EDMS 4.1 Note

How EDMS models gates with AERMOD

How EDMS models gates with AERMOD depends upon the number of points chosen from the drop-down list in the gates dialog box used to represent the gate. The user may choose "1" or "3" to "20" points, inclusive. If "1" is chosen, the gate will be modeled as a VOLUME source centered on the one specified point. If "3" to "20" points is chosen, the gate will be modeled as an AREA source that is a polygon with the specified points for vertices.

EDMS *Reference Manual* Supplement

-Model Changes between EDMS 4.05 and EDMS 4.1-

September 30, 2002

General

Change	Effect
Right-Click Popup Menus In version 4.1, popup menus activated by "right-clicking" the mouse are implemented in most dialog boxes. For example, in the Operational Profiles dialog box, right-clicking in the list of profiles creates a popup menu with the options: Add New, Delete, Duplicate and Select All.	The user can more easily perform dialog box functions.
Duplication In version 4.1, users can duplicate items in a list in most dialog boxes. For example, in the Operational Profiles dialog box, clicking the "Duplicate" button duplicates each selected item in the list and adds it to the study.	The user can more easily create items in the study.
Multiple-Selection Editing In version 4.1, users can select more than one item simultaneously in a list in most dialog boxes and proceed to make appropriate editions to all those selected. For example, in the Aircraft dialog box, the user can set the taxi and queue time simultaneously for several selected aircraft.	The user can more easily edit items in the study.

Study Setup

Change	Effect
GSE Modeling Basis Previously, users modeled GSE emissions by basing GSE operations on aircraft LTO cycles. In version 4.1, users can alternatively select "Population Based" to specify a GSE population whose operations are entered independently of aircraft. Any specified population is meant to be inclusive of all GSE operations. However, users can also select "LTO based" to base all GSE operations on aircraft as in prior versions of EDMS. LTO based and population based GSE data are maintained by EDMS separately. Switching between one basis to the other will not delete or transfer any data.	Users are given a new option when modeling GSE.

Change	Effect
Study Year Previously, users did not specify this parameter. In version 4.1, users must specify a study year for which the airport is being modeled. Because of forecasted changes in GSE technology and the impact on GSE emission factors, this parameter is used in determining applicable emission factors. Study year also applies to the MOBILE5a scenario year for determining on-road vehicle emission factors.	Users must specify the year for which the airport is being modeled.
Vehicle Fleet Year Previously, the vehicle fleet year was used to determine on-road vehicle emission factors, however in version 4.1, "Study Year" has replaced this parameter.	Users set the MOBILE5a scenario year with the Study Year parameter.

Operational Profiles

Change	Effect
Combined Three-tabbed Dialog Box Previously, the user had to switch between three separate dialog boxes. In version 4.1, the three separate dialog boxes are grouped into a single three-tabbed dialog box. The user needs to only click on a tab to view and edit an operational profile of a particular type.	The user can more easily switch between all of the operational profiles.
Deletion Previously, deleting an operational profile that was in use would not result in any warning. In version 4.1, the user is warned when attempting to delete a profile that is in use and prompted to change any uses to "DEFAULT". The "DEFAULT" profiles may not be deleted, however.	Both used and unused operational profiles may be safely deleted.
Name Changing Previously, operational profiles could not have their names changed. In version 4.1, name changing is allowed with the exception of the "DEFAULT" profiles.	The user more easily manages the naming of operational profiles.

Aircraft Operations & Assignments

Change	Effect
Aircraft-Engine Combination Tree Previously, the user chose an aircraft-engine combination to add to a study by selecting an aircraft from a list box followed by selecting an engine from a separate combo box below. In version 4.1, the two box controls are replaced by a tree control that has a "branch" for each aircraft type and whose nodes expand to reveal the available engines as "leaves."	The user needs only to make one selection when selecting an aircraft-engine combination to add, and therefore the interface is easier to use.
Bold Default Engines Previously, default aircraft engines were labeled only as "Default," requiring the user to look up the engine name in a separate table. In version 4.1, default engines are labeled by their names with **bold** text to signify them.	The user can determine the engine that is used by default without looking in a separate table.
Aircraft-Engine Tree Right-Click Popup Menu Right-clicking on any engine produces a menu with the options to add the selected aircraft-engine combination to the study, or alternatively, view emissions or default times in mode before adding it to the study. This also applies to user-created aircraft and system aircraft that have a designated default engine.	The user can more easily review emissions and default times in mode information for a particular aircraft-engine combination prior to including it in a study.
"Switch Eng…" Button Previously, once an aircraft was added to a study, the user could not change its assigned engine. In version 4.1, the assigned engine can be exchanged for another engine appropriate for the airframe by selecting a single aircraft in the study and either clicking the "Switch Eng…" button, double-clicking the engine name, or right-clicking on the selection and choosing the "Switch Eng…" option.	The user can more easily change engine assignments within a study.
Running Total Previously, the user had to add up each aircraft's LTOs and Touch and Gos manually to verify that the correct total amount had been entered. EDMS 4.1 includes a running total of annual LTOs and Touch and Gos for all aircraft in the status bar (the bottom of the EDMS window).	The user can quickly see how many LTOs and Touch and Gos have been specified.
Takeoff Weight Previously, the user chose a takeoff weight from a combo box on the Times In Mode tab. In version 4.1, the same functionality in the interface has been replaced with a continuous slider control.	During a multiple-selection of aircraft in a study, the user can simultaneously set the aircraft's takeoff weights to the maximum, the minimum or somewhere midway.

<u>Approach Angle</u> Previously, only approach angles appropriate for the selected airframe would appear in the approach angle combo box. When "5 degrees if applicable" appears, it means that some but not all of the aircraft selected can have an approach angle of 5 degrees. When this is chosen, EDMS assigns an approach angle of 5 degrees to all aircraft for which such an angle is appropriate and 3 degrees to all those for which it is not.	The user need not look to see if 5 degrees is available for every aircraft in the study, and therefore aircraft setup is less time consuming for the user. Moreover, during a multiple-selection of aircraft in a study, the user can simultaneously set the aircraft's approach angle to either the minimum or maximum allowed.
<u>APU Assignment</u> Previously, users could accidentally assign more than one APU to an aircraft. In version 4.1, the user selects a single APU to assign to an aircraft from a combo box and enters the respective operating time per LTO cycle in the edit box below. As with engines, default APUs are denoted in **bold**	The user is now prevented from accidentally assigning more than one APU to an aircraft.
<u>Gate Assignment</u> Previously, users could not unassign an aircraft from a gate. In version 4.1, the user can select "-NONE-" from the gate combo box to specify that an aircraft is not assigned to any gate and therefore cannot have its GSE emissions considered in a dispersion analysis.	The user is given greater freedom in aircraft gate assignment.

GSE

Change	Effect
<u>GSE Operating Parameters</u> Previously, users could not specify the load factor or brake horsepower of a particular GSE; these elements were an internal component of the model. With the phasing-in of the NONROAD draft model emission factors in version 4.1 (see below), the user can specify an assigned GSE's fuel, operating time per cycle, brake horsepower and load factor. All four of these factors are used in determining a GSE's contribution to airport emissions. GSE Assignment appears in the aircraft dialog box if GSE are being modeled on an LTO basis.	The user is given greater freedom in modeling GSE emissions.
<u>GSE Emission Factors</u> New emission factors for Ground Support Equipment have been provided by EPA based on the NONROAD draft model. The fleet average grams per horsepower-hour emission indices are provided for four fuel types (gasoline, diesel, CNG, and LPG) and study years 1990 to 2020.	GSE emission factors are expanded, updated, and more consistent with EPA's NONROAD draft model.

<u>GSE Population Dialog Box</u> Previously, users could only model GSE emissions by assigning GSE to aircraft. In version 4.1, users can specify a GSE population whose operations are entered independently of aircraft by using the GSE Population dialog box. The menu option for this dialog box is enabled only when the user has chosen "Population Based" as the GSE Modeling Basis in the Study Setup dialog box.	Users are given greater flexibility when modeling GSE.

Parking Lots & Roadways

Change	Effect
<u>System Emission Factors</u> Previously, users went to a separate sub-screen to enter ground access vehicle emission factors if it was necessary to override the EDMS defaults. In this version, the emissions factors are included and editable within the dialog boxes. By using the check box marked "Use System Default Values", the user can restore edited values to system defaults. If the factors are manually edited, the box becomes unchecked.	The user is given both an indicator of whether or not default system emissions factors are being used and a means to restore altered factors to original default values.
<u>Nudge (Parking Lots only)</u> By clicking on the nudge arrow controls, the user can "nudge" an entire parking lot or just the selected points of a lot in the desired direction.	The user can more easily position a parking lot.

