

Methods and Models Database for Analysis of Small Scale Contingencies

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ABSTRACT

Currently not too many methods and models exist for the relatively new field of analysing Small Scale Contingencies (SSCs) under Operations Other Than War (OOTWs). To facilitate exchange of knowledge on methods and models that do exist for this analysis of SSCs, the NATO SAS-027 Technical Team "Analysis of Small Scale Contingencies" has established a database for recording and cataloguing these items.

INTRODUCTION

Analysis of Small Scale Contingencies (SSCs) for Operations Other Than War (OOTW) is complex. As stated in other SAS-027 contributions to the Cornwallis VII conference, the problem scope is much wider than for traditional theatre wars and therefore requires new approaches to explore new fields of analysis.

Because of this wide problem scope and the complexity of the problems at stake, a need for good methods and tools for analysis arises. Existing tools developed for analysis of traditional theatre wars often do not suit the problem at stake well enough, so new methods and tools are required. At some locations relevant developments in this field can be distinguished, but because of their rarity it is hard to get a good insight in available methods and tools or in new developments.

The NATO SAS-027 Technical Team "Analysis of Small Scale Contingencies" decided to mend this problem by designing a database for multinational knowledge exchange on methods and tools. The database was designed in Microsoft Access 97 and populated by all

participating countries¹ in SAS-027 with their methods and models specific for OOTW analysis or at least somehow useable for OOTW analysis. This database was then distributed among all participating countries.

A first impression of the database user interface is shown in Figure 1. It allows a user to report all available items, to search items having specific features and to edit the items in the database.

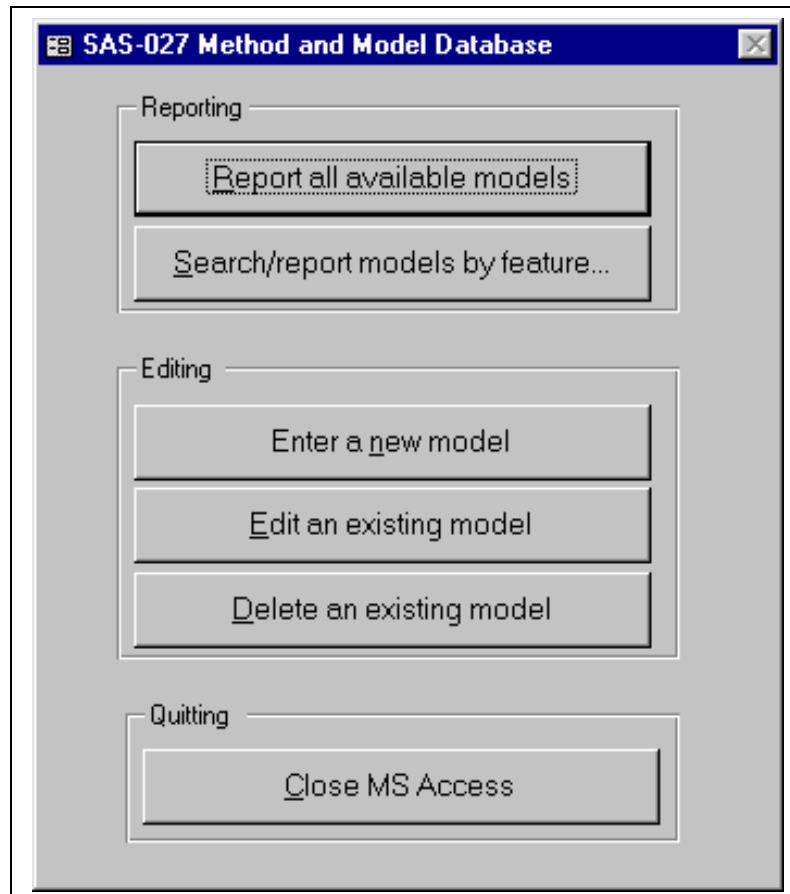


Figure 1: SAS-027 Method and model database interface.

COVERED DATA

The data covered by the database are divided into six main areas:

1. **General information.** This area includes the name and description as well as an indication whether it concerns a method, a model or both. A method is considered a general description of an approach that does not use significant, specially for that purpose developed, software tools. A method may, however, use standard tools like spreadsheets, word processors or standard LP solvers. A tool is considered a software item specifically developed for that purpose. Sometimes a tool is part of an extensively described method, in which case

¹ UK, Australia, Canada, France, Georgia, Italy, NC3A, Netherlands, Norway, Sweden, Turkey, USA.

the item is both a tool and a method. The general information also covers an imperative indication to what extent the item is OOTW specific (ranging from specifically developed for OOTW up to not specifically developed for OOTW and of little use for that purpose), the status (conceptual, under development, in operation for a specified number of years or obsolete) and a typification (like '(war)-game,' 'force structure balancing,' or 'probability theory'). An example of a model is given below.

