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## **Chapter 3 – DATABASE ISSUES FOR NLT**

### **3.1 THE NEED FOR A DATABASE**

While there are many areas of knowledge that bare on military and police technologies, the focus on NLT/NLW as a separate discipline is relatively new. As with any new field of study, the relevant information, facts, and opinions need to be assembled, organized, and stored in a manner that allows rapid search and retrieval. Collectively, this assembly of information and means of its management is referred to as a database. A database on NLT/NLW could be used, for example, to draw conclusions, make decisions, solve problems, make predictions, create and validate models, evaluate the sufficiency of data on a particular topic, provide design criteria for potential systems, and choose the best NLW for a particular military scenario. A well-developed database would also be useful to rapidly address questions that might arise during or immediately after the use of an NLW, including inquiries from the press and public. A database for NLT/NLW needs to be highly dynamic in order to best serve this rapidly developing field.

### **3.2 ISSUES IN DEVELOPING AN HFM-073 NLT DATABASE**

At the beginning of the work of HFM-073, we planned to develop an actual NLT database for use by the Technical Team, the HFM Panel, and other NATO organizations. In particular, it was anticipated that the desired database would be transferred to SAS-035 to supply data for the model being developed by that team (see Section 1.4). We reviewed existing databases from several member countries, including Germany, the Netherlands, United Kingdom, and United States, and evaluated the requirements for developing a common HFM database. It was agreed that ideally a joint database should be developed through the contributions of many participating countries, thereby sharing the work and cost. However, this goal proved impractical. A summary of the issues that impeded the completion of this objective is provided below.

#### **3.2.1 Choice of Computer Software**

A contemporary database must be computer-based. It must be portable among user computer capabilities, or be exportable to other capabilities, or reside on a host computer that can be remotely accessed by everyone involved, probably via the Internet. Existing attempts to start NLT databases have used a mixture of custom (non-commercial) software or custom database formats based on Microsoft Access. Several members expressed dissatisfaction with the approach they were currently using. Some of the existing databases are little more than a collection of original papers and reports. It was obvious that a solution with much more sophisticated search capabilities would be needed. The database being developed by the United States Joint Non-Lethal Weapons Directorate Human Effects Centre of Excellence uses the commercial database program “AskSam.” The host computer for this database is located at Brooks City-Base, TX, USA, and was readily demonstrated to HFM-073 over the Internet at the meeting in the Netherlands. This program appeared to have the features and search capabilities required for a useful database. However, other issues blocked the development of an HFM-073 database, so no software was officially selected by the Team.

#### **3.2.2 Obtaining Sufficient Resources**

After reviewing the requirements for an adequate database it became apparent that building one would be a very time consuming and expensive endeavour. There would be both start-up and continuing costs for software, hardware, communication links, and systems management. Data management and data entry

personnel would be required. The content of the database would need to be acquired and evaluated, requiring the considerable time of specialists in the relevant disciplines (e.g., science, engineering, medicine, political science, psychology). As none of the members of HFM-073 was able to provide either the financial, system, or human resources required, lack of resources was a significant impediment to developing an HFM-073 database.

### **3.2.3 Restricted Information**

Another issue that complicated and impeded the development of a common HFM-073 database was the various restrictions that are placed on data sharing. This issue becomes greater as the information become more detailed, relevant, and recent and, therefore, useful. Some data are classified at various security levels, including “For Official Use Only”, Restricted, Secret, and Top Secret. In addition, the compilation of unclassified data, as would be done in a database, may itself become classified. Data that are developed by for-profit industry often have proprietary or ownership issues. The team allowed that a database with different levels of access was possible, e.g., some data open to everyone and other data restricted to holders of a NATO clearance, but this approach would further complicate and increase the expense of the database. The existing databases were said to have a mixture of types of restricted and unrestricted information and separating them out for different audiences would require additional expense, time, and the judgement of trained security officials.