Stationary Sources

Change	Effect
<u>System Emissions Factors</u> Previously, users were unable to restore manually edited emissions factors to original system default values. In this version, by using the check box marked "Use System Default Values", the user can restore edited values to system defaults. If the factors are manually edited, the box becomes unchecked.	The user is given a means to restore altered factors to original default values.
<u>Units of Measure</u> Previously, users were required to operate in units of metric tons when the "Other" category had been selected. In this version, the user can select more appropriate units by clicking on the radio button for "Metric Tons", "Kiloliters" or "Thousands of Cubic	The user is given the ability to work in units more appropriate to a source modeled as category "Other".

Gates

Change	Effect
Area Sources Previously, users could specify only one (x, y) point for each gate. In turn, gates were modeled in AERMOD as volume sources centered on the given points. In version 4.1, the user can specify a polygonal area with at most 20 vertices to represent a gate.	Because users frequently use an EDMS gate to model a large group of physical gates, users may continue to do so more accurately by employing EDMS gates that are area sources.
Height Previously, the release height of gate emissions was set by EDMS at 1.5 meters. In EDMS 4.1, the user can set the release height for each gate in the study individually.	The user is given greater freedom in modeling gate dispersion.
Nudge By clicking on the nudge arrow controls, the user can "nudge" an entire gate or just the selected points of a gate in the desired direction.	The user can more easily position a gate.

Taxiways

Change	Effect
Default Values Previously, all aircraft were assumed to taxi at a speed of 30 mph. In this version, the user can set either the time the assigned aircraft spends on the taxiway or the speed of the aircraft on the taxiway. Editing either one adjusts the other such that the product of the time and speed agrees with the taxiway's length. These values may be overridden in any particular aircraft assignment to the taxiway.	The user is given greater freedom modeling aircraft taxi speed by being able to adjust the default speed along the taxiway and the speed of individual aircraft along the taxiway.

Runways

Change	Effect
Naming Previously, users were allowed to name runway ends using any combination of 3 characters. In version 4.1, users choose from a drop down list of standard runway names.	The user enters conforming runway end names.

Configurations

Change	Effect
Circular Wind Angle Range Control In version 4.1, there is a new circular control that provides the user with both a graphic representation of wind angle range and a means of editing the range. The user can click and drag either the start or end of the range to increase or decrease the size of the range. The user can also reposition the range by clicking and dragging anywhere else in the circle.	The user can more easily edit and understand the wind angle ranges.

Dispersion

Change	Effect
Aircraft Release Height & Initial Dispersion Coefficient Previously, the release height and the initial vertical dispersion coefficient were based on best available information and good engineering judgment. Based on results of an aircraft plume behavior study performed using LIght Detection And Ranging (LIDAR) aircraft plume behavior can be more accurately characterized through revised model defaults for release height and the initial vertical dispersion coefficient. More information on the results of the LIDAR study is provided in the report prepared by the U.S. DOT's Volpe National Transportation Systems Center for FAA titled "Preliminary Report: The Use of LIDAR to Characterize Aircraft Initial Plume Characteristics."	
Previously, the release height was airframe dependent and set to the average engine centerline height. In EDMS 4.1, the release height as been set to 12 meters for all aircraft types. This is meant to compensate for plume rise in buoyant jet and turboprop exhaust, since the LIDAR study concluded that significant plume rise occurs and was not being accounted for.	A release height for aircraft that accounts for plume rise is included.
Previously, all aircraft sources were given an initial vertical dispersion coefficient of 3 meters. In EDMS 4.1, this coefficient, σ_{z0}, is set to 3.8 meters for all aircraft based on results of the LIDAR analysis. It is a measure of how dispersed exhaust is at its origin location.	The initial vertical dispersion coefficient for aircraft sources is more accurate because it is based upon recent LIDAR measurements of actual jet exhaust.

Vertically Stacked Area Sources Previously, a fleet average weighted on annual number of operations of aircraft release height was used to generate release heights for taxiways, queues and runways. In this version, the fleet average is weighted on annual emissions per aircraft. Moreover, the initial vertical dispersion coefficient, σ_{z0}, has been made dependent on the release height as demonstrated in the white paper "The Approximation of Vertically Stacked Area Sources with a Single Area Source in AERMOD", prepared by CSSI, Inc. for FAA and available on the EDMS website.	Initial dispersion coefficients and release height are used more accurately in modeling aircraft sources.
Combined Four-tabbed Receptors Dialog Box Previously, the user had to switch between two separate dialog boxes in order to see all of the receptors in a study. In EDMS 4.1, the user needs to only click on a tab to view and edit a receptor of a particular type.	The user can more easily switch between all of the different types of receptors.
Generate AERMOD Input Files Previously, each time a user chose the "Generate AERMOD Input Files" menu option, a great deal of time was spent constructing the AERMOD source data table. In version 4.1, this is done only when the table is in need of an update.	The user spends less time on average when generating AERMOD input files.
Generate AERMOD Input Files The user can select "Tabulation of all values for every period in a text (.txt) file" in the Output Reporting box to create a list of concentrations for further post processing.	The user can quickly view the raw concentration results.
Generate AERMOD Input Files A progress dialog box is displayed to give the user some indication of the status of the input file generation as well as disk space remaining.	The user can quickly see the AERMOD Input File generation progress.
Run AERMOD Previously, the user was forced to keep the DOS window from which AERMOD was running active or experience significantly lengthened runtimes. In version 4.1, the user can continue to work on the study during processing or even choose to exit from EDMS. If EDMS is still running when AERMOD finishes processing, the user is given notice as to whether or not the processing was successful.	The user may edit an EDMS study while running AERMOD without incurring a significant runtime penalty.

View

Change	Effect
Airport Previously, receptors, taxiways, queues, training fires and stationary sources were not labeled. In version 4.1, these items are all individually labeled. The user can also move the sources using the mouse.	The airport view is more clearly labeled and the sources are now interactive.
Airport Wallpaper Previously, this feature did not exist. In version 4.1, users may select "Modify Wallpaper…" to select a bitmap file to display in the Airport View upon which the airport coordinates can be laid out. The user must specify the scale of the bitmap and which pixel in the bitmap is to represent the origin of the airport.	The user can set airport coordinates more accurately by referring to the wallpaper.
General Conformity Rule Previously, users were not able to view the General Conformity Rule de minimis thresholds from within EDMS. In version 4.1, the user may select this option and be referred to the appropriate page in the online help.	The user can more quickly refer to and view the General Conformity Rule de minimis thresholds.
Emissions Inventory… & System Tables… Previously, a static fixed-width font spreadsheet displayed the queried values. In this version, the values are displayed in the selected system font in a spreadsheet that allows dynamic column resizing and rearrangement. The column titles also remain at the top of the view during vertical scrolling. As before, these tables can also be printed.	Viewing the emissions inventory and the system tables has been enhanced.

Reports

Change	Effect
Print Emissions Report(s)… & Print All Model Inputs… In this version, both of these reports have been enhanced for easier readability and now include page numbers.	The reports are now easier to read.

Add/Create Aircraft

Change	Effect
Times In Mode In version 4.1, the user can set a user-created aircraft to have the same default times in mode as a system aircraft by choosing an aircraft-engine combination in the Flight Profile box and checking the “Use times in mode of specified aircraft-engine combination” check box. The EPA default times in mode can be used as well, based on the category of the aircraft.	The user can more easily make a user-created aircraft emulate a system aircraft or quickly apply the EPA default times in mode for emissions inventory purposes.
Engine Emissions Data Source In version 4.1, the user can set a user-created aircraft to have the same emission factors as a system aircraft in the Engine Emissions Data Source box by selecting “System Tables” and choosing an aircraft-engine combination.	The user can more easily make a user-created aircraft emulate a system aircraft.
ICAO Format Previously, emission factors were entered as kilograms per hour. In version 4.1, the user specifies emission indices (grams of pollutant emitted per kilogram of fuel burned) and fuel flow (kilograms per second).	The engine emission factors for user-created aircraft are put into the same format as the ICAO databank’s engine emission factors.

Add/Create GSE

Change	Effect
Annual Operating Time In version 4.1, the user can specify a default annual operating time for a particular user-created GSE. This value is used when adding a user-created GSE to a study’s GSE airport population.	The format of the user-created GSE data screen allows for an annual operating time to be entered for use in population based GSE calculations.
Emission Factors Data Source In version 4.1, the user can set a user-created GSE to have the same emission factors as a system GSE in the Emission Factors Data Source box by selecting “System Tables” and choosing a GSE type and year.	The user can more easily make a user-created GSE emulate a system GSE.
Power Rating, Load Factor, and Emission Factors With the phasing-in of the NONROAD draft model in version 4.1, the user can specify a power rating and load factor for each user-created GSE. For each GSE, fuel burned and pollutant, the user also can enter user-specified emission factors (that are different from the NONROAD draft model emission factors) in units of grams per brake horsepower per hour.	The format of the user-created GSE data more closely resembles the format found in the NONROAD draft model.

