

D2.4.1-04c - User Manual for the Influence Model -Annex to EP3 Performance Framework

EPISODE 3

Single European Sky Implementation support through Validation



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EXECUTIVE SUMMARY

The focus of this work is to develop a methodology and a model that will allow future ECAC wide performance assessment of the potential performance benefits of the SESAR concept in 2013 and 2020 corresponding to the SESAR Implementation Packages (IP1 and IP2).

This document, D2.4.1-04c, is the Influence Model Manual. The document does not replace the relevant software user manuals, but is a description of how to get started in using, reviewing and changing the influence model.

The Influence Model has been developed using Analytica. Analytica is a decision support tool that is published by Lumina. The Influence Model is also supported by an MS Excel inputs data spreadsheet. Users and developers must have access to both of these software programmes to use the model. Analytica comes in a variety of versions:

- Analytica Player is recommended for users of the Influence Model;
- Analytica Professional is recommended for users that wish to make changes to the model, or develop the model further.

To use Analytica, you need the following quite modest minimum configuration:

- Pentium 500 MHz+ or AMD Athlon is recommended;
- 30 MB disk space;
- 256 MB RAM (2 GB recommended for large models);
- 8-bit colour display;
- Windows 98, 2000, NT 4, ME, XP, or Vista.

The latest versions of the Analytical model file and the MS Excel input data sheet can be downloaded from the Episode 3 website:

http://www.episode3.aero/library/wp2/system_assessments/performance_assessment/wp241 2_performance/influence-model-and-validation-plan/influence-models/folder_contents

To open and view the Influence Model, the user shall open the MS Excel spreadsheet, and accept to 'Update Links' when prompted. This automatically opens the correct Analytica file.

The Influence Model can be navigated through by using a mouse, and interacting with the nodes of the model.

The Influence Model can be edited if the user has Analytica Professional. Input data can also be edited and new data can be entered into the model by using the MS Excel input data spreadsheet.



1 INTRODUCTION

1.1 PURPOSE OF THE DOCUMENT

This document D2.4.1-04c is the Influence Model Manual. The document is a description of how to get started in using, reviewing and changing the influence model, but does not replace the relevant software user manuals.

The documentation of the influence model that has been developed for Episode 3 WP2.4.1 consists of three documents:

- D2.4.1-04a, Influence Diagrams Update Annex to EP3 Performance Framework: provides a detailed description of the individual influence diagrams, the variables that are included and how the influence models fit together;
- D2.4.1-04c, User Manual for the Influence Model Annex to EP3 Performance Framework: this document, provides a description of the requirements for using the model, hardware and software requirements and high-level instructions for running the model;
- D2.4.1-04e, Influence Model Study Final Report: describes how the model has been developed, its current status and what actions would be required to make further progress with the model.

This document contains a number of output graphs from the model as examples. As a manual, it does not provide any interpretation of the results. Please refer to D2.4.1-04a, Influence Diagrams Update, for interpretation of graphs and reliability of the model.

1.2 INTENDED AUDIENCE

The intended audience for this document is the same as for the Performance Framework, and includes users of the influence model within Episode 3. The intended audience also includes people working within the ATM performance domain.

Users of the model should focus on reading Chapters 1 to 4. Developers of the model should read the entire document, and may also benefit from reading the software user guides and doing the software tutorials identified in section 2.2.

1.3 DOCUMENT STRUCTURE

This document is structured as follows:

Section 2 – Requirements for viewing, running and changing the model;

Section 3 – How to view the model;

- Section 4 Introducing the Influence Model;
- Section 5 Making changes to the model;

Section 6 – Input data;

Section 7 – How the model and the inputs are linked;

Section 8 – Quick Start Guide;

Section 9 - How to undertake an assessment;

Section 10 – References.





1.4 BACKGROUND

Episode 3 (EP3) is charged with beginning the validation of the operational concept expressed by SESAR Task 2.2 and consolidated in SESAR Deliverable D3 [3]. The focus of this work is to develop a methodology and a model that will allow future ECAC wide performance assessment of the potential performance benefits of the SESAR concept in 2013 and 2020 corresponding to the SESAR Implementation Packages (IP1 and IP2).

Future validation exercises within EP3, or future work within the SJU, should provide evidence; in the form of studies, simulation results or expert judgement to describe the ability of some aspects of the concept to deliver on some aspects of the performance targets.

These validation exercises can help to populate the EP3 influence model in the future, and the influence model could subsequently provide an ECAC-wide assessment of performance and support the decision to conduct further exercises or to revise priorities.

1.5 GLOSSARY OF TERMS

1.5.1 Definitions

Term	Definition
Airport, TMA, En-route ECAC Performance Indicator	The Airport, TMA, En-route ECAC layer are a sub part of the ECAC wide Performance Indicator. They address the ECAC wide performance of all Airports, TMA and En-route of an OI or a group of OIs. For example, this can be the influence of group of OIs on the fuel consumption for all the ECAC airports.
Airport	A defined area on land or water (including buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft. ¹
ATM Network	Airspace structure (airport nodes linked together by airspace volumes e.g. sectors and routes) and technical infrastructure network (aircraft, ground systems, communication network, etc) supporting the management of air traffic.
ECAC Performance Indicator	The ECAC wide Performance Indicator layer addresses the ECAC wide picture of the performance. For example, this can be the ECAC (Airport + TMA + En-route) fuel consumption, CO_2 emission or delay.
En-route or ER	A defined area that is neither TMA nor airport. ²
Focus Area	Within each KPA a number of more specific areas — Focus Areas — are identified in which there are potential intentions to establish performance management. Focus Areas are typically needed where performance issues have been identified. For example, within the Capacity KPA one can identify airport capacity, runway capacity and apron capacity as Focus Areas. Within the Safety KPA, the list of Focus Areas includes: accidents, incidents, mid-air collisions, CFIT accidents, runway incursions, safety management system maturity, etc.
Influence Diagram	A diagram presenting the key elements of a situation and the relationships between them. The diagram provides a high-level qualitative view under which a quantitative model can be built.

