Chapter 1 – BACKGROUND TO NATO ACTIVITIES ON NON-LETHAL WEAPONS (NLW)

1.1 INITIAL NATO NLW ACTIVITY: 1994 – 1997

In 1994, the North Atlantic Treaty Organisation (NATO) Conference of National Armaments Directors (CNAD) tasked the Defence Research Group (DRG), one of the precursors to today's Research and Technology Organisation (RTO), to create a Specialist Team to study the possible contributions NLW could make to NATO crisis management, peacekeeping, and peace support operations. In March 1966, this DRG team issued its report to the CNAD [1.7.1]. In August 1966, the CNAD reported the findings [1.7.2] to the North Atlantic Council (NAC), the highest decision-making body of NATO, and forwarded them for comment to the Military Committee, a group parallel to the CNAD but consisting of high-ranking military personnel. On 27 September, the NAC agreed to consider the policy aspects of NLW, including the pertinent political, legal, ethical, and moral issues and formed the NLW Policy Team in August 1997.

On 19-20 September 1996, the DRG organized an international seminar in Pisa, Italy, titled "37th DRG Seminar on Non-Lethal Weapons" [1.7.3], which was NATO's first conference on NLW. The only presentation at this Seminar on the human effects of NLW was "Health and Safety Issues for Non-Lethal Technologies" by Michael R. Murphy.

1.2 NATO POLICY ON NLW: 1998 – 1999

The report of the NLW Policy Team [.17.4] and deliberations of the CNAD led to the issuance of a NATO Policy on NLW on 27 September 1999 1.7.5], three years to the day after the Team was authorized by the NAC. From the perspective of human effects, some salient points from this policy are:

- **Definition of NLW:** "Non-Lethal Weapons are weapons which are explicitly designed and developed to incapacitate or repel personnel, with a low probability of fatality or permanent injury, or to disable equipment with minimal undesired damage or impact on the environment."
- **Objectives for NLW Use:** "Non-Lethal Weapons should enhance the capability of NATO forces to achieve objectives such as (not necessarily in priority) to: (1) accomplish military missions and tasks in situations and conditions where the use of lethal force, although not prohibited, may not be necessary or desired; (2) discourage, delay, prevent, or respond to hostile activities; (3) limit or control escalation; (4) improve force protection; (5) repel or temporarily incapacitate personnel; (6) disable equipment or facilities; (7) help decrease the post-conflict costs of reconstruction."
- **Caveat on Non-Lethality:** "Non-Lethal Weapons shall not be required to have zero probability of causing fatalities or permanent injuries. However, while complete avoidance of these effects is not guaranteed or expected, Non-Lethal Weapons should significantly reduce such effects when compared with the employment of conventional lethal weapons under the same circumstances."
- **Direction to Planners:** "NATO planners shall ensure that the potential contribution of Non-Lethal Weapons is taken fully into account in the development of their plans."
- **Minimal Characteristic of NLW:** "They must achieve an appropriate balance between the competing goals of having a low probability of fatality or permanent injury, with minimal undesired damage, and a high probability of having the desired effects."

- **Compliance with Existing Regulations, etc.:** "The research and development, procurement and employment of Non-Lethal Weapons shall always remain consistent with applicable treaties, conventions and international law, particularly the Law of Armed conflict as well as national law and approved Rules of Engagement."

1.3 NATO ROADMAP FOR NLW: 1999 – 2000

At its April 1999 Washington Summit meeting, NATO approved a Strategic Concept to equip the Alliance for the security challenges and opportunities of the next century and to guide its future political and military development [1.7.6]. Among new focus areas were crisis management and peacekeeping activities. New threats included ethnic conflict, abuse of human rights, political instability, and terrorism. The strategy called for military capabilities that will be effective under the full range of foreseeable circumstances and specifically called out (1) ability to engage opposing forces effectively; (2) deployability and mobility; (3) survivability of forces and infrastructure; and (4) sustainability and interoperability. There is a clear potential for NLW to help address many of these goals and capabilities.

Also at the Washington Summit, NATO launched its Defence Capabilities Initiative (DCI) to help ensure the goals of the Strategic Concept. A High Level Steering Group (HLSG) was formed to oversee the program of the DCI. Two of the five focus areas of the DCI are especially relevant to NLW, namely (1) Effective Engagement – "i.e., the ability to successfully engage an adversary in all types of operations, from high to low intensity;" and (2) Survivability; "i.e., the ability to protect forces and infrastructure against current and future threats." The DCI requirement for promoting the development of a NATO NLW capability was documented in DCI item EE 2(i) and states [1.7.7]:

> *"The Alliance should complete work to ensure that NATO has sufficient range of capabilities for the full spectrum of crisis response operations, including: i/ work on a policy for the development and use of non-lethal weapons technology in accordance with national and international law; ii/ adapting weapons technologies for use in operations that have a particular emphasis on the requirement to minimize collateral damage."*

The lead for the DCI NLW item was assigned through the CNAD to the RTO, which had recently been formed as a combination of the old Advisory Group on Aerospace Research and Development (AGARD) and the Defence Research Group (DRG). The RTO reports to both the CNAD and the Military Committee and is composed of a senior management body, the Research and Technology Board (RTB), and seven Technical Panels: (1) Studies, Analysis and Simulation (SAS); (2) Human Factors and Medicine (HFM); (3) Applied Vehicle Technology (AVT); (4) Information Systems Technology (IST); (5) Systems, Concepts and Integration (SCI); (6) Sensors and Electronics Technology (SET); and (7) the NATO Modelling and Simulation Group (NMSG). Each Technology Panel enables and referees multiple Exploratory Teams (ET) and Technical Teams (TT). The RTO provides the greatest international mechanism ever conceived for the advancement of defence Science and Technology [1.7.8].

