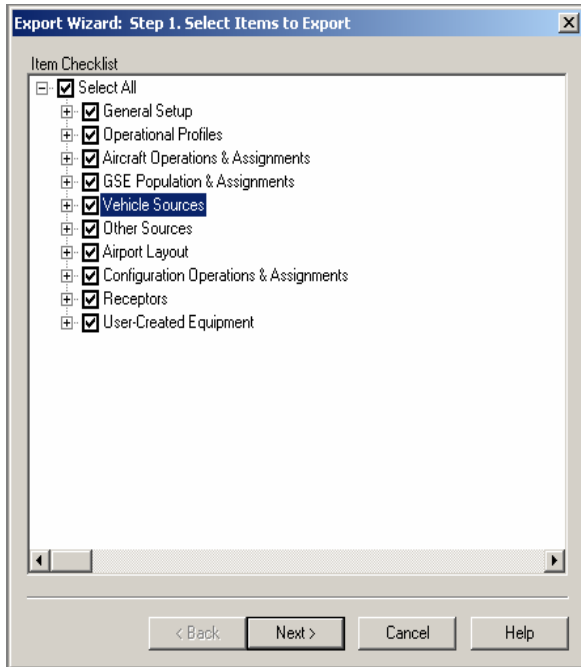
Figure 6-40: Export Step 2
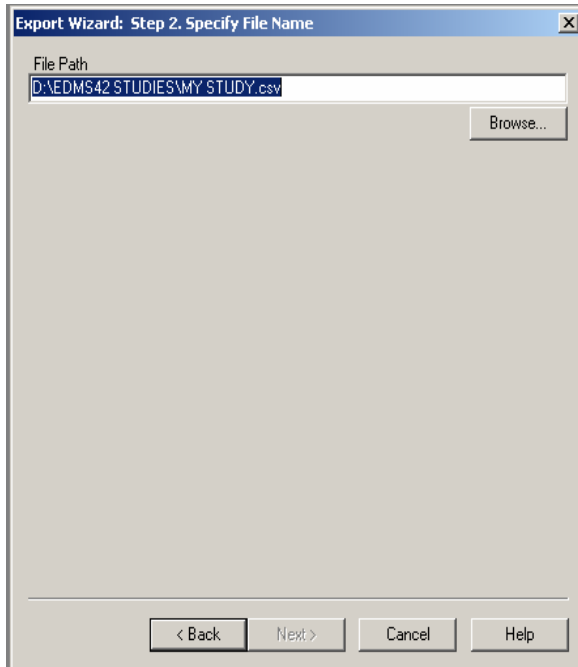
Figure 6-41: Export Step 3
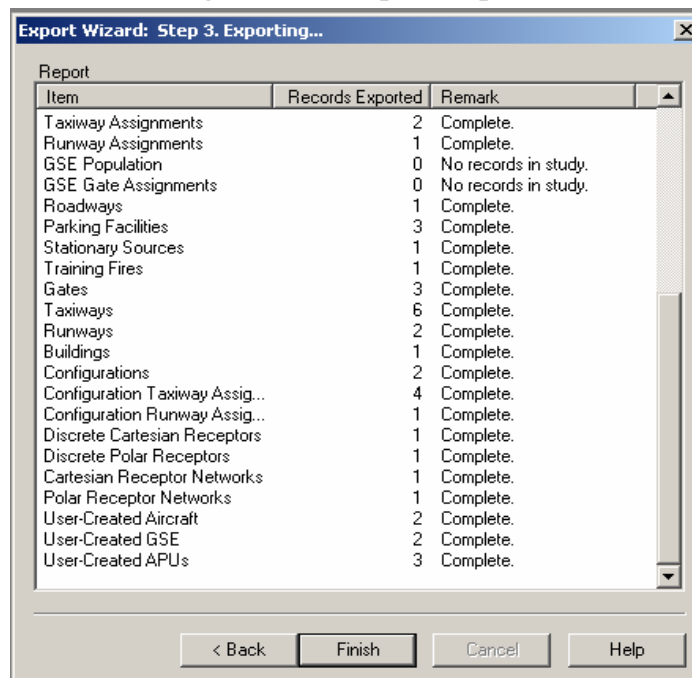
6.6.5   Import

The Import Utility

The import utility is used to read a comma-separated (CSV) text file that contains data for importing. It is made up of three steps which include: Step 1(Figure 6-42) identifying the file to input, Step 2 (Figure 6-43) selecting the sources to input and Step 3 (Figure 6-44) the import report window which details the outcome of the import.

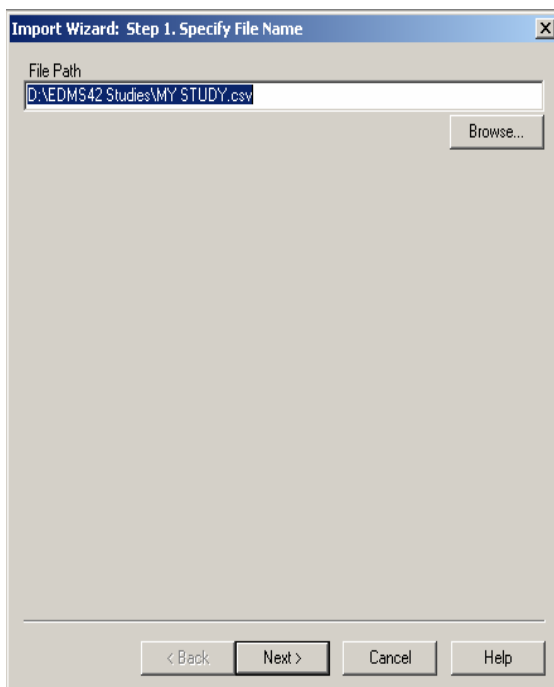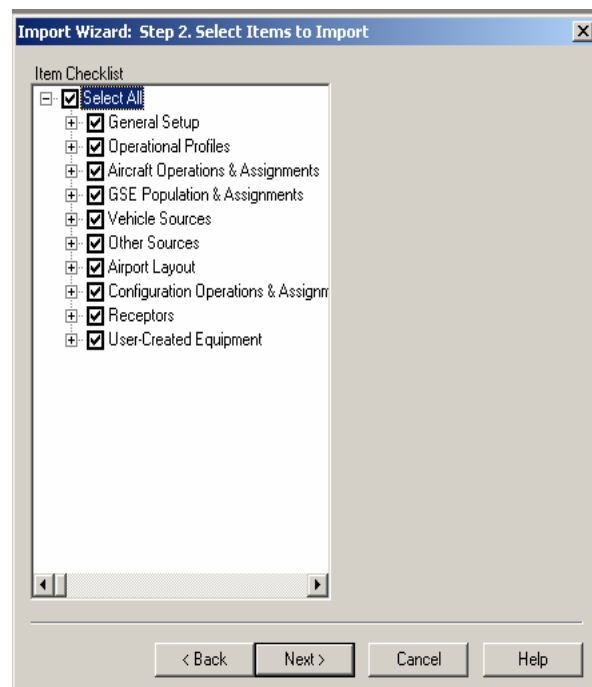**Figure 6-42: Import Step 1**   **Figure 6-43: Import Step 2**

Figure 6-44: Import Step 3
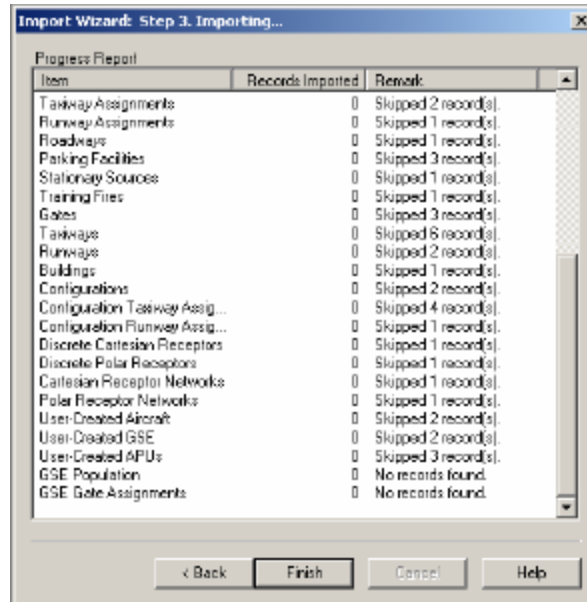
Users should refer to Appendix C for a complete description of the import formats supported by EDMS 4.2. As the file is being imported into the study, the screen is updated with a running total of errors encountered with the file. A text file with the extension .LOG is created in the same directory as the import file that provides detailed information about errors encountered during the import. A sample .LOG file is shown below.

Figure 6-45: Import Log File

```
Error Messages:


------------------------------------------------------------
USER_AIR SECTION
------------------------------------------------------------
Incorrect number of fields in record:
**F900 CF700-2D,3,1,,,,,,,,SGJB,Falcon 50,TFE731-3,1,CF700-2D, ,
Incorrect number of fields in record:
**F900 CF700-2D,3,2,,,,,,,,SGJB,Falcon 50,TFE731-3,1,CF700-2D, ,
Incorrect number of fields in record:
**F900 CF700-2D,3,3,,,,,,,,SGJB,Falcon 50,TFE731-3,1,CF700-2D, ,
------------------------------------------------------------
AIR_POP SECTION
------------------------------------------------------------
Incorrect number of fields in record:
C-130 HERCULES,501D22A,,1,,0,E,,,,,Turboprop Orig. AC:C130 Orig. Eng.:501D22A #1,12, , ,,
Incorrect number of fields in record:
C-130 HERCULES,501D22A,,1,,0,G,,,,,Turboprop Orig. AC:C130 Orig. Eng.:501D22A #2,15.5, , ,,
Incorrect number of fields in record:
C-130 HERCULES,501D22A,,1,,0,W,,,,,Turboprop Orig. AC:C130 Orig. Eng.:501D22A #3,12.5, , ,,
```

6.7 The Window Menu

The *Window* Menu is a standard Microsoft Windows menu item. It contains the following options:

- Cascade

- Tile

- Arrange Icons

The user can arrange the display of windows in EDMS for View modules only, since only the View modules allow more than one window at a time to be open. The Cascade command resizes and layers an open group of windows so that each title bar is visible. The Tile command resizes and arranges an open group of windows side by side. When the user minimizes a window (to an icon), the Arrange Icons command will evenly arrange them in the window

6.8 The Help Menu

The *Help* menu provides access to the EDMS online help. The Help menu contains the following options:

- Online Help

- Logo

- About EDMS…

Selecting *Online Help* calls up the EDMS 4.2 online help. The logo option displays the EDMS logo, and the *About EDMS...* option displays the version of EDMS that is being used, the release date, and a technical support phone number.

APPENDIX A. AERCPP

A.1. Introduction

The Airport Emissions Reduction Credit Post-Processor (AERCPP) tool is bundled with the EDMS 4.2 distribution CD and the EDMS 4.2 upgrade file. This post processor is designed to work with EDMS 4.2 only and is intended to support the new emission provisions in the Federal Aviation Administration (FAA) reauthorization, Vision-100 – Century of Flight Authorization Act of 2003 (P.L. 108-176). The new program for airports is voluntary and is called the Voluntary Airport Low Emission (VALE) program. To be eligible, airports must be located in non-attainment or maintenance areas as designated by the U.S. Environmental Protection Agency (EPA). This software facilitates airport applications for VALE program funding based on the proposed project's emissions savings and cost effectiveness. In addition, it provides standardization of airport emission reduction estimates and reporting forms for the benefit of State and local air quality agencies, which will grant airport emission reduction credits (AERCs) to airports for their projects.

The AERCPP tool is part of a phased approach for developing new EDMS capabilities to support VALE program requirements and early emission reductions by participating airports. In the current (first) phase, applicants will use EDMS version 4.2 in combination with AERCPP to facilitate emission reduction calculations until a fully automated enhancement is added to EDMS. In the second phase, applicants will use a new version of EDMS, version 5.0, which will fully automate the emission reduction calculation capability.

In order to function correctly, the Microsoft .net framework version 1.1 or later must be installed on the computer's operating system. Selecting "Windows Update" will allow users to install this free update to Windows, if it has not previously been installed. The AERCPP tool will accept as input EDMS 4.2 studies whose emissions inventories have been previously generated. Its primary function is to collect emission inventory data from previously generated EDMS studies and reformat them in the form of an AERC report.

A.2. Working with EDMS

In EDMS, a study is a collection of user inputs[1]. Currently, a study represents only one user-specified calendar year of airport operations. After users enter all of the operational inputs that they wish to model, an annual emissions inventory can be generated by selecting "Run Emissions Inventory" from the "Emissions" menu. The generated inventory is a set of tables that list the total annual emissions of the seven pollutants (CO, THC, NMHC, VOC, NO_x, SO_x and PM) for each emissions source, or source category (aircraft, on-road vehicles, etc…) for the entire airport.

---

[1] In other software applications, a collection of user inputs in often termed a "document"; but because EDMS user inputs are stored in a collection of several files, rather than one single file, the term "study" is used.

Assuming no change in year-to-year total operations (e.g., no growth), modeling emissions for a different calendar year only requires the user to change the "Study Year" input or the user can save the study under a different name (select "Save Study As") and then change the "Study Year". Since EDMS 4.2 permits the modeling of one year at a time (i.e., only one study can be open within EDMS at a time), regenerating the emissions inventory without saving under a new name overwrites all previous results for the existing study. EDMS 4.2 stores the most recently generated emissions inventory in data tables (.DBF files) located in the study directory.

With respect to EDMS 4.2, a **scenario** is defined as a set of studies such that each study represents a distinct calendar year of activity, and these years form a consecutive set. In most cases, users will need to compare only two scenarios: a *baseline* and a *proposed* project. Both scenarios will consist of a set of studies, corresponding to the same calendar years of activity. Users should first develop a consecutive set of *baseline* studies for each calendar year in chronological order. Secondly, users should develop a set of *proposed* studies. The manner in which the baseline and proposed studies should be created is described below.

Sections A.3 through A.8 detail the main steps of the methodology, summarized as follows:

1. Create the first study for the baseline activity in EDMS 4.2, and generate an emissions inventory. This will correspond to the first year and first level of activity being examined.
2. Make a duplicate copy of the study under a new name.
3. Make the necessary adjustments to define a new study for the next year of the same baseline activity, and generate another emissions inventory.
4. Repeat steps 2 and 3 for the remaining baseline studies and analysis years.
5. Repeat steps 1 through 4 for the proposed project studies.
6. Create an AERC report by running AERCPP and selecting the appropriate EDMS studies.

A.3.   Creating a First Year Study

This appendix assumes that the reader has already reviewed the other sections of the EDMS user manual to become familiar with the operation of EDMS. The user is encouraged to name all of their studies in a standardized manner. For example, if the airport being modeled is "XYZ" and the first year being modeled is 2005, then the first baseline study should be named "XYZ Baseline 2005," and all successive studies should be similarly named. To reduce confusion, all years should be entered as four-digits (e.g., not "05"). ***The AERCPP tool will only understand the four-digit year format.*** If a study relates to the proposed airport project, then "Proposed" should replace "Baseline" in its name.

Users should be especially familiar with the "Study Setup" dialog box where the "global" parameters of a study are set. This dialog is automatically displayed immediately after creating a new study. After opening a previously created study, the "Study Setup" dialog box is accessed by selecting *Setup...* under the *File* menu. In this dialog, the user is

encouraged to select or type the airport ID, which causes the airport's elevation, default average yearly temperature, and default mixing height to be retrieved from the system tables. Six parameters in the "Study Setup" dialog box are critical to correct emissions modeling. They are: the study year, the default taxi time, the mixing height, the MOBILE version, the elevation, and the average yearly temperature. Table 1 summarizes their respective impacts on emissions.

Table 1. EDMS 4.2 Study Parameters Critical to Emissions Modeling.

Parameter Name	Emissions Impact
Study Year	On-road Vehicles
	Ground Support Equipment
	Aircraft
Default Taxi Time	Aircraft
Mixing Height	Aircraft
MOBILE Version	On-road Vehicles
Elevation	On-road Vehicles
Average Yearly Temp	On-road Vehicles

Three parameters – mixing height, elevation and average yearly temperature - do not normally vary from year to year. Their values should be kept set to values which accurately correspond to the geographic location of the airport. Moreover, although EDMS 4.2 will allow the user to select from three versions of MOBILE, *MOBILE6.2 must be used for the airport emission reduction credit process* (it is important to ensure MOBILE6.2 data are used since the MOBILE version has a significant impact on on-road vehicular emissions). In addition, the study year should be adjusted to match the calendar year in which the modeled emissions are meant to occur. For example, if the first year in the scenario is 2005, the study year should be initially set to "2005." Study year can impact the default taxi time which in turn impacts aircraft emissions. It is entirely possible that the default taxi time varies from year to year as an airport's layout and operations evolve over time.

The study year also changes the emission indices for on-road vehicles and ground support equipment due to the fleet assumptions embedded into MOBILE6.2 and NONROAD by EPA. This includes scheduled emission standards, the average age of the fleet, and the associated deterioration rates. Advanced users who need to modify these parameters directly will need to run the associated EPA model (either NONROAD or MOBILE6.2) outside of EDMS and then import the new emission factors.

For AERC studies, the user should have the Emissions Only option checked in the Study Setup dialog box.

On the *General* tab of the Study Setup dialog box, *System Aircraft Times in Mode Basis* may be set to either *EPA/ICAO Defaults* or *Performance Based* ; however, the choice must be consistent for each EDMS study in order to provide a valid comparison of emissions, as this setting has a significant effect on aircraft emissions.

Based on available Ground Support Equipment (GSE) data, the user must understand how GSE can be modeled for properly setting the "GSE Modeling Basis." If the user has obtained airport population data on GSE (e.g, an inventory of all GSE operating at an airport with annual operating times), then *Population Based* would most likely be the appropriate choice. Otherwise, if EDMS's default GSE data, based on the annual landing and takeoff cycles (LTOs), is sufficient for the user's needs or if the user has site-specific data on GSE operations on a per aircraft operation basis, then *LTO Based* should be selected. It is important to note that selecting the latter option requires the user to input aircraft operations data in addition to the GSE operations. Both GSE modes allow users to specify the year of manufacture for the equipment. EDMS will calculate the appropriate deterioration based on the study year and apply the value to determine the appropriate emission factor.

Regardless of the GSE modeling basis selected, users will want to enable the option to use the draft NONROAD emission factors by supplying the year of manufacture of the equipment. This overrides the age distribution assumptions embedded within EDMS 4.2.

A similar option for on-road vehicles is present on the roadways and parking facilities screens in EDMS 4.2 and should be used for AERC analyses. The *Vehicle Emission Parameters* drop down list on those screens can be used to select the MOBILE6.2 option.

On the *Units of Measure* tab of the Study *Setup* dialog box, the user is free to select whichever units are desired. The particular settings on this tab are irrelevant to AERC purposes and have no impact on the final results.

Finally, after all inputs have been made to EDMS, the emissions inventory should be generated by selecting *Run Emissions Inventory* from the *Emissions* menu. A window will appear when the emissions inventory is complete and displays the results.

A.4. Creating Future Year Studies

EDMS studies consist of a directory populated by a single EDMS study (.EDM) file, several database (.DBF) files and several files of a few other file types. Duplication of a study, albeit under a new name, is essentially the duplication of the original directory and the directory's contents.

Users can duplicate studies within EDMS by using the *Save Study As...* function under the *File* menu. This is done to create new studies based on previously input studies. This can be a significant timesaver, especially when there is little difference in airport operations from one year to the next or between two scenarios for a given year. When a user selects *Save Study As...,* he or she is prompted to specify the location and the name for a new directory that will be created to contain the duplicated files. In addition, the duplicated .EDM file will be appropriately renamed to correspond to the name of the new directory.

It is important to note that the actual name of the .EDM file and directory is immaterial to EDMS; however, users should follow a standardized naming scheme similar to the one

described in section A.3 to avoid confusion and to comply with the AERCPP tool requirements described in section A.5. For example, if the study being copied is "XYZ Baseline 2005", the most appropriate name for the new study might be "XYZ Baseline 2006". If a user enters this in the *Save Study As...* dialog box, EDMS will create a new directory called "XYZ Baseline 2006", copy all of the pertinent files in the "XYZ Baseline 2005" directory into the "XYZ Baseline 2006" directory and rename "XYZ Baseline 2005.EDM" to "XYZ Baseline 2006.EDM". EDMS will then automatically close the original "XYZ Baseline 2005" study, open the newly created "XYZ Baseline 2006" study and be ready to accept incremental changes to the inputs of the new study (e.g., adjusting the study year).

A.5.   Editing Future Year Studies

Incrementing a study is the process of making changes to the inputs of a study to reflect the changes from year to year. These changes may be internal to the emission factors (e.g., vehicle deterioration rates) or they may be working assumptions, for example:

- Number of vehicles
- Vehicle fleet mix
- Vehicle usage rates
- Useful life of current and new equipment
- Introduction of new Federal emission standards

EDMS provides the ability to print out all of the model inputs on the basis of a single study by year. The airport sponsor can submit these annual input records to the State air quality agency as part of their project proposal. In addition, to insure understanding of the study changes affecting emissions inventory results, airport sponsors should summarize and compare the modeled changes that occur year-to-year manually and include this information in their project proposal to the FAA and State air quality agencies.