¹ EATMP glossary

² EP3 definition



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Term	Definition
Influence Model	A quantified model containing data and calculations built from an Influence Diagram.
КРА	Key Performance Areas are a way of categorising performance subjects related to high level ambitions and expectations. ICAO has defined 11 KPAs: safety, security, environmental impact, cost effectiveness, capacity, flight efficiency, flexibility, predictability, access and equity, participation and collaboration, interoperability.
Local Performance Indicator	The Local PIs layer for Airport, TMA and En-route represents a sub part of the Airport, TMA or En-route ECAC Performance Indicator to a local indicator. This addresses the local performance of an OI or a group of OIs. This can be the influence of group of OIs on the fuel consumption for a specific airport assessed by the validation exercise For example but then it will be needed to develop a methodology to extrapolate such result in order to obtain a value at ECAC level.
Performance Indicator (PI)	Current/past performance, expected future performance (estimated as part of forecasting and performance modelling), as well as actual progress in achieving performance objectives is quantitatively expressed by means of indicators (sometimes called Key Performance Indicators, or KPIs). To be relevant, indicators need to correctly express the intention of the associated performance objective. Since indicators support objectives, they should not be defined without having a specific performance objective in mind.
	Indicators are not often directly measured. They are calculated from supporting metrics according to clearly defined formulas, e.g. cost-per-flight-indicator = Sum (cost)/Sum(flights).
	Performance measurement is therefore done through the collection of data for the supporting metrics.
Performance Target (PT)	Performance targets are closely associated with performance indicators: they represent the values of performance indicators that need to be reached or exceeded to consider a performance objective as being fully achieved.
Sensitivity analysis	An analysis of how a result varies with changes made to the key variables from which the result is calculated.
SESAR	The SESAR project (formerly known as SESAME) is the European air traffic control infrastructure modernisation programme. SESAR aims at developing the new generation air traffic management system capable of contributing to the safety and fluidity of air transport worldwide over the next 30 years.
ТМА	A control area normally established at the confluence of ATS routes in the vicinity of one or more major aerodromes. ³ For consistency and convenience for performance aggregation of the measurement within the ECAC model there was a need to have a numerical representation. There is work ongoing in PRC to revise the current 30NM radius to probably 100NM as in US. Given that EP3 is considering a 100NM that will allow capturing most of the benefit in the TMA.
Uncertainty	In statistics, an uncertainty is not a "mistake" but is a difference between a computed, estimated, or measured value and the true, specified, or theoretically correct value.

Table 1-1: Glossary of definitions

³ EATMP glossary



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1.5.2 Acronyms

Term	Definition
ACC	Area Control Centre
AIS	Aeronautical Information System
ANS	Air Navigation System
АТСО	Air Traffic Controller
АТМ	Air Traffic Management
CONOPS	Concept of Operations
EC	European Commission
ECAC	European Civil Aviation Conference
E-OCVM	European Operational Concept Validation Methodology
ER	En-route
EP3	Episode 3
ERC	EUROCONTROL
ESARR	EUROCONTROL Safety Regulation Requirements
ICAO	International Civil Aviation Organisation
КРА	Key Performance Area
LoC	Lines of Change
OACI	Organisation de l'Aviation Civile Internationale
OCE	Operational Concept Element
OI	Operational Improvement
PF	Performance Framework
PI	Performance Indicator
РТ	Performance Target
QoS	Quality of Service
SESAR	Single European Sky ATM Research
ТМА	Terminal and Manoeuvring Area

Table 1-2: Glossary of Acronyms

1.6 DESCRIPTION OF THE EP3 INFLUENCE MODEL

The EP3 Influence Model (EP3 IM) was developed in a step-wise and iterative process. Initially a comprehensive set of independent influence diagrams was developed for each of the focus areas described in the Performance Framework Document [8]. These diagrams were based initially on the influence models that were developed for the SESAR D3 and D4 deliverables.

Following extensive consultation with EP3 partners, these diagrams were updated and then combined into one integrated influence diagram. During the final phase of this work, a selected number of the areas of the diagram were quantified. The objectives of this quantification were to:





- Show that the methodology of developing an influence model and using the results of validation exercises to populate the model is valid;
- Progress the quantification in as many areas of the model as possible given the time constraints.

The Influence Model Study - Final Report, [2], which describes the maturity of the model and the output results, describes how the level of expert judgement impacts upon the quality of the results and what steps need to be taken to improve the quality of the output.

1.7 TIME HORIZON OF THE ANALYSIS

The influence model considers performance at three snapshots in time: 2006, 2013 and 2020. In order to assess the impact of the SESAR Operational Concept on performance a reference case, or baseline, is required. Therefore, the influence model considers the performance in these three years assuming that business continues as usual, without the operational improvements of the SESAR operational concept. This performance is then compared with that when the operational improvements are included. This enables the model to present the overall impact of the operational improvements on ATM performance. The model also allows comparison against SESAR targets. For fuel efficiency, there is a SESAR target of a 10% reduction in the average fuel burn per flight compared to 2005 value. Since the year 2005 does not relate to the defined baseline scenarios, a single value for 2005 average fuel burn per flight can be input by the user and this is compared to the value for each scenario.

1.8 SCOPE OF QUANTIFICATION IN THE MODEL

The EP3 Influence Model study has not quantified all of the focus areas within the model. Because of the scope of the work, the study has selected a number of focus areas to quantify in order to show that the methodology used for influence modelling is valid. The focus areas, and the related Key Performance Areas are presented in Table 1-3, including whether the influence diagram for each focus area is quantified and transformed into an influence model.



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КРА	Focus Area	Status of the quantification		
Environment	Global Emissions	Influence Diagram and part- quantified Influence Model ⁴		
	Local Air Quality	Influence Diagram		
	Noise	Influence Diagram		
Efficiency	Fuel Efficiency	Influence Diagram and Influence Model		
	Time Efficiency	Influence Diagram and Influence Model		
	Mission Effectiveness	Influence Diagram		
Predictability	Knock On Effect	Influence Diagram and Influence Model		
	Service Disruption Effect	Influence Diagram		
	On-Time Operation	Influence Diagram		
Capacity	Airspace Capacity	Influence Diagram and Influence Model		
	Airport Capacity	Influence Diagram and Influence Model		
	Network Capacity	Influence Diagram		
Safety	ATM-related safety	Influence Diagram		
Cost-effectiveness	Cost-effectiveness	Influence Diagram		
Flexibility	Service Location Flexibility	Influence Diagram		
	Sustainability for military requirements	Influence Diagram		
	BT Update Flexibility	Influence Diagram		
	Flexible Access for Non- Scheduled Flights	Influence Diagram		

Table 1-3:Overview of focus areas

For the focus areas that have been quantified the data supporting the quantification is presented in the MS Excel data input file. This data input file can be used to adjust the inputs to the model to allow it to be run again quickly and efficiently, whilst minimising potential errors. It helps to facilitate the comparison of results when changes to the input data are made.

This file should be used, where possible, to change or update the input data to the model.

⁴ Only emissions proportional to fuel burn have been quantified.



2 TECHNICAL REQUIREMENTS FOR VIEWING, RUNNING AND CHANGING THE MODEL

2.1 INTRODUCTION TO REQUIREMENTS

This chapter describes the software and hardware requirements to view, run and change the EP3 Influence Model. It also defines the files that are required.

2.2 SOFTWARE REQUIREMENTS

The following software is required to run and view the EP3 Influence Model:

- Microsoft Excel;
- Analytica Web Player, Analytica Player, Analytica trial, Analytica Power Player or Analytica Professional.

Microsoft Excel is a standard spreadsheet application that is packaged with Microsoft Office. Analytica, licensed by Lumina Decision Systems Ltd, is a visual tool for creating, analysing and communicating decision models.

