



Emissions and Dispersion Modeling System

FY2000 Research and Development Plan

Version 1.1

February 2000



Federal Aviation Administration
Office of Environment and Energy
Washington, DC

Emissions and Dispersion Modeling System FY2000 Research and Development Plan

1.0 Introduction

The Emissions and Dispersions Modeling System (EDMS) is the FAA's required model for assessing the local air quality impacts of aviation sources from proposed FAA airport actions. EDMS is used to inventory emissions and model air dispersion at an airport based upon the emissions of aircraft, auxiliary power units, ground support equipment, and other sources operating on the airport surface or in nearby vicinity. EDMS incorporates EPA-approved emission factors and calculation methodologies (e.g., dispersion algorithms).

EDMS was developed jointly by the FAA's Office of Environment and Energy and the US Air Force. Since its original release, EDMS has undergone continuous enhancement to respond to the needs of the user community and to incorporate advances made in the field of local air quality analysis. In 1997 the FAA's Office of Environment and Energy released a significantly re-engineered model, EDMS Version 3.0. Subsequent to this, incremental enhancements to the model have been released approximately once per year with the latest, Version 3.2, released in January of 2000.

The purpose of this document is to outline the model development and local air quality research activities planned for the remainder of FY2000. These planned activities are loosely categorized into three functional areas: model development, model maintenance and research and analysis. The remainder of this document presents the activities to be performed in each of these functional areas during FY2000.

2.0 Model Development Activities

This section discusses the physical and functional enhancements planned for incorporation into EDMS during the remainder of FY2000. The order in which they are presented in no way reflects their perceived importance.

2.1 Update Dispersion Algorithms

EDMS dispersion algorithms are being updated to reflect new EPA general dispersion algorithms that have recently been made available. The EDMS Development Team has completed a thorough review of the available EPA-approved dispersion algorithms. Based upon this review, AERMOD will be incorporated to perform all dispersion calculations within EDMS.

In addition to providing increased accuracy and being the EPA-approved model for this type of application, incorporation of AERMOD will provide the following user benefits:

- Additional flexibility regarding the location and shape of parking lots
- Increased flexibility in specifying receptors locations for calculating emissions

2.2 Improved Aircraft Flight Profile

Currently, EDMS uses EPA standard methodologies to calculate aircraft emissions and model aircraft dispersion. These methodologies do not sufficiently characterize aircraft flight profiles. To improve EDMS' capability, existing tools (e.g., FAA's Integrated Noise Model (INM)) will be evaluated for aircraft flight profile information that can be readily adopted into EDMS. These flight profiles will be used in EDMS to calculate aircraft dispersions on approach and climbout.

2.3 Stationary Sources

In order to encourage users to use inventory tools specifically designed for stationary sources, the capability to inventory stationary source emissions will be removed from EDMS. However, within EDMS users will still be able to include the stationary source emissions in the calculation of their total emissions inventory as well as in dispersion calculations. Users will have the ability to specify the location and type of the stationary source and the ability to input the associated emissions.

2.4 Increase Accuracy/Flexibility of EDMS Input Data:

In order to increase analysis accuracy and user flexibility, the following enhancements will be made with regard to EDMS input data:

- EDMS will be modified to allow importing NCDC's new format of weather data (i.e., TD3280). AIRMET, a module of AERMOD, will be incorporated to provide this import capability.

- Engine/airframe combinations and default engines will be updated to reflect the most current data available. Default engines will be provided for as many airframes as possible. Aircraft names will be clarified as necessary to avoid confusion among users.

In addition to these model development activities, annual average aircraft taxi time data for airports available in the FAA's Consolidated Operational Delay Analysis System (CODAS) will also be made available to EDMS users via the EDMS web-site.

2.5 Enhance Fidelity of Airport Operations

To provide increased user flexibility, specifically with respect to the ability to accurately model complex airport operations, the following enhancements will be incorporated:

- The number of permissible taxiway links will be increased from four to ten. This will allow for increased fidelity when modeling complex airports.
- The operations of a single aircraft type will be able to be divided among runways, taxiways, etc.

2.6 Increase User Flexibility

EDMS is being enhanced to allow operations on multiple records (e.g., when the user wants to remove a large number of records).