Utilities

Change	Effect
Add/Create APU Previously, the user created GSE and APU were co-located in the same dialog box. In version 4.1, there is a separate dialog box for user created APUs. This new APU dialog box is similar to the previous Add/Create GSE dialog box, and will allow users to copy in emission factors from system APUs.	The user creates APUs separately from GSE, and can more easily make a user-created APU emulate a system APU.
Import Study Previously, the user imported items in various dialog boxes throughout EDMS. In 4.1, EDMS is enhanced to allow all EDMS inputs to be entered via a comma-delimited text file. The user has the option to only import the desired portions of the file. A detailed description of the import format is provided in the online help documentation. This import capability also enables parts or complete copies of other EDMS studies to be imported.	The user can more easily transfer data into a study.
Export Study In version 4.1, the user can export all or any part of a study along with user-created Aircraft, GSE and APUs to a comma delimited text file. This file can be reloaded into EDMS using the Import option.	When used in conjunction with the Import Study wizard, the user can more easily merge studies or parts of studies.

System Tables

Change	Effect
Editions Aircraft engine emission factors were reviewed for accuracy and reformatted to match the ICAO format of breaking emission factors into fuel flow and emission indices. Several engines had their names revised to be more consistent with the existing EDMS engine-naming scheme. Many engines had emission factors revised based on recent updates to the ICAO databank. A list of new and revised engines appears in the attachment to this reference manual supplement.	The format and values of aircraft engine emission factors are more consistent with the ICAO databank. After converting an older study, the user may experience a change in overall aircraft emissions even though the study inputs were not altered.
Additions Previously, there were only 11 system database tables. In version 4.1, there are 14 with the inclusion of 3 new tables: EPA default time in mode based on aircraft category, GSE types and default values and a new separate table for APU emission factors.	

EDMS 4.1 Supplement Attachment

EDMS 4.1 revises the emissions data of 78 aircraft engines. Table 1 is a list of these engines. Tables 2 through 6 provide details into which and how specific values have been revised.

Table 1: A List of Aircraft Engines Revised.

250B17B	PW123
6-285-B	PW127-A
AE3007A1	PW2037
AE3007C	PW2040
CF6-80E1A4 Low Emis	PW4152
CF700-2D	PW4168
CFM56-5B2/2P DAC-II	PW4256
CFM56-5B3/2P DAC-II	PW4X58
CFM56-7B24/2 (DAC)	RB211-524G-T
CJ610-2C	RB211-535E4B
F100-PW-220	RB401-6
F101DFE	RDa7
F404-GE-400	RR SPEY-MK555
GE90-76B	RR SPEY-MK555-15
GE90-85B	SPEY MK511
IO-320-DIAD	T400-CP-400
IO-360-B	T53-L-11D
J52-P-408	T53-L-13
J52-P-8B	T56-A-16
J57-P-22	T58-GE-16
J69-25A	T58-GE-5
J79-GE-10B	T58-GE-8F
J79-GE-8D	TAY650
J85-GE-5F	TAY650-15
JT8D-217	TF30-P-412A
JT8D-217A	TF30-P-6B(JFT 10)
JT8D-217C	TF33-P3/5/7
JT8D-219	TF34-GE-100-100A
JT9D-70	TF34-GE-400
O-200	TFE731-2
O-320	TFE731-3
PT6A-27	TIO-540-J2B2
PT6A-45	TPE331-2
PT6A-45R	TPE331-3
PT6A-65AR	TRENT-768
PT6A-65B	TRENT-772
PW119-B	TRENT-890
PW120	TSIO-360C
PW121	TYNE

EDMS 4.1 revises the fuel flow rate of 48 aircraft engines. Table 2 lists these engines and shows the changes made to fuel flow rate for the affected modes only. The current source of the engine data is also given.

Table 2: Aircraft Engine Fuel Flow Revisions.

		Fuel Flow (Kg/s)		
Engine	Mode	EDMS 4.0	EDMS 4.1	EDMS 4.1 Data Source
250B17B	Approach	0.0107	0.011	AP-42 Table II-1-7
6-285-B	Takeoff	0.0255	0.01928	AP-42 Table II-1-7
AE3007A1	Approach	0.11	0.117	ICAO Issue 4. Tested 3/3/95 to 5/19/95.
	Climb Out	0.301	0.319	
	Idle	0.047	0.05	
	Takeoff	0.358	0.38	
CF700-2D	Climb Out	0.276	0.2926	AP-42 Table II-1-7
CJ610-2C	Approach	0.1239	0.12915	AP-42 Table II-1-7
F404-GE-400	Approach	0.8259	0.327	AESO Memorandum Report 9734, Rev B, Mar 99 (Approach = Straight-in 85%N2)
	Climb Out	1.021	0.7462	
GE90-76B	Approach	0.782	0.763	ICAO Issue 8. Tested January 2000.
	Climb Out	2.332	2.28	
	Idle	0.295	0.267	
	Takeoff	2.832	2.781	
GE90-85B	Approach	0.85	0.832	ICAO Issue 9. Tested January 2000 incorporating 3D aero.
	Climb Out	2.6	2.55	
	Idle	0.3	0.282	
	Takeoff	3.19	3.115	
IO-320-DIAD	Idle	0.001	0.000989	AP-42 Table II-1-7
IO-360-B	Idle	0.001	0.00102	AP-42 Table II-1-7
J52-P-408	Climb Out	0.7263	1.018	AESO Report 6-90 p. 17 (normal)
J52-P-8B	Climb Out	0.5455	0.772	AESO Report 6-90 p. 16 (Normal rated)
J69-25A	Climb Out	0.1099	0.1367	Air Force contact: Mark Zimmerhanzel, 24 Apr 00
J79-GE-10B	Takeoff	4.419	1.26	AESO Report 6-90 p. 22 (Intermediate)
J79-GE-8D	Climb Out	1.194	1.034	AESO Report 6-90 p. 21 (Climb out = 90% Nor. Rated, Takeoff = Military)
	Takeoff	4.333	1.191	
JT8D-217C	Approach	0.3833	0.363	ICAO Issue 3. Tested March 1999 with Environmental Kit (E-Kit) Combustor and Fuel Nozzles.
	Climb Out	1.078	1.045	
	Takeoff	1.32	1.282	
JT9D-70	Approach	0.6804	0.7371	AP-42 Table II-1-7
	Idle	0.237	0.2268	
O-200	Idle	0.001	0.00104	AP-42 Table II-1-7

Engine	Mode	Fuel Flow (Kg/s) EDMS 4.0	EDMS 4.1	EDMS 4.1 Data Source
PT6A-27	Approach	0.0271	0.0245	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
	Climb Out	0.0504	0.0455	
	Takeoff	0.0535	0.0515	
PT6A-45	Idle	0.0207	0.01	Pratt & Whitney Canada, contact: Kian McCaldon on 16 Nov 96
PT6A-65AR	Approach	0.0442	0.0471	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
	Climb Out	0.0792	0.0844	
	Idle	0.0229	0.0254	
	Takeoff	0.0886	0.0956	
PT6A-65B	Approach	0.0408	0.0416	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
	Idle	0.0217	0.0225	
	Takeoff	0.0779	0.0787	
PW119-B	Approach	0.0784	0.0761	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
	Climb Out	0.1269	0.1303	
	Idle	0.0558	0.0542	
	Takeoff	0.1481	0.1457	
PW120	Approach	0.0778	0.06503	Pratt & Whitney Canada, contact: Kian McCaldon on 06 Nov 96
PW121	Approach	0.0836	0.0696	Pratt & Whitney Canada, contact: Kian McCaldon on 06 Nov 96
PW123	Approach	0.0763	0.0746	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
	Climb Out	0.1361	0.1325	
PW127-A	Climb Out	0.1351	0.1377	Pratt & Whitney Canada, contact: Kian McCaldon on 06 Nov 96
PW2037	Approach	0.399	0.458	ICAO Issue 4. Tested November 1998.
	Climb Out	1.266	1.307	
	Idle	0.141	0.152	
	Takeoff	1.538	1.571	
PW2040	Idle	0.155	0.159	ICAO Issue 4. Tested November 1998.
PW4152	Approach	0.593	0.613	ICAO C108
	Idle	0.177	0.203	
	Takeoff	2.177	2.129	
PW4168	Approach	0.798	0.809	ICAO Issue 7. Tested April 2000 with TALON II combustor.
	Climb Out	2.327	2.363	
	Idle	0.221	0.25	
	Takeoff	2.836	2.884	
RB211-524G-T	Idle	0.0964	0.26	ICAO Issue 2. Tested September 1994.
SPEY MK511	Idle	0.119	0.127	ICAO C138
T400-CP-400	Approach	0.018	0.03247	AESO Memorandum Report 9809 (Idle = Hover, Takeoff = Climbout)
	Climb Out	0.0357	0.04578	
	Idle	0.0174	0.04362	
	Takeoff	0.0519	0.04578	
T53-L-11D	Approach	0.0814	0.028	AESO Report 6-90 p. 28 (Flight Idle)
T53-L-13	Climb Out	0.0813	0.0863	Air Force contact: Mark Zimmerhanzel, 24 Apr 00 (Military)