The EP3 Influence Models have been developed using Analytica Professional (version 4.1). A license to use this software can be purchased from Lumina. There are number of different options for using Analytica to view, run and change the influence model. The options are outlined below:

- Analytica Player: Lets you browse a model, view diagrams and variables, change inputs, and compute results. It does not let you create new models, make changes, or save results. Analytica Player is available to download free of charge from http://www.lumina.com/ana/player.htm.
- Analytica Web Player: AWP lets users interact with models via a web browser. It provides a similar user interface to Analytica Player with several enhancements. Users can view models including influence diagrams, change inputs, and view result tables and graphs. Users can log in and save their own versions of models. To create an AWP application, you create the model with Analytica on the desktop, and then upload it onto a server with a couple of clicks. AWP provides a way for users to share, review, and run models. It also lets you rapidly create analytic web applications harnessing the full power of Analytica.
- **Analytica trial**: Offers the full functionality of Analytica Professional for 15 days once only. After that, it reverts to the Player Edition.
- Analytica Power Player: Like the standard Player, it lets you browse a model, view diagrams and variables, change inputs, and compute results. Unlike the standard Player, it also lets you save changes and use Enterprise features, including accessing databases, Huge Arrays, etc. There is a charge for a license for the Analytica Power Player.
- **Analytica Professional**: Offers full Analytical functionality, including the ability to create, edit, and save models.

There is also an Enterprise version of Analytica, but this has not been used to develop the influence model and there is no requirement foreseen to use it. A summary of the features of the different versions of Analytica is presented in Table 2-1.

Users of the model are recommended to use Analytica Player to run and review the model, whereas developers are recommended to use Analytica Professional.



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Features	Player	Web Player	Trial	Power Player	Professi onal
Browse models, change inputs, compute and view results	Yes	Yes	Yes	Yes	Yes
Save changes to models		Yes	Yes	Yes	Yes
Create, and edit models			Yes		Yes
Edition marked on print outs	Yes		Yes		
Hierarchical influence diagrams	Yes	Yes	Yes	Yes	Yes
Monte Carlo uncertainty analysis	Yes	Yes	Yes	Yes	Yes
Intelligent Arrays™	Yes	Yes	Yes	Yes	Yes
Function libraries: Math, Array, Distributions, Statistical, Text	Yes	Yes	Yes	Yes	Yes
Advanced Function libraries: Advanced math, Financial, and Matrix	Yes	Yes	Yes	Yes	Yes
Outline Window	Yes	Yes	Yes	Yes	Yes
Graphing and OLE linking with Microsoft Excel		Yes	Yes	Yes	Yes
Create input and output Forms			Yes		Yes
Open Database Connectivity access		Yes		Yes	
Make Browse-only models					
Encrypt proprietary models		Yes		Yes	
Huge Arrays™ — dimensions or sample size up to 100 million		Yes		Yes	
Time Profiling showing computation time per variable					
Optimizer extension available		Yes		Yes	
Application Programming Interface (API) & server license					
Table 2-1:	Summary	of Analytica fea	atures		

The Analytica software comes with a number of supporting files and documents that are useful for users and developers that wish to familiarise themselves with the software:

- User Guide Analytica 4.1 [13]. This is an in-depth user guide, comprising 420 pages. ٠ It is recommended that users of the model review chapters 1 to 3 in the User Guide. Developers are recommended to review Chapters 1 to 6 and to then refer to the User Guide as required during development of the model.
- Tutorials. Analytica Professional comes with a number of example models that can . be used with the tutorial to help familiarise users and developers with the Analytica modelling environment. It is recommended that developers of the model, and users with Analytica Professional, complete Chapters 1 to 5 of the Analytica tutorial.





2.2.1 Reasons for Using Analytica

Analytica software was chosen as it fulfilled all requirements and proved to be the most user friendly tool of those that were considered. The strong and deciding features of the Analytica software are summarised below:

- Scalability hierarchical modules, intelligent arrays, and ultra-compact code enables the management, running and communication of models much larger than is practical with spreadsheets.
- Transparency visual influence diagrams make models easier to create, understand and audit (integrated documentation).
- Flexibility models can be very flexible in terms of data extension by using Intelligent Arrays[™]. It makes it easy to build and extend multidimensional models.
- Risk and sensitivity analysis Integrated Monte Carlo simulation enables fast evaluation of risks and uncertainty including easy production of Tornado diagrams.
- Communication / Sharing / Pricing Lumina offers a free player and in addition they are about to launch the Analytica Web Publisher – a web based player, which doesn't require any special installation and can be run on any computer connected to Internet.

2.3 HARDWARE REQUIREMENTS

To use Analytica, you need the following quite modest minimum configuration:

- Intel 486-66 MHz or better (Pentium 500 MHz+ or AMD Athlon recommended);
- 30 MB disk space;
- 256 MB RAM (2 GB recommended for large models);
- 8-bit colour display;
- Windows 98, 2000, NT 4, ME, XP, or Vista.

It helps to have a faster CPU, and, especially, more RAM for large models. Analytica will benefit from up to 3 GB RAM if you have it. It is also handy to have a large screen, or even multiple screens, when working with a large model.

2.4 FILES

The EP3 Influence Model comprises two files:

- The Analytica model file, with filename "MTV Influence Model quantification v3.0.ANA". The .ANA file extension shows that the file is an Analytica file;
- The MS Excel input data sheet, with filename "Input data sheet MASTER.xls". The .xls file extension shows that the file is an MS Excel file.

The latest versions of the Analytical model file and the MS Excel input data sheet can be downloaded from the EP3 website:

http://www.episode3.aero/library/wp2/system_assessments/performance_assessment/wp241 2_performance/influence-model-and-validation-plan/influence-models/folder_contents

These files are linked together using OLE (Object Linking and Embedding). Therefore, these files need to be placed within the same folder on the user's computer. The Analytica model takes inputs directly from data contained in the MS Excel spreadsheet. This reduces the requirement to make changes to the data in the Analytica file.



3 HOW TO VIEW THE MODEL

3.1 INTRODUCTION TO VIEWING THE MODEL

This chapter describes how to open the model files and view the model in MS Excel and Analytica.

3.2 OPENING THE FILES

The MS Excel workbook and the Analytica model file are linked together using OLE, as described above. Therefore, these files should be opened together when viewing the model. The easiest way to ensure that both files are open and that the links between the two files are up-to-date is to:

- 1. Open the MS Excel input file, D2.4.1-04d "Input Data Required MASTER.xls". MS Excel will identify that the file is linked to the Analytica files and will ask whether the user would like to update these links.
- 2. Click 'Update Links'.

This process will open the Analytica file automatically.

3.3 FILE DESCRIPTIONS

3.3.1 Analytica Model File

The Analytica model file opens on a diagram which is an overview of all of the Key Performance Areas and focus areas that are included within the model. A screenshot of this interface is presented in Figure 3-1.



For a detailed description of the structure of the model, please refer to the Influence Diagrams Update - Annex to EP3 Performance Framework [1]. Further description regarding how to use the model is presented in Chapter 4.

3.3.2 MS Excel Data Input File

The MS Excel data input file is an MS Excel workbook, with a number of separate worksheets. The worksheets are colour coded according to the Key Performance Area the input data relates to, matching the colours presented in Figure 3-1.