Table 2 lists the major sources and some of the variables of a study that will impact the emissions inventory results. These items along with the parameters listed in Table 1 represent the changes at the airport that the modeler is able to capture for each year within EDMS.

Table 2. Sources to be Incremented in an EDMS Study by the User.

Source	Change
Aircraft	Annual LTOs
	Annual number of touch and go operations
	Total (combined) taxi and queue time
	Fleet change
	GSE assignments
Auxiliary Power Unit (APU)	Operating time
	Equipment change
Ground Support Equipment (GSE)	Fleet change
	Fuel type change (e.g. conversion to CNG or electric)
	Operating time
Parking structures	Number of vehicles
	Vehicle type
	Average speed
	Average idle time
	Average distance traveled
Roadways	Number of vehicles
	Vehicle type
	Average speed
	Distance traveled
Stationary sources	Annual fuel use
	Type of fuel
Training fires	Fuel consumption
	Fuel type

The first incremental change made should be to adjust the study year in the *Study Setup* dialog box as described in section A.3. For example, for the "XYZ Baseline 2006" study, set the study year to "2006" in the *Study Setup* dialog box. Setting the study year is critical to correctly modeling the emissions of on-road vehicles and GSE. In addition, changing the study year also updates the default combined average taxi and queue time set for the airport. Changing this value only impacts new aircraft added to the study. Aircraft that were added prior to changing the study year will retain their previously specified combined taxi and queue times. When the study year is changed, users must acknowledge the changes by clicking "Yes" on the dialog box that pops up or the change will revert to the previous value. The user should press "OK" to close the *Study Setup* dialog box. This will save all of the changes and update the vehicular and GSE emissions. The user should then make whatever incremental changes are necessary to the annual airport operations being modeled.

Following the previous example, the "XYZ Baseline 2006" study initially has its inputs set for modeling calendar year 2005 activity. These 2005 inputs should be adjusted to model calendar year 2006 activity. If there is no change in modeled activities for a particular category, the user can simply skip this part.

The study year cannot be set later than "2025". To model study years later than 2025, users must set the study year to "2025" and indicate the actual study year in the name of the study. Users may also want to include the study year in the study's comment box (in the *Study Setup* dialog window). As explained in section A.3, use a four-digit year format in the description of the study.

Since the study year impacts vehicular and GSE emission rates, modeling beyond 2025 may prompt advanced users to compute their own emission rates for vehicles with MOBILE6.2.

When modeling beyond 2020, advanced users may also opt to extrapolate their own emission rates for user-created GSE. Novice users can learn more about this by reviewing the EDMS online help (press the "Help" button on the "Parking Lots" or "User-Created GSE" dialog box) or EDMS documentation (sections 3.5, 6.2.2, 5.2 and 6.7.2 of the EDMS manual). However, this is optional because GSE and vehicular emission rates generally decrease and level-off over time; and therefore, not opting to include extrapolated emission rates is a conservative choice.

Finally, after all incremental changes to the inputs of a study are made; the emissions inventory should be generated by selecting *Run Emissions Inventory* from the *Emissions* menu. Once the inventories are created for each study year, the user will have a set of consecutive annual results for each scenario.


A.6. Input to AERCPP

To facilitate user input, the AERCPP tool will invoke on startup a simple two-page wizard as seen in Figure 1. The wizard will allow the user to perform the first three steps of the above instructions.

On page 1 of the wizard, the user identifies the EDMS 4.2 studies that serve as the baseline. The *"Add Studies…"* button will bring up a standard file dialog box that allows users to browse through their files to select the desired EDMS 4.2 studies. Below the button, the list box containing the added studies will list the calendar years corresponding to the studies the user has specified. Because the years must form a consecutive set, any missing years will be listed below in the "Missing Years" box. If there are no missing years and the user has added at least one year, the user is free to continue onto the second page of the wizard by clicking the "Next" button.

On page 2 of the wizard, the "Add Studies…" button and the added studies list box serve the same functions for proposed project studies as their counterparts on page 1 did for baseline studies. As on page 1, the selected study years must form a consecutive set, and any missing years will be listed below in the "Missing Years" box. Additionally, any year that has been specified as part of the baseline scenario on page 1 will also be considered missing on page 2, unless the user has also specified it on page 2. If there are no missing years, the user is free to click the "Finish" button, which will automatically generate the AERC report.

Figure 1. AERCPP Input Wizard Concept.
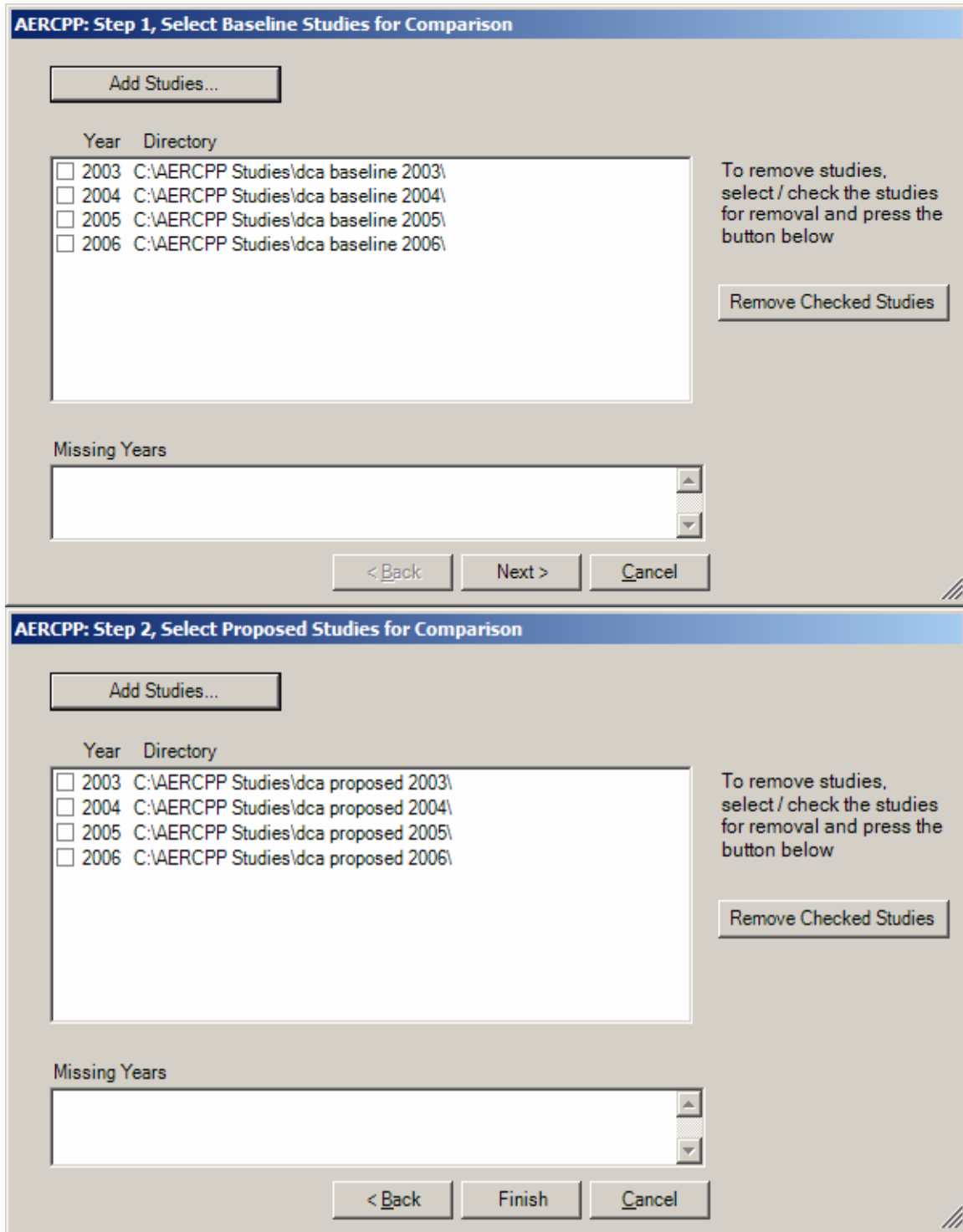
The AERCPP tool will be able to read the EDMS 4.2 file format and discern the study year of each study, and as a check, will also verify that the year provided in the directory name also matches the year in the EDMS study file. The only exception is for those

studies with study year "2025"; the AERCPP tool will parse the study's name to determine the year to which the study actually corresponds. The AERCPP tool will assume the user has followed a naming convention similar to one described in section A.3. Therefore, the first string of characters to match the pattern "20XY" where X and Y are digits between 0 and 9 inclusive will be assumed to be the year of the study.

A.7. Error Messages

The AERCPP tool will generate an error for the following reasons:

1. No data has been supplied.
2. A scenario has one or more missing years of data.
3. The ranges of years in both scenarios' datasets are not the same.

These errors will prevent or abort the generation of an AERC report and will generate a message to alert the user in order to possibly correct the situation.

A.8. Output

The AERCPP tool will produce an AERC report on-screen that can be printed, saved, or copied to the system clipboard for pasting to other documents. Figure 2 provides a sample report.

Figure 2. AERCPP Report
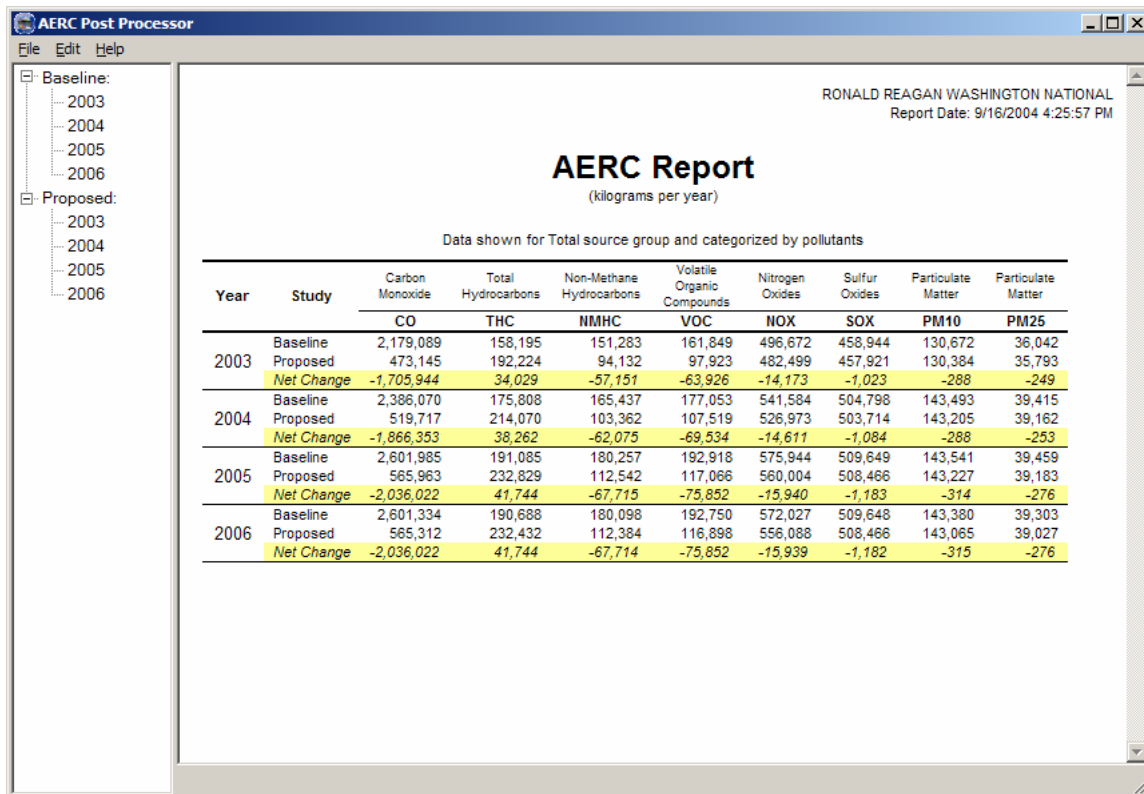
In Figure 2, the generated report takes up a majority of the screen space. The panel on the left side indicates which data years have been specified by the user represented in the

AERC Report. The menu at the top of the figure provides users with several features which are described below.

Users are able to print the generated report by selecting the *Print...* option under the *File* menu. Users are able to save the report as an HTML file and save all of the inputs used to generate the report in a new proprietary format called an AERC file. A standard "Save As…" file selection box is used, so the files may be saved anywhere. The AERCPP tool is able to read previously saved AERC files to allow users to edit and resave them.

The *Edit* menu will allow users to add additional years of data or remove or replace other years. In addition, users can tailor their report by selecting how the sources and pollutants will be represented in the report by choosing the *Display Settings* option from the edit menu.

Appendix B. EDMS TUTORIAL

INTRODUCTION

The purpose of this tutorial is to demonstrate the application of the Emissions and Dispersion Modeling System (EDMS). These sample scenarios are fictional and are used only to show the working of the model. Each "hands on" example problem has been included to demonstrate the many features of the EDMS model. After running the example problems, the user can check his or her results against the sample cases distributed with the EDMS software.

This document assumes a working knowledge of the Microsoft® Windows™ environment. Please refer to your Microsoft® Windows™ documentation for further guidance.

B.1 A SAMPLE EMISSIONS INVENTORY

Project Description

This example demonstrates the steps necessary to compute an airport emissions and dispersion inventory. For our example, we are going to look at a HAGERSTOWN REGIONAL-RICHARD A HENSON FIELD, HGR. The following tables contain all of the data necessary for the combined emissions and dispersion example. Users who are only interested in performing an emissions inventory should ignore the data outlined in orange. **This example uses fictitious data; the results should not be used for any regulatory purposes.**

Table B-1-1: Gates

(Dispersion)

Gate	Point	x-coordinate	y-coordinate
FBO	1	912.07	1151.58
	2	705.38	1422.27
	3	536.99	1277.92
	4	586.20	728.35
	5	818.04	743.11
Main	1	-994.10	-1167.98
	2	-856.30	-903.85
	3	-1205.14	-838.23
	4	-1270.76	-1099.08

Table B-1-2: Taxiways
(Dispersion)

Taxiway Name	x1-coordinate	y1-coordinate	x2-coordinate	y2-coordinate
27-to-A	-324.8	419.95	1656.57	813.83
9-to-F	593.83	-488.85	-3577.09	-951.78
A -to-27	-324.8	419.95	1656.57	813.83
A -to-C	793.96	-1312.33	-277.89	415.06
20-to-C	875.98	-1669.95	-6.17	1369.8
C-to-20	875.98	-1669.95	-6.17	1369.8
C-to-A	797.24	-1318.89	-281.17	408.5
C-to-F	816.93	-1332.02	-597.68	-472.38
F-to-9	593.83	-488.85	-3577.09	-951.78
F-to-C	816.93	-1332.02	-597.68	-472.38
W-Inbound	551.18	1263.12	352.84	1307.57
W-Outbound	551.18	1263.12	352.84	1307.57

Table B-1-3: Runways (Dispersion)

Runway	End 1		End 2		Queue 1		Queue 2	
	x1	y1	x2	y2	x1	y2	x1	y2
2-20	-423.23	-1538.71	381.76	1439.56	-863.59	-1694.67	67.53	1378.98
9-27	-3579.39	-616.8	1646.36	261.25	-3530.31	-963.52	1653.04	847.48

Table B-1-4: Buildings (Dispersion)

Building	Height(ft)	Point	x-coordinate	y-coordinate
Airpark Building	46	1	501.97	-1171.27
		2	838.20	-1295.93
		3	647.91	-2091.30
		4	-95.15	-1874.76
		5	168.96	-610.47
		6	272.30	-645.39
		7	359.25	-896.85
		8	538.88	-937.27
Hangars	32.81	1	-711.94	1748.69
		2	-135.77	1640.42
		3	-319.50	926.57
		4	-882.54	1113.58

Table B-1-5: Operations, APU & Gate Assignment

Aircraft Type	Engine Type	Identification	Annual LTO Cycles	Annual Touch and Go	APU Assignment	Operation Time (minutes)	Assigned Gate (Dispersion)
ATR72-200	PW124-B	Commuter	2665	0	APU GTCP 36 (80HP)	26	Main
Aztec	TIO-540-J2B2	Training	400	1200	NONE	0	FBO
B737-300	CFM56-3-B1	Training	500	0	NONE	0	FBO
B737-300	CFM56-3-B1	Airline	1583	0	APU GTCP 85 (200 HP)	26	Main
C-130 Hercules	T56-A-16	Military	600	1200	APU GTCP100-544 (400 HP)	26	FBO
DC9-30	JT8D-7B	Airline	580	0	APU GTCP 85 (200 HP)	26	Main
Fokker 100	TAY650-15	Training	1038	0	NONE	0	FBO
Navajo	TIO-540-J2B2	Training	507	0	NONE	0	None

Table B-1-6: Operational Profiles

Aircraft Type	Engine Type	Identification	Operational Profiles		
			Hourly	Daily	Monthly
ATR72-200	PW124-B	Commuter	Airline	DEFAULT	DEFAULT
Aztec	TIO-540-J2B2	Training	Training	Training	DEFAULT
B737-300	CFM56-3-B1	Training	Training	Training	DEFAULT
B737-300	CFM56-3-B1	Airline	Airline	Training	DEFAULT
C-130 Hercules	T56-A-16	Military	Military	DEFAULT	DEFAULT
DC9-30	JT8D-7B	Airline	Airline	DEFAULT	DEFAULT
Fokker 100	TAY650-15	Training	Training	Training	DEFAULT
Navajo	TIO-540-J2B2	Training	Training	Training	DEFAULT

Table B-1-7: Aircraft Weights and Times in Mode

Aircraft Type	Identification	Takeoff Weight	Total Taxi & Queue Time	Approach Angle
ATR72-200	Commuter	46,500	26.0	3°
Aztec	Training	5,500	26.0	3°
B737-300	Training	110,000	26.0	3°
B737-300	Airline	110,000	26.0	3°
C-130 Hercules	Military	132,000	26.0	3°
DC9-30	Airline	103,000	26.0	3°
Fokker 100	Training	88,000	26.0	3°
Navajo	Training	5,500	26.0	3°

Table B-1-8: Aircraft Assigned Ground Support Equipment

Aircraft Type	Identification	Assigned GSE	GSE Operating Time	Load Factor %
ATR72-200	Commuter	Aircraft Tractor	5.0	80
		Baggage Tractor	35.0	55
		Belt Loader	30.0	50
		Catering Truck	10.0	53
		Fuel Truck	20.0	25
		Ground Power Unit	40.0	75
		Lavatory Truck	15.0	25
		Service Truck	15.0	20
Aztec	Training	None		
B737-300	Training	None		
B737-300	Airline	Aircraft Tractor	8.0	6.0
		Baggage Tractor	75.0	48.0
		Belt Loader	48.0	15.0
		Cabin Service Truck	20.0	35.0
		Catering Truck	15.0	35.0
		Fuel Truck	10.0	20.0
		Lavatory Truck	15.0	85.0
C-130 Hercules	Military	Generator	120.0	105.0
		Lift	25.0	6.0
		Lavatory Truck	10.0	95.0
DC9-30	Airline	Aircraft Tractor	8.0	6.0
		Baggage Tractor	75.0	85.0
		Belt Loader	48.0	48.0
		Cabin Service Truck	20.0	15.0
		Catering Truck	15.0	35.0
		Fuel Truck	10.0	35.0
		Lavatory Truck	15.0	20.0
Fokker 100	Training	None		
Navajo	Training	None		

Table B-1-9: Taxiway Assignments (Dispersion)

Taxiways	ATR72-200 (Commuter)	Aztec (Training)	B737-300 (Airline)	B737-300 (Training)	C-130 Hercules (Military)	DC9-30 (Airline)	Fokker 100 (Training)	Navajo (Training)
27-to-A	☑	☐	☑	☑	☑	☑	☑	☐
A -to-27	☑	☐	☑	☑	☑	☑	☑	☐
9-to-F	☑	☐	☑	☑	☑	☑	☑	☐
F-to-9	☑	☐	☑	☑	☑	☑	☑	☐
A -to-C	☑	☐	☑	☑	☑	☑	☑	☐
C-to-A	☑	☐	☑	☑	☑	☑	☑	☐
C-to-F	☑	☐	☑	☑	☑	☑	☑	☐
F-to-C	☑	☐	☑	☑	☑	☑	☑	☐
20-to-C	☐	☑	☐	☐	☐	☐	☐	☑
C-to-20	☐	☑	☐	☐	☐	☐	☐	☑
W-Inbound	☐	☑	☐	☐	☐	☐	☐	☑
W-Outbound	☐	☑	☐	☐	☐	☐	☐	☑

Table B-1-10: Runway Assignments (Dispersion)

Aircraft Type	Identification	Runway 2	Runway 9	Runway 20	Runway 27
ATR72-200	Commuter	Not Assigned	Departure – 25% Arrival – 25% Touch and Go – 25%	Not Assigned	Departure – 75% Arrival – 75% Touch and Go – 75%
Aztec	Training	Departure – 20% Arrival – 20% Touch and Go – 20%	Departure – 10% Arrival – 10% Touch and Go – 10%	Departure – 50% Arrival – 50% Touch and Go – 50%	Departure – 20% Arrival – 20% Touch and Go – 20%
B737-300	Training	Not Assigned	Departure – 25% Arrival – 25% Touch and Go – 25%	Not Assigned	Departure – 75% Arrival – 75% Touch and Go – 75%
B737-300	Airline	Not Assigned	Departure – 25% Arrival – 25% Touch and Go – 25%	Not Assigned	Departure – 75% Arrival – 75% Touch and Go – 75%
C-130 Hercules	Military	Not Assigned	Departure – 25% Arrival – 25% Touch and Go – 25%	Not Assigned	Departure – 75% Arrival – 75% Touch and Go – 75%
DC9-30	Airline	Not Assigned	Departure – 25% Arrival – 25% Touch and Go – 25%	Not Assigned	Departure – 75% Arrival – 75% Touch and Go – 75%
Fokker 100	Training	Not Assigned	Departure – 25% Arrival – 25% Touch and Go – 25%	Not Assigned	Departure – 75% Arrival – 75% Touch and Go – 75%
Navajo	Training	Departure – 20% Arrival – 20% Touch and Go – 20%	Departure – 10% Arrival – 10% Touch and Go – 10%	Departure – 50% Arrival – 50% Touch and Go – 50%	Departure – 20% Arrival – 20% Touch and Go – 20%

Procedures

Start EDMS by selecting EDMS from the Programs group in the start menu. If you are unfamiliar with the use of the mouse, icons, menus, or program groups, please refer to your Windows™ documentation.