### **3.2.4 Data Availability**

It was the Team’s assessment that there was very little relevant data available on the human effects of NLT and that the data which were available were of varying quality and usefulness. The Team observed that the concept of “data” and “useful data” seemed to have vastly different meaning to different people and groups. Because of the importance of data and the common misunderstanding of its complexity, we developed a review of the fundamental nature of data to allow all parties involved to have a reference for a common understanding (Annex G).

## **3.3 A MULTI-TIERED DATABASE STRUCTURE**

Because of the issues described earlier in this section, the Technical Team agreed that its database activity should be focused on general topics. Following considerable discussion, a conceptual process and approach for organizing a database for the Human Effects of NLT/NLW was developed by HFM-073. Our approach involves placing human effects information within the context of a total knowledge-base for NLT/NLW. A four-tiered structure is proposed, with the simplest tier on the bottom. In the proposed database scheme, Tier I is similar to a computer searchable list of published references. Tier II is matrix of data available for the various proposed non-lethal **technologies**. Tier III address the human effects data available, extrapolated, or modelled for specific non-lethal **weapons** that are currently in use or are under development. Tier IV is a high-level decision tool for commanders. With successive tiers, the information becomes more and more directly relevant to using specific non-lethal weapons in specific military operations. With successive tiers, more knowledge and experience is required for proper data evaluation and classification. The lower tiers are based more on scientific considerations, while the upper tiers are based more on considerations that are practical, weapon-oriented, and scenario-driven. Similarly, the higher tiers are much more likely to contain proprietary and classified data. An essential aspect of our concept is that the data in any upper tier can be traceable to the previous tiers. A diagram of the proposed database structure is shown in Figure 2.

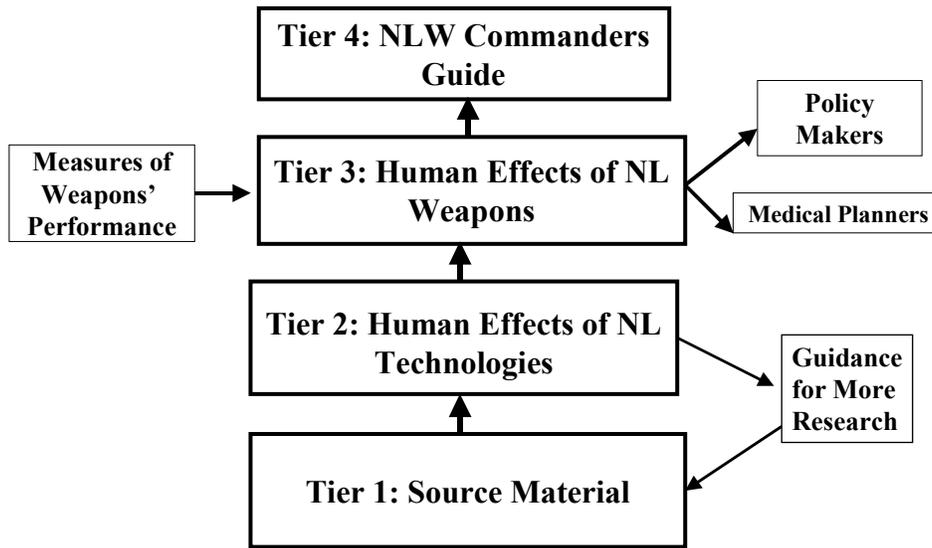


Figure 2: A Multi-Tiered Database for the Human Effects of NLW.

### 3.3.1 Tier 1 – Primary Source Material

Tier 1 is proposed as a searchable library of references, documents, and other recorded material relevant to the human effects of NLT. It could contain information in any form, including raw and processed data, text, pictures, animation, video, and audio. Ideally, the complete material would be searchable electronically, but, at a minimum, the title (or brief description), source, summary, and keywords would be coded. Intelligent coders and data entry personnel are required to create Tier 1. While Tier 1 could contain both restricted and unrestricted material, it is likely that most of the material will be unrestricted, making it available for academic, civilian, and multi-national use. It is envisioned that Tier 1 will not include much information on specific NLW. Tier 1 will be useful to those evaluating the basis for current beliefs (e.g., so called conventional wisdom), for authors writing summaries of the state-of-knowledge on a particular topic, and for experimentalists designing new research. It will provide the source data for developing Tier 2.