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4 INTRODUCING THE ANALYTICA MODEL FILE

4.1 INTRODUCTION

This chapter presents an overview of the Analytica model file. The topics covered are:

- Model notation;
- Navigating through the model;
- Reviewing variables, including their attributes and calculation results;
- Scope of quantification in the model.

For more detailed information about using the software, navigating and reviewing Analytica files, the user should consult the Analytica user guide. The Analytica user guide can be accessed by clicking on the 'Help' menu within Analytica and selecting 'User Guide'. It can also be opened by pressing the F1 key whilst in Analytica.

4.2 MODEL NOTATION

The modelling tool used for the influence diagrams is Analytica version 4.1. The notation used by Analytica is described in Table 4-1. It also describes where the EP3 Influence Model study has amended the meaning of the variables in order to fit the scope and objectives of the study.

	Decision variable — a quantity that the decision maker can control directly.			
Decision	The EP3 Influence Model study uses the Decision variable to represent an Operation Improvement Step (OI Step).			
Chance	Chance variable — an uncertain quantity whose definition contains a probabili distribution.			
Objective	Objective (utility) variable — a quantity that evaluates the relative value, desirability, or utility of possible outcomes. In an influence model, users are trying to find the decision(s) that maximize (or minimize) the value of this node.			
	The EP3 Influence Model study uses the Objective variable to represent Key performance Indicators.			
Variable	General variable — a quantity that is not one of the above classes. It can be uncertain because it depends on one or more chance variables. This variable shall be used in the initial development stage when the exact type of variable is unknown. Once the type of requirement becomes clearer, the type can be changed.			
Modulo	Module — a collection of nodes organised as a diagram. Modules can themselves contain modules, creating a nested hierarchy.			
Wodule	The EP3 Influence Model study uses modules to create a hierarchy of levels within the model. Modules are colour coded by KPA.			
Index	Index variable — an index is used to define a dimension of an array.			
Constant	Constant — a variable whose value is fixed. A constant is not dependent on other variables: it has no inputs.			

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Function	 Function — either an existing function from a library can be used or a new function can be defined to augment the functions provided in Analytica. The EP3 Influence Model study uses the Function variable to represent an external simulation, dataset, tool or validation study that can be used to quantify the model.
Alias	Alias — a copy of a node, referring to the same variable, module, or other object as the original node. It is often useful to display an alias node in a different module than its original node. An alias node is identified by its title being shown in <i>italics</i> .

Table 4-1: Notation (as used in Analytica 4.1)

The above mentioned nodes are linked using arrows. There are several combinations and meanings of arrows, depending on the type of nodes they connect. The basic set of arrows is shown in Table 4-2 below.



4.3 NAVIGATING THROUGH THE MODEL

In Analytica, there are a number of means of interacting with the model and accessing information, e.g. double-clicking, right-clicking for drop-down menus and using toolbar icons. The means described in this manual are not necessarily the only options for performing a





certain task, but allow the user get started in using, reviewing and changing the influence model. More detailed information can be found in the Analytica User Guide [13].

The EP3 Influence model is constructed from a number of nodes, as described in section Model Notation above. A single diagram / module containing more than 20 nodes often looks too complicated. The structure of the model is organised into a hierarchy of modules. The objective of this is to make the diagrams clear and understandable for users.

The top level influence diagram, presented in Figure 3-1, shows the Focus Areas of the Key Performance Areas (KPAs), each as a separate module. Each of the Focus Areas contains the key influences as variables, or modules containing variables, and arrows indicating the dependencies among these.

To view the part of the influence model that is contained within a module the user must double-click the left mouse button on the required module. This will open the diagram contained within the module.

The nature of the model quantification means that not all of the variables in the detailed influence diagrams were fully quantified. In many instances data has been entered into the model through variables displayed further to the right-hand side of the influence diagram. The left-hand side does not have any direct inputs, but the inputs are to variables to the right-hand side of the models and the data takes account of the preceding influences.

The influence model notation was changed to show which parts of the influence model are not quantified. An example of this can be seen in the "Enroute" module of the Fuel Efficiency Focus area, which can be accessed as shown in Figure 4-1 by double clicking on the "Fuel Efficiency" module in the top level diagram and then on the "Enroute" module in the diagram which appears. The "Enroute" module is presented in Figure 4-2.



Figure 4-1:

Navigating to the "Enroute" module of the Fuel Efficiency focus area



Figure 4-2: Example influence model with variables not quantified on the left-hand side

Figure 4-2 shows that the variables on the left-hand side of the influence model that do not have a border to the nodes, and whose arrows do not quite reach the subsequent variables have not been quantified. In this example data is input directly into the following three variables:

- Average direct fuel burnt en-route;
- Fuel burnt en-route due to additional distance;
- Additional fuel burnt en-route due to vertical deviations.

The data input for these three variables is then used in the influence model.

4.3.1 Analytica Toolbar

A picture of the Analytica toolbar is presented in Figure 4-3. It shows that there are three main groups of icons:

- Windows: Icons that reveal and hide modelling windows. For example, to go up one level in the modelling hierarchy, which returns the user to the module above, the user must click on the icon labelled 'Diagram Window' in the Analytica user interface.
- Tools: Icons that enable functionality within the model. The Browse Tool locks the model so that it cannot be edited. Analytica Player operates solely in the Browse mode. The Edit Tool is available in more advanced versions of Analytica and enables the user to edit the model. The Arrow Tool enables the user to connect two variables together to show an influence between them.
- Nodes: Icons that enable the user to add each of the different nodes in the model. Note that the nodes are not available when using Analytica Player.





Figure 4-3: Analytica toolbar

Table 4-3 presents a brief overview of the functions of each of these icons.

Opens the Diagram window for the module or model containing the object selected i.e. go up one level to the parent module.
Opens the Outline window which displays a listing of the nodes inside a model.
Opens the Object window which shows the attributes of an object.
Opens a Result window (table or graph) for the selected variable.
Displays the definition of the selected variable, either as an edit table or in an attribute panel – depending on the form of the definition.
Puts the user in "Browse mode" which allows the user to navigate a model, compute and view results, and change inputs but not change variables.
Puts the user in "Edit mode" which allows the user to make changes to the model.
Allows the user to draw influences between nodes in the diagram.
Allows the user to add a node of the relevant type to the diagram by dragging.

Table 4-3: Functions of icons in Analytica toolbar

To review the attributes of a variable or module, the user must click on the variable to select it and then click on the 'Object Window' icon in the Analytica toolbar, or double-click on the variable or module. This opens the 'Object Window' describing the variable or module.

To look at the results of a calculation, the user must select the variable that they would like to assess and then click on the 'Show Result' icon in the Analytica interface The 'Show Result' icon is the fourth icon from the left in the Analytica toolbar, as shown in Figure 4-3. This action will bring up the 'Result Window'. An example of the 'Result Window' can be viewed by selecting the "Fuel Efficiency" node in the Fuel Efficiency module and clicking on the "Show Result" icon as shown in Figure 4-4. The result window then displayed is presented in Figure 4-5.