B.1.1 Setting up the scenario

We will begin the tutorial by creating a new scenario, and entering basic descriptive information.

| **Action**	**Result**
When you first start EDMS, you will be prompted to Create a New Study, Open the Most Recent Study, or Open a Study from Disk. Choose the Create a New Study option. Click OK button.	This brings up the new study box. Here you can select where EDMS will create the directory to hold your data files. You can also name your study. For this example, we have chosen the name Emissions & Dispersion Tutorial.
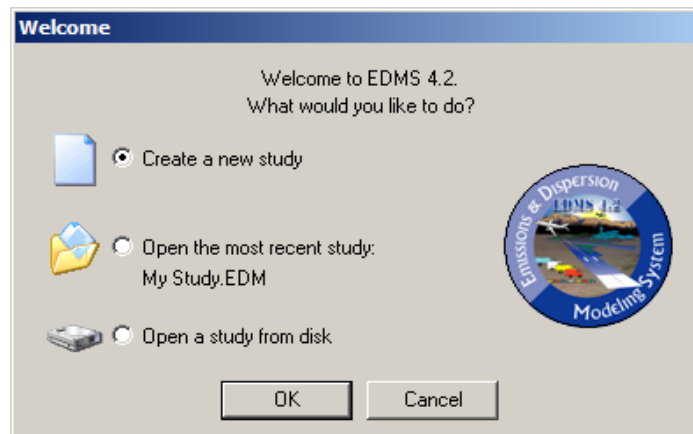
1. Select the directory where you wish to create your new study with its own subdirectory.	As with any Windows™ file selection box, you can choose where you wish to save your files.
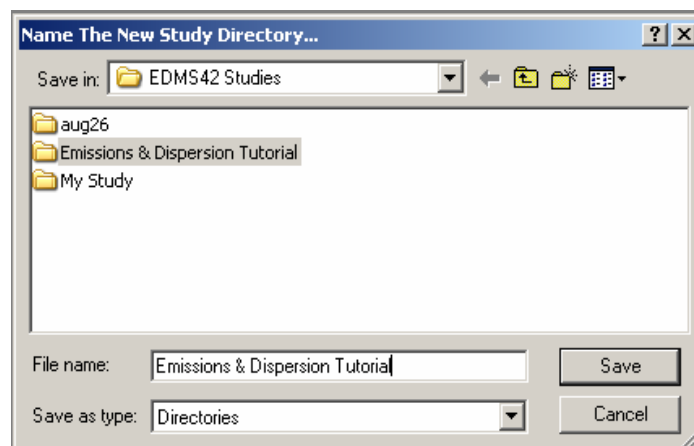
2. Type "Emissions & Dispersion Tutorial" in the File name box	This action creates a directory called Emissions & Dispersion Tutorial at the selected location. All information relevant to the study will be saved

3. Press "Open".

This saves the information and closes the New Study box. This will also bring up the Study Setup box. See Figure B -1.

Figure B-1: The Study Setup Window

4. Type or select "HGR" in the Airport ID drop down list box.

This will be a fictitious sample of Hagerstown Regional-Richard A. Henson field in Maryland.

5. Highlight the default Mixing Height value and enter 3,000.

If accurate mixing height information is available for your airport, you can replace the default feet with a new number. In this case, we are assuming that HGR has an average mixing height of 3,000 feet.

6. Enter 52 in the Avg. Yearly Temp. box.

We are assuming that the average annual temperature at HGR is 52°F.

7. Choose Emissions & Dispersion.

We will produce an emissions and dispersion inventory.

8. Select "LTO Based" from the GSE Modeling Basis, and select MOBILE6.2 for the version of MOBILE.

GSE will be LTO based and MOBILE6.2 will be the model of choice for this study.

9. Select the "*Units of Measure*" tab and choose English and Pounds for the units.

All the airport layout numbers used in this tutorial are based on English units and the emissions inventory results will be presented in pounds.

10. In the Study Info box, enter a brief description of the study.

This information is for your use. You should include a brief description of your study so that when you re-visit the file, you will understand the reasons for selecting the inputs you have. In this case, we have indicated that this is a sample study that demonstrates how to generate an emissions and dispersion inventory.

11. Press "OK".

This saves the changes entered and closes the setup window.
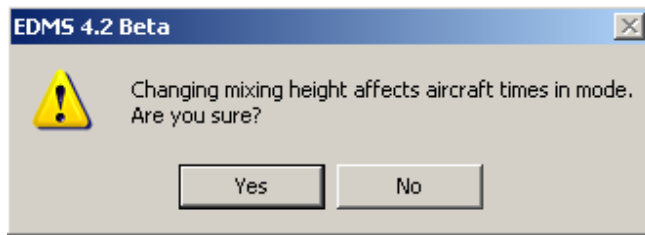
12. Answer "Yes" to the warning about changing the mixing height.

Changing the mixing height also changes the time in mode for aircraft.
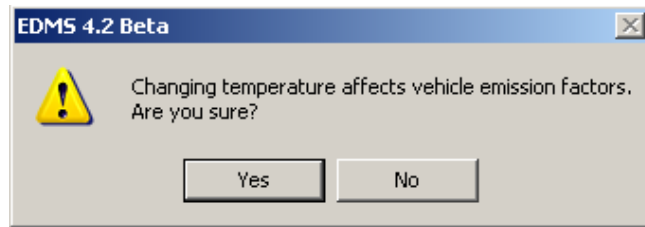
13. Answer "Yes" to the warning about changing the average yearly temperature.

The average yearly temperature affects the motor vehicle emission factors.

B.1.2 Adding Gates

Gates are considered to be the theoretical point where GSE and APUs are used. We must specify the location of the gates for this study, so that we can later assign aircraft (and therefore their associated GSE and APUs to them). Refer to Figure B-1-1

Action	Result
1. Select *Gates* from the *Airport* menu.	This brings up a window which allows you to specify information about the gates to be added to the study.
2. Press "Add New" and create a gate called "Main". Change the number of points to 4.	We will be creating two gates for this study.
3. Press "Add New" again and create another gate called "FBO". Change the number of points to 5.	
4. Set the coordinates for Main and FBO to the values listed in Table B-1-1.	This is the location for the gates called "Main" and "FBO".
5. Press "Apply".	This saves the information for gate we just created.
6. Press" OK".	This saves all of the changes made to this window.

Figure B-1-1: Gates Window
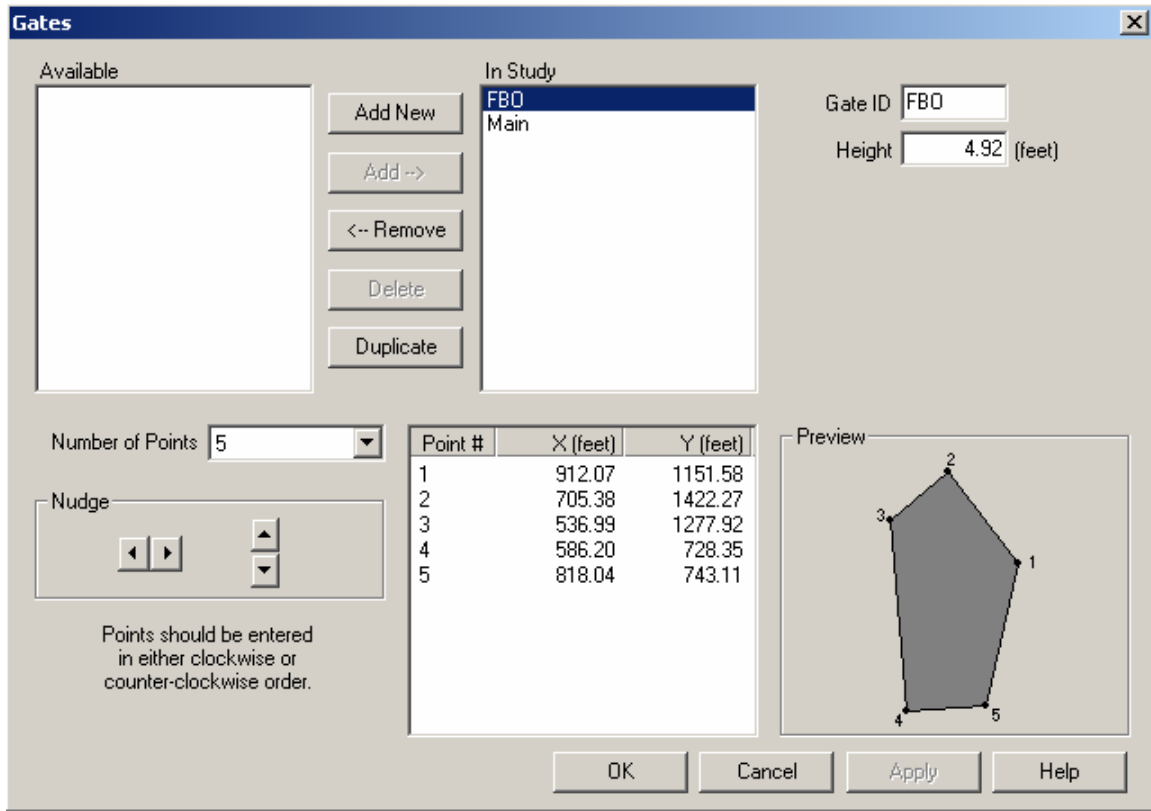
B.1.3 Aircraft Taxiways

Now we must define the path that the aircraft will take from the gates to the runways. Refer to Figure B-1-2.

Action	Result
1. Select *Taxiways* from the *Airport* menu.	This brings up the Aircraft Taxiways window where we will specify the location of the taxiways that will be considered in our study.
2. Press "Add New" and create a new taxiway called "20-to-C".	This prompts you for the name taxiway. We'll call it "20-to-C".
3. Set the speed to 10mph.	Average speed of aircraft on taxiway 20-to-C.
4. Set the coordinates of the taxiway to (-875.98, -1669.95) and (-6.17, -1369.8)	This specifies the location of the taxiway.
5. Press "Apply".	This saves the information for the taxiway we just created.
6. Repeat steps 2-4 for each of the taxiways listed in Table B-1-2.	We need to add the remaining taxiways to the study. This defines complete paths between the gates and runways in both directions.
7. Press "OK".	This saves all of the changes made to this window.

Figure B-1-2 Taxiways Window
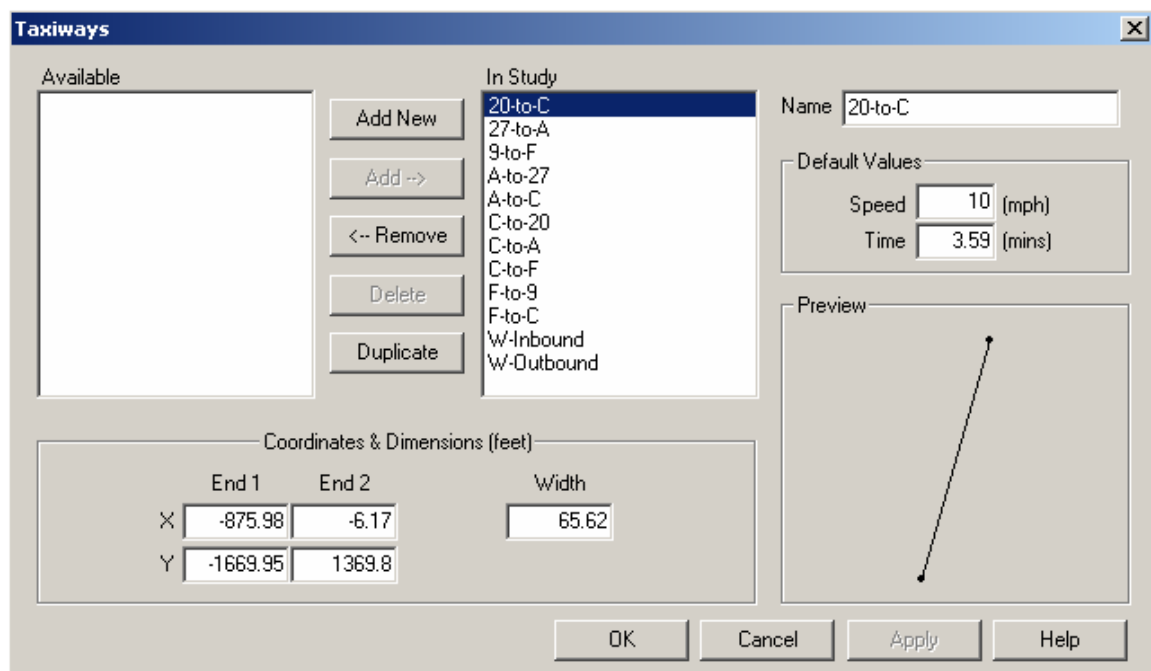
B.1.4 Runways

We are now going to add the two runways at the airport. Refer to Figure B-1-3.

<u>Action</u>	<u>Result</u>
1. Select *Runways* from the *Airport* menu.	This brings up the *Runways* window where we can specify the location and length of the runways in our study.
2. Add two new runways called "2-20" and "9-27".	We are going to have two runways in the study.
3. Set the coordinates for runways 2-20 and 9-27 to the coordinates specified in Table B-1-3.	This creates two runway that run roughly north-south and east-west.
4. Set the queue coordinates for runways 2-20 and 9-27 to those specified in Table B-1-3.	This specifies the dimension of the queues at peak length.
5. Set the Peak Queue Time for both runways to 11 minutes at peak.	We are going to assume that there is an 11-minute queue for each of the runways.
6. Press "Apply".	The values are saved.
7. Press "OK".	This saves the runway data and closes the Runways window.

Figure B-1-3: Runways Window

B.1.5 Buildings

We are now going to add the two buildings to the airport. Refer to Figure B-1-4.

Action	**Result**
1. Select *Buildings* from the *Airport* menu.	This brings up the *Buildings* window where we can specify the location of the buildings in our study.
2. Add two new buildings called "Airpark Building" and "Hangars".	We are going to have two buildings in the study.
3. Set the coordinates for "Airpark Building" and "Hangars" to those specified in Table B-1-4.	This specifies the location of the two buildings at the airport.
4. Press "Apply"	The values are saved.
5. Press "OK".	This saves the building data and closes the Buildings window.

Figure B-1-4: Buildings Window
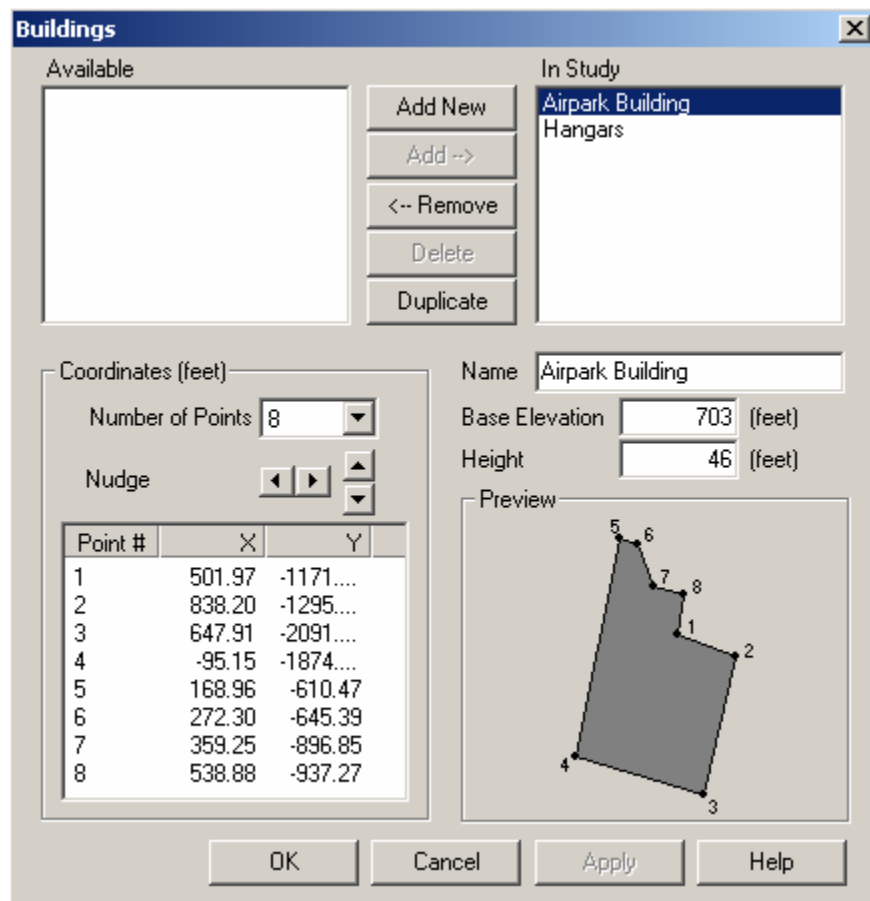
B.1.6 Adding Aircraft

For each of our sources, we must first provide EDMS with information to compute the emissions inventory. We begin by matching engines with aircraft and assigning them to the study. See Figure B-1-5.

Action	**Result**
1. Select *Aircraft* from the *Emissions* menu.	This brings up the *Aircraft Operations & Assignments window* with the Operations tab activated (See Figure B-1-5), which allows you to specify information about the aircraft included in the study, their associated activity rates, and their associated ground support equipment.
2. For each aircraft added to the study, provide identification. For the purposes of this study, use the same identifications shown in Table B-1-5.	Since EDMS 4.2 allows you to enter the same aircraft-engine combination more than once in a study, it is important to provide descriptive identifications.
3. With the "*Operations, APU, and Gate*" tab activated, select the aircraft to be used in the study by clicking on the aircraft name as listed in the Available list and engine name as listed in the available engines list, then pressing Add. For each aircraft select the APU Assignments, Operation Time, and Gate assignments corresponding with Table B-1-5. (Gate Assignment is for Dispersion analysis)	We will be using the aircraft-engine pairs shown on the screen in Figure B-1-5 for the tutorial. There are often multiple engines available for each aircraft type. For this tutorial it is important to use the engines shown. Remember to select the aircraft and engine before pressing Add.
4. After adding each aircraft, enter the number of yearly operations shown (both LTO and Touch and Go operations) in Table B-1-5.	We are assuming that the user knows the number of annual operations for the aircraft operating at HGR.
5. For each aircraft, select the hourly, daily, and monthly profiles as listed in Table B-1-6.	
6. Choose the "*Time In Mode*" tab and for each aircraft, assign the weights shown in Table B-1-7.	To properly determine the amount of time required to climb to the mixing height, the takeoff weight of the aircraft must be specified.
7. For each aircraft, set the approach angle to 3°.	We are assuming that all aircraft will fly a 3° approach to the runway.
8. For each aircraft entered, set total taxi and queue time to 26 minutes	We are assuming that all aircraft at the airport spend on average 16 minutes taxiing to the runway, and 10 minutes waiting to takeoff.

Action	Result
9. Choose the "*GSE Assignments*" tab and for each aircraft assign the equipment as shown in Table B-1-8. To change an operating time, simply double-click on the time and edit the value.	Specific ground support equipment are being modeled for each aircraft in the study.
10. Select the *"Taxiway Assignment"* tab.	This allows us to assign each aircraft to specific taxiways.
11. For each of the aircraft in the study, select the corresponding taxiway assignments as listed aircraft in table B-1-9.	This assigns each of the aircraft in the study to the appropriate taxiways.
12. Press "Apply"	This saves all of the changes made to this window.
13. Select the "*Runway Assignments*" tab.	This allows us to assign each aircraft to runways
14. For each aircraft in the study assign the corresponding runways as listed in Table B-1-10.	This assigns each of the aircraft in the study to the appropriate runway.

See Figures B-1-5 through Figure B-1-8 for completed windows of aircraft assignments.