The screenshot shows a software window titled 'Model Information'. On the left, there is a 'Topics' sidebar with buttons for 'General Information', 'Measures of Merit', 'Resources Required', 'Software Implementation', 'Domain Information', and 'Other Information'. The main area is titled 'General Information' and contains the following fields:

- Name:** Analysis of Mobility Platform (AMP)
- Description:** AMP provides a common platform for the operation of a suite of transportation models, simulations and tools which provide an end-to-end assessment of the strategic deployment of units and sustainment stocks from origin to final destination. Primary OR methodology within the component models is simulation based on rule sets and heuristic algorithms. AMP tracks all
- Value for SSC Analysis:** AMP enables rapid transportation analysis. AMP is a general model but also applicable to SSC issues.
- Countries:** A list box containing Australia, Canada, France, Georgia, Germany, and Italy. Below it is an 'Add Country...' button.
- Class / Type:** A list box containing War-game, Artificial intelligence, Automated information system, Calculation, Concurrency Analysis Model, and Database. Below it is an 'Add Class / Type...' button.
- Status:** In operation (nr. of years) with a dropdown arrow and a value of 1.
- Category:** Method and model (software)
- OOTW specific:** Not developed for OOTW but of good use

At the bottom of the main area are two buttons: 'Save the information above' and 'Points of Contact...'. A note in the top right corner states: 'NOTE: In the listboxes on this screen it is possible to select more than one item (multiple select).' A 'Back to main menu...' button is located at the bottom left of the sidebar.

Figure 2: General information interface.

2. **Measures of Merit (MoMs).** This area includes five separate lists of MoMs, each list at a different level at the MoM hierarchy as discussed in another NATO SAS-027 Technical Team contribution to Cornwallis VII. The levels discerned are Measure of Policy Effectiveness (MoPE), Measure of Force Effectiveness (MoFE), Measure of Effectiveness (MoE), Measure of Performance (MoP) and Dimensional Parameter (DP).

An example of several MoMs related to a model is given below. For each level at the MoM hierarchy multiple MoMs can be selected and so linked to the model. The user of the database can also easily add new MoMs to the database, if required.

3. **Resources.** This includes the manpower to maintain expertise, manpower for a typical application and special facilities required to practice the method or model.
4. **Software application.** This includes the programming language, operating system and hardware requirements of the software application. Obviously,

this is only relevant for a model or for a combined method and model, as a pure method has no specific software implementation related to it.

5. **Domain information.** This includes the operational phases and problem types for which the item is applicable. Examples of phases are ‘planning,’ ‘preparation,’ or ‘initial deployment.’ Examples of problem types are ‘operational planning’ or ‘mission rehearsal.’ The domain information also covers the levels of aggregation, tasks and parties handled by the item. Examples of the level of aggregation are ‘individual systems,’ ‘battle group,’ or ‘theatre.’ Examples of tasks are ‘combat engineers,’ ‘evacuation,’ or ‘protection,’ while some examples of parties are ‘armed forces,’ ‘refugees,’ or ‘domestic government.’

Figure 3: Measures of merit interface.

6. **Other information.** This includes a description of the item's strengths and weaknesses, a SSC track record, documentation references, points of contact for further information and any freely describable additional information.

AIMED APPLICATION

The main application of the database is finding methods or models that meet an analyst's specific requirements. The analyst must be able to search, for instance, all known methods applicable for wargaming using linear programming techniques. Figure 4 shows how the analyst can make his selection and find all items satisfying all or some of these required features. The database will then generate a report on the appropriate items.