Engine	Mode	Fuel Flow (Kg/s) EDMS 4.0	EDMS 4.1	EDMS 4.1 Data Source
T56-A-16	Approach	0.252	0.105	AESO Report 6-90 p. 29 (Approach = Flight Idle, Takeoff = 100%)
	Takeoff	0.2802	0.2691	
T58-GE-16	Approach	0.0828	0.063	AESO Memorandum Report 9820, Rev C, Jan 01 (Idle = Taxi Out)
	Climb Out	0.0983	0.089	
	Idle	0.0189	0.047	
	Takeoff	0.1288	0.089	
T58-GE-5	Climb Out	0.0954	0.103	Air Force contact: Mark Zimmerhanzel, 24 Apr 00 (Climb out = Int Mil)
	Takeoff	0.1034	0.112	
T58-GE-8F	Approach	0.0792	0.0732	AESO Report 6-90 p. 30 (Climb out = Cruise)
	Climb Out	0.0733	0.079	
TAY650	Approach	0.2545	0.25	ICAO ADD2/C52
	Takeoff	0.8758	0.86	
TF30-P-412A	Approach	0.3273	0.3648	AESO Memorandum Report 9901, Rev A, Jan 99 (Approach = Straight-in 87%RPM)
	Climb Out	0.9316	0.8883	
	Idle	0.1259	0.116	
	Takeoff	5.0399	6.023	
TF34-GE-400	Approach	0.1633	0.1443	AESO Memorandum Report 9914, Jan 99 (Approach = Straight-in Approach 85%N2)
	Climb Out	0.4783	0.3068	
	Idle	0.0576	0.0611	
TIO-540-J2B2	Idle	0.0032	0.003158	AP-42 Table II-1-7
TRENT-768	Approach	0.8	0.81	ICAO ADD2/C50. Tested September 1994 with improved traverse combustor.
	Idle	0.26	0.27	
	Takeoff	2.94	2.97	
TRENT-772	Approach	0.84	0.85	ICAO ADD2/C51. Tested September 1994 with improved traverse combustor.
	Idle	0.27	0.28	
	Takeoff	3.15	3.2	
TRENT-890	Approach	1.03	1	ICAO ADD1/C37
	Takeoff	3.87	3.91	
TSIO-360C	Idle	0.0014	0.00145	AP-42 Table II-1-7

EDMS 4.1 revises the CO emissions indices (and therefore effectively revises the CO emissions factors) of 50 aircraft engines. Table 3 lists these engines and shows the effective changes made to CO emissions factors for affected modes only. The current source of the engine data is also given.

Table 3: Effective Aircraft Engine CO Emissions Factors Revisions.

Engine	Mode	CO (Kg/hour) EDMS 4.0	CO (Kg/hour) EDMS 4.1	Data Source
AE3007A1	Idle	3.893292	4.0374	ICAO Issue 4. Tested 3/3/95 to 5/19/95.
CF6-80E1A4 Low Emis	Takeoff	0.20908	0.418176	ICAO Issue 2. Tested 1/13 to 3/16/1996 with low emissions combustor.
CF700-2D	Climb Out	26.8272	26.334	AP-42 Table II-1-7
CFM56-5B2/2P DAC-II	Idle	10.0152	16.614	ICAO Issue 2. Tested September 1996 with DAC-II combustor.
CFM56-5B3/2P DAC-II	Climb Out	6.624	5.382	ICAO Issue 2. Tested September 1996 with DAC-II combustor.
F404-GE-400	Approach	3.24083	5.214996	AESO Memorandum Report 9734, Rev B, Mar 99 (Approach = Straight-in 85%N2)
	Climb Out	3.85938	3.2504472	
GE90-76B	Approach	16.32816	4.339944	ICAO Issue 8. Tested January 2000.
	Climb Out	1.09138	1.2312	
	Idle	42.8517	15.052392	
	Takeoff	0.91756	1.201392	
GE90-85B	Approach	77.571	3.89376	ICAO Issue 9. Tested January 2000 incorporating 3D aero.
	Climb Out	1.1232	1.1934	
	Idle	40.8564	14.31432	
	Takeoff	0.91872	1.34568	
IO-320-DIAD	Takeoff	8.03045	49.56336	AP-42 Table II-1-7
J52-P-408	Climb Out	8.31468	7.14636	AESO Report 6-90 p. 17 (normal)
J52-P-8B	Climb Out	5.8914	2.417904	AESO Report 6-90 p. 16 (Normal rated)
J57-P-22	Climb Out	6.82409	6.747624	AP-42 Table II-1-8
	Takeoff	6.82409	6.747624	
J69-25A	Climb Out	15.12928	16.166142	Air Force contact: Mark Zimmerhanzel, 24 Apr 00
J79-GE-10B	Takeoff	231.6263	7.2576	AESO Report 6-90 p. 22 (Intermediate)
J79-GE-8D	Climb Out	8.89769	11.390544	AESO Report 6-90 p. 21 (Climb out = 90% Nor. Rated, Takeoff = Military)
	Takeoff	206.6841	8.875332	
JT8D-217	Approach	5.7541	4.8847752	ICAO Issue 3. Tested March 1999 with Environmental Kit (E-Kit) Combustor and Fuel Nozzles.
	Climb Out	4.77338	1.823976	
	Idle	6.0604	7.5619152	
	Takeoff	3.8016	1.99584	
JT8D-217A	Approach	5.7541	4.8847752	ICAO Issue 3. Tested March 1999 with Environmental Kit (E-Kit) Combustor and Fuel Nozzles.
	Climb Out	4.77338	1.823976	
	Idle	6.0604	7.5619152	
	Takeoff	3.8016	1.99584	

Engine	Mode	CO (Kg/hour) EDMS 4.0	EDMS 4.1	Data Source
JT8D-217C	Approach	5.7541	4.952772	ICAO Issue 3. Tested March 1999 with Environmental Kit (E-Kit) Combustor and Fuel Nozzles.
	Climb Out	4.77338	1.84338	
	Idle	6.0604	8.823348	
	Takeoff	3.8016	1.938384	
JT8D-219	Approach	5.59267	4.9056084	ICAO Issue 3. Tested March 1999 with Environmental Kit (E-Kit) Combustor and Fuel Nozzles.
	Climb Out	4.6872	1.79676	
	Idle	6.1109	8.3172096	
	Takeoff	3.55831	2.047248	
JT9D-70	Approach	4.16405	3.449628	AP-42 Table II-1-7
	Climb Out	1.43971	2.174472	
	Idle	45.2196	27.76032	
PT6A-27	Approach	2.273148	0.32634	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
	Climb Out	0.217728	0.1638	
	Idle	3.3408	0.902016	
	Takeoff	0.1926	0.16686	
PT6A-45R	Approach	0.648014	0.706752	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
	Climb Out	0.224139	0.53208	
	Idle	1.53648	1.892736	
	Takeoff	0.197356	0.697176	
PT6A-65AR	Approach	3.27713	2.746872	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
	Climb Out	1.453561	1.06344	
	Idle	5.313996	4.828032	
	Takeoff	0.957312	0.653904	
PT6A-65B	Approach	3.200414	3.129984	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
	Climb Out	1.620403	1.55916	
	Idle	5.160672	5.103	
	Takeoff	1.318068	1.246608	
PW119-B	Approach	1.072649	1.013652	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
	Climb Out	0.959288	0.891252	
	Idle	1.667603	1.580472	
	Takeoff	1.119712	0.996588	
PW123	Approach	1.043237	0.966816	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
	Climb Out	0.980091	0.9063	
	Idle	1.63458	1.520892	
	Takeoff	1.074096	1.016424	
PW2037	Approach	3.30372	3.21516	ICAO Issue 4. Tested November 1998.
	Climb Out	1.86862	1.599768	
	Idle	11.72556	12.235392	
	Takeoff	2.21472	1.866348	