Figure B-1-5: Aircraft Operations & Assignments Window
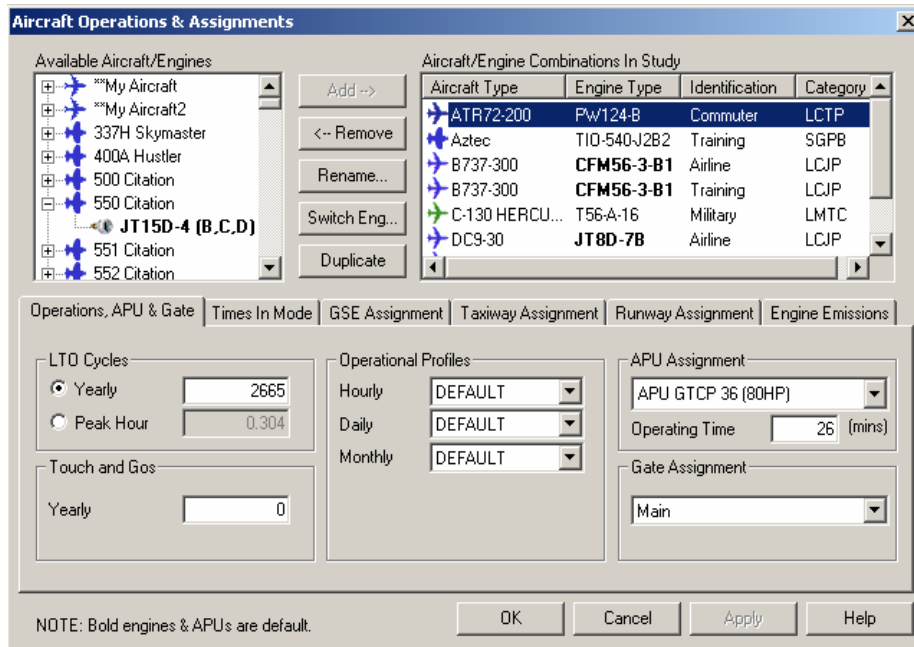
Figure B-1-6: GSE Assignment
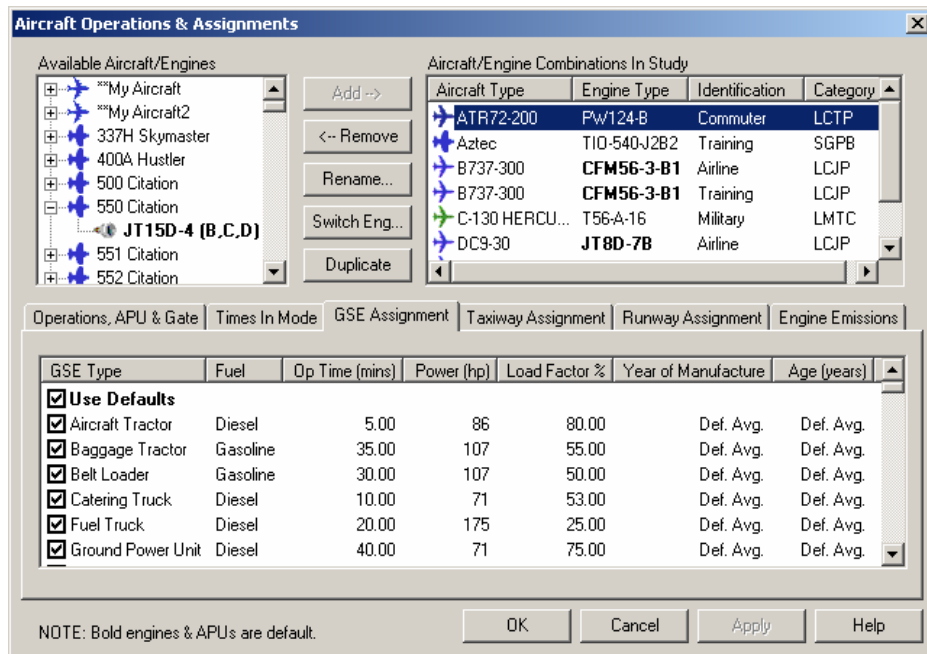
Figure B-1-7: Taxiway Assignment
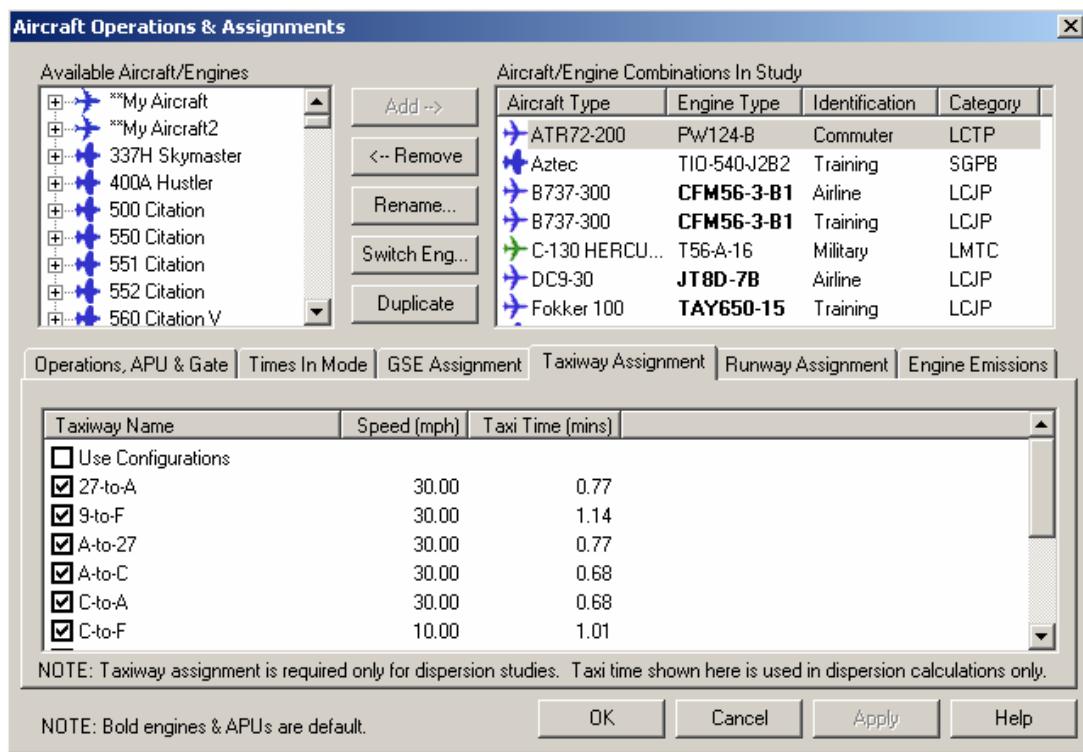
Figure B-1-8: Runway Assignment

B.1.7 Parking Facilities

We are now going to include one parking facility in our tutorial with an annual traffic flow of 600,000 vehicles and an average speed of 10 mph. See Figure B-1-9.

Action	Result
1. Select *Parking Facilities* from the *Emissions* menu.	This brings up the *Parking Facilities* window where we will specify all of the information about our parking lot.
2. Press "Add New" and create a new parking facility called "Parking Garage".	This prompts you for the name of the parking facility. We'll call it Parking Garage.
3. Set the Yearly number of vehicles to 600000.	This means that during the course of the entire year 600,000 vehicles will use the parking garage.
4. Set the Speed in Lot to 10 mph.	The speed of the traffic within the lot affects the emissions factors.
5. Leave the Avg. Idle Time set to 1.5 minutes and the avg. Distance Traveled In Lot set to 820.21 feet.	The Peak Hour number of vehicles is automatically computed. This creates the new record.
6. Set the number of points to 4 and the number of levels to 3. Enter the coordinates for the parking lot as shown in Table B-1-11.	A preview of the parking lot will be in the bottom center of the dialog. When you have finished, the parking facility should look like Figure B-1-9.
7. Press "OK". See Figure B-1-9 for completed window.	This saves the parking garage information and closes the window.

Table B-1-11: Parking Facilities Activity (Dispersion)

Parking Facility	Point	x-coordinate	y-coordinate
Parking Garage	1	-1932.42	-3795.94
	2	-432.42	-3795.94
	3	-432.42	-2795.94
	4	-1932.42	-2795.94

Figure B-1-9: Parking Facilities Window

B.1.8 Roadways

We are now going to add an access road to the airport that is two and a half miles long, and will pass in front of the parking garage See Figure B-1-10.

Action	**Result**
1. Select *Roadways* from the *Emissions* menu.	This brings up a window very similar to the parking facility example.
2. Click *Add New* button and add a new roadway called "Access Road".	This will be our only road to and from the airport.
3. Set the Yearly number of vehicles to 600000, the Speed of vehicles on the roadway to 35.	These are the only values required for computing an emissions inventory and as before the peak hour value will be computed automatically.
4. Enter the coordinates for the roadway as shown in Figure B-1-10.	This specifies the exact location of the roadway.
6. Press "OK". See Figure B-1-10 for completed window.	The values are saved.

Figure B-1-10: Roadways Window

B.1.9 Stationary Sources

We are going to add a natural gas Emergency Generator for our airport. We are assuming that it has been in use for 96 hours in the year.

Action	Result
1. Select *Stationary Sources* from the *Emissions* menu.	This brings up the *Stationary Sources* window where you can add emissions information about stationary sources.
2. Click *Add New* button and add a new source called "Airport Backup Power" of category Emergency Generator.	This will be our airport Emergency Generator.
3. Select Type: Gasoline Fuel (EPA Methodology).	The emission rates for this source type are expressed in g/hp-hr and are displayed on the lower right.
4. Under "Dispersion Parameters" select "Point" and enter the coordinates (1250.00, 4461.94).	Supply emissions and dispersion parameters for our generator.
5. Change the Base Elevation to 820 ft, and the Diameter to 4ft.	
6. Finally, enter the Yearly hours operated as 96 hours, Press "Apply".	Our generator will be added to the list.
7. Press "OK". See Figure B-1-11 for completed window.	The values are saved.

Figure B-1-11: Stationary Sources Window

B.1.10 Training Fires

We are now going to add a training fire that burns 12,000 gallons of propane during the course of an entire year. See Figure B-1-12.

<u>Action</u>	<u>Result</u>
1. Select *Training Fires* from the Emissions menu.	This brings up the Training Fires window.
2. Add a new training fire called "TF 1", with a Fuel Type of Propane, and Yearly gallons of fuel used 12000. Then, Press "Apply".	We are specifying that a total of 12,000 gallons of fuel used will be used over the course of an entire year. As before, the peak hour value will be computed automatically but this value will not be used for the emissions inventory.
3. Enter the training fire coordinates as (-3077.43, 3789.37) and a Height of 3.3 ft as shown in Figure B-1-12.	Specify dispersion parameters.
4. Press "OK". See Figure B-1-12 for completed window.	The values are saved.

Figure B-1-12: Training Fires Window

B.1.11 Emissions results

At this point all of the inputs necessary for the emissions inventory have been entered into the program. We are ready to run the emissions inventory for the scenario. You can compare the results you obtained against the scenario provided with the software.

Action	Result
1. Select *Run Emissions Inventory* from the *Emissions* menu.	This should run quickly, since our scenario is not very detailed. A window will appear when the emissions inventory is complete. The results will appear automatically and should be identical to those as shown below in Figure B-1-13.

Figure B-1-13: Emissions Inventory View Window

Emissions Inventory : Summary

Summary	Aircraft by Mode	Aircraft/GSE/APU	GSE Population	Vehicular	Stationary

Category	CO	THC	NMHC	VOC	NOx	SOx	PM-10	PM-2.5
Aircraft	193,960	23,347	23,347	25,452	41,943	5,935	0	0
GSE/APU	113,750	34,798	4,180	4,359	9,321	1,016	152	1,164
Roadways	49,562	3,732	3,556	3,523	4,725	192	134	99
Parking Facilities	12,778	1,786	1,706	1,693	966	26	13	13
Stationary Sources	587,885	27,758	24,983	25,898	14,771	791	966	966
Fires	417	381	381	381	77	0	1,407	1,407
Total	958,352	91,803	58,154	61,306	71,802	7,961	2,672	3,649

UNITS: (Lbs/Year)

The values listed in this table should correspond to the values on your screen. If they do not, please check your inputs against those listed in the example.

B.2 A SAMPLE DISPERSION ANALYSIS

This example demonstrates how to model concentrations for the same airport used in the emissions inventory example. If the dispersion data has already been entered completely, we can now begin dispersion calculations.

B.2.1 Receptors

Before we can complete the dispersion analysis, we must specify the location of the receptors. For this analysis we will use polar coordinates to specify a ring of receptors in the southeast corner of the airport. See Figures B-2-1 and B-2-2.

Action	Result
1. Select *Receptors* from the *Dispersion* menu.	This brings up the *Receptor Networks* menu.
2. Select the tab labeled "*Polar*" under the Receptor Networks heading.	We are going to specify the location of the receptor using polar coordinates.
3. Press "Add New" and create a network of receptors called "POLEGRID".	This places a network of receptors in the In Study list and prepares it for input.
4. Enter the coordinates (-581,-1157) for the origin.	This sets the center of the receptor network in the southeast corner of the airport.
5. In the Rings column, set the Start to 1524 meters, with the spacing set to 45.72 meters and count set to 1.	
6. In the Vectors column, set the Start to 60, the Spacing to 30, and the Count to 4.	This specifies that we want a single ring with a 60' radius with 7 receptors spaced 30° apart in the shape of a half-circle.
7. Set the receptor height to 1.8 meters.	This specifies the receptor height.
8. Press "Apply".	This saves the receptor network information.
9. Select the tab labeled "*Cartesian*" under the Discrete Receptors heading.	We are going to specify the location of the receptor using discrete coordinates.
10. Press "Add New" and create a receptor called "Terminal Receptor".	This places the receptor in the In Study list and prepares it for input.
11. Enter the coordinates (-448, -441) for the origin and give the receptor a height of 1.9 meters.	This sets the receptor near the Main gate.

Figure B-2-1. Polar Receptor Networks Window.

Receptors & Receptor Networks

Discrete Receptors
Cartesian | Polar

Receptor Networks
Cartesian | Polar

Total number of receptors in study: 5

Unused Networks

Add New
Add -->
<-- Remove
Delete
Duplicate
Decompose

Networks In Study
POLEGRID

Name POLEGRID

Origin Source
Type Parking Facility
Name Parking Garage

Origin Coordinates (meters)
X -581   Y -1157

Rings (meters) | Vectors (0-360)
Start 1524 | 60
Spacing 45.72 | 30
Count 1 | 4

Height 1.8 (meters)

OK | Cancel | Apply | Help

Figure B-2-2. Discrete Receptors Window.
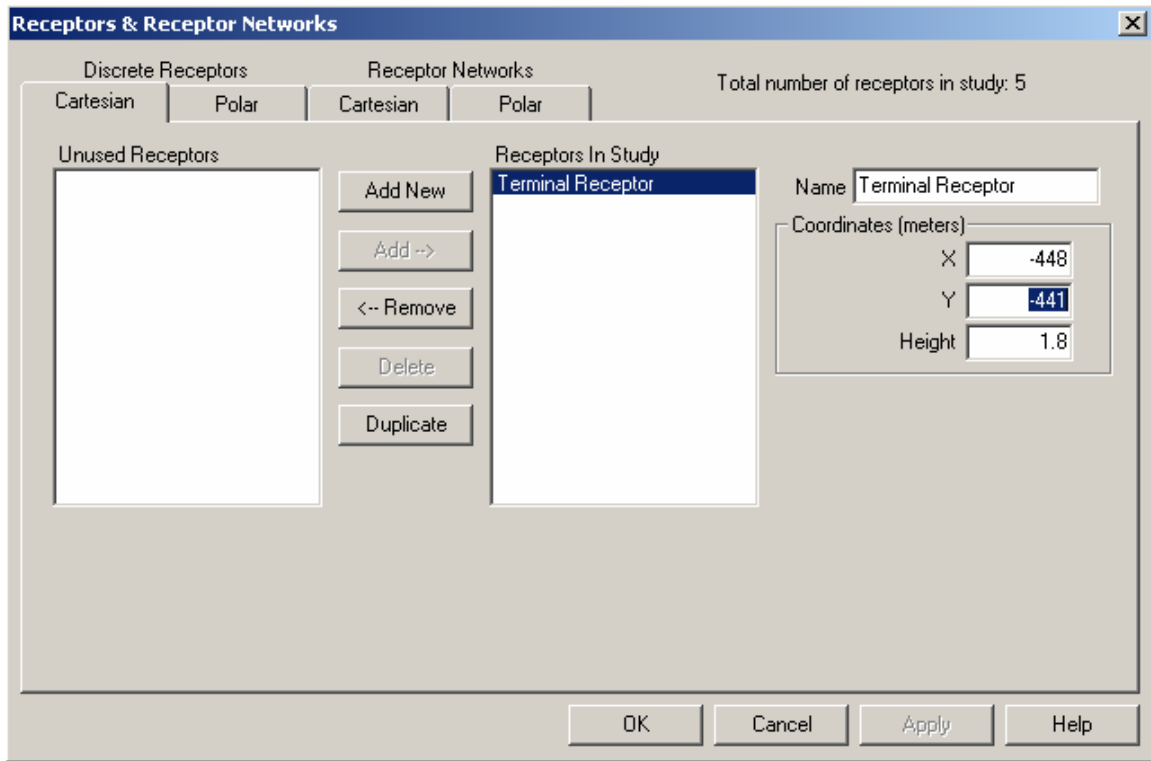
B.2.2 Airport View & Wallpaper

To verify that we have placed all of our sources in the appropriate location we can look at a view of the airport that we have created. By selecting *Airport* from the *View* menu, the sources and receptors are presented in a graphical format. Figure B-2-3 shows the airport view for this example.

Figure B-2-3. Airport View
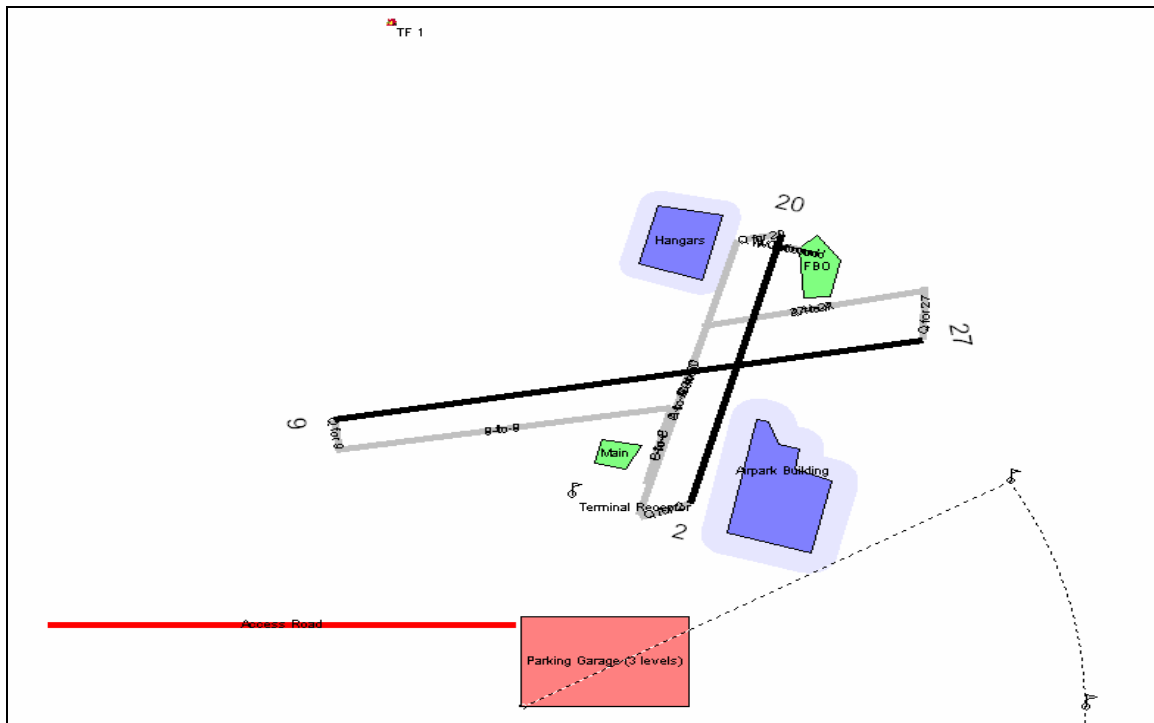
Action	**Result**
1. With the Airport View open select *Edit Wallpaper* from the view menu. See Fig. B-2-4.	This brings up the wall paper wizard.
2. Specify the path of the bitmap file for Hagerstown airport. (HGR).	Locate the source of the airport bitmap.
3. Click Next.	Advances to step 2 to in the wallpaper wizard.
4. Enter (630, 2980) for the study point coordinates.	This centers the airport bitmap at the origin of your airport.
5. Enter the coordinates (731, 351) for the image point coordinates as shown in Figure B-2-5.	
6. Click Next.	Advances to step 3 to in the wallpaper wizard.
7. Enter 6.83 ft/pixels for the scale, and an image length of 1 as shown in Figure B-2-6.	This provides a scale for the bitmap.