2.7 Enhance EDMS Documentation

The EDMS User Manual and Online-Help will both be updated and enhanced to be consistent with the current state of the model.

3.0 Model Maintenance Activities

In addition to the physical and functional enhancements to be incorporated within EDMS during this fiscal year, there are also model maintenance activities planned. These activities largely involve enhancements to the model design documentation to facilitate maintenance and enable further development of the EDMS system in subsequent years. These design documentation enhancements are particularly important in light of the increased complexity in EDMS software associated with some of the current functional enhancements being incorporated this fiscal and those planned for future incorporation. EDMS activities planned that fall within this section are:

3.1 EDMS Database Design Documentation

The current database design document will be updated to reflect the database changes associated with EDMS enhancements being incorporated during FY2000.

3.2 Object Description Document

The current EDMS software was designed and developed in an object-oriented fashion. While the process of documenting the EDMS objects was begun, funding limitations precluded its completion. EDMS currently consists of over 100 objects. Any modification planned for the software must be evaluated from the perspective of the resultant impact on the existing EDMS objects. Better object description documentation will facilitate the software design and development of future enhancements and will be a tremendous aid in maintaining the current software. The current, partially completed object description document will be completed and reflect the changes associated with EDMS enhancements being incorporated during FY2000.

4.0 Research and Analysis Activities

In addition to the physical and functional EDMS enhancements and model maintenance activities planned for FY2000, there are also planned research activities. As these research activities are carried out and yield increased insights, they will become candidates for EDMS enhancements. The research and analysis activities planned for FY2000 include the following activities:

4.1 Evaluate New Dispersion Algorithms

The algorithmic performance of the new EPA dispersion algorithms (i.e., AERMOD) being incorporated into EDMS will be rigorously tested. This testing is necessary to quantify the impact of these new algorithms on EDMS results. The assessment of new modeling concepts as a possible long-term enhancement to EDMS will begin but will not be completed during FY2000.

4.2 Evaluate Methods of Calculating Aircraft Particulate Emissions

Currently, there is no methodology for directly measuring aircraft particulate data for use in calculating aircraft particulate emissions per air quality requirements. However, considerable research has been performed in deriving particulate data from measurable sources. Research also has been performed in estimating particulate emissions using dated emission factor data for a limited number of engines. As part of a longer-term research effort, during FY2000 collaboration with European counterparts will begin to research appropriate methodologies for estimating particulate emissions given available data.

4.3 Document and Enhance EDMS Ground Support Equipment (GSE) DataBase

Currently, GSE data within EDMS is not well documented, and has not been updated recently to include new information. During FY2000, current EDMS data will be evaluated for appropriateness and its basis documented. In addition, the GSE database will be updated as necessary to reflect these results.

4.4 Develop an Air Quality Screening Tool

Currently EDMS is the only tool available to assess the air quality effects of aircraft-related activity at an airport, regardless of how minor these changes in activity might be. During FY2000, development of a prototype, screening tool to facilitate quick and easy assessments of apparently minor changes in aircraft-related activity will begin.

4.5 Validation of EDMS

A comprehensive validation of the FAA's EDMS is necessary to scientifically determine the accuracy of the model and to make the model results defensible. This task is an ongoing task that will begin in FY00. As a part of this comprehensive, multi-year EDMS validation effort, the following tasks will be performed during FY2000:

- A plan will be developed for validating EDMS dispersion algorithms (i.e., EPA approved algorithms such as AERMOD) within the airport environment.
- EDMS performance will be compared with that of other similar models (e.g., the United Kingdom's Aircraft Dispersion Modeling System (ADMS)).
- Previously collected field measurement data from past studies that could potentially be used in validation will be identified and collected.

5.0 Schedule and Major Milestones

The final section of this document provides the schedule and major milestones for the remainder of the fiscal year, as well as the first quarter of FY2001.

<i>Task</i>	<i>Completion Date</i>
CODAS Data Available via EDMS Web-Site	March 2000
Incorporation of AERMOD Dispersion Algorithms	September 2000
EDMS Version 4.0 Beta Release	October 2000
EDMS Version 4.0 Final Release	December 2000