Engine	Mode	CO (Kg/hour) EDMS 4.0	EDMS 4.1	Data Source
PW2040	Approach	3.5496	2.535552	ICAO Issue 4. Tested November 1998.
	Climb Out	2.08512	2.13282	
	Idle	14.0058	11.41938	
	Takeoff	2.53584	2.018304	
PW4152	Approach	2.32693	5.053572	ICAO C108
	Climb Out	1.09242	3.979656	
	Idle	8.13067	17.298036	
	Takeoff	0.94046	3.8322	
PW4168	Approach	5.0274	6.98976	ICAO Issue 7. Tested April 2000 with TALON II combustor.
	Climb Out	6.19913	1.70136	
	Idle	18.70456	14.31	
	Takeoff	7.35091	1.03824	
PW4X58	Approach	4.35708	9.06984	ICAO Issue 6. Tested November 1999 with TALON II combustor.
	Climb Out	3.80264	2.15892	
	Idle	21.53174	18.54576	
	Takeoff	3.93149	1.79712	
RB211-535E4B	Approach	2.079	4.8114	ICAO Issue 5. Tested May 1999 with phase 5 combustor.
	Climb Out	3.564	1.53504	
	Idle	8.04384	12.47616	
	Takeoff	7.03872	2.45916	
RR SPEY-MK555	Approach	2.94372	4.598568	ICAO Issue 2. Tested in 1987 with Transply IIF combustors with standard fuel pump.
	Climb Out	1.49184	4.440384	
	Idle	10.12608	10.8137664	
	Takeoff	0.7938	4.07484	
SPEY MK511	Approach	20.38932	2.65212	ICAO C138
	Climb Out	5.38402	1.646568	
	Idle	41.96606	14.525244	
	Takeoff	5.79272	0.384912	
T400-CP-400	Approach	1.99198	0.67329792	AESO Memorandum Report 9809 (Idle = Hover, Takeoff = Climb out)
	Climb Out	0.33889	0.14503104	
	Idle	1.86412	0.15860232	
	Takeoff	0.14016	0.14503104	
T53-L-11D	Approach	2.00245	3.809232	AESO Report 6-90 p. 28 (Flight Idle)
T53-L-13	Climb Out	1.99825	1.0376712	Air Force contact: Mark Zimmerhanzel, 24 Apr 00 (Climb out = Military)
	Takeoff	1.03778	1.204434	
T56-A-16	Approach	0.38102	1.71612	AESO Report 6-90 p. 29 (Flight Idle)
T58-GE-16	Approach	4.34004	5.68134	AESO Memorandum Report 9820, Rev C, Jan 01 (Idle = Taxi Out)
	Idle	9.50723	7.53786	
	Takeoff	3.58425	3.851208	
T58-GE-5	Takeoff	3.47825	3.278016	Air Force contact: Mark Zimmerhanzel, 24 Apr 00

		CO (Kg/hour)		
Engine	Mode	EDMS 4.0	EDMS 4.1	Data Source
T58-GE-8F	Approach	4.02875	4.5536256	AESO Report 6-90 p. 30 (Climb out = Cruise)
	Climb Out	4.55985	4.018572	
TAY650	Approach	5.9553	1.584	ICAO ADD2/C52
	Climb Out	5.1588	1.22688	
	Idle	14.50426	9.65952	
	Takeoff	5.3599	2.13624	
TF30-P-412A	Approach	17.90986	8.5625856	AESO Memorandum Report 9901, Rev A, Jan 99 (Approach = Straight-in 87%RPM)
	Climb Out	7.0429	4.4130744	
	Idle	30.91097	23.180976	
	Takeoff	272.1546	233.523756	
TF34-GE-400	Approach	8.8182	7.324668	AESO Memorandum Report 9914, Jan 99 (Straight-in Approach 85%N2)
	Climb Out	4.30449	7.620912	
	Idle	15.88378	20.0119608	
	Takeoff	4.30449	10.26018	
TFE731-3	Climb Out	1.07136	1.084752	ICAO C002
	Takeoff	0.891	0.9153	
TPE331-2	Takeoff	0.16524	0.17268552	AP-42 Table II-1-7
TRENT-768	Approach	2.4768	2.97432	ICAO ADD2/C50. Tested September 1994 w ith improved traverse combustor.
	Climb Out	1.13256	1.3122	
	Idle	9.84672	19.65384	
TRENT-772	Approach	2.35872	2.7234	ICAO ADD2/C51. Tested September 1994 with improved traverse combustor.
	Climb Out	1.3932	1.48608	
	Idle	9.09792	18.08352	
	Takeoff	2.0412	2.304	
TRENT-890	Climb Out	2.10672	2.232	ICAO ADD1/C37
	Idle	14.5044	14.1156	
	Takeoff	3.76164	3.94128	
TYNE	Climb Out	0.59551	0.5855868	AP-42 Table II-1-7
	Takeoff	0.53802	0.5487804	

EDMS 4.1 revises the HC emissions indices (and therefore effectively revises the HC emissions factors) of 53 aircraft engines. Table 4 lists these engines and shows the effective changes made to HC emissions factors for affected modes only. The current source of the engine data is also given.

Table 4: Effective Aircraft Engine HC Emissions Factors Revisions.

Engine	Mode	HC (Kg/hour) EDMS 4.0	HC (Kg/hour) EDMS 4.1	Data Source
250B17B	Climb Out	0.04104	0.044496	AP-42 Table II-1-7
	Takeoff	0.03198	0.036072	
AE3007A1	Climb Out	0.335916	0.34452	ICAO Issue 4. Tested 3/3/95 to 5/19/95.
	Idle	0.631116	0.558	
	Takeoff	0.347976	0.35568	
CF700-2D	Climb Out	0.09936	0.10428264	AP-42 Table II-1-7
CFM56-5B2/2P DAC-II	Idle	1.1232	1.2636	ICAO Issue 2. Tested September 1996 with DAC-II combustor.
CFM56-7B24/2 (DAC)	Approach	0.01802	6.772068	ICAO Issue 2. Tested November 1997.
F404-GE-400	Approach	1.04063	0.635688	AESO Memorandum Report 9734, Rev B, Mar 99 (Approach = Straight-in 85%N2)
	Climb Out	1.13944	0.940212	
GE90-76B	Approach	1.88618	0.164808	ICAO Issue 8. Tested January 2000.
	Climb Out	0.50371	0.24624	
	Idle	3.63204	0.499824	
	Takeoff	0.71366	0.400464	
GE90-85B	Approach	4.6512	0.14976	ICAO Issue 9. Tested January 2000 incorporating 3D aero.
	Climb Out	0.6552	0.2754	
	Idle	3.294	0.466992	
	Takeoff	0.91872	0.44856	
IO-320-DIAD	Idle	0.12996	0.12853044	AP-42 Table II-1-7
J52-P-408	Climb Out	1.75184	2.235528	AESO Report 6-90 p. 17 (normal)
J52-P-8B	Climb Out	1.139	1.639728	AESO Report 6-90 p. 16 (Normal rated)
J69-25A	Climb Out	0.02768	0.098424	Air Force contact: Mark Zimmerhanzel, 24 Apr 00
J79-GE-10B	Takeoff	8.27237	5.48856	AESO Report 6-90 p. 22 (Intermediate)
J79-GE-8D	Climb Out	0.60177	0.409464	AESO Report 6-90 p. 21 (Climb out = 90% Nor. Rated, Takeoff = Military)
	Takeoff	14.19491	0.600264	
J85-GE-5F	Approach	0.58749	0.597456	AP-42 Table II-1-8
JT8D-217	Approach	2.20781	0	ICAO Issue 3. Tested March 1999 with Environmental Kit (E-Kit) Combustor and Fuel Nozzles.
	Climb Out	1.66874	0	
	Idle	1.64475	0	
	Takeoff	1.33056	0	
JT8D-217A	Approach	2.20781	0	ICAO Issue 3. Tested March 1999 with Environmental Kit (E-Kit) Combustor and Fuel Nozzles.
	Climb Out	1.66874	0	
	Idle	1.64475	0	
	Takeoff	1.33056	0	

Engine	Mode	HC (Kg/hour) EDMS 4.0	EDMS 4.1	Data Source
JT8D-217C	Approach	2.20781	0	ICAO Issue 3. Tested March 1999 with Environmental Kit (E-Kit) Combustor and Fuel Nozzles.
	Climb Out	1.66874	0	
	Idle	1.64475	0	
	Takeoff	1.33056	0	
JT8D-219	Approach	2.18485	0	ICAO Issue 3. Tested March 1999 with Environmental Kit (E-Kit) Combustor and Fuel Nozzles.
	Climb Out	1.64052	0	
	Idle	1.68376	0	
	Takeoff	1.31609	0	
JT9D-70	Approach	0.73483	1.194102	AP-42 Table II-1-7
	Climb Out	1.43971	1.087236	
	Idle	10.2384	5.552064	
	Takeoff	1.75817	1.318572	
O-320	Approach	0.0004	0.4092624	AP-42 Table II-1-7
PT6A-27	Approach	0.213656	0.01764	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
	Idle	2.618874	0.062208	
PT6A-45R	Idle	0.230472	0.341170326	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
PT6A-65AR	Approach	0.524977	0.374719334	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
	Idle	1.760364	1.439925437	
PT6A-65B	Approach	0.55787	0.523792346	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
	Climb Out	0	0.063431635	
	Idle	1.720224	1.670687508	
	Takeoff	0	0.032711103	
PW2037	Approach	0.30164	0.181368	ICAO Issue 4. Tested November 1998.
	Climb Out	0.27345	0.094104	
	Idle	1.14718	1.050624	
	Takeoff	0.27684	0.113112	
PW2040	Approach	0.31946	0.17856	ICAO Issue 4. Tested November 1998.
	Climb Out	0.18244	0.10404	
	Idle	1.2555	0.94446	
	Takeoff	0.16483	0.063072	
PW4152	Approach	0.32022	0.286884	ICAO C108
	Climb Out	1.02816	0.064188	
	Idle	0.47152	1.636992	
	Takeoff	1.01884	0.229932	
PW4168	Approach	0.43092	0	ICAO Issue 7. Tested April 2000 with TALON II combustor.
	Climb Out	0.33508	0	
	Idle	2.61752	0.18	
	Takeoff	0.30628	0	