Action	**Result**

8. Click Finish. The airport bitmap is shown in Figure B-2-7.

Figure B-2-4 Wallpaper wizard Step 1
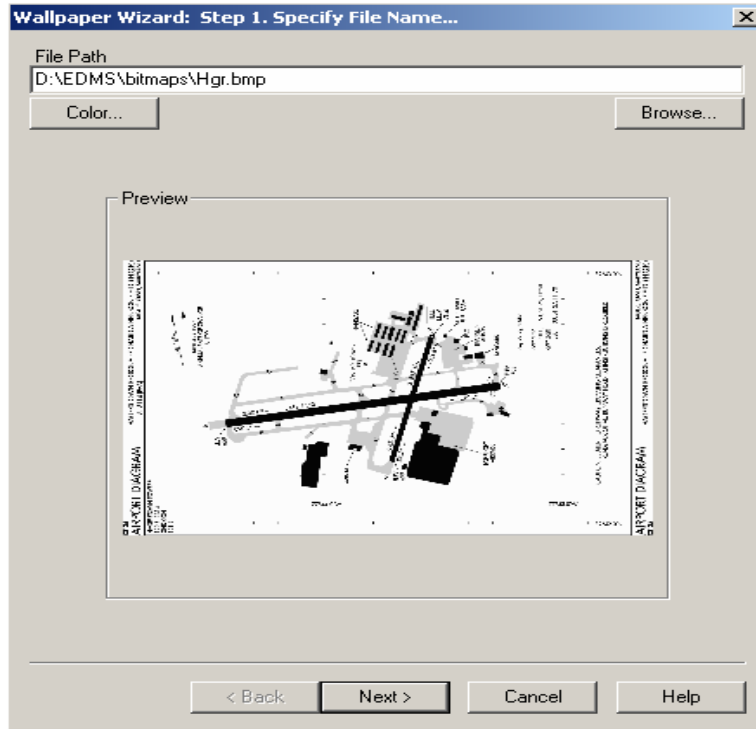
Figure B-2-5 Wallpaper wizard Step 2
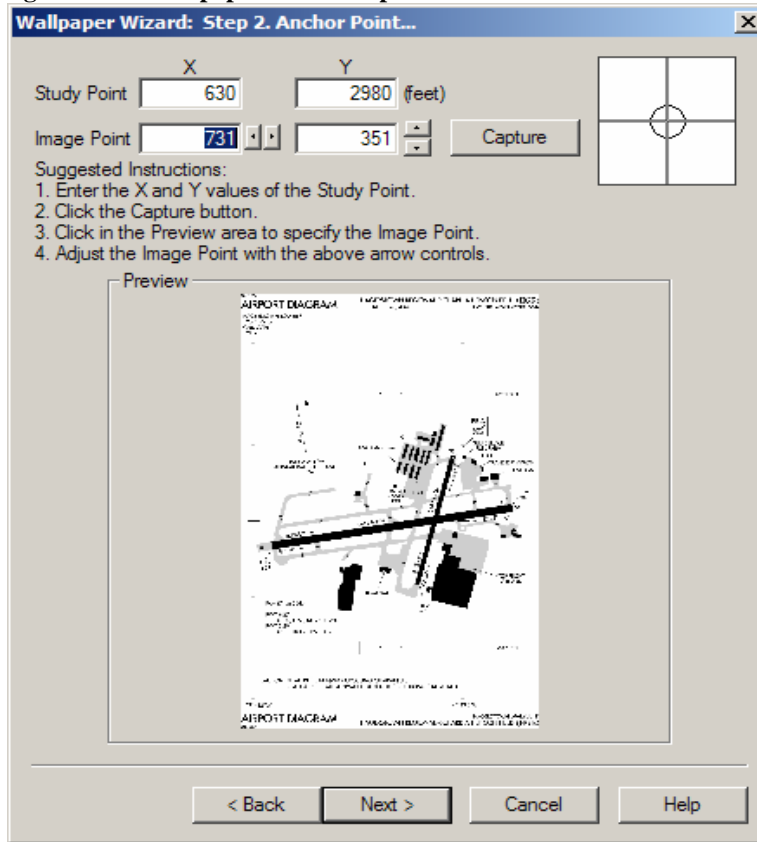
Figure B-2-6 Wallpaper wizard Step 3

Wallpaper Wizard: Step 3. Scale...

Real-World Distance [6.83] (feet)

Image Length [1] (pixels)   Capture

Scale [6.83] (feet/pixel)

Suggested Instructions:
1. Enter the Real-World Distance.
2. Click the Capture button to capture Image Length.
3. Click & hold on a point in the Preview area.
4. Drag to & release at a 2nd point.
5. Make fine adjustments to the capture.

Preview

< Back   Finish   Cancel   Help
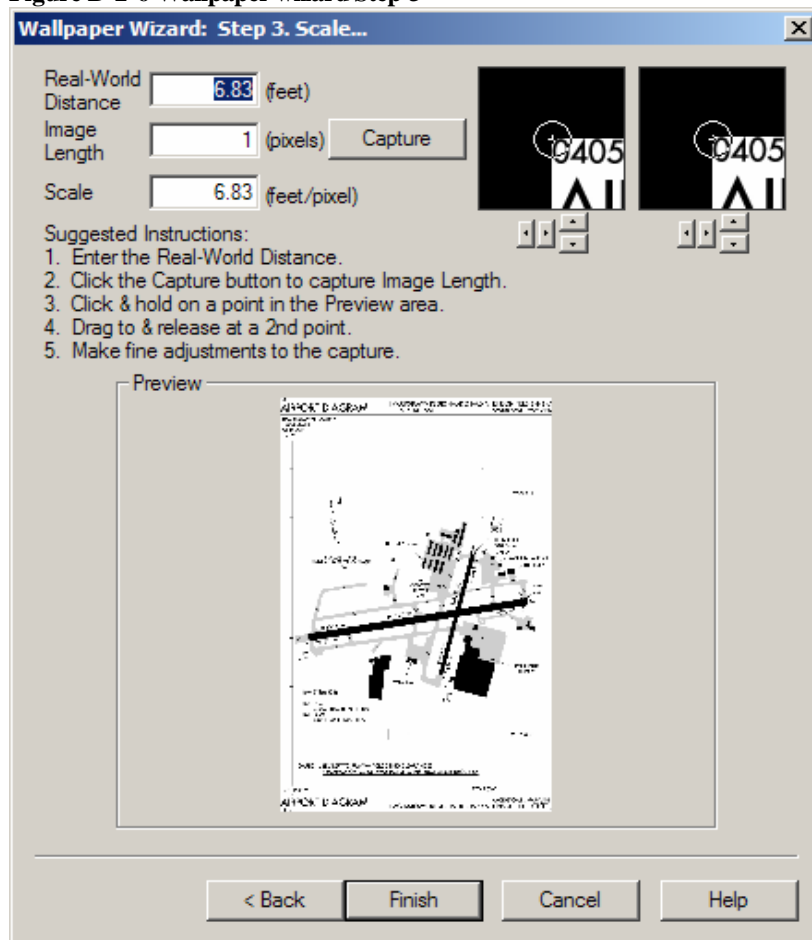
Figure B-2-7 Airport View with Wallpaper
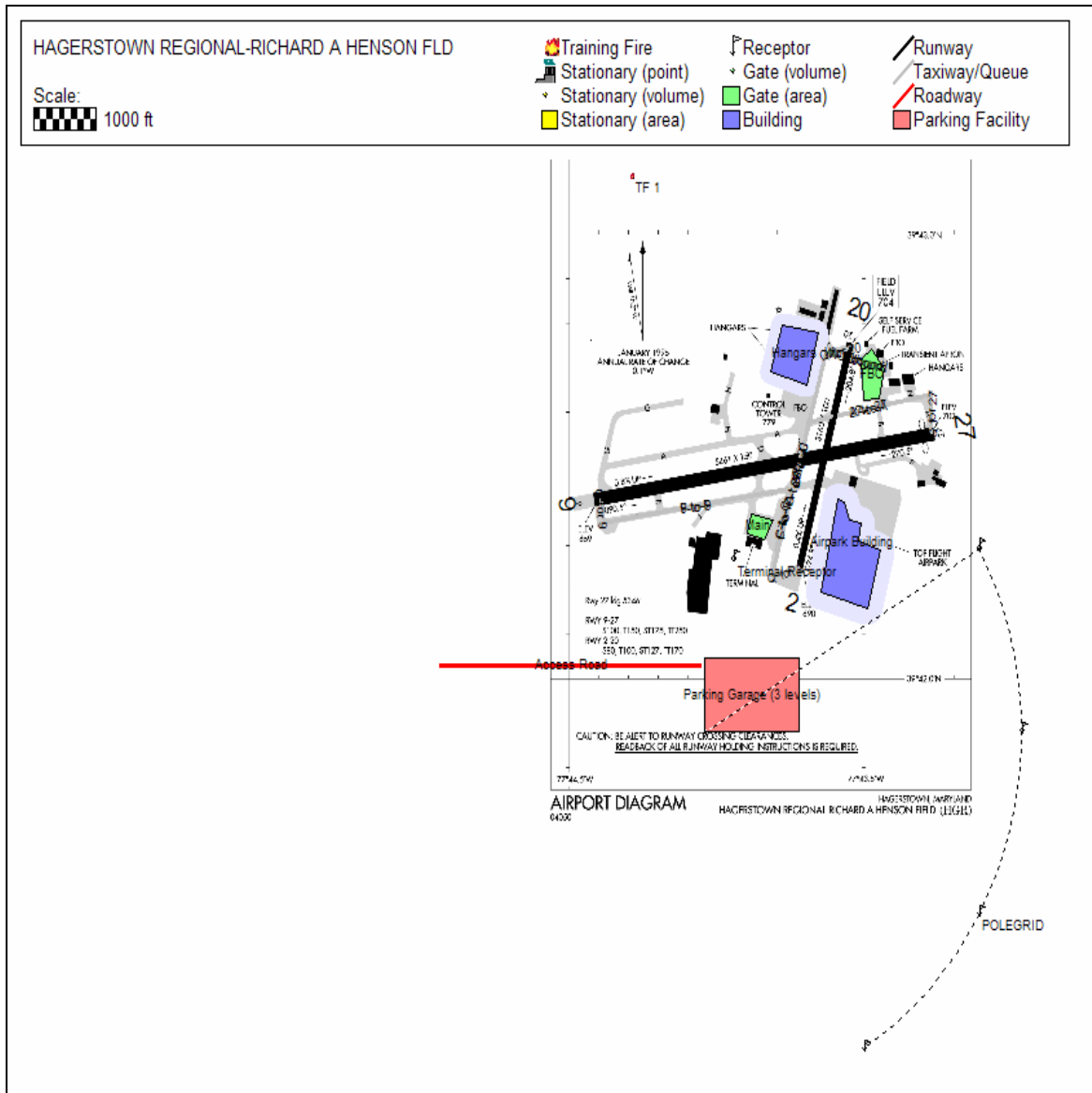
B.2.3 Meteorology

AERMOD requires both surface and upper-air weather data for dispersion. This section of the tutorial describes how to load and merge this data for a dispersion run.

B.2.3.1 The AERMET Wizard

The AERMET wizard provides a step-by-step interface that takes surface and upper-air data and merges it for AERMOD use.

B.2.3.1.1   AERMET Wizard Step 1. Surface Weather Data

The first step in the AERMET Wizard is to extract the surface weather data that will be used in the study.
See Figure B-2-8.

Action	Result
1. Select *AERMET Wizard* from the *Dispersion* menu.	This brings up the AERMET Wizard.
2. Press the button marked "…" (located after the Location input box) to select the surface weather file titled S93721_03.DAT	This selects the surface weather file that we will use for this study. **Note: This is a fictitious set of weather data. It should not be used for regulatory analyses.**
3. Set the start and end dates to 12/1/2003.	We are only interested in looking at concentrations for this day. The remaining necessary fields on the screen should be populated automatically.
4. Press "Process".	The AERMET wizard will extract the surface weather data and the upper-air data screen will appear.

Figure B-2-8. AERMET Wizard Step 1. Extract and QA NWA Surface Data.

B.2.3.1.2   AERMET Wizard Step 2. Upper Air Data.

The next step will be to extract the upper-air soundings that will be merged with the surface weather data.
See Figure B-2-9.

Action	Result
1. Press the button marked "…" to select the upper-air weather file titled 13701_92.ua.	This selects the upper-air weather file that we will use for this study. Note: This is a fictitious set of weather data. It should not be used for regulatory analyses.
2. Set the start and end dates to 12/1/2003.	We are only interested in looking at concentrations for this day. We are only interested in looking at concentrations for this day.
3. Enter 39.467 for the Latitude and 76.167 for the longitude.	Provide the location of the weather station.
4. Press "Process".	The AERMET wizard will extract the upper-air weather data and the merge screen will appear.

Figure B-2-9. AERMET Wizard Step 2. Upper-air data.
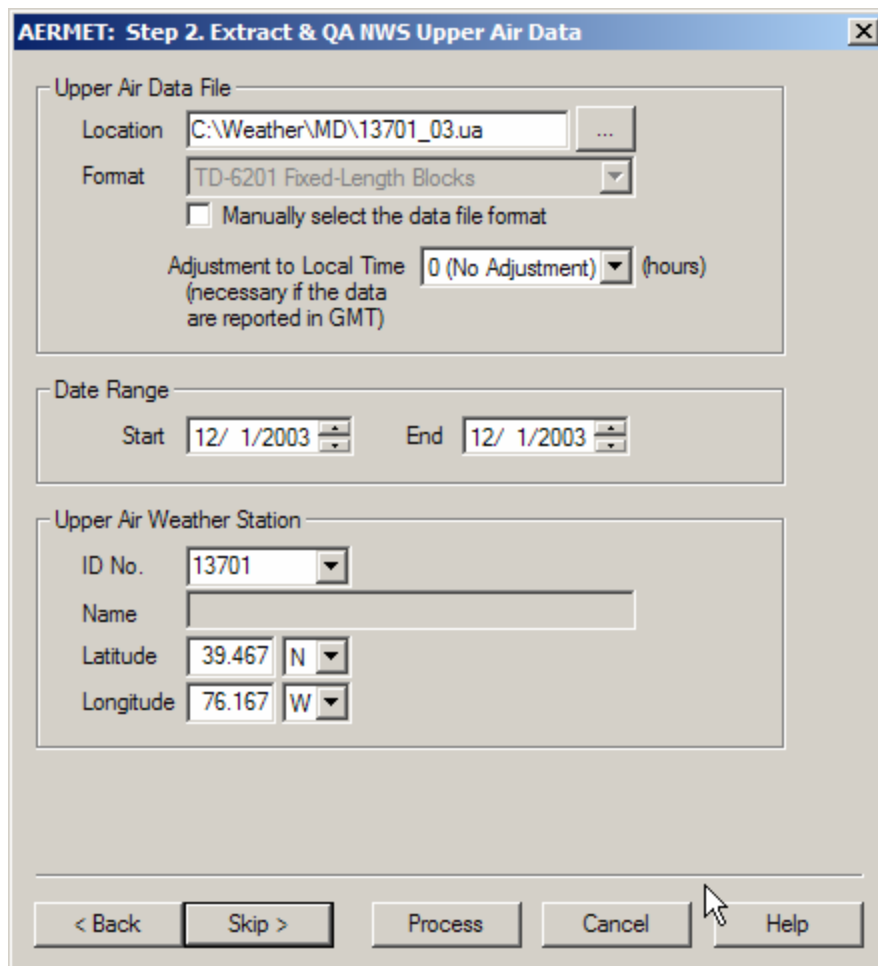
B.2.3.1.3   AERMET Wizard Step 3. Merge data.

Next, we need to merge the surface and upper-air data and create AERMOD weather files by taking the merged surface and upper-air weather data and converting it into surface (.sfc) and profile (.pfl) weather files that AERMOD can read. See Figure B-2-10.

<u>Action</u>	<u>Result</u>
1. Make sure the start and end dates are set to 12/1/2003.	We are only interested in looking at concentrations for this day.
2. Uncheck the box labeled "Randomize NWS Wind Directions (+/- 5 degrees)".	We do not want to randomize the wind data by 5° to either side of the reported wind direction.
3. Make sure the box labeled "Substitute Missing On-Site Data with NWS Data" is checked.	Since we are not supplying any on-site data, we will have the AERMET Wizard use the surface data instead.
4. Press "Finish".	The AERMET wizard will merge the data and convert the weather data into surface and profile files for use with AERMOD. You will be prompted to save the AERMOD weather data. By calling the file Dec1, we will be reminded that this file contains weather for the single day, December 1st.
5. Enter the filename Dec1 and press "Save".	This closes the AERMET Wizard.

Figure B-2-10 AERMET Wizard Step 3. Merge Data and Create AERMOD Weather files.

B.2.4 Run AERMAP

Our next step is to run the AERMOD terrain processor AERMAP. See Figure B-2-11.

Action	Result
1. From the *Dispersion* menu, choose the *Run AERMAP*.	This brings up the AERMAP interface window.
2. Select "Add Files" and choose the "Baltimore-w.dem".	This instructs EDMS to include terrain data for our AERMOD processing.
3. Enter "DecSample" for the Base name and Title.	Name the output file for AERMAP.
4. Press "Run".	This begins the terrain data processing.
5. Press "Close" to close the AERMAP dialog.	This exits the AERMAP processor.

Figure B-2-11. The AERMAP window.

B.2.5 Generating AERMOD Input Files

Our next step is to generate the input files that will be used by AERMOD to calculate our concentrations.   See Figure B-2-12 through Figure B-2-15.

Action	Result
1. From the *Dispersion* menu, choose the *Generate AERMOD Input Files* option.	This brings up the generate AERMOD input files window.
2. Set the Title to "sample".	This instructs EDMS to generate a series of input files for AERMOD called sample with different extensions (e.g. sample.inp, sample.hre, etc.).
3. Set the pollutant to CO and the averaging period set to 1 hour.	We are interested in 1-hour CO concentrations, so we will not change these settings.
4. Press "Next".	Advance to Step 2 of AERMOD processing.
5. Select 'Use AERMAP Generated Files" and select the two AERMAP files created in the previous step and press "Next".	The AERMOD run will include AERMAP terrain data and we are ready to move to Step 3 of AERMOD processing.
6. Press the "…" button next to the Surface File line and choose the "Dec1.sfc" file that we created with the AERMET wizard.	This specifies the December 1st surface weather file.
7. Again in the Meteorology section, press the "…" button next to the Profile File line and choose the "Dec1.pfl" file.	This specifies the December 1st profile weather file.
8. Set the base elevation to 146 feet.	This specifies that our airport is 146 feet above sea level.
9. Press "Next"	Advance to Step 4 of AERMOD processing.
10. Name the Output file "sampleOutput".	This specifies the output file name to be sampleOutput.inp.
11. Press "Generate".	The AERMOD input files will be generated and the window will be closed.

Figure B-2-12. Step 1 of Generate AERMOD Input Files window

.

Figure B-2-13. Step 2 of Generate AERMOD Input Files window.

Figure B-2-14. Step 3 of Generate AERMOD Input Files window.

Figure B-2-15. Step 4 of Generate AERMOD Input Files window.

B.2.6 Running AERMOD

Now we are ready to run AERMOD and generate concentrations.

Action	Result
1. From the *Dispersion* menu, choose the *Run AERMOD* option.	This brings up a dropdown list where the AERMOD input file to be run can be selected.
2. Choose the "sampleOutput.inp" file and press "OK".	AERMOD will now run with the input file that we previously created.

B.2.7 Viewing Results

Now that AERMOD has finished running, we are ready to look at the results. See Figure B-2-16.

Action	Result
1. Select *View Concentrations* from the *View* menu option.	After AERMOD has finished running, the results are saved in the output file that we previously specified. Select *View Concentrations* to access it.
2. Select the "sampleOutput.CON" file and press the button labeled "Query".	This populates the table for viewing the concentrations from AERMOD.

Figure B-2-16. Sample Dispersion Results.