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Figure 4-4:

Navigating to Fuel Efficiency result

Result Mid							
	Lal						
	2006	2013	2020	<u>*</u>			
IP0	6853	7030	7171				
IP1	0	6546	6528				
IP1+IP2	0	0	6542				

Figure 4-5: Example of the 'result window' – table view

In the results window, the user can switch between a table and a graph by clicking on the graph icon in the top left hand corner of the window (see Figure 4-6). The user can switch back to a table by clicking in the table icon which is situated just above the graph icon.







The information displayed in the rows and columns of the table, or axes in the graph view, can be changed by clicking on the titles of the rows and columns (titled IP and Time respectively in Figure 4-5) and selecting a choice from the drop down list.

It should be noted that when reviewing a model the most interesting results to view are those of the Key Performance Indicators. These variables are identified by hexagonal objective nodes, as described in Table 4-1.

4.3.2 Sensitivity Analyses

There are two forms of sensitivity analysis that have been used on the results: "tornado analyses" and "importance analyses". The most appropriate form of sensitivity analysis used for a particular result will depend on whether the relevant inputs are represented as single values or as distributions.

4.3.2.1 Tornado Analyses

Tornado analyses are used to depict the sensitivity of a result to specified changes in selected variables. These show the effect on the result of varying each input variable, one at a time by a percentage specified by the user, keeping all the other input variables at their initial values. Tornado analyses are used for analysing sensitivity to the uncertainty of selected variables where the uncertainty is not included in the input value i.e. where the input is a single value rather than a distribution.

A number of the results have been set up with a sensitivity analysis – for example Figure 4-7 shows variables that are part of the tornado and importance analyses for fuel efficiency. This is part of the diagram that is displayed by double clicking on the "Tornado Analysis – Fuel Efficiency" module in the Fuel efficiency focus area. The "Fuel Efficiency" variable represents the average fuel burn per flight and the "Fuel Efficiency Range" variable produces a tornado analysis by varying the values of specified variables used in the calculation of "Fuel Efficiency".





Figure 4-7: Example sensitivity analysis variables

The input variables which will be considered in the analysis are contained in the index node i.e. "Variables (Fuel Eff)" in this example. The "Low" and "High" percentages by which each of these are varied are contained in the "Low/High (Fuel Eff)" node and can be viewed by clicking on the "Show Result" icon.

🗊 Result - Low/High (Fuel Eff)					
mid▼ Mid Value of Low/High (Fuel Eff) (%) Image: Variables (Fuel Eff) ▼ Image: Variables (Fuel Eff)					
	Low	High	*		
Total enroute fuel burnt	90%	110%			
Total fuel burnt TMA arrival	90%	110%			
Total fuel burnt TMA departure	Total fuel burnt TMA departure 90% 110%				
Total fuel burnt on Taxi in	90%	110%			
Total fuel burnt Taxi out	90%	110%			
Total Fuel burnt on stand 90% 110%					

Figure 4-8: Example sensitivity analysis variables

The user may wish to change the Low/High percentages used, currently all set to 90% and 110%, to reflect different uncertainty for different variables. To change the Low/High percentages: Double click on the Low/High variable; this will reveal the object window. Click on "Edit table" in the definition field. Enter the new Low/high percentages for each variable.



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🕡 Object - Low/	High (Fuel Eff)						
🔘 Variable 🔻	L_fueleff	Units	s: %				
Title:	Low/High (Fuel Eff)						
Description:	Percentage variations u	sed to define	Low and High	n values			
Definition:	Edit Table inde:	ked by Variak	les (Fuel Eff)	, Low/High (Fuel			
Value:	💓 Edit Table - Lov	//High (Fu	el Eff)				
Inputs:	Edit Table of I	Low/High (F	uel Eff) (%)				
Outputs:		Low/Higl	n (Fuel Eff) (9	%) T			
		Low	High	A			
	Tot_fuel_er	90%	110%				
	Tot_fuel_tma_arr	80%	110%				
	Tot_fuel_tma_dep	90%	110%				
	Taxi_in_fuel	90%	110%				
	Taxi_out_fuel	90%	110%				
	Tot_on_stand_fuel 90% 110%						
	<.						





See also Section 5.3.2 – Editing a Variable.

The tornado diagram shows the effect on the result of varying each input variable, one at a time by a percentage specified by the user, keeping all the other input variables at their initial values. In this example, it shows the effect on the value of "Fuel Efficiency" of varying each of the variables listed in the index "Variables (Fuel Eff)" to 90% or 110% of their initial value.

The diagram can be viewed by clicking on the "Show Result" icon for the "Fuel Efficiency Range" variable. Note that sensitivity analysis results can take a little while to be calculated.



Figure 4-10 shows, for example, that with current, illustrative, input data the value of the fuel efficiency variable (for 2006, IP0) is most sensitive to a 10% change in the Total en-route fuel burnt.





4.3.2.2 Importance Analyses

Where input variables are represented as distributions, rather than single values, the sensitivity analysis takes the form of an "importance analysis". This analysis uses as a metric the "importance" of each distribution input to the result, the absolute rank-order correlation between each input sample and the output sample. A "low" and a "high" value are used for each input. The result is then displayed as a bar graph, with bars for each input variable displaying the variation from the nominal value.

An example importance analysis can be viewed for "Aircraft ready to push back delay (variability vs. EOBT)" in the "Tornado Analysis – Knock-on Effect" module of the Knock-on Effect focus area.



The importance analysis diagram can be viewed by clicking on the "Show Result" icon for the "Ready to push back delay importance" variable, as indicated in Figure 4-11. Note that an importance analysis can only be calculated where the input variables are entered as distributions.



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Figure 4-12: Example importance analysis

Figure 4-12 shows an importance analysis for the "Ready to push back delay" variable in Knock on effect. It shows that, with the current, illustrative, input data, the value of the variable is most sensitive to variation within the distribution of the input "Arrival variability" in IP0, but to variations within the other two input distributions for IP1 and IP1+IP2⁵.

⁵ Note that the outputs of the model manual have been altered in this document to make airport names anonymous.



5 MAKING CHANGES TO THE MODEL

5.1 INTRODUCTION

This section describes two types of changes that a user may wish to make to the model, and how to implement the changes:

- Input data changes;
- Changes to the model logic and functions, including:
 - adding a variable;
 - editing a variable;
 - o deleting a variable;
 - changing an influence in the model.

The following sections present a brief description of how to undertake such changes. More detailed information about Analytica and how to use it can be found in the Analytica User Guide.

5.2 INPUT DATA CHANGES

Changes to the input data should be made in the Excel input data spreadsheet, which then updates the Analytica model through OLE linking. The only instance where data should be changed directly in the Analytica model is where there is no input data in the Excel spreadsheet. Normally, this should not be required other than to change the percentages required for the sensitivity analysis as described in section 4.3.2, but can be undertaken if necessary.