The DCI item on the development and use of NLW and the development of a NATO NLW Roadmap was assigned to the SAS Panel [1.7.9]. In response, the SAS Panel established an Exploratory Team (ET) on NLW, designated SAS-E15, at its meeting in November 1999. SAS-E15 held its first meeting in April 2000 and completed and transmitted its report, through the CNAD, to the DCI HLSG by 8 November 2000 [1.7.10]. This report is an excellent review of NLW issues. The report concludes that because of the unconventional nature of NLW, issues relating to their employment, and the urgent requirement of the DCI, that the normal means by which NATO acquires equipment, the Conventional Armaments Planning System (CAPS), is inadequate to establish an initial NATO NLW capability. It highlights the importance of policy, especially

relating to incipient directed energy weapons. It also notes the importance of studying the target effects of NLW in order to establish the type, predictability, and severity of injury, both physiological and psychological, caused by an NLW. The report also endorses the work of three RTO-initiated Technical Teams (TT), one on measures of military effectiveness (SAS-035), one on human effects (HFM-073), and one on the long-term impact of emerging technologies (SAS-040), and includes them in its Roadmap (see Annex A).

Annex B of this report provides an Organization chart for the NATO components involved in the early efforts of NATO to achieve an NLW capability.

1.4 NATO TECHNICAL TEAMS ON NLW & NLT: 2000 – 2004

Before focusing on the activities of NATO RTO HFM-073, the Human Effects of Non-Lethal Technologies, it is informative to summarize the activities of all three NATO RTO TT on NLW, thereby placing HFM-073 in context. The work of both SAS-035 and SAS-040 has been completed and Final Reports have been submitted.

SAS-035, which is a successor to SAS-E15, has proposed a basic mathematical methodology for assessing the effectiveness of NLW in specific military scenarios. Inputs to the methodology include the physical characteristics of the weapon and the environment in which it is used, the level of a weapon's output that reaches a specific target, and the actual response of the target vis-à-vis the desired response and the military requirement. Effectiveness is calculated across seven dimensions: (1) mobility; (2) communications; (3) physical function; (4) sensation and interpretation; (5) group cohesion; (6) motivation; and (7) identification. The lack of adequate target response data was seen as a significant inhibitor to the implementation of the methodology developed by SAS-035. [1.7.11, 1.7.12]

SAS-040 held a multinational exercise to evaluate future technologies (out to the year 2020) that might be suited to address the whole spectrum of NATO peace support operations. The group identified five promising technologies and recommended accelerating research in these areas: (1) RF devices; (2) anti-traction approaches; (3) rapid barriers; (4) stun devices; and (5) nets. Its final report noted that NLW must satisfy national and international legal and political constraints and that doing so might become an issue between NATO countries; it recommended increasing activities to foster NATO acceptance of NLW. [1.7.13, 1.7.14]

HFM-073 addressed the human effects of non-lethal technologies from the perspective of both the target (effectiveness and non-lethality) and the operator/bystander (accident, fratricide, long-term health effects). The implications of NLWs on training and field medicine were reviewed. Special attention was directed to the issues involved in obtaining target response data of the type, quality, and quantity that would satisfy the methodology proposed by SAS-035.

Both HFM-073 and SAS-035 created glossaries for terms relating to NLW and proposed frameworks for developing a database for NLW. Both HFM-073 and SAS-040 reviewed the legal/political issues that might constrain the development of NLW.

1.5 THE HUMAN FACTORS AND MEDICINE PANEL

The HFM Panel was formed in 1998 following the creation of the RTO. It is, without question, the most appropriate NATO group to address human issues associated with the development and use of non-lethal weapons. The mission of the HFM Panel is to:

> *"Optimize performance, health, well being, & safety of the human in operational environments with consideration of affordability. This involves understanding & ensuring the physical, physiological, psychological, & cognitive compatibility among military personnel, technological systems, missions, & environments. This is accomplished by exchange of information, collaborative experiments, & shared field trials."*

In response to the tasking from RTA, the HFM panel sponsored an Exploratory Team (ET-4) titled "Physiological and Psychological Issues in Non-Lethal Technologies." The ET was chaired by the UK and met twice in 2000, once in Germany and once in the UK. The Technical Activity Proposal of ET-4 is presented in Annex C.

Upon reviewing the mission of the HFM Panel, the team immediately perceived a potential conflict between adhering strictly to the HFM Panel's mission and fully addressing the needs of other NATO groups on NLW. The HFM Panel is oriented toward operator/warfighter health & safety, not that of a potential target. The HFM Panel mission does not address weapon effectiveness, which is one reason the eventual HFM-073 addressed non-lethal "technologies," instead of "weapons." The fact that medical organizations and people in medical professions generally do not study better ways to incapacitate or repel people, reflects a general problem for studying the human effects of NLWs. In addition, most of the military expertise for such study lies in medically oriented organizations, which may be either prohibited or disinclined to address weapon effectiveness or non-