Receptor Name	X (m)	Y (m)	Concentration (μg/m³)	Elevation (m)	Hill (m)	Height (m)	Averaging Period	Source Group
POLEGRID	738.82147	-395.00146	0.00000	203.76	203.76	1.80	1-HR	PARKING
POLEGRID	942.99878	-1157.00146	1.57043	198.00	198.00	1.80	1-HR	PARKING
POLEGRID	738.82153	-1919.00146	0.02116	198.00	198.00	1.80	1-HR	PARKING
POLEGRID	180.99881	-2476.82422	0.00000	198.00	198.00	1.80	1-HR	PARKING
Terminal Receptor	-448.00000	-441.00000	0.00000	212.79	212.79	1.80	1-HR	PARKING
POLEGRID	738.82147	-395.00146	0.00000	203.76	203.76	1.80	1-HR	ROADWAYS
POLEGRID	942.99878	-1157.00146	0.00000	198.00	198.00	1.80	1-HR	ROADWAYS
POLEGRID	738.82153	-1919.00146	2.70237	198.00	198.00	1.80	1-HR	ROADWAYS
POLEGRID	180.99881	-2476.82422	0.00000	198.00	198.00	1.80	1-HR	ROADWAYS
Terminal Receptor	-448.00000	-441.00000	0.00000	212.79	212.79	1.80	1-HR	ROADWAYS
POLEGRID	738.82147	-395.00146	0.00042	203.76	203.76	1.80	1-HR	STATSRCS
POLEGRID	942.99878	-1157.00146	0.00042	198.00	198.00	1.80	1-HR	STATSRCS
POLEGRID	738.82153	-1919.00146	0.00044	198.00	198.00	1.80	1-HR	STATSRCS
POLEGRID	180.99881	-2476.82422	0.00047	198.00	198.00	1.80	1-HR	STATSRCS
Terminal Receptor	-448.00000	-441.00000	0.00058	212.79	212.79	1.80	1-HR	STATSRCS
POLEGRID	738.82147	-395.00146	0.00000	203.76	203.76	1.80	1-HR	FIRES
POLEGRID	942.99878	-1157.00146	0.00000	198.00	198.00	1.80	1-HR	FIRES
POLEGRID	738.82153	-1919.00146	0.00000	198.00	198.00	1.80	1-HR	FIRES
POLEGRID	180.99881	-2476.82422	0.00000	198.00	198.00	1.80	1-HR	FIRES
Terminal Receptor	-448.00000	-441.00000	0.00000	212.79	212.79	1.80	1-HR	FIRES
POLEGRID	738.82147	-395.00146	0.00000	203.76	203.76	1.80	1-HR	GATES
POLEGRID	942.99878	-1157.00146	0.00000	198.00	198.00	1.80	1-HR	GATES
POLEGRID	738.82153	-1919.00146	0.00000	198.00	198.00	1.80	1-HR	GATES
POLEGRID	180.99881	-2476.82422	0.00000	198.00	198.00	1.80	1-HR	GATES
Terminal Receptor	-448.00000	-441.00000	0.00000	212.79	212.79	1.80	1-HR	GATES
POLEGRID	738.82147	-395.00146	0.00000	203.76	203.76	1.80	1-HR	AIRCRAFT
POLEGRID	942.99878	-1157.00146	0.00000	198.00	198.00	1.80	1-HR	AIRCRAFT
POLEGRID	738.82153	-1919.00146	0.00000	198.00	198.00	1.80	1-HR	AIRCRAFT

File Size: 93.953 KB (840 records) File Last Modified: 09/17/2004 11:41 AM

Appendix C Import/Export File Formats

C.1. Introduction

This appendix details the import and export formats used by EDMS 4.2. EDMS 4.2 is only able to import files in this format, therefore study data exported from a previous version of EDMS must be re-formatted to match those listed below. This information is also contained in the on-line help for your convenience.

C.2. Format

The file to be imported should be a comma-separated (CSV) text file with the following format rules:

If the first character of a line is the pound sign, "#", the line is ignored as a comment.

If the first character of a line is an exclamation point, "!", or bang, EDMS assumes that a keyword will immediately follow.

Any lines not beginning with "#" or "!" are assumed to be data to be imported (if the last keyword was selected for import).

All files to be imported must begin with "!VERSION" followed by the EDMS version on the next line (e.g., "4.2"). This is the only required keyword for every EDMS import file.

C.3. Keywords

Table C-1 lists all of the keywords available in EDMS 4.2. Detailed import formats for each of the keywords follows the table.

Table C-1. EDMS 4.2 import keywords.

Keyword	Data Description
VERSION	The EDMS version of the file to be imported. Should be set to "4.2".
AIRPINFO	General information about the modeled airport
STDYYEAR	Study Year (year being modeled)
TAXITIME	Default aircraft taxi time
MOBILE	Version of MOBILE to use for onroad vehicles
STUDYTYP	Study Type (Emissions Only or Emissions & Dispersion)
TIMBASIS	System Aircraft Time in Mode Basis (ICAO or Performance)
GSEBASIS	GSE Modeling Basis (Population or LTO-based)
UNITS	Airport layout & emission inventory units
DOMAIN	AERMAP terrain domain
ORIGIN	Geographic coordinate mapped to the study point of origin (0,0)
HOURPROF	Hourly operational profiles
DAY_PROF	Daily operational profiles
MON_PROF	Monthly operational profiles
AIR_POP	Aircraft Activity
GSE_ASGN	GSE Assignments (for LTO-based GSE)
TAXIASGN	Aircraft Taxiway assignments
RNWYASGN	Aircraft Runway assignments
GSE_POP	GSE Population
GATEASGN	GSE Population gate assignments
ROADWAYS	Roadways
PARKING	Parking Facilities
STATNRY	Stationary Sources
FIRES	Training Fires
GATES	Gates
TAXIWAYS	Taxiways
RUNWAYS	Runways
BUILDING	Buildings
CONFIGS	Airport Configurations
CNFGTAXI	Configuration Taxiway assignments
CNFGRNWY	Configuration Runway assignments
NETWORKC	Cartesian receptor networks
NETWORKP	Polar receptor networks
RECEPTRC	Discrete Cartesian receptors
RECEPTRP	Discrete polar receptors
USER_AIR	User-created Aircraft
USER_GSE	User-created GSE
USER_APU	User-created APUs

C.3.1. VERSION

This keyword is required for all import files.

Number of fields: 1.

Field #	Description	Optional?
1	EDMS Version Number (should always be 4.2)	No

Example

```
    !VERSION
4.2
```

C.3.2. AIRPINFO

Number of fields: 6

Field #	Description	Format	Optional?
1	Airport Name	Text up to 50 characters	Yes
2	Airport 3 or 4-character ID	Text up to 4 characters	Yes
3	Airport State (Postal abbreviation)	Text up to 2 characters	Yes
4	Airport Elevation (feet)	Integer 0 to 10000	Yes
5	Average Temperature (°F)	Integer 0 to 110	Yes
6	Mixing Height (feet)	Integer 1000 to 10000	Yes

Example

```
!AIRPINFO
DOHA INTL, OTBD, NA, 35, 79.0, 3000
```

C.3.3. STDYYEAR

Number of fields: 1

Field #	Description	Format	Optional?
1	Study Year	4-digit integer 1990-2020	No

Example

```
!STDYYEAR
2005
```

C.3.4. TAXITIME

Number of fields: 1

Field #	Description	Format	Optional?
1	Default Taxi Time (in minutes)	Numerical value from 0 to 60, inclusive	No

Example

```
!TAXITIME
22.5
```

C.3.5. MOBILE

Number of fields: 2

Field #	Description	Format	Optional?
1	MOBILE version number	5a, 5b or 6	No
2	Diesel fuel sulfur content (in PPM)	Integer from 0 to 5000, inclusive	Not optional for version 6, otherwise yes.

Example

```
!MOBILE
6, 7.8
```

C.3.6. STUDYTYP

Number of fields: 1

Field #	Description	Format	Optional?
1	Study Type	"EMISONLY" for emissions only "EMISDISP" for both emissions and dispersion	No

Example

```
!STUDYTYP
EMISDISP
```

C.3.7. TIMBASIS

Number of fields: 1

Field #	Description	Format	Optional?
1	System Aircraft Time in Mode Basis	"PERF" for performance based "ICAO" for ICAO time in mode defaults	No

Example

```
!TIMBASIS
PERF
```

C.3.8. GSEBASIS

Number of fields: 1

Field #	Description	Format	Optional?
1	GSE Modeling Basis	"LTO" for LTO based "POP" for Population based	No

Example

```
!GSEBASIS
LTO
```

C.3.9. UNITS

Number of fields: 2

Field #	Description	Format	Optional?
1	Measuring system	"ENGLISH" for English. "METRIC" for metric.	No
2	Emission Inventory reporting units	"TONS" for tons. If using English system, this refers to short tons. If using the metric system, this refers to metric tons. "LBS" for pounds. "KGS" for kilograms.	Yes. If blank, pounds or kilograms are used.

Example

```
!UNITS
ENGLISH,TONS
```

C.3.10.   DOMAIN

Number of fields: If using UTMs, 7. If using latitudes and longitudes, 5.

Field #	Description	Format	Optional?
1	Coordinate system in which the domain and origin are expressed.	"UTM" for Universal Transverse Mercator (UTM) coordinates "L/L" for latitude and longitude	No

If using UTMs, follow this format:

Field #	Description	Format	Optional?
2	Southwest Corner Northing	Numerical value.	No
3	Southwest Corner Easting	Numerical value.	No
4	Southwest Corner Zone	Positive Integer.	No
5	Northeast Corner Northing	Numerical value.	No
6	Northeast Corner Easting	Numerical value.	No
7	Northeast Corner Zone	Positive Integer.	No

If using latitudes and longitudes, follow this format:

Field #	Description	Format	Optional?
2	Southwest Corner Latitude (degrees)	Numerical value. Positive values are north. Negative values are south.	No
3	Southwest Corner Longitude (degrees)	Numerical value. Positive values are east. Negative values are west.	No
4	Northeast Corner Latitude (degrees)	Numerical value. Positive values are north. Negative values are south.	No
5	Northeast Corner Longitude (degrees)	Numerical value. Positive values are east. Negative values are west.	No

Examples

```
!DOMAIN
L/L, 25.161125, 51.465056, 25.361125, 51.665056
```
OR

```
!DOMAIN
UTM, 2782869.950000, 546867.570000, 39, 2805101.920000, 566914.040000,
39
```

Number of fields: If using UTMs, 4. If using latitudes and longitudes, 3.

Field #	Description	Format	Optional?
1	Coordinate system in which the domain and origin are expressed.	"UTM" for Universal Transverse Mercator (UTM) coordinates "L/L" for latitude and longitude	No

If using UTMs, follow this format:

Field #	Description	Format	Optional?
2	Origin Northing	Numerical value.	No
3	Origin Easting	Numerical value.	No
4	Origin Zone	Positive Integer.	No

If using latitudes and longitudes, follow this format:

Field #	Description	Format	Optional?
2	Origin Latitude (degrees)	Numerical value. Positive values are north. Negative values are south.	No
3	Origin Longitude (degrees)	Numerical value. Positive values are east. Negative values are west.	No

Examples

```
!ORIGIN
L/L, 25.261125, 51.565056
```
OR

```
!ORIGIN
UTM, 2793981.990000, 556899.090000, 39
```

C.3.11.   HOURPROF

Number of fields: 25

Field #	Description	Format	Optional?
1	Hourly Operational Profile Name	Text up to 20 characters	No
2	Temporal factor for the first hour: (midnight - 1:00 am)	Number from 0 to 1 with up to 4 decimal places	Yes
3	Temporal factor for the second hour: (1:00 am - 2:00)	Number from 0 to 1 with up to 4 decimal places	Yes
. . .	. . .	. . .	. . .
25	Temporal factor for the 24th hour: (11:00 pm - midnight)	Number from 0 to 1 with up to 4 decimal places	Yes

Notes

0 will be entered if a numerical field is left blank or is a negative value.

1 will be entered if the value in the field is greater than 1.

The existing "DEFAULT" profile can be overwritten during the import process.

Example

```
!HOURPROF
DEFAULT, 1.0000, 0.9000, 0.8000, 0.7500, 0.5000, 0.3000, 0.0000,
0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000,
0.3000, 0.5000, 0.9000, 1.0000, 1.0000, 1.0000, 1.0000, 1.0000
```

C.3.12.   DAY_PROF

Number of fields: 8

Field #	Description	Format	Optional?
1	Daily Operational Profile Name	Text up to 20 characters	No
2	Temporal factor for Monday	Number from 0 to 1 with up to 4 decimal places	Yes
3	Temporal factor for Tuesday	Number from 0 to 1 with up to 4 decimal places	Yes
. . .	. . .	. . .	. . .
8	Temporal factor for Sunday	Number from 0 to 1 with up to 4 decimal places	Yes

Notes

0 will be entered if a numerical field is left blank or is a negative value.

1 will be entered if the value in the field is greater than 1.

The existing "DEFAULT" profile can be overwritten during the import process.

Example

```
!DAY_PROF
DEFAULT, 1.0000, 0.9000, 0.8000, 0.7500, 0.5000, 0.3000, 0.0000
```

C.3.13.   MON_PROF

Number of fields: 13

Field #	Description	Format	Optional?
1	Monthly Operational Profile Name	Text up to 20 characters	No
2	Temporal factor for January	Number from 0 to 1 with up to 4 decimal places	Yes
3	Temporal factor for February	Number from 0 to 1 with up to 4 decimal places	Yes
. . .	. . .	. . .	. . .
13	Temporal factor for December	Number from 0 to 1 with up to 4 decimal places	Yes

Notes

0 will be entered if a numerical field is left blank or is a negative value.

1 will be entered if the value in the field is greater than 1.

The existing "DEFAULT" profile can be overwritten during the import process.

Example

```
!MON_PROF
DEFAULT, 1.0000, 0.9000, 0.8000, 0.7500, 0.5000, 0.3000, 0.0000,
0.9000, 0.8000, 0.7500, 0.5000, 0.3000
```

C.3.14.   AIR_POP

Number of fields: 18

Field #	Description	Format	Optional?
1	Aircraft Type	Text up to 20 characters. This name must match an aircraft type in the system or user-created tables exactly.	No. User-created aircraft must begin with "**", two (2) stars.
2	Engine Type	Text up to 20 characters. This name must match an appropriate engine type for the appropriate aircraft exactly.	No. Enter "User-Created" for user-created aircraft.
3	Operations by Peak Hour flag	T (for true) if the peak hour operations are given, F (false) for annual ops.	Yes (leaving this field blank assumes that annual operations will be specified)
4	Annual LTOs	Number between 0 and 4000000	Yes (this field can be left blank if peak hour operations will be specified)
5	Peak Hour LTOs	Number from 0 to 400	Yes (this field can be left blank if annual LTOs will be specified)
6	Annual Touch and Gos	Number from 0 to 200000	Yes
7	Assigned Gate	Text up to 6 characters. This must match a Gate ID exactly	Yes (set to -NONE- if left blank)
8	Hourly Profile	Text up to 20 characters. This must match a Hourly Profile ID exactly.	Yes (set to DEFAULT if left blank)
9	Daily Profile	Text up to 20 characters. This must match a Daily Profile ID exactly.	Yes (set to DEFAULT if left blank)
10	Monthly Profile	Text up to 20 characters. This must match a Monthly Profile ID exactly.	Yes (set to DEFAULT if left blank)
11	Uses Configurations flag	"T" (for True) if this aircraft uses configurations, "F" if not	Yes (leaving this field blank implies that the aircraft is not using configurations)
12	Identification	Text up to 100 characters. All aircraft/engine/identification combinations must be unique. Records that are not unique will be ignored.	No
13	Emissions Inventory Total Taxi & Queue Time (minutes)	Number 0 to 200 with 2 decimal places	Yes (set to 0 if blank)
14	Takeoff weight stage	Integer (1 = heaviest, 7 = lightest)	Yes (set to heaviest if blank)

Field #	Description	Format	Optional?
15	Approach angle	Integer (1 = 3 degree, 2= 5 degree glide slope)	Yes (set to 3 degrees if blank)
16	Use Default GSE Assignments flag	"T" (for True) if this aircraft uses the default GSE assignments, "F" if not	Yes (leaving this field blank implies that the aircraft is not using default GSE assignments)
17	Assigned APU Name	Text up to 30 characters. This field can be blank or match the name of an APU exactly.	Yes (if blank, then set to "APU -NONE-")
18	APU Operating Time per LTO	Number 0 to 200 with 2 decimal places.	Yes (set to 0 if blank)

Example

```
!AIR_POP
B717-200, BR700-715C1-30, F, 100, 0.011, 0, -NONE-, DEFAULT, DEFAULT,
DEFAULT, F, #1, 26.00, 2, 1, T, APU GTCP 85 (200 HP), 26.00
```

C.3.15.   GSE_ASGN

Number of fields: 8

Field #	Description	Format	Optional?
1	Aircraft Name	Text up to 20 characters. This name must match the aircraft type in the study exactly.	No
2	Engine Type	Text up to 20 characters. This name must match the engine type in the study exactly.	No
3	Identification	Text up to 100 characters. This must match the identification of the aircraft in the study exactly.	No
4	GSE Type	Text up to 30 characters. This must match the name of a GSE in the system or user-created tables exactly.	No
5	Fuel Type	1 character: "G" = Gasoline "D" = Diesel "C" = Compressed Natural Gas "L" = Liquid Propane Gas "E" = Electric	No
6	Operating Time (minutes per LTO)	Number from 0 to 480 with 2 decimal places allowed.	Yes. 0 will be used if this field is left blank.
7	Brake Horsepower	Number appropriate to the equipment type and fuel burned, 0 to 10000 allowed. Blank for APUs.	Yes. 0 will be used if this field is left blank.
8	Load Factor	Number from 0 to 1 with 4 decimal places allowed. Blank for APUs.	Yes. 0 will be used if this field is left blank.
9	Year of Manufacture	A 4-digit year or zero. Zero means the default average year of manufacture.	Yes. If left blank, it is set to zero.

Notes

The first 5 fields must form a unique combination; otherwise, the record is skipped.

Default values for operating time, brake horsepower and load factor will be assigned if all three of these fields are left blank. If the user intends to set zero emissions for a particular GSE assignment, only the operating time should be set to zero.

Example

```
!GSE_ASGN
B717-200, BR700-715C1-30, #1, Water Service, D, 12.00, 0, 0.2000, 0
```

C.3.16. TAXIASGN

Number of fields: 5

Field #	Description	Format	Optional?
1	Aircraft Name	Text up to 20 characters. This name must match the name of an aircraft in the study exactly.	No
2	Engine name	Text up to 20 characters. This name must match the name of an engine that is assigned to the aircraft in the study exactly.	No
3	Aircraft Identification	Text up to 100 characters. This name must match the name of an identification for the aircraft/engine combination exactly.	No
4	Taxiway Name	Text up to 20 characters. This must match the name of a taxiway exactly.	No
5	Speed (in miles per hour)	Number from 0 to 60, 2 digits to the right of the decimal are allowed.	Yes. Speed set to 30 mph if left blank or 0.

Example

```
!TAXIASGN
B717-200, BR700-715C1-30, #1, Taxiway A, 20.00
```

C.3.17. RNWYASGN

Number of fields: 7

Field #	Description	Format	Optional?
1	Aircraft Name	Text up to 20 characters. This name must match the name of an aircraft in the study exactly.	No
2	Engine name	Text up to 20 characters. This name must match the name of an engine that is assigned to the aircraft in the study exactly.	No
3	Identification	Text up to 100 characters. This name must match the name of an identification for the aircraft/engine combination exactly.	No
4	Runway name	Text up to 3 characters. This must match a runway end name in the study.	No
5	Fraction of the aircraft's LTOs to use the runway for landings	Number from 0 to 1, inclusive.	Yes. EDMS sets this to 0 if left blank.
6	Fraction of the aircraft's LTOs to use the runway for takeoffs		
7	Fraction of the aircraft's TGOs to use the runway		

Example

```
!RNWYASGN
B717-200, BR700-715C1-30, #1, 27, 0.5000, 0.5000, 0.5000
```

C.3.18. GSE_POP

Number of fields: 14

Field #	Description	Format	Optional?
1	GSE Type	Text up to 30 characters. This name must match a GSE type in the system or user-created tables exactly.	No
2	GSE Identification	Text up to 100 characters.	No
3	Population	Number 0 to 10000	Yes (blank = 0)
4	Annual or Peak Hour Operations?	"T" = hours per year "F" = minutes per peak hour	Yes (blank = "F")
5	Annual Hours	Number between 0 and 8760.	Yes (this field can be left blank if peak hour minutes is specified)
6	Peak Hour Minutes	Number from 0 to 60.	Yes (this field can be left blank if annual hours is specified)
7	Hourly Profile	Text up to 20 characters. This must match a Hourly Profile ID exactly.	Yes (set to DEFAULT if left blank)
8	Daily Profile	Text up to 20 characters. This must match a Daily Profile ID exactly.	Yes (set to DEFAULT if left blank)
9	Monthly Profile	Text up to 20 characters. This must match a Monthly Profile ID exactly.	Yes (set to DEFAULT if left blank)
10	Fuel burned	1 character: "G" = Gasoline "D" = Diesel "C" = Compressed Natural Gas "L" = Liquid Propane Gas "E" = Electric	No
11	Brake Horsepower	Integer 0 to 10000.	Yes (blank = 0)
12	Load Factor	Number 0 to 1 with 4 decimal places.	Yes (blank = 0)
13	Use Draft Nonroad Emission Factors flag	"T" = use Draft Nonroad Emission Factors "F" = use System Emission Factors	Yes (blank = "F")
14	Year of Manufacture	A 4-digit year.	Yes, if the Use NONROAD May 2004 draft data flag is "F".

Notes

If the annual hours/peak hour minutes flag is left blank or "F" and the annual hours is blank or 0, then the default annual usage will be assigned.

If both the brake horsepower and load factor are blank, zero or a combination of the two, then default values will be assigned to them.

Example

```
!GSE_POP
Air Conditioner, #1, 73, F, 808, 5.53, DEFAULT, DEFAULT, DEFAULT,
D,300, 0.7500, F, 2001
```

C.3.19.   GATEASGN

Number of fields: 4

Field #	Description	Format	Optional?
1	GSE Type	Text up to 30 characters. This name must match the name of a GSE Type in the study exactly.	No
2	GSE identific ation	Text up to 100 characters. This name must match the name of a GSE that in the study exactly.	No
3	Gate name	Text up to 6 characters. This must match a gate name in the study.	No
4	Fraction of the GSE population operating at the specified gate	Number from 0 to 1.	Yes (blank = 0).