5.3 MODEL LOGIC AND FUNCTION

5.3.1 Adding a Variable

Adding a variable to an influence model in Analytica is straight forward:

- 1) Ensure the Analytica software is in Edit Mode, and select the 'Edit tool' if it is not.
- 2) Decide on what category the variable is and choose an appropriate node for the variable, referring to Table 4-1 if required.
- 3) Click on and drag the node from the toolbar at the top of the Analytica software interface on to the modelling screen.
- 4) The software will present blank node with a white text box for you to enter the title of the variable. Type in the variable title.
- 5) In order to edit the details of the variable and provide details of all of the attributes double click with the left mouse button on the variable. This will reveal the object window.
- 6) Attributes of the variable can be entered into the relevant fields in the Object window.
- 7) Changes that are made are saved when the user closes the Object window, by clicking on the red cross in the top right-hand corner of the Object window⁶. When

⁶ Be careful not to click on the red cross in the main Analytica model window, which will close down the software programme.



entering a value or formula into the Definition attribute the green tick that appears above the data entry box can be clicked to validate the new value or formula.

5.3.2 Editing a Variable

Editing a variable is done by double clicking on the appropriate variable with the left mouse button and changing the attributes, referring to steps 5 and 6 from section 5.3.1 above. An example of editing a variable is also demonstrated in section 4.3.2, where Figure 4-9 shows how to edit the Low/High percentages for tornado analysis.

5.3.3 Adding/Removing Influences between Variables

Changes to the model logic must be undertaken with care. Deleting or adding an influence to the model will only modify the calculated result in the desired way when the definition, i.e. value or formula, for a variable has been amended to reflect the changes that have been made.

This section focuses on adding an influence between two existing variables that are not currently related, and then removing an influence between two variables with dependence between them.

To add an influence between two existing variables e.g. after adding a variable as described in section 5.3.1:

- 1) Ensure the Analytica software is in Edit Mode, and select the 'Edit tool' if it is not.
- 2) Select 'arrow tool' from the Analytica toolbar.
- 3) Click the left mouse button on the influencing variable, i.e. the input variable, and drag the mouse over the dependent variable. An arrow will be drawn between the two variables. The attributes of the precedent variable will display the dependent variable in the list of 'Output variables'. The attributes of the dependent variable will display the precedent variable in the list of 'Input variables'.
- 4) Double click the left mouse button to view the attributes of the dependent variable.
- 5) Change the definition of the variable to take account of the influencing variable. When entering a definition a drop down list appears that includes all of the inputs that influence the current variable. These inputs can be selected from the list. Using this drop down list can help to eliminate errors that may be generated by typing in the variable identifier manually.

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Figure 5-1 shows the Object window when the Definition attribute is being edited, and clearly shows the green tick to accept a change and the drop down list button to access the list of input variables.

🗊 Object - Fuel Ef	ficiency						
🔘 Objective 🔻 Fu	el_eff_tot	Units: Kg/flight	_				
Title: Fu	el Efficiency						
Description: Re	presents the average fuel	burn per flight 					
Definition: (To	r ▼ XV Inputs ▼ ot_fuel_a∳rport+Total_fuel_t	rna+Total_fuel_er)/Num_flights	ecac				
Value:	Calc						
Inputs: 🛆	Num_flights_ecac	Number flights (ECAC)	(Flights)				
C) Total_fuel_er	Total enroute fuel bu	(Kg) 🧮				
C) Total_fuel_tma	Total fuel burnt - TMA	(Kg)				
C) Tot_fuel_airport	Total fuel burnt man	(Kg)				
Outputs: 📿) Fuel_efficiency_imp2	Fuel Efficiency Importance2					
C) Fuel_efficiency_impo	Fuel Efficiency Importance					
C	Pct_change_2005	% change from 2005 (SESA	R target con 💌				
			\mathbf{F}				
Figure 5-1: Editing a definition							

To remove an influence between two existing variables:

- 1) Ensure the Analytica software is in Edit Mode, and select the 'Edit tool' if it is not.
- 2) Select 'arrow tool' from the Analytica toolbar.
- 3) Select the arrow between the two variables.
- 4) Press 'Delete' on the keyboard to remove the arrow⁷.
- 5) Double click the left mouse button to view the attributes of the previously dependent variable. Change the definition of the variable to remove the reference to the influencing variable. If the changes that have been made create an error in the logic of the model Analytica will provide a warning, and a yellow warning triangle will appear next to the definition.

5.3.4 Deleting a Variable

Deleting a variable is straightforward; however, it is best practice to remove influences to external variables prior to deleting the variable. Therefore, follow the second procedure outlined in section 5.3.3 prior to deleting the variable.

To delete the variable:

- 1) Ensure the Analytica software is in Edit Mode, and select the 'Edit tool' if it is not.
- 2) Follow the second procedure outlined in section 5.3.3 to remove influences to other variables.
- 3) Select the variable to be deleted.
- 4) Press delete on the keyboard to delete the variable.

⁷ Note that there is no user confirmation for this action.



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Please note that once a variable is deleted the action cannot be undone. Analytica does prompt the user with this information, but it is a point worth remembering.



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6 INPUT DATA

6.1 INTRODUCTION

This chapter describes the input data spreadsheet that provides a consolidated source of information for the influence model. The spreadsheet for deliverable D2.4.1-04d has been developed in Microsoft Excel and is titled 'Input Data Required – MASTER.xls'.

This chapter addresses the following aspects of the input data spreadsheet:

- Layout of the file;
- Description of data held in the file;
- Consistency checking;
- Sub-models for calculating inputs;
- Sources of data used.

6.2 LAYOUT OF THE FILE

On opening, the user of the file will be presented with an introductory worksheet, titled 'Notes'. This worksheet describes some of the most important aspects of entering the data that the user of the model should consider. Such considerations include:

- Colour coding of the cells. Data presented in blue text in the worksheet can be changed by the user. It is recommended that the user should not change the data presented in black text.
- Notes for entering data on fuel and time efficiency. Both value for fuel burn and value for duration per flight are entered separately by the user for the efficiency KPA, and it is the responsibility of the user to ensure that these inputs are consistent.
- Aircraft groupings. Different groupings of aircraft are used for different aspects on the model. For example, for aircraft spacing on approach the ICAO (International Civil Aviation Organisation) wake vortex categories are used. When the aircraft is at the airport the ICAO categories A-F are used, as these better reflect the relationship between the size of the aircraft and the facilities that are required at the airport.

A list of all variables in the workbook and the sheet on which they are located is also displayed.

The data required by the influence model is presented in the data input spreadsheet. The colour of the tab for each worksheet is colour coded according to the KPA. Figure 6-1 presents a screenshot of the opening worksheet of the data input spreadsheet. It clearly shows the 'Notes' spreadsheet. The following seven tables of the spreadsheet are coloured purple to match them to the colour of the Efficiency KPA in the Analytica model. The next tab relates to the Knock-On Effect focus area, which is coloured green to match it to the Predictability KPA in the Analytica model. The next three worksheets are coloured orange to match them to the colour of the Capacity KPA in the Analytica model. The last worksheet in view is coloured blue as this contains data used in all KPAs in the Analytica model.