Engine	Mode	HC (Kg/hour) EDMS 4.0	EDMS 4.1	Data Source
PW4X58	Approach	0.3591	0	ICAO Issue 6. Tested November 1999 with TALON II combustor.
	Climb Out	0.64573	0	
	Idle	3.28957	1.29744	
	Takeoff	0.71481	0	
RB211-535E4B	Approach	0.0594	0.099	ICAO Issue 5. Tested May 1999 with phase 5 combustor.
	Idle	0.19152	0.09576	
	Takeoff	0.07488	0.52164	
RDa7	Approach	0.00087	0.879336	EPA 420-92-009 Table 5-4
	Takeoff	0.06408	0.6408	
RR SPEY-MK555	Approach	0.23072	0.262548	ICAO Issue 2. Tested in 1987 with Transply IIF combustors with standard fuel pump.
	Climb Out	0.31968	0.469656	
	Idle	0.64281	1.1834064	
	Takeoff	0.76734	0.3969	
SPEY MK511	Approach	7.26181	0.180144	ICAO C138
	Climb Out	3.44995	0.313632	
	Idle	24.30313	1.687068	
	Takeoff	3.13639	0.288684	
T400-CP-400	Approach	0.56107	0.03272976	AESO Memorandum Report 9809 (Idle = Hover)
	Climb Out	0.0231	0.02142504	
	Idle	0.65225	0.02041416	
T53-L-11D	Approach	0.16711	1.367856	AESO Report 6-90 p. 28 (Flight Idle)
T53-L-13	Climb Out	0.19309	0.093204	Air Force contact: Mark Zimmerhanzel, 24 Apr 00 (Climb out = Military)
	Takeoff	0.09321	0.1001088	
T56-A-16	Approach	0.15422	0.3591	AESO Report 6-90 p. 29 (Approach = Flight Idle, Climb out = Military, Idle = L/S Gr. Idle, Takeoff = 100%)
	Climb Out	0.16139	0.1409184	
	Idle	7.43541	5.229432	
	Takeoff	0.16139	0.1162512	
T58-GE-16	Approach	0.11327	1.154412	AESO Memorandum Report 9820, Rev C, Jan 01 (Idle = Taxi Out)
	Climb Out	0.22294	0.410112	
	Idle	2.78352	2.027016	
	Takeoff	0.61205	0.410112	
T58-GE-5	Climb Out	0.48072	1.086444	Air Force contact: Mark Zimmerhanzel, 24 Apr 00 (Int Mil)
	Takeoff	1.09114	0.298368	Air Force contact: Mark Zimmerhanzel, 24 Apr 00
T58-GE-8F	Approach	0.22809	0.2951424	AESO Report 6-90 p. 30 (Climb out = Cruise)
	Climb Out	0.29554	0.22752	
TAY650	Approach	0.82458	0.099	ICAO ADD2/C52
	Climb Out	1.03176	0.56232	
	Idle	1.4161	0.53136	
	Takeoff	1.26115	0.34056	

Engine	Mode	HC (Kg/hour) EDMS 4.0	EDMS 4.1	Data Source
TF30-P-412A	Approach	1.31967	3.808512	AESO Memorandum Report 9901, Rev A, Jan 99 (Approach = Straight-in 87%RPM)
	Climb Out	0.30183	2.878092	
	Idle	17.42255	15.225696	
	Takeoff	18.14364	5.203872	
TF33-P3/5/7	Climb Out	1.29922	1.328688	AP-42 Table II-1-8
	Takeoff	1.39829	1.35756	
TF34-GE-100-100A	Idle	4.21277	4.09058316	Air Force contact: Mark Zimmerhanzel, 24 Apr 00
TF34-GE-400	Approach	0.36448	0.9662328	AESO Memorandum Report 9914, Jan 99 (Approach = Straight-in Approach 85%N2)
	Climb Out	0.72315	0.6737328	
	Idle	3.22237	3.827304	
	Takeoff	0.72315	0.793224	
TFE731-2	Climb Out	0.0811	0.0797184	ICAO C001, engine name in EPA 420-92-009
	Takeoff	0.08137	0.084132	
TFE731-3	Climb Out	0.04687	0.0482112	ICAO C002
	Takeoff	0.0486	0.05022	
TIO-540-J2B2	Approach	0.00059	0.603	AP-42 Table II-1-7
TRENT-768	Approach	2.4192	0.02916	ICAO ADD2/C50. Tested September 1994 with improved traverse combustor.
	Climb Out	3.31056	0.08748	
	Idle	1.01088	1.83708	
	Takeoff	2.646	0	
TRENT-772	Approach	2.44944	0.0306	ICAO ADD2/C51. Tested September 1994 with improved traverse combustor.
	Climb Out	3.2508	0	
	Idle	0.94284	1.47168	
	Takeoff	3.7422	0	
TRENT-890	Idle	0.7992	0.756	ICAO ADD1/C37
TSIO-360C	Approach	0.31351	0.304524	AP-42 Table II-1-7

EDMS 4.1 revises the NOx emissions indices (and therefore effectively revises the NOx emissions factors) of 58 aircraft engines. Table 5 lists these engines and shows the effective changes made to NOx emissions factors for affected modes only. The current source of the engine data is also given.

Table 5: Effective Aircraft Engine NOx Emissions Factors Revisions.

Engine	Mode	NOx (Kg/hour) EDMS 4.0	NOx (Kg/hour) EDMS 4.1	Data Source
250B17B	Approach	0.0859	0.08712	AP-42 Table II-1-7
	Idle	0.04078	0.02844	
AE3007A1	Approach	2.76804	3.041064	ICAO Issue 4. Tested 3/3/95 to 5/19/95.
	Climb Out	17.413452	19.339056	
	Takeoff	24.255216	27.05904	
CF700-2D	Climb Out	4.37184	4.529448	AP-42 Table II-1-7
	Idle	0.18792	0.185832	
F100-PW-220	Approach	21.80786	21.49641	Air Force contact: Mark Zimmerhanzel, 24 Apr 00
F101DFE	Climb Out	75.73997	89.9659728	AESO Report 6-90 p. 07 (15083 lbs thrust)
F404-GE-400	Approach	44.00395	6.41574	AESO Memorandum Report 9734, Rev B, Mar 99 (Approach = Straight-in 85%N2)
	Climb Out	92.4781	34.25058	
GE90-76B	Approach	35.69674	41.449212	ICAO Issue 8. Tested January 2000.
	Climb Out	297.10613	260.76816	
	Idle	6.24456	5.421168	
	Takeoff	457.35667	404.568756	
GE90-85B	Approach	31.518	48.642048	ICAO Issue 9. Tested January 2000 incorporating 3D aero.
	Climb Out	376.9272	332.0406	
	Idle	6.4908	5.949072	
	Takeoff	597.28284	529.8615	
IO-320-DIAD	Idle	0.00414	0.0035604	AP-42 Table II-1-7
IO-360-B	Idle	0.00418	0.0044064	AP-42 Table II-1-7
J52-P-408	Climb Out	21.91102	37.710792	AESO Report 6-90 p. 17 (normal)
J52-P-8B	Climb Out	19.83438	33.711696	AESO Report 6-90 p. 16 (Normal rated)
J57-P-22	Approach	2.26525	2.30364	AP-42 Table II-1-8
J69-25A	Climb Out	1.15497	2.2243824	Air Force contact: Mark Zimmerhanzel, 24 Apr 00
J79-GE-10B	Takeoff	71.74688	46.53936	AESO Report 6-90 p. 22 (Intermediate)
J79-GE-8D	Climb Out	44.8753	31.491504	AESO Report 6-90 p. 21 (Climb out = 90% Nor. Rated, Takeoff = Military)
	Takeoff	73.62634	44.762544	
J85-GE-5F	Approach	1.35921	1.344276	AP-42 Table II-1-8
	Idle	0.31838	0.2376	
JT8D-217	Approach	12.55691	10.5698808	ICAO Issue 3. Tested March 1999 with Environmental Kit (E-Kit) Combustor and Fuel Nozzles.
	Climb Out	79.94448	52.546032	
	Idle	1.8275	2.2572144	
	Takeoff	122.1264	83.35008	