Example

```
!GATEASGN
Air Conditioner, #1, 3, 1.0000
```

C.3.20.   ROADWAYS

Number of fields: 28

Field #	Description	Format	Optional?
1	Roadway name	Text up to 20 characters.	No
2	x-coordinate 1 (meters)	Number within +/- 999999.999999	Yes (only needed for dispersion analysis)
3	y0coordinate 1 (meters)	Number within +/- 999999.999999	Yes (only needed for dispersion analysis)
4	x-coordinate 2 (meters)	Number within +/- 999999.999999	Yes (only needed for dispersion analysis)
5	y-coordinate 2 (meters)	Number within +/- 999999.999999	Yes (only needed for dispersion analysis)
6	Round trip vehicle distance (miles)	Number from 0 to 4000 with 3 decimals allowed	Yes (only needed for emissions inventory only studies).

Field #	Description	Format	Optional?
7	Number of vehicles per year	Number from 0 to 1000000000	Yes (only needed if the peak hour value is not specified).
8	Number of vehicles in a peak hour	Number from 0 to 100000	Yes (only needed if the annual number of vehicles is not specified).
9	Peak hour flag	T (for true) if the peak hour value is to be used. F (for false) if the annual value is to be used.	Yes (blank = "F")
10	Average speed (MPH)	Integer multiple of 5 from 5 to 65, inclusive, or 2.5	Yes (blank = 35 mph)
11	Height of roadway (meters)	Number from -5 to 20 with 6 decimals allowed	Yes (only needed for dispersion analyses)
12	Hourly Profile Name	Text up to 20 characters. This must match the name of an hourly profile exactly.	Yes (default will be used if this is left blank)
13	Daily profile name	Text up to 20 characters. This must match the name of a daily profile exactly.	
14	Monthly profile name	Text up to 20 characters. This must match the name of a monthly profile exactly.	
15	CO (g/vehicle-mile)	Number from 0 to 2000.	Yes, if the user-edited emissions factors flag is "F", then MOBILE will assign the value.
16	THC (g/vehicle-mile)	Number from 0 to 200.	
17	NMHC (g/vehicle-mile)	Number from 0 to 200.	
18	VOC (g/vehicle-mile)	Number from 0 to 200.	
19	NOx (g/vehicle mile)	Number from 0 to 20.	
20	SOx (g/vehicle mile)	Number from 0 to 2.	
21	PM-10 (g/vehicle mile)	Number from 0 to 2.	

Field #	Description	Format	Optional?
22	PM-2.5 (g/vehicle mile)	Number from 0 to 2.	
23	User edited emissions factors flag	T (for true) if emissions factors are meant to override the MOBILE values F (for false) if MOBILE is to automatically generate the emission factors	Yes (blank = "F"). Leave blank or "F" to automatically assign MOBILE values.
24	In-study flag	T (for true) if this roadway should be in the active list F (for false) if this roadway should appear in the available list	Yes (blank = "F")
25	Width (in meters)	Number from 0 to 99.999999.	Yes (blank = 1 meter)
26	Vehicle Type Index	Integer from 0 to 16. 0 = Default Fleet Mix. 1 = Light Duty Vehicles (Passenger Cars) 2 = Light Duty Trucks 1 (0-6,000 lbs. GVWR, 0-3750 lbs. LVW) 3 = Light Duty Trucks 2 (0-6,000 lbs. GVWR, 3751-5750 lbs. LVW) 4 = Light Duty Trucks 3 (6,001-8500 lbs. GVWR, 0-3750 lbs. LVW) 5 = Light Duty Trucks 4 (6,001-8500 lbs. GVWR, 3751-5750 lbs. LVW) 6 = Class 2b Heavy Duty Vehicles (8501-10,000 lbs. GVWR) 7 = Class 3 Heavy Duty Vehicles (10,001-14,000 lbs. GVWR) 8 = Class 4 Heavy Duty Vehicles (14,001-16,000 lbs. GVWR) 9 = Class 5 Heavy Duty Vehicles (16,001-19,500 lbs. GVWR) 10 = Class 6 Heavy Duty Vehicles (19,501-26,000 lbs. GVWR)	Yes (blank = 0)

Field #	Description	Format	Optional?
		11 = Class 7 Heavy Duty Vehicles (26,001-33,000 lbs. GVWR) 12 = Class 8a Heavy Duty Vehicles (33,001-60,000 lbs. GVWR) 13 = Class 8b Heavy Duty Vehicles (>60,000 lbs. GVWR) 14 = School Busses 15 = Transit and Urban Busses 16 = Motorcycles	
27	Fuel	1 character: "G" = Gasoline "D" = Diesel	Yes (blank = "G")
28	Year of Manufacture	A 4-digit year.	Yes, if the Vehicle Type Index is zero.

Example

```
!ROADWAYS
Road Link 3b, 1634, 2237, -681, 330, 3.727, 1000000, 114, F, 35, 0,
DEFAULT, DEFAULT, DEFAULT, 19.214, 1.539, 1.474, 1.462, 1.848, 0.4042,
0.0828, 0.0656, F, T, 20, 0, D, 2003
```

C.3.21.   PARKING

Number of fields: 67

Field #	Description	Format	Optional?
1	Parking Facility name	Text up to 20 characters.	No
2	Average Idle Time (minutes)	Number 0 to 30 with 1 decimal allowed	Yes (blank = 0)
3	Average distance traveled (meters)	Number 0 to 10000 with 6 decimals allowed	Yes (blank = 0)
4	Average number of vehicles per year	Number 0 to 1000000000.	Yes (only needed if the peak hour value is not specified).
5	Number of vehicles in a peak hour	Number from 0 to 100000	Yes (only needed if the annual value is not specified).
6	Peak hour flag	T (for true) if the peak hour value is to be used. F (for false) if the annual value is to be used.	Yes (blank = "F")
7	Average speed in lot (MPH)	Integer multiple of 5 from 5 to 65, inclusive, or 2.5	Yes (blank = 10 mph)
8	Hourly Profile Name	Text up to 20 characters. This must match the name of an hourly profile exactly.	Yes (default will be used if this is left blank)
9	Daily profile name	Text up to 20 characters. This must match the name of a daily profile exactly.	
10	Monthly profile name	Text up to 20 characters. This must match the name of a monthly profile exactly.	
11	CO (g/vehicle)	Number from 0 to 9999.99.	Yes, if the user-edited emissions factors flag is "F", then MOBILE will assign the value.
12	THC (g/vehicle)	Number from 0 to 2000.	
13	NMHC (g/vehicle)	Number from 0 to 2000.	
14	VOC (g/vehicle)	Number from 0 to 2000.	
15	NOx (g/vehicle)	Number from 0 to 200.	
16	SOx (g/vehicle)	Number from 0 to 20.	
17	PM-10 (g/vehicle)	Number from 0 to 20.	
18	PM-2.5 (g/vehicle)	Number from 0 to 20.	
19	User edited emission factors flag	T (for true) if emission factors are provided to override the MOBILE values

otherwise F (for false) | Yes (blank = "F") |

Field #	Description	Format	Optional?
		T (for true) if this roadway should be in the active list. Otherwise F (for false) if this roadway should appear in the available list.	
20	In study flag		
21	Number of Levels	Integer from 1 to 20, inclusive.	Yes (blank = 1)
22	Top Release Height (in meters)	Number from 0 to 99.999999, inclusive.	Yes (blank = 0)
23	Spacing	Number from 1 to 99.999999, inclusive.	Yes (blank = 1)
24	Number of points used to define the parking lot	Integer 3 to 20.	Yes (Dispersion only)
25	x-coordinate 1 (meters)	Number within +/- 999999.999999	Yes (Dispersion only)
26	y-coordinate 1 (meters)	Number within +/- 999999.999999	Yes (Dispersion only)
. . .	. . .	. . .	. . .
63	x-coordinate 20 (meters)	Number within +/- 999999.999999	Yes (if fewer than 20 points are used to define the parking lot)
64	y-coordinate 20 (meters)	Number within +/- 999999.999999	Yes (if fewer than 20 points are used to define the parking lot).

Field #	Description	Format	Optional?
65	Vehicle Type Index	Integer from 0 to 16. 0 = Default Fleet Mix 1 = Light Duty Vehicles (Passenger Cars) 2 = Light Duty Trucks 1 (0-6,000 lbs. GVWR, 0-3750 lbs. LVW) 3 = Light Duty Trucks 2 (0-6,000 lbs. GVWR, 3751-5750 lbs. LVW) 4 = Light Duty Trucks 3 (6,001-8500 lbs. GVWR, 0-3750 lbs. LVW) 5 = Light Duty Trucks 4 (6,001-8500 lbs. GVWR, 3751-5750 lbs. LVW) 6 = Class 2b Heavy Duty Vehicles (8501-10,000 lbs. GVWR) 7 = Class 3 Heavy Duty Vehicles (10,001-14,000 lbs. GVWR) 8 = Class 4 Heavy Duty Vehicles (14,001-16,000 lbs. GVWR) 9 = Class 5 Heavy Duty Vehicles (16,001-19,500 lbs. GVWR) 10 = Class 6 Heavy Duty Vehicles (19,501-26,000 lbs. GVWR) 11 = Class 7 Heavy Duty Vehicles (26,001-33,000 lbs. GVWR) 12 = Class 8a Heavy Duty Vehicles (33,001-60,000 lbs. GVWR) 13 = Class 8b Heavy Duty Vehicles (>60,000 lbs. GVWR) 14 = School Busses 15 = Transit and Urban Busses 16 = Motorcycles	Yes (blank = 0)
66	Fuel	1 character: "G" = Gasoline "D" = Diesel	Yes (blank = "G")
67	Year of Manufacture	A 4-digit year.	Yes, if the Vehicle Type Index is zero.

Example

```
!PARKING
Parking Facility, 1.50, 250.000000, 0, 0, F, 2.5, DEFAULT, DEFAULT,
DEFAULT, 62.40, 61.74, 14.26, 14.16, 1.10, 0.03, 0.01, 0.01, F, F, 1,
1, 3, 4, 610, 190, 710, 190, 710, 340, 610,
340,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, 1, G, 2000
```

C.3.22.   STATNRY

Number of fields: 97

Notes

If not using category **Other** and using system defaults, emissions parameters will be automatically set to the appropriate values and therefore the user may leave all the emissions factors fields blank.

Operational Parameter Fields

Field #	Description	Format	Optional?
1	Stationary source name	Text up to 20 characters	No
2	In-study flag	"F" = available "T" = is the study	Yes (blank = "F", not in study)
3	Units Code	0 = Metric Tons 1 = Kiloliters 2 = 1,000s of m³ 3 = Hours 4 = Test Cycles	Yes (blank = 0)
4	Annual amount used	Number from 0 to 20000000 with 2 decimals	
5	Peak hour used	Number from 0 to 200000 with 2 decimals	
6	Peak hour flag	"F" = Annual "T" = Peak Hour	Yes (blank = "F", Annual)
7	Hourly profile name	Text up to 20 characters. This must match the name of an hourly profile exactly.	Yes (blank = "DEFAULT")
8	Daily profile name	Text up to 20 characters. This must match the name of a daily profile exactly.	Yes (blank = "DEFAULT")
9	Monthly profile name	Text up to 20 characters. This must match the name of a monthly profile exactly.	Yes (blank = "DEFAULT")

Emission Parameter Fields

Most emission parameter fields only apply to certain categories and types. Those that only apply to certain categories have been colored.

Field #	Description	Format	Optional?
10	Category code	Integer from 0 to 9: 0 = Other 1 = Boiler/Space Heater 2 = Emergency Generator 3 = Incinerator 4 = Aircraft Engine Testing 5 = Fuel Tank 6 = Surface Coating/Painting 7 = Deicing Area 8 = Solvent Degreaser 9 = Sand/Salt Pile	Yes (blank = 0, which is category Other)
11	Type code	Integer from 1 to 93. What each one means depends on the context of the category.	Yes (blank = 1, unused for category Other)
12	User-edited emissions factors flag	"F" = use system defaults "T" = user edited values	Yes (blank = "F"). Is set to "T" if using category Other.
13	CO (Kg/unit)	Number from 0 to 1000 with 4 decimals	Yes (blank = 0)
14	HC (Kg/unit)	Number from 0 to 1000 with 4 decimals	
15	NOx (Kg/unit)	Number from 0 to 1000 with 4 decimals	
16	SOx (Kg/unit)	Number from 0 to 1000 with 4 decimals	
17	PM (Kg/unit)	Number from 0 to 1000 with 4 decimals	
18	PM (Kg/unit - % ash)	Number from 0 to 1000 with 4 decimals	
19	Fuel Sulfur Content (%)	Number from 0 to 99.99.	
20	Calcium-to-Sulfur Ratio	Number from 0 to 9.9999	
21	Fuel Ash Content (%)	Number from 0 to 99.99.	
22	CO Pollution Control %	Number from 0 to 100.	
23	HC Pollution Control %		
24	NOx Pollution Control %		
25	SOx Pollution Control %		
26	PM Pollution Control %		
27	Horsepower	Integer from 0 to 9999	
28	30% Power Time in	Number from 0 to 999.99 (in minutes)	

	Mode		
29	85% Power Time in Mode		
30	100% Power Time in Mode		
31	7% Power Time in Mode		
32	Fuel Tank Height (meters)	Number from 0 to 999.99.	
33	Tank Diameter (meters)		
34	Tank Average Liquid Level (meters)		
35	Tank Maximum Liquid Level (meters)		
36	Reid Vapor Pressure (psi)	Integer from 6 to 13, inclusive.	Yes (blank = 6)
37	Solution Density (g/L)	Number from 0 to 1999.9	Yes (blank = 0)
38	Solution Concentration (%)	Number from 0 to 99.99	
39	Pile Surface Area (square meters)	Number from 0 to 9999	
40	Mass per Disturbance (metric tons)	Number from 0 to 999.999	
41	Moisture Content (%)	Number from 0.01 to 99.99	Yes (blank = 0.01)
42	Average Wind Speed (m/s)	Number from 0 to 99.99	Yes (blank = 0)
43	Fastest Mile of Wind (m/s)		
44	Pile friction velocity threshold (m/s)		
45	Pile Surface Roughness (cm)	Number from 0.01 to 99.99	Yes (blank = 0.01)
46	Surface-to-Approaching Wind Speed Ratio	Number from 0 to 1, inclusive	Yes (blank = 0)
47	Aircraft Engine Testing Engine Name	Text up to 20 characters. This name must match an engine in the system or user-created tables.	Not optional for Aircraft Engine Testing.

Dispersion Parameter Fields

Field #	Description	Format	Optional?
48	Base Elevation (meters)	Number within +/- 999999.999999	Yes (blank = 0)
49	Release Height (meters)	Number from 1 to 100, with 6 decimals	

50	Sigma-Z0 (meters)	Number from 0.1 to 100.	
51	Sigma-Y0 (meters)		
52	Stack Diameter (m)	Number from 0.1 to 10 with 2 decimals	Yes (blank = 0.1 m)
53	Gas velocity (m/s)	Number from 1 to 30 with 2 decimals	Yes (blank = 1 m/s)
54	Temperature (°F)	Number from 32 to 600 with 2 decimals	Yes (blank = 32°F)
55	Above ambient temperature flag	"F" = temperature is absolute "T" = temperature is relative to current ambient temperature	Yes (blank = "F")
56	AERMOD Source Type	0 = POINT 1 = AREA 2 = VOLUME	Yes (blank = 0)
57	Number of Points	Number from 3 to 20, if AREA source. Must be 1, otherwise.	Yes (blank = 1).
58	x-coordinate 1 (meters)	Number within +/- 999999.999999	Yes (blank = 0)
59	y-coordinate 1 (meters)	Number within +/- 999999.999999	Yes (blank = 0)
. . .	. . .	. . .	. . .
96	x-coordinate 20 (meters)	Number within +/- 999999.999999	Yes (blank = 0)
97	y-coordinate 20 (meters)	Number within +/- 999999.999999	Yes (blank = 0)

Example

```
!STATNRY
My Source, T, 0, 1000, 0.11, F, DEFAULT, DEFAULT, DEFAULT, 1, 1, F,
0.2500, 0.0300, 11, 19,, 1.15, 2.16,, 11.12, 0, 0, 0, 0,
0,,,,,,,,,,,,,,,,,,, 4.57, 20, 1, 1, 1, 15, 400.00, F, 0, 1, 1955,
-762,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
```

C.3.23.   FIRES

Number of fields: 15

Field #	Description	Format	Optional?
1	Fire name	Text up to 20 characters	No
2	x-coordinate	Number within +/-	Yes

		(meters)	999999.999999	
3	y-coordinate (meters)	Number within +/- 999999.999999	Yes	
4	Height (z-coordinate) (meters)	Number from 1 to 15 with 6 decimals	Yes (blank = 1)	
5	Hourly profile name	Text up to 20 characters. This must match the name of an hourly profile exactly.	Yes (blank = "DEFAULT")	
6	Daily profile name	Text up to 20 characters. This must match the name of a daily profile exactly.	Yes (blank = "DEFAULT")	
7	Monthly profile name	Text up to 20 characters. This must match the name of a monthly profile exactly.	Yes (blank = "DEFAULT")	
8	Annual number of gallons used	Number from 0 to 999999999 with 2 decimals	Yes (blank = 0)	
9	Peak hour number of gallons used	Number from 0 to 999999 with 2 decimals	Yes (blank = 0)	
10	Peak hour flag	"F" = annual usage "T" = peak hour usage	Yes (blank = "F", annual usage)	
11	Fuel	"JP-4", "JP-5", "JP-8", "Propane" or "Tekflame"	No	
12	Fire temperature (°F)	Number from 100 to 600 with 2 decimals	Yes (blank = 100°F, see note.)	
13	Fire diameter (meters)	Number from 1 to 15 with 2 decimals	Yes (blank = 1 m, see note.)	
14	Gas velocity	Number from 1 to 30 with 2 decimals	Yes (blank = 1 m/s, see note.)	
15	CO Emission Factor (grams/gallon)	Number from 0 to 3000	Yes (blank = 0). If the User-Edited Emission Factor flag is "F", then these are set to the values for the specified fuel.	
16	HC Emission Factor (grams/gallon)	Number from 0 to 100		
17	NOx Emission Factor (grams/gallon)	Number from 0 to 100		
18	SOx Emission Factor	Number from 0 to 10		

		(grams/gallon)		
19	PM-10 Emission Factor (grams/gallon)	Number from 0 to 1000		
20	In-study flag	"F" = available "T" = in study	Yes (blank = "F", not in study)	
21	User-Edited Emission Factor flag	"F" = system emission factors "T" = edited by the user	Yes (blank = "F")	

Notes

If temperature is blank or 100, then it is set to the default value of 400°F.

If diameter is blank or 1 then it is set to the default value of 5 meters.

If velocity is blank or 1, then it is set to the default value of 10 m/s.

Example

```
!FIRES
Training Fire, 1961, 1113, 4, DEFAULT, DEFAULT, DEFAULT, 1000.00, 0.11,
F, JP-4, 400, 5,10.00, 1625.68, 58.06, 12.19, 1.72, 435.44, F, F
```

C.3.24.   GATES

Number of fields: 44

Field #	Description	Format	Optional?
1	Gate name	Text up to 20 characters.	No
2	In-study flag	"F" = available "T" = in study	Yes (blank = "F", not in study)
3	Height (meters)	Number 0 to 100 with 6 decimals allowed	Yes (blank = 0)
4	Number of points used to define the gate	Integer from 1 to 20, inclusive.	Yes (blank = 1). If set to 2, it is reset to 1.
5	x-coordinate 1 (meters)	Number within +/- 999999.999999	Yes (blank = 0)
6	y-coordinate 1 (meters)	Number within +/- 999999.999999	Yes (blank = 0)
. . .	. . .	. . .	. . .
43	x-coordinate 20 (meters)	Number within +/- 999999.999999	Yes (if fewer than 20 points are used to define the gate)
44	y-coordinate 20 (meters)	Number within +/- 999999.999999	Yes (if fewer than 20 points are used to define the gate).

Example

```
!GATES
1A, T, 1.5, 1, -36, -109,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
```

C.3.25. TAXIWAYS

Number of fields: 9

Field #	Description	Format	Optional?
1	Taxiway name	Text up to 20 characters.	No
2	x-coordinate 1 (meters)	Number within +/- 999999.999999	Yes (blank = 0)
3	y coordinate 1 (meters)		
4	x-coordinate 2 (meters)		
5	y coordinate 2 (meters)		
6	Taxi speed (MPH)	Number from 0 to 60 with 2 decimals allowed	Yes (blank = 0, see note.)
7	Taxi time (minutes)	Number from 0 to 99.99 with 2 decimals allowed	Yes (blank = 0, see note.)
8	In-study flag	T (for true) if this taxiway should be in the active list. Otherwise F (for false) if this taxiway should appear in the available list.	Yes (blank = "F")
9	Width (meters)	Number from 1 to 99.99	Yes (blank = 1)

Note

If both taxi speed and time are blank or 0, then speed will be set to a default of 30 mph and time is adjusted to agree. Otherwise if only one of the two fields is 0 or blank, the other value will be adjusted to agree. If neither speed nor time is blank or 0, then the time will be adjusted to agree with the given speed.