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Figure 6-1: Opening worksheet of the input data spreadsheet

6.3 DESCRIPTION OF DATA HELD IN THE FILE

The scope of the influence model and the detail included means that a large amount of information is required to run the model. The data can generally be broken down into two categories:

- Baseline data: data that refers to the business as usual scenario. To fit in with the notation used by SESAR the model refers to this scenario as IP0 (Improvement Package zero). This data is required to provide a baseline, or business as usual, measurement for the three years that are being assessed: 2006, 2013 and 2020.
- Data with operational improvements: data that includes the impact of the operational improvements on performance. This data is required for the years 2013 and 2020. The year 2013 is assessed with IP1 improvements included in performance. The year 2020 is assessed with IP1 improvements only and with both IP1 and IP2 operational improvements having been implemented.

	Baseline	With Operational Improvements		
Year	IP0	IP1	IP1 + IP2	
2006	~			
2013	~	\checkmark		
2020	\checkmark	\checkmark	\checkmark	

Table 6-1: Summary of scenarios and data requirements

Furthermore, in a number of cases this is broken down further into 'optimal' data and current data. Optimal data is considered to be the value taken when the system is working optimally.

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For example, the unimpeded taxi time, which can be compared to the actual time taken to taxi when encountering congestion and queuing prior to take off.

Continuing this example, for taxiing fuel burn, the following data is required:

- The baseline data (IP0) requires:
 - Average fuel burnt per flight in kilograms for unimpeded taxiing at each airport for the years 2006, 2013 and 2020;
 - Average fuel burnt per flight in kilograms as a result of taxiing delay encountered at each airport for the years 2006, 2013 and 2020.
- With operational improvement data requires:
 - Average fuel burnt per flight in kilograms for unimpeded taxiing at each airport for IP1 in 2013 and 2020, and IP1 plus IP2 in 2020;
 - Average fuel burnt per flight in kilograms for the taxiing delay encountered at each airport for the years 2006, 2013 and 2020.

The input data spreadsheet is set up to enable the user to capture all of this information, which is linked to the Analytica influence model.

Table 6-2 presents an example of one of the data input tables in the Excel input data sheet for 22 of the 145 airports that are included in the influence model. The inputs for the remaining airports can be accessed by scrolling down in the input data spreadsheet. It shows the input for the average fuel burnt per flight in the arrival TMA, both for the baseline (IPO) and for the values with OI step influences.

				Average fuel burn	TM/	A arrival (Kg/flight)		
		Baseline values					Value	s with OI	step influences
					1			2020	
Airport	2006 IP0	2013 IP0	2020 IP0	Current source/Assumptions		2013 IP1	2020 IP1	IP1+IP2	Current source/Assumptions
LONDON HEATHROW	310	310	310	None - Illustrative value only		270	210	210	None - Illustrative value only
LONDON LUTON	310	310	310			270	210	210	
LONDON GATWICK	310	310	310			270	210	210	
LONDON CITY	310	310	310			270	210	210	
LONDON STANSTED	310	310	310			270	210	210	
AMSTERDAM/SCHIPHOL	310	310	310			270	210	210	
PARIS-CHARLES DE GAULLE	310	310	310			270	210	210	
PARIS-LE BOURGET	310	310	310			270	210	210	
PARIS/ORLY	310	310	310			270	210	210	
BRUSSELS-NATIONAL	310	310	310			270	210	210	
BERLIN-SCHONEFELD	310	310	310			270	210	210	
BERLIN-TEGEL	310	310	310			270	210	210	
FRANKFURT/MAIN	310	310	310			270	210	210	
KOLN/BONN	310	310	310			270	210	210	
HELSINKI-VANTAA	310	310	310			270	210	210	
BELFAST/ALDERGROVE	310	310	310			270	210	210	
BELFAST CITY	310	310	310			270	210	210	
KOBENHAVN/KASTRUP	310	310	310			270	210	210	
STOCKHOLM/ARLANDA	310	310	310			270	210	210	
STOCKHOLM/BROMMA	310	310	310			270	210	210	
MADRID/BARAJAS	310	310	310			270	210	210	
MILANO/MALPENSA	310	310	310			270	210	210	

Table 6-2: Example data input table

These inputs are presented in blue text, which means the user may update this data if more accurate data is available from simulations or other sources.

The user of the spreadsheet must ensure that all of the cells are completed with appropriate data. Failure to do so will mean that the results of the model execution will not be valid, and neither the spreadsheet nor the Analytica model will identify an error unless the error is severe enough to stop the model from running. Therefore, it is of the utmost importance to ensure that data is entered into the model correctly.





6.4 CONSISTENCY CHECKING

The responsibility for ensuring that the input data that is used in the model is consistent lies with the user of the model⁸. For example, the model requires the user to input both fuel burnt in various phases of flight and also the time spent in each of these phases. Therefore, it is the user's responsibility to ensure that the fuel burnt and time spent are consistent.

In some simple cases, such as the input for en-route fuel burn and time spent, a simple consistency check is presented. A grey box beneath the data input tables shows the ratio of fuel burnt to time, which should not change considerably between years or scenarios. Such a check does not, however, ensure that the data is fully consistent or correct but is a simple way to identify potential inconsistencies in the data input.

Table 6-3 presents a screenshot of the en-route fuel burn input data table. Underneath the input data tables, there is a consistency check, presented as grey boxes. It shows that there is not a considerable difference in the rate of fuel burn. A large difference in these values would highlight a potential inconsistency between the input of the fuel burnt and duration in the en-route phase of flight.

Average Fuel burn (Kg/flight)				
<u> </u>			Baseline	values
	2006 IP0	2013 IP0	2020 IP0	Current source/Assumptions
Average Fuel burnt on Direct (GCD) route	4,171	4,317	4,463	Use PRU 2007 average that is 4:
Average Fuel burnt ER due to additional distance	125.1	129.5	133.9	5,8% inefficiency in distance PRL
Average Fuel burnt ER due to vertical deviations	23	23.8	24.6	PRU 2007 for 2006
Average flight duration (minutes/flight)			Baseline	values
	2006 IP0	2013 IP0	2020 IP0	Current source/Assumptions
Average Duration on Direct (GCD) route	127.8	132	138.6	EP3 ECAC wide simulation on 3
Average Extra time ER due to additional distance	4	4.2	4.3	PRU for 2007 and 8% more extra
Average Extra time ER due to vertical deviations	0	0	0	PRU for 2007
Check data - average rate of fuel burn (Kg/min)	33	33	32	
	31	31	31	
	#DIV/0!	#DIV/0!	#DIV/0!	

 Table 6-3:
 En-route fuel burn input data showing consistency checking

6.5 SUB-MODELS FOR SUPPORTING EXPERT JUDGEMENT

The data inputs for the influence model often require a simulation of validation exercise to inform the model. Without such data the model relies heavily on expert judgement. To help inform expert judgement number of sub-models have been developed. These sub-models can be used by the user of the model to provide some estimates for input data based on a number of assumptions.

These sub-models are identified and described in the 'Notes' worksheet at the start of the Excel data input spreadsheet.