Engine	Mode	NOx (Kg/hour) EDMS 4.0	EDMS 4.1	Data Source
JT8D-217A	Approach	12.55691	10.5698808	ICAO Issue 3. Tested March 1999 with Environmental Kit (E-Kit) Combustor and Fuel Nozzles.
	Climb Out	79.94448	52.546032	
	Idle	1.8275	2.2572144	
	Takeoff	122.1264	83.35008	
JT8D-217C	Approach	12.55691	9.99702	ICAO Issue 3. Tested March 1999 with Environmental Kit (E-Kit) Combustor and Fuel Nozzles.
	Climb Out	79.94448	48.98124	
	Idle	1.8275	1.99746	
	Takeoff	122.1264	76.104648	
JT8D-219	Approach	12.54572	10.512018	ICAO Issue 3. Tested March 1999 with Environmental Kit (E-Kit) Combustor and Fuel Nozzles.
	Climb Out	81.2448	53.62938	
	Idle	1.74182	2.0127744	
	Takeoff	131.6088	91.248768	
JT9D-70	Approach	19.10563	21.493836	AP-42 Table II-1-7
	Climb Out	184.28314	175.407408	
	Idle	2.5596	2.612736	
	Takeoff	277.79054	272.50488	
O-200	Approach	0.01313	0.01272348	AP-42 Table II-1-7
	Idle	0.00569	0.0059904	
PT6A-27	Approach	0.816577	0.49392	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
	Climb Out	1.27008	1.19574	
	Idle	0.126846	0.222912	
	Takeoff	1.504206	1.40904	
PT6A-45R	Approach	0.942566	0.780372	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
	Climb Out	2.481538	2.021904	
	Idle	0.307296	0.26712	
	Takeoff	3.03624	2.485584	
PT6A-65AR	Approach	0.731786	0.8478	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
	Climb Out	1.966583	2.2788	
	Idle	0.238554	0.292608	
	Takeoff	2.39328	2.787696	
PT6A-65B	Approach	0.660636	0.688896	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
	Climb Out	1.671041	1.71252	
	Takeoff	1.96308	2.011572	
PW119-B	Climb Out	6.760699	7.130016	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
	Idle	1.446595	1.4634	
	Takeoff	9.117652	8.864388	
PW120	Takeoff	6.29495	6.190992	Pratt & Whitney Canada, contact: Kian McCaldon on 06 Nov 96
PW121	Idle	1.11333	0.949428	Pratt & Whitney Canada, contact: Kian McCaldon on 06 Nov 96

Engine	Mode	NOx (Kg/hour) EDMS 4.0	EDMS 4.1	Data Source
PW123	Approach	2.662999	2.712456	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
	Climb Out	7.938734	7.5843	
	Idle	1.253178	1.3743	
PW2037	Approach	14.79492	16.108776	ICAO Issue 4. Tested November 1998.
	Takeoff	172.19448	166.331196	
PW2040	Climb Out	142.30944	138.47724	ICAO Issue 4. Tested November 1998.
	Idle	2.3436	2.501388	
	Takeoff	217.44828	221.004288	
PW4152	Climb Out	145.8702	135.43668	ICAO C108
	Idle	3.12228	3.50784	
	Takeoff	210.82068	193.90932	
PW4168	Approach	42.11525	35.24004	ICAO Issue 7. Tested April 2000 with TALON II combustor.
	Climb Out	284.07085	171.83736	
	Idle	3.30174	4.68	
	Takeoff	432.78494	279.28656	
PW4X58	Approach	29.3265	26.49348	ICAO Issue 6. Tested November 1999 with TALON II combustor.
	Climb Out	180.94846	129.5352	
	Idle	3.05953	3.28176	
	Takeoff	290.48335	202.176	
RB211-535E4B	Approach	14.553	17.127	ICAO Issue 5. Tested May 1999 with phase 5 combustor.
	Climb Out	218.7108	113.9472	
	Idle	2.40768	3.13272	
	Takeoff	407.79648	192.85776	
RR SPEY-MK555	Approach	5.41008	4.01778	ICAO Issue 2. Tested in 1987 with Transply IIF combustors with standard fuel pump.
	Climb Out	35.1648	27.880488	
	Idle	1.27872	0.7738992	
	Takeoff	57.9474	45.85518	
RR SPEY-MK555-15	Idle	0.72639	0.7038	AP-42 Table II-1-7
SPEY MK511	Approach	7.97494	7.20576	ICAO C138
	Climb Out	50.12885	45.21528	
	Idle	0.63403	1.64592	
	Takeoff	74.47331	72.81252	
T400-CP-400	Approach	0.19978	0.5026356	AESO Memorandum Report 9809 (Idle = Hover, Takeoff = Climbout)
	Climb Out	0.629	0.99214416	
	Idle	0.19091	0.90921528	
	Takeoff	1.24837	0.99214416	
T53-L-11D	Approach	1.88517	0.255024	AESO Report 6-90 p. 28 (Flight Idle)
T53-L-13	Climb Out	1.88123	1.9697112	Air Force contact: Mark Zimmerhanzel, 24 Apr 00 (Climb out = Military)
	Takeoff	1.96993	2.42451	
T56-A-16	Approach	9.0085	2.46456	AESO Report 6-90 p. 29 (Approach = Flight Idle, Takeoff = 100%)
	Takeoff	10.54112	9.9685404	

Engine	Mode	NOx (Kg/hour) EDMS 4.0	EDMS 4.1	Data Source
T58-GE-16	Approach	2.34887	0.82782	AESO Memorandum Report 9820, Rev C, Jan 01 (Idle = Taxi Out)
	Climb Out	3.35124	1.464228	
	Idle	0.20616	0.49914	
	Takeoff	5.37869	1.464228	
T58-GE-5	Climb Out	2.20102	2.510316	Air Force contact: Mark Zimmerhanzel, 24 Apr 00 (Climb out = Int Mil)
	Takeoff	2.52117	2.951424	
T58-GE-8F	Approach	1.33436	1.1779344	AESO Report 6-90 p. 30 (Climb out = Cruise)
	Climb Out	1.17954	1.330992	
TAY650	Approach	4.21452	4.734	ICAO ADD2/C52
	Climb Out	42.5601	33.07464	
	Idle	0.7295	1.08	
	Takeoff	62.42702	50.9292	
TF30-P-412A	Approach	8.34222	9.5738112	AESO Memorandum Report 9901, Rev A, Jan 99 (Approach = Straight-in 87%RPM)
	Climb Out	55.87364	62.678448	
	Idle	1.08778	1.344672	
	Takeoff	122.46957	103.860612	
TF30-P-6B(JFT 10)	Idle	0.40934	0.31248	AP-42 Table II-1-8
TF33-P3/5/7	Idle	0.70222	0.69336	AP-42 Table II-1-8
TF34-GE-400	Approach	4.53843	2.1142836	AESO Memorandum Report 9914, Jan 99 (Approach = Straight-in Approach 85%N2)
	Climb Out	9.4871	6.6158352	
	Idle	0.27164	0.3717324	
	Takeoff	9.4871	12.950244	
TIO-540-J2B2	Climb Out	0.02229	0.02180142	AP-42 Table II-1-7
TPE331-2	Idle	0.12212	0.1238328	AP-42 Table II-1-7
	Climb Out	2.20567	0.002214828	
	Takeoff	2.572	0.002580192	
TRENT-768	Approach	29.7792	29.18916	ICAO ADD2/C50. Tested September 1994 with improved traverse combustor.
	Climb Out	261.44712	215.72568	
	Idle	5.2416	4.39344	
	Takeoff	413.94024	334.125	
TRENT-772	Approach	32.29632	31.518	ICAO ADD2/C51. Tested September 1994 with improved traverse combustor.
	Climb Out	303.34608	245.57472	
	Idle	5.57928	4.74768	
	Takeoff	494.424	396.0576	
TRENT-890	Climb Out	367.23456	371.628	ICAO ADD1/C37
	Idle	5.6808	5.7564	
	Takeoff	628.47252	643.2732	
TSIO-360C	Approach	0.10449	12.485484	AP-42 Table II-1-7
	Climb Out	0.1944	19.62	
	Idle	0.00963	1.40418	
	Takeoff	0.1639	29.69568	

EDMS 4.1 revises the SOx emissions indices (and therefore effectively revises the SOx emissions factors) of 8 aircraft engines. Table 6 lists these engines and shows the effective changes made to SOx emissions factors for affected modes only. An index of 1 pertains to the sulfur content of commercial jet fuel, 0.54 to military jet fuel and 0.11 to piston engine fuel. The IO-320-DIAD and O-320 are both piston engines and were revised accordingly. For the other engines, it was determined that they function commercially more frequently than they do militarily, and therefore they too were revised accordingly.

Table 6: Aircraft Engine SOx Emissions Indices Revisions.

	SOx EI (g/Kg)	
Engine	EDMS 4.0	EDMS 4.1
AE3007C	0.54	1
CF700-2D	0.54	1
CJ610-2C	0.54	1
IO-320-DIAD	0.54	0.11
O-320	0.54	0.11
PW4256	0.54	1
RB401-6	0.54	1
TAY650-15	0.54	1

EDMS 4.1 added 117 new aircraft engines to its database. Table 6 lists these and the data source. Some of these engines are new in name only and contain previously incorporated data, but have been renamed to increase the consistency of the EDMS engine-naming scheme. The new data sources are:

- ICAO Issues 3 through 9
- AESO memorandum reports
- Allison contact: Nader Rizk, 9 Jun 00
- Air Force contact: Mark Zimmerhanzel, 24 Apr 00
- Honeywell, RAP:TJK:0133:09801, 18 Sep 01
- Pratt & Whitney Canada,
  5 July 01 and contact: Domingo Sepulveda, c. May 2000

Table 7: New Aircraft Engines in EDMS 4.1.