While Tier 1 is proposed to be fully searchable, the Technical Team discussed the types of data entry fields that might be useful. The primary classification should be by technology (see Annex H). The source of the data should be coded (e.g., animal experiments, human experiments, field report, accident, analysis of incidents, lessons learned, experiences, debriefings, modelling, anecdotes, theoretical, historical, opinion). The nature of the effects measured should be identified (e.g., environmental, biological, psychological, sociological, medical, physical). The nature of the data (e.g., quantitative vs. qualitative) should be noted, as described in Annex G.

### 3.3.2 Tier 2 – The Human Effects of Non-Lethal Technologies

Tier 2 will provide an evaluation and organization of the data found in Tier 1. Tier 2 might be thought of as a critical review of the existing data, organized in tables of numbers and text, or in figures, diagrams, and mathematical curves that can be conveniently searched and retrieved. It is basically a computerized “review article”. Subject matter experts are required to organize and populate Tier 2, making it inherently more

difficult to create than Tier 1. In developing this database it will become apparent where data are lacking and where additional research is needed. Although incomplete without the existing classified information, Tier 2 will still be useful at the unclassified level. It will contain links to models that predict effects of NLT. The Tier 2 database is expected to be useful to experimenters, equipment designers, policy makers, and medical planners.

We suggest that a primary means of organization for Tier 2 be the NLT area (see Annex G) and intended and unintended effects. Beyond these classifications, the possible categorization schemes are unlimited. Desired effects include incapacitation, repel, immobilization, sensory loss or distortion, area denial, distraction, annoyance, reduced communication, warning, disorientation, etc. Metrics of these effects include level achieved, onset time, duration, and total recovery time. Possible unintended effects range from lethality to minor injury or psychological trauma. Such effects may recover quickly or last for a lifetime. The modification of potential effects by environmental (e.g., weather) or personal (e.g., drug use, clothing, special sensitivity) factors has enormous possibilities. The possible preventative and treatment medical issues are also extremely important for planning triage, treatment, and recovery actions for targets, operators, and bystanders exposed to NLT.

### **3.3.3 Tier 3 – The Human Effects of Non-Lethal Weapons**

The difference between Tier 2 and Tier 3 is that Tier 3 is based on specific weapons systems. Tier 3 will require knowledge of the measures of performance (MOP – see Annex H) of existing or potential weapon systems, e.g. the type of energy, dispersion, range, incidental emissions. Much of the information for this database will be derived from extrapolations based on data included in Tier 2, but additional information on operational goals, rules of engagement, and policy will be required from planners, policy makers, and commanders. Through the use of models, such as the one developed by SAS-035, the information from Tier 3 will provide an assessment of the operational utility and effectiveness of specific or potential NLW systems. Such a database will assist planners in deciding the best course of action to achieve a particular objective.

### **3.3.4 Tier 4 – Commanders Aid**

Tier 4 is envisioned as a high level decision tool for military commanders in choosing and establishing the rules of engagement for specific NLW in a specific operation. It is a distillation of information that is based on and is traceable to the data provided in the lower three Tiers. In addition to the expertise required to develop Tier 3, the completion of Tier 4 will require the input of experienced field commanders.

## **3.4 THE FUTURE OF AN NLT/NLW HUMAN EFFECTS DATABASE**

Establishing a database to cover all the technologies envisioned for NLW will be expensive and complicated, even if it were limited to existing data. However, we believe that there exist very few existing data of the type that would be suitable for Tier 2 of the proposed database or that could be used in the model developed by SAS-035. Any matrices developed for Tier 2 will have a lot of blank cells; there is far more to learn than is already known. The collection of good, dose-response data is accomplished one experiment and one datapoint at a time and is tedious and expensive. Thus, the completion of a complete Human Effects Database is likely to be very slow. The best we can propose is that a common structure for the rapid assimilation of new NLW human effects data be agreed upon among NATO nations and that the NLT/NLW database be built in this structure as data become available.