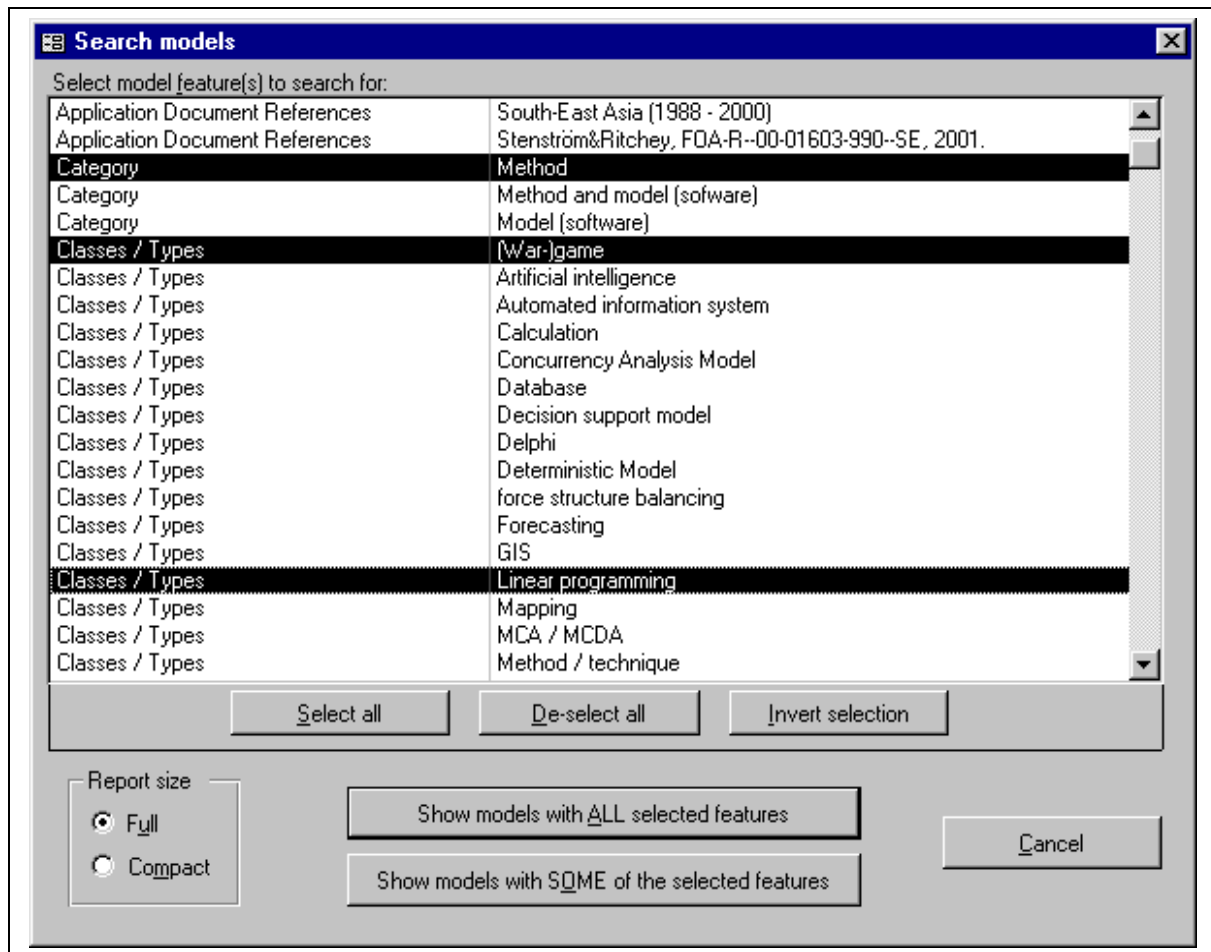


Figure 4: Analysis selection interface.

MANAGEMENT AND STATUS

At the moment the database has been populated once and no formal periodic update procedures are prevailing. Therefore the database is currently a mere snapshot of the state of the art. Maybe in the future some update procedures will be established. Use of this database is open to all SAS-027 members. Currently the database holds seven methods, 22 models, and 14 combined methods and models. An example of a report generated on a model is given in Figure 5.

CONCLUSIONS

To facilitate the development of methods and models for the comparatively new field of analysis of Small Scale Contingencies, a database is constructed by a NATO Working Group, containing available models and features of these models from several countries. It is hoped that this database improves knowledge exchange between countries as well as reuse of existing methods and models.

SAS Model Database - [ReportModelsAll : Report]

File Edit View Tools Window Help

100% Close

All SAS-027 Methods and Models

Analysis of Mobility Platform (AMP)

Description: AMP provides a common platform for the operation of a suite of transportation models, simulations and tools which provide an end-to-end assessment of the strategic deployment of units and sustainment stocks from origin to final destination. Primary OR methodology within the component models is simulation based on rule sets and heuristic algorithms. AMP tracks all requirements within a deployment or sustainment scenario to include airlift, sealift, in place/forward deployed forces, and ashore and afloat pre-positioned assets. The dynamic sustainment generation algorithm can be synchronized to the combat situation of the scenario to properly account for increased consumption during periods of heightened activity. The theater component of AMP simulates the movement of arriving units and stocks from the air and seaports of embarkation to the destination specified in the TPFDD. These movements are simulated over the in theater infrastructure (trucks, aircraft, ships, trains, associated networks, and holding/staging areas) to determine the capability of that infrastructure to support the required movements. The in theater network may be defined from a rudimentary link and node level through highly detailed networks, i.e., bridge strengths, tunnels heights, etc. Included in the AMP suite are several supporting tools that enhance the analyst's ability to set up the scenario. These include the TPFDD Editor (ETEdit), a map-based query and display tool (Open Map) and an experiment capability which allows an analyst to set up parametric changes to the scenario and then make sequential runs for analysis.

Value for SSC analysis: AMP enables rapid transportation analysis. AMP is a general model but also applicable to SSC issues.

Strengths: Views reported readiness of units assigned to an SSC

Weaknesses: Can only display U.S. Forces because other NATO forces do not report readiness in the U.S. GSORTS system.

Special requirements:

Special facilities: PC/Sun workstation

Effort for analysis: 1 well-trained person

Effort for maintenance: 1 well-trained person

Additional information:

- * **Category**
Method or model?
 - Method and model (software)
- * **Classes / Types**
What is the type of the model?
 - Simulation
- * **Detail levels**
What level of aggregation is used by the model?
 - Individual system level
- * **Domains**
On what types of problems is this model applicable?
 - Operational planning
- * **Nationalities**
By what countries is the model developed / in use?
 - USA

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Figure 5: An example of a report generated on a model.