Example

```
!TAXIWAYS
Taxiway A, -77.000000, 3.000000, -119.000000, 582.000000, 30.00, 0.72,
T, 20.000000
```

C.3.26.   RUNWAYS

Number of fields: 13

Field #	Description	Format	Optional?
1	Runway name	Text. 4 to 7 characters. Must be a valid pair or runway end names separated by a hyphen. 1 to 3 characters for each runway end named appropriately (i.e., 1-36 + L,C, or R)	No
2	x-coordinate of end 1 (meters)	Number within +/- 999999.999999	Yes (blank = 0)
3	y coordinate of end 1 (meters)		
4	x-coordinate of end 2 (meters)		
5	y coordinate of end 2 (meters)		
6	x-coordinate of the queue for runway end 1		
7	y-coordinate of the queue for runway end 1		
8	x-coordinate of the queue for runway end 2		
9	y-coordinate of the queue for runway end 2		
10	Peak queue time (minutes)	Number from 0 to 60 with 2 decimals allowed	Yes (blank = 0)
11	In-study flag	T (for true) if this runway should be in the active list. Otherwise F (for false) if this runway should appear in the available list.	Yes (blank = "F", not in study)
12	Queue time hourly profile	Text up to 20 characters. This must match the name of an hourly profile exactly.	Yes. DEFAULT will be used if this is left blank
13	Queue length hourly profile	Text up to 20 characters. This must match the name of an hourly profile exactly.	Yes. DEFAULT will be used if this is left blank.

Example

```
!RUNWAYS
9-27, -2408, -2673, 1592, -2673, -2254, -1852, 1593, -2299, 0.00, T,
DEFAULT, DEFAULT
```

C.3.27.   BUILDING

Number of fields: 45

Field #	Description	Format	Optional?
1	Building name	Text up to 20 characters.	No
2	In-study flag	T (for true), if this building should be in the in study list. F (for false), if this building should appear in the available list.	Yes (blank = "F")
3	Base Elevation (meters)	Number from 0 to 10000.	Yes (blank = 0)
4	Height (meters)	Number from 0 to 100.	
5	Number of points	Integer from 3 to 20, inclusive.	Yes (blank = 3).
6	x-coordinate 1 (meters)	Number within +/- 999999.999999	Yes (blank = 0)
7	y-coordinate 1 (meters)		
. . .	. . .	. . .	. . .
44	x-coordinate 20 (meters)	Number within +/- 999999.999999	Yes (if fewer than 20 points are used to define the gate)
45	y-coordinate 20 (meters)		

Example

```
!BUILDING
Building Name, F, 11., 7., 3, 52., 323., 234., 333., 234., 53., 59249.,
601275.,,,,,,,,,,,,,,,,,,,,,,,,,,,
```

C.3.28. CONFIGS

Number of fields: 5

Field #	Description	Format	Optional?
1	Configuration Name	Text up to 20 characters.	No
2	Start angle (°)	Integer from 1 to 360, inclusive	Yes (blank = 1)
3	End angle (°)		
4	Minimum wind speed (m/s)	Number from 0 to 99.99 with 2 decimals allowed	Yes (blank = 0)
5	In-study flag	"F" = available "T" = in-study	Yes (blank = "F", not in study)

Notes

The wind angle range used by a configuration will be the clockwise arc from the start angle to the end angle. The wind angle is the direction from which the wind is blowing. For example, winds out of the north correspond to 360 degrees. Wind angles for configurations should be thought of as discrete vectors with 360 possible directions, as opposed to having the continuity of a complete circle.

Example

```
!CONFIGS
Winds from northeast, 342, 64, 7.00, T
```

C.3.29. CNFGTAXI

Number of fields: 3

Field #	Description	Format	Optional?
1	Configuration Name	Text up to 20 characters. This name must match the name of a configuration in the study exactly.	No
2	Taxiway Name	Text up to 20 characters. This must match the name of a taxiway exactly.	No
3	Speed (in miles per hour)	Number from 0 to 60, 2 digits to the right of the decimal are allowed.	Yes. Speed set to 30 mph if left blank or 0.

Example

```
!CNFGTAXI
Winds from northeast, Taxiway6, 30.00
```

C.3.30.　　CNFGRNWY

Number of fields: 5

Field #	Description	Format	Optional?
1	Configuration Name	Text up to 20 characters. This name must match the name of a configuration in the study exactly.	No
2	Runway name	Text up to 3 characters. This must match a runway end name in the study.	No
3	Fraction of the aircraft's LTOs to use the runway for landings	Number from 0 to 1, inclusive.	Yes. EDMS sets this to 0 if left blank.
4	Fraction of the aircraft's LTOs to use the runway for takeoffs		
5	Fraction of the aircraft's TGOs to use the runway		

Example

```
!CNFGRNWY
Winds from northeast, 3R, 1.0000, 1.0000, 1.0000
```

C.3.31. NETWORKC

Number of fields: 9

Field #	Description	Format	Optional?
1	Receptor network name	Text up to 8 characters.	No
2	Start x-coordinate (meters)	Number within +/- 999999.999999	Yes (blank = 0)
3	Start y-coordinate (meters)		
4	Number of receptors in the x-direction	Integer from 1 to 100	Yes (blank = 1)
5	Number of receptors in the y-direction		
6	Distance increment in the x-direction (meters)	Number from 1 to 1000 with 6 decimals allowed	
7	Distance increment in the y-direction (meters)		
8	Receptor height (meters)	Number 0 to 10 meters with 6 decimals allowed	Yes (blank = 0)
9	In-Study flag	T (for true) if this receptor should be in the active list. Otherwise F (for false) if this receptor should appear in the available list.	Yes (blank = "F", not in study)

Example

```
!NETWORKC
CARTGRID, -4611, -5241, 10, 10, 1000, 1000, 1.800000, T
```

C.3.32.   NETWORKP

Number of fields: 14

Field #	Description	Format	Optional?
1	Receptor network name	Text up to 8 characters.	No
2	Source based flag	T (for True), if the network of receptors is centered around a source. F (for False), if coordinates for the center will be specified.	Yes (blank = "F", not source based)
3	Origin source type	Text, must be one of the following values: "Gate", "Parking Lot", "Queue", "Roadway", "Runway", "Stationary Source", "Taxiway" or "Training Fire"	Yes (Should not be blank for source based networks, but should be blank it not source based).
4	Origin source name	Text up to 20 characters. Must match the origin source name exactly.	Yes (This field can be left blank if not source based).
5	Center x-coordinate (meters)	Number from -999999.999999 to 999999.999999	Yes (This field can be left blank if source based).
6	Center y-coordinate (meters)		
7	Distance from the center for the first receptor (meters)	Number from 1 to 999999.999999	Yes (blank = 1)
8	Direction from the center for the first receptor (°)	Number from 0 to 360.	Yes (blank = 0).
9	Number of rings	Number from 1 to 100	Yes (blank = 1)
10	Number of vectors	Number from 1 to 36	
11	Ring distance increment (meters)	Number from 1 to 1000	
12	Vector degree increment (°)	Number from 1 to 90	
13	Receptor height (meters)	Number 0 to 10 with 6 decimals allowed	Yes (blank = 0)
14	In-study flag	T (for true) if this receptor should be in the active list. F (for false) if this receptor should appear in the available list.	Yes (blank = "F", not in study)

Example

```
!NETWORKP
POLEGRID, F,,, 0, 0, 50, 0, 1, 1, 50, 10, 1.8, F
```


C.3.33.   RECEPTRC

Number of fields: 5

Field #	Description	Format	Optional?
1	Receptor name	Text up to 20 characters.	No
2	x-coordinate (meters)	Number within +/- 999999.999999	Yes (blank = 0)
3	y coordinate (meters)		
4	Receptor height (meters)	Number 0 to 10 with 6 decimals allowed.	
5	In-study flag	T (for true), if this receptor should be in the active list. F (for false), if this receptor should appear in the available list.	Yes (blank = "F", not in study)

Example

```
!RECEPTRC
Cartesian Receptor, 2941, -1482, 1.8, F
```

C.3.34.   RECEPTRP

Number of fields: 7

Field #	Description	Format	Optional?
1	Receptor name	Text up to 20 characters.	No
2	Origin source type	Text, must be one of the following strings: "Gate", "Parking Facility", "Queue", "Roadway", "Runway", "Stationary Source", "Taxiway" or "Training Fire"	No
3	Origin source name	Text up to 20 characters. Must match a source name of a specified source exactly.	No
4	Direction from source (°)	Integer from 0 to 360	Yes (blank = 0)
5	Distance from source (meters)	Number from 0 to 999999.999999	Yes (blank = 0)
6	Receptor height (meters)	Number 0 to 10 with 6 decimals allowed	Yes (blank = 0)
7	In study flag	T (for true) if this receptor should be in the active list. Otherwise F (for false) if this receptor should appear in the available list.	Yes (blank = "F", not in the study)

Example

```
!RECEPTRP
Polar Receptor, Queue, 3R, 107, 1326.692504, 1.800000, F
```

C.3.35.   USER_AIR

Number of fields: 36

Field #	Description	Format	Optional?
1	Aircraft name	Text up to 20 characters.	No
2	Number of engines	Integer from 1 to 8, inclusive.	Yes (blank = 1)
3	Mode 1 Time in mode (minutes)	Number from 0 to 120 with 2 decimals allowed	Yes (blank = 0)

Field #	Description	Format	Optional?
4	Mode 1 Fuel Flow rate (Kg/s)	Number from 0 to 10 with 6 decimals allowed	
5	Mode 1 CO emission index	Number from 0 to 2333 with 6 decimals allowed	
6	Mode 1 THC emission index	Number from 0 to 1000 with 6 decimals allowed	
7	Mode 1 NOx emission index	Number from 0 to 1000 with 6 decimals allowed	
8	Mode 1 SOx emission index	Number from 0 to 2 with 6 decimals allowed	
9	Mode 1 PM-10 emission index	Number from 0 to 1000 with 6 decimals allowed	
10	Mode 2 Time in mode (minutes)	Number from 0 to 120 with 2 decimals allowed	Yes (blank = 0)
11	Mode 2 Fuel Flow rate (Kg/s)	Number from 0 to 10 with 6 decimals allowed	
12	Mode 2 CO emission index	Number from 0 to 2333 with 6 decimals allowed	
13	Mode 2 THC emission index	Number from 0 to 1000 with 6 decimals allowed	
14	Mode 2 NOx emission index	Number from 0 to 1000 with 6 decimals allowed	
15	Mode 2 SOx emission index	Number from 0 to 2 with 6 decimals allowed	
16	Mode 2 PM-10 emission index	Number from 0 to 1000 with 6 decimals allowed	
17	Mode 3 Time in mode (minutes)	Number from 0 to 120 with 2 decimals allowed	Yes (blank = 0)
18	Mode 3 Fuel Flow rate (Kg/s)	Number from 0 to 10 with 6 decimals allowed	
19	Mode 3 CO emission	Number from 0 to 2333 with 6	

Field #	Description	Format	Optional?
	index	decimals allowed	
20	Mode 3 THC emission index	Number from 0 to 1000 with 6 decimals allowed	
21	Mode 3 NOx emission index	Number from 0 to 1000 with 6 decimals allowed	
22	Mode 3 SOx emission index	Number from 0 to 2 with 6 decimals allowed	
23	Mode 3 PM-10 emission index	Number from 0 to 1000 with 6 decimals allowed	
24	Mode 4 Time in mode (minutes)	Number from 0 to 120 with 2 decimals allowed	Yes (blank = 0)
25	Mode 4 Fuel Flow rate (Kg/s)	Number from 0 to 10 with 6 decimals allowed	
26	Mode 4 CO emission index	Number from 0 to 2333 with 6 decimals allowed	
27	Mode 4 THC emission index	Number from 0 to 1000 with 6 decimals allowed	
28	Mode 4 NOx emission index	Number from 0 to 1000 with 6 decimals allowed	
29	Mode 4 SOx emission index	Number from 0 to 2 with 6 decimals allowed	
30	Mode 4 PM-10 emission index	Number from 0 to 1000 with 6 decimals allowed	
31	Aircraft category	Text up to 4 characters.	Yes (blank = "HCJP")
32	Flight profile aircraft	Text up to 20 characters. Must exactly match a system aircraft name.	Required only for non-helicopters.
33	Flight profile engine	Text up to 20 characters. Must exactly match a system engine name.	Required only for non-helicopters.
34	Times in mode source code	Integer from 0 to 2. 0 = User-specified times in mode, 1 = Derive times in mode from selected flight profile aircraft-engine combination, or 2 = Use EPA times in mode for the specified category	Yes (blank = 0)

Field #	Description	Format	Optional?
35	Emissions factors data source system engine	Text up to 20 characters. Must exactly match a system engine name.	Yes. Leave blank if emissions data is user-edited.
36	User-edited Fuel flow and/or emissions indices flag	"F" = use system fuel flow and emission indices, "T" = user-edited fuel flow and/or emission indices.	Yes (blank = "F", system defaults based on engine name in field 15)

Example

```
!USER_AIR
**My Aircraft , 2, 6.50, 0, 0, 0, 0, 0, 0, 4.33, 0, 0, 0, 0, 0, 0,
     2.17, 0, 0, 0, 0, 0, 0, 7.00, 0, 0, 0, 0, 0, 0, HCJH, 337H
     Skymaster, TSIO-360C, 0,,T
```

C.3.36.　　USER_GSE

Number of fields: 28

Field #	Description	Format	Optional?
1	GSE/AGE name	Text up to 30 characters.	No
2	Default horsepower	Integer from 0 to 10000	Yes (blank = 0)
3	Default load factor	Number from 0 to 1 with 4 decimals	Yes (blank = 0)
4	Default operating time per LTO (minutes)	Number from 0 to 120 with 2 decimals allowed	Yes (blank = 0)
5	Default operating time per year (hours)	Integer from 0 to 8760	Yes (blank = 0)
6	User emissions factors flag	"F" = use default system emission factors from specified system GSE "T" = user-edited emissions factors	Yes (blank = "F", user-edited)
7	Emissions factors system GSE	Text up to 30 characters. Must exactly match a system GSE name.	Yes, if emissions factors are user-edited.
8	Emissions factors system GSE year	A year from "1990" to "2020" inclusive.	Yes, if emissions factors are user-edited.
9	Diesel Fuel CO emission factor (grams/horsepower-hour)	Number from 0 to 1000 with 6 decimals allowed	Yes (blank = 0)
10	Diesel Fuel THC emission factor (grams/horsepower-hour)		
11	Diesel Fuel NOx emission factor (grams/horsepower-hour)		
12	Diesel Fuel SOx emission factor (grams/horsepower-hour)		
13	Diesel Fuel PM-10 emission factor (grams/horsepower-hour)		
9	Gasoline Fuel CO emission factor (grams/horsepower-hour)	Number from 0 to 1000 with 6 decimals allowed	Yes (blank = 0)
15	Gasoline Fuel THC emission factor (grams/horsepower-hour)		
16	Gasoline Fuel NOx emission factor (grams/horsepower-hour)		
17	Gasoline Fuel SOx emission factor (grams/horsepower-hour)		
18	Gasoline Fuel PM-10 emission factor (grams/horsepower-hour)		
19	CNG Fuel CO emission factor (grams/horsepower-hour)	Number from 0 to 1000 with 6 decimals allowed	Yes (blank = 0)
20	CNG Fuel THC emission factor (grams/horsepower-hour)		
21	CNG Fuel NOx emission factor (grams/horsepower-hour)		

22	CNG Fuel SOx emission factor (grams/horsepower-hour)		
23	CNG Fuel PM-10 emission factor (grams/horsepower-hour)		
24	LPG Fuel CO emission factor (grams/horsepower-hour)	Number from 0 to 1000 with 6 decimals allowed	Yes (blank = 0)
25	LPG Fuel THC emission factor (grams/horsepower-hour)		
26	LPG Fuel NOx emission factor (grams/horsepower-hour)		
27	LPG Fuel SOx emission factor (grams/horsepower-hour)		
28	LPG Fuel PM-10 emission factor (grams/horsepower-hour)		

Example

```
!USER_GSE
**My GSE, 83, 0.5000, 30.00, 1300, F, Belt Loader, 2009,
2.532785, 0.410008, 4.796540, 0.902556, 0.457974, 241.064047,
10.025057, 7.243274, 0.175686, 0.068254, 33.361252, 37.196309,
12.176982, 0.013270, 0.056752, 33.361252, 2.536112, 12.176982,
0.013270, 0.056752
```

C.3.37.　　USER_APU

Number of fields: 9

Field #	Description	Format	Optional?
1	APU name	Text up to 30 characters. Must contain the sub-string "APU" disregarding case.	No
2	Default operating time per LTO (minutes)	Number from 0 to 1000 with 2 decimals allowed	Yes (blank = 0)
3	User emissions factors flag	"F" = use default system emission factors from specified system GSE, "T" = user-edited emissions factors	Yes (blank = "F", user-edited)
4	Emissions factors system APU	Text up to 30 characters. Must exactly match a system APU name.	Yes, if emissions factors are user-edited.
5	CO emission factor (Kg/hour)	Number from 0 to 1000 with 6 decimals allowed	Yes (blank = 0)
6	THC emission factor (Kg/hour)		
7	NOx emission factor (Kg/hour)		
8	SOx emission factor (Kg/hour)		
9	PM-10 emission factor (Kg/hour)		

Example

```
!USER_APU
**My APU 7, 6.00, T,, 5.000000, 4.000000, 3.000000, 2.000000,
1.000000
```

Appendix D. GSE Reference Models

EDMS 4.2 includes ground support equipment (GSE) reference models that are representative of the equipment types in the EPA draft NONROAD model. The following table lists, for each GSE type, the available reference models and a picture of the equipment, if available. Users are not limited to selecting available GSE reference models, which are merely provided as a convenience. The user can override the horsepower and/or operating time of any GSE in a study to improve modeling fidelity.

GSE Name	Reference Model	Picture
Air Conditioner	ACE 802	 Source: www.fsm-vienna.at
Air Conditioner	ACE 804	 Source: www.fsm-vienna.at
Air Start	ACE 180	*Picture Not Available*
Air Start	ACE 300/400	 Source: www.fsm-vienna.at
Aircraft Tractor	Stewart & Stevenson TUG GT-35	 Source: www.ssss.com

GSE Name	Reference Model	Picture
Aircraft Tractor	Stewart & Stevenson TUG MC	Source: www.ssss.com
Aircraft Tractor	Douglas TBL-180	Source: www.douglas-tugmaster.co.uk
Aircraft Tractor	Douglas TBL-400	Source: www.douglas-tugmaster.co.uk
Aircraft Tractor	Stewart & Stevenson TUG GT-50H	Source: www.ssss.com
Aircraft Tractor	Stewart & Stevenson TUG T-750	Source: www.ssss.com
Baggage Tractor	Stewart & Stevenson TUG MA 50	Source: www.ssss.com

GSE Name	Reference Model	Picture
Belt Loader	Stewart & Stevenson TUG 660	Source: www.ssss.com
Bobtail	Eagle Bobtail / F350	Source: www.eagleindustrialtruck.com
Cabin Service Truck	Hi-Way / TUG 660 chasis	Source: www.tescohilift.com
Cabin Service Truck	Hi-Way F650	Source: www.tescohilift.com
Cargo Loader	FMC Commander 15	Source: www.fsm-vienna.at

GSE Name	Reference Model	Picture
Cargo Loader	FMC Commander 30	 Source: www.airport-technology.com
Cargo Tractor	Stewart & Stevenson TUG MT	 Source: www.ssss.com
Cart	Taylor Dunn	 Source: www.taylor-dunn.com
Catering Truck	Hi-Way / TUG 660 chasis	 Source: www.tescohilift.com
Catering Truck	Hi-Way F650	 Source: www.tescohilift.com
Deicer	FMC LMD, Dual engines in GSE	 Source: www.airport-technology.com

GSE Name	Reference Model	Picture
Deicer	FMC Tempest II, Single engine in GSE	 Source: www.fsm-vienna.at
Fork Lift	Toyota 5,000 lb	 Source: www.loadstarmhe.com
Fuel Truck	F350	***No Picture Available.***
Fuel Truck	F750, Dukes Transportation Services, DART 3000 to 6000 gallon fuel truck	 Source: www.dukestransportation.com
Fuel Truck	Dukes Transportation Services / DART 8000 to 10,000 gallon fuel truck	 Source: www.dukestransportation.com
Generator	(None.)	 Pictured: MD-3 Source: www.victorygse.com

GSE Name	Reference Model	Picture
Ground Power Unit	TLD	 Source: www.tld-gse.com
Ground Power Unit	TLD, 28 VDC	 Source: www.tld-gse.com
Ground Power Unit	TLD, 400 Hz AC	 Source: www.tld-gse.com
Hydrant Cart	Dukes Transportation Services THS-400	 Source: www.dukestransportation.com
Hydrant Truck	F250 / F350	*No Picture Available.*
Lavatory Truck	TLD 1410	 Source: www.tld-gse.com

GSE Name	Reference Model	Picture
Lavatory Truck	Wollard TLS-770 / F350	 Source: www.gseservices-llc.com
Lift	None.	 Pictured: ML15-20 Source: www.tescohilift.com
Passenger Stand	Wollard CMPS170 / CMPS228	 Source: www.nmc-wollard.com
Service Truck	F250 / F350	 Source: www.contentedits.com
Sweeper	Tennant	 Source: www.tennantco.com

GSE Name	Reference Model	Picture
Water Service	Wollard TWS-402 F250 / F350	Source: www.nmc-wollard.com
Water Service	Gate Service	Pictured: FMC Jetway with JetFlo Source: www.jetwaysystems.com

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