⁸ The current modelling strategy is to demonstrate the techniques and example outputs. It was not possible to include any data checking functionality at this stage within the timescales. For the scope of this initial model, this function has to be carried out by the user.

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6.6 SOURCES OF DATA USED FOR VERSION 3.0

The data that currently exists in the input data spreadsheet is predominantly based on expert judgement. There are however some references to EUROCONTROL studies and simulations that have been carried out. Sources of information so far include:

- Performance Review Reports (PRRs) of the Performance Review Commission (PRC);
- EP3 ECAC wide simulation of fuel burn for three reference days;
- Airport Air Quality Guidance Manual, preliminary edition published by ICAO in 2007.

Other sources of data should be recorded in the inputs data spreadsheet when improved data is available.



7 HOW DATA IS LINKED BETWEEN ANALYTICA AND MS EXCEL

7.1 INTRODUCTION TO OLE

This chapter describes how OLE links are used to link the Analytica model with the Excel data input spreadsheet.

OLE linking makes it possible to link data in Analytica to and from external applications. With OLE linking, changes to inputs or results are automatically and instantaneously propagated between applications. This chapter describes how to exchange data between Analytica and the Excel data input spreadsheet used by the influence model.

The Analytica model file has been supplemented by the Excel data input file. This enables the user to input the data for the model in the familiar environment of MS Excel.

Another benefit of inputting data directly into MS Excel is that there are a large number of multi-dimensional tables in the Analytica model. Navigating through such a model and ensuring that all of the dimensions of the model are input correctly is a complex task and is one that could be a possible source of error in the model.

7.2 LINKING PROCEDURE

The steps required for creating a linked edit table in Analytica with data from an Excel spreadsheet are:

- 1) In Excel, select the cells you want to link to Analytica and choose Copy from the Edit menu.
- 2) In Analytica, select the edit table where you want the Excel data linked.
- 3) From the Edit menu or the right mouse button pop-up menu, choose Paste Special. The Paste Special dialog appears.
- 4) In this box, choose the option Paste Link, select Text from the As list, and click OK.

For further information about how to use the OLE functions in Analytica please refer to the Analytical User Guide.



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8 QUICK START GUIDE

This chapter provides a step-by-step guide to opening and using the EP3 Influence Model.

#	Objective	Action required	Hints and tips
1	Obtain the latest Influence Model files.	Go to the Episode 3 website and download the latest version of the Influence Model (IM) and MS Excel Input Data spreadsheet. Save the files in the same folder on your PC.	The user must be registered to the Episode 3 website. For further enquiries <u>click here</u> .
2	Open the data spreadsheet and Influence Model.	Open the MS Excel data input spreadsheet. This will ask whether the user wishes to update links within the spreadsheet. Click yes to update the links.	Updating the links for the spreadsheet automatically opens the Analytica model file. The user must have Analytica installed.
3	Open the focus area that the user would like to review.	On the front page of the influence model double click on the focus area to be reviewed. This will present you with the top level influence diagram for that focus area.	The focus area modules are colour coded according to KPA.
4	Navigate through the model.	Navigate through the model, double clicking on modules to go a level deeper into the model, to find the node to be reviewed or changed.	See Section 4.3. Click on the 'Diagram Window'; see Figure 4-3, to go back up one level. Additional details regarding the structure of the model are presented in the Influence Model Description Document. This should be used in conjunction with using the model.
5	View results	To view results/values of variables and KPIs, select the variable and click on the 'Show Result' icon in the Analytica interface.	See section 4.3.1.
6	Undertake action required by user:	Details of how to change the influence model are described in the following sections:	If the user has Analytica Player installed only, changes cannot be made to the model.
	а	- adding a variable;	See section 5.3.1 – Adding a Variable.
	b	- editing a variable;	See section 5.3.2 – Editing a Variable.
	с	- deleting a variable;	See section 5.3.4 – Deleting a Variable.
	d	- changing an influence in the model.	See section 5.3.3 – Adding/Removing Influences between Variables.
	е	Input data changes.	See section 5.2 – Input Data Changes.
7	Save the model	Save the Analytica model by clicking on File and then Save As.	Similar to saving any file in the Microsoft Windows PC environment.
8	Version control	Click on the 'Object Window' when at the overview of the influence model, with all focus areas listed.	See Figure 4-3 to see the Object Window Icon on the Analytica toolbar.
		The Object window will appear and the properties of the model can be changed.	
9	Save the MS Excel spreadsheet	Click file and save to save the MS Excel spreadsheet.	

Table 8-1:

Quick start guide



9 HOW TO UNDERTAKE AN ASSESSMENT

9.1 INTRODUCTION TO PERFORMING AN ASSESSMENT

Performing an assessment is not trivial – it is not as simple as just pressing an button and obtaining results. Much work is required to define the data requirements for running the model and validation exercises, studies, research and expert judgement is required to populate the model with data. This section takes a brief look at the steps required to perform an assessment.

9.2 IDENTIFY THE SCENARIOS TO BE ASSESSED

The scenarios to be assessed are currently defined in the influence model. These are the baseline scenarios for 2006, 2013, and 2020 with no operational improvements i.e. IPO. Scenarios for the years 2013 and 2020 with IP1 OI steps only, and then a scenario for the year 2020 with OI steps for and IP1 plus IP2 included. This provides the years for which data is required to populate the model, both for the baseline and for the case with operational improvements.

9.3 DATA REQUIREMENTS

The data requirements for the performance assessment also need to be assessed. The data that is required to populate the model is held within the Excel data spreadsheet "Input data required – MASTER". This is broken down into data required for baseline scenarios and data required for scenarios with operational improvements, where relevant. This data should be reviewed and sources of data for each of the elements of data that are required should be identified. The process for identifying the data could take the following form:

- Use sub models, as presented in section 6.5 to help inform expert judgement to populate the model;
- If no sub-models exist for the data then initial expert judgement will be required to populate the model;
- The data that is based on initial expert judgement should then be improved. This improvement can take the following forms:
 - o Simulations;
 - Validation exercises. Validation exercises can actually be defined during the data requirements stage to ensure that the validation exercises output the data required to populate the model;
 - o Improved expert judgement through discussions with expert groups.

Any process, source or assumptions used or made should be recorded in the Excel spreadsheet alongside the relevant data.

9.4 TRANSFERRING THE DATA INTO THE MODEL

The data to be used should be input into the Excel spreadsheet. This will ensure that it feeds the model at the appropriate variable. See section 6 for more information on entering data into the Excel spreadsheet.

The consistency of the data is the responsibility of the user of the model. The user of the model must ensure that ALL of the data within the model is consistent. This requires all of the model data to be checked thoroughly in the excel spreadsheet prior to the execution of the model, and consistency checks, as described in section 6.4 should be observed.



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9.5 RUNNING THE MODEL

Section 4 presents an overview of the Analytica model file and includes navigating through the model, reviewing results and the scope of quantification in the model. However, the user must always recognise that the outputs of the model will always be reliant on the data being reasonable and correctly input.



10 REFERENCES

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END OF DOCUMENT