Engine Name	Data Source
AE3007A1/1	ICAO Issue 4. Tested 3/3/95 to 5/19/95.
AE3007A1/2	ICAO Issue 4. Tested 3/3/95 to 5/19/95.
AE3007A1/3	Allison contact: Nader Rizk, 9 Jun 00
AE3007C1	ICAO Issue 9. Tested April 1995.
BR700-710A1-10 GulfV	ICAO Issue 4. Tested October 1996 for Gulfstream V application.
BR700-715A1-30 newFI	ICAO Issue 3. Tested June 1999 with improved fuel injector.
BR700-715B1-30 newFI	ICAO Issue 3. Tested June 1999 with improved fuel injector.
BR700-715C1-30 newFI	ICAO Issue 3. Tested June 1999 with improved fuel injector.
CF34-3B	ICAO Issue 8. Tested March 1991.
CF6-45A2 non-LEFN	ICAO C023
CF6-50C non-LEFN	ICAO C024. LEFN = Low Emissions Fuel Nozzle.
CF6-50C1 non-LEFN	ICAO C025. LEFN = Low Emissions Fuel Nozzle.
CF6-50C2 non-LEFN	ICAO C025. LEFN = Low Emissions Fuel Nozzle.
CF6-50C2R non-LEFN	ICAO C026. LEFN = Low Emissions Fuel Nozzle.
CF6-50E2 (non-LEFN)	ICAO C027. LEFN = Low Emissions Fuel Nozzle.
CF6-80C2A1 old comb	ICAO C032
CF6-80C2A2 (revised)	ICAO C034. Tested June 1985.
CF6-80C2A2 old comb	ICAO C033. Certification data was superseded by revised data on page C034.
CF6-80C2A3 (revised)	ICAO C036. Tested June 1985.
CF6-80C2A3 old comb	ICAO C035. Certification data was superseded by revised data on page C036.
CF6-80C2A5 (revised)	ICAO C038. Tested June 1985.
CF6-80C2A5 old comb	ICAO C037. Certification data was superseded by revised data on page C038.
CF6-80C2A8 old comb	ICAO C039
CF6-80C2B1 old comb	ICAO C040
CF6-80C2B1F old comb	ICAO C041. Certification data was superseded by revised data on page C042.
CF6-80C2B1F revised	ICAO C042. Tested June 1985.
CF6-80C2B2 old comb	ICAO C043
CF6-80C2B2F old comb	ICAO C044
CF6-80C2B4 old comb	ICAO C045
CF6-80C2B4F old comb	ICAO C046
CF6-80C2B6 old comb	ICAO C047
CF6-80C2B6F old comb	ICAO C048
CF6-80C2B7F old comb	ICAO ADD1/C27
CF6-80C2D1F old comb	ICAO C049
CF6-80E1A1 old comb	ICAO C050
CF6-80E1A2 old comb	ICAO C051
CF6-80E1A3	ICAO Issue 8. Tested January 1995.
CFM56-3-B4	EPA 420-92-009 Table 5-4
F100-PW-100 (w/AB)	Air Force contact: Mark Zimmerhanzel, 24 Apr 00
F100-PW-200 (w/AB)	Air Force contact: Mark Zimmerhanzel, 24 Apr 00

Engine Name	Data Source
F100-PW-220 (w/AB)	Air Force contact: Mark Zimmerhanzel, 24 Apr 00
F100-PW-229 (w/AB)	Air Force contact: Mark Zimmerhanzel, 24 Apr 00
F101-GE-102 (w/AB)	Air Force contact: Mark Zimmerhanzel, 24 Apr 00
F110-GE-100 (w/AB)	Air Force contact: Mark Zimmerhanzel, 24 Apr 00
F110-GE-129 (w/AB)	Air Force contact: Mark Zimmerhanzel, 24 Apr 00
F110-GE-400	AESO Memorandum Report 9813 (Straight-in approach 90%RPM)
F118-GE-100	Air Force contact: Mark Zimmerhanzel, 24 Apr 00
F402-RR-406A	AESO Memorandum Report 9913 (conventional straight-in 62%RPM)
F402-RR-408	AESO Memorandum Report 2000-12, Apr 00 (conventional straight-in 70%RPM)
GE90-76B (DAC I)	ICAO ADD1/C25. Tested July 1995 with DAC-I combustor.
GE90-76B w/ 3D Aero	ICAO Issue 9. Tested January 2000 incorporating 3D aero.
GE90-77B	ICAO Issue 9. Tested January 2000 incorporating 3D aero.
GE90-85B (DAC I)	ICAO ADD1/C26
GE90-90B	ICAO Issue 9. Tested January 2000 incorporating 3D aero.
GE90-94B	ICAO Issue 9. Tested January 2000 incorporating 3D aero.
J52-P-6B	AESO Report 6-90 p. 15
J57-P-10	AESO Report 6-90 p. 18 (75% Thrust)
J57-P-420	AESO Report 6-90 p. 19
J57-P-420 (w/AB)	AESO Report 6-90 p. 19
J65-W-20	AP-42 Table II-1-8
J65-W-5F	AESO Report 6-90 p. 20 (7450 rpm)
J79-GE-10B (w/AB)	AESO Report 6-90 p. 22 (30% thrust)
J79-GE-8D (w/AB)	AESO Report 6-90 p. 21 (75% rpm)
J85-GE-2	AESO Report 6-90 p. 23 (30% normal rated power)
J85-GE-5H (w/AB)	Air Force contact: Mark Zimmerhanzel, 24 Apr 00
JT8D-217 (old comb)	ICAO C081
JT8D-219 old comb	ICAO C082
NK-8-2U w/o NOx data	ICAO C060, 14 Jun 90
PT6A-114	Pratt & Whitney Canada, 5 July 01
PT6A-20	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
PT6A-28	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
PT6A-34	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
PT6A-36	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
PT6A-45A	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
PT6A-60, -60A, -60AG	Pratt & Whitney Canada, 5 July 01
PT6A-65R	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
PT6A-67D	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
PW118A	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
PW118B	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
PW119-C	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
PW123B	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
PW123C	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000

Engine Name	Data Source
PW123D	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
PW123E	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
PW126A	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
PW127-C,F,J	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
PW127E	Pratt & Whitney Canada, contact: Domingo Sepulveda, c. May 2000
PW2037 original data	ICAO C102. Tested August 1983.
PW2040 original data	ICAO C103. Tested August 1983.
PW2041	EPA 420-92-009 Table 5-4
PW4098	ICAO Issue 7. Tested January 1998.
PW4152 (old Comb)	ICAO C107
PW4156	ICAO C110
PW4168 (Floatwall)	ICAO C113. Tested February 1993 with Floatwall combustor.
PW4168A	ICAO Issue 2. Tested February 1993 with Floatwall Combustor.
PW4X58 Phase 3	ICAO C119. Tested January 1993 with phase 3 reduced pressure loss combustor.
PW530	Pratt & Whitney Canada, 5 July 01
RB211-22B new engine	ICAO C124
RB211-524	AP-42 Table II-1-7
RB211-524G original	ICAO C131. Certification data was superseded by revised data on page C132.
RB211-535E4 original	ICAO C135. The original certification data was superseded by revised data on page C136.
RB211-535E4 revised	ICAO C136. This revised data was superseded by new data on page ADD2/C49.
RB211-535E4B old com	ICAO ADD2/C55. Tested April 1991.
SPEY MK511 old Comb	ICAO C137
SPEY MK555 HP F.Pump	ICAO C140, RR report CRR10145, Transply IIF combustors with H.P. fuel pump, Aug 83 to Nov 84
SPEY MK555 original	ICAO C139
T63-A-5A	AESO Report 6-90 p. 32 (Flight Idle)
T64-GE-413	AESO Report 6-90 p. 34 (75% hp)
T64-GE-416	AESO Memorandum Report 9905, Rev A, Mar 99 (same as T64-GE-415)
T64-GE-6B	AESO Report 6-90 p. 33 (75% hp)
T700-GE-401 -401C	AESO Memorandum Report 9709A, Rev A
TF30-P-109 (w/AB)	Air Force contact: Mark Zimmerhanzel, 24 Apr 00
TF30-P-6C	AESO Report 6-90 p. 11 (30% Thrust)
TPE331-8	Honeywell, RAP:TJK:0133:09801, 18 Sep 01
TRENT 556-61	ICAO Issue 9. Tested January 2002 with phase 5 tiled combustor.
TRENT-768 old comb	ICAO ADD1/C32. Out of service. Tested July 1994 with old combustor.
TRENT-772 old comb	ICAO ADD1/C33. Out of service. Tested July 1994 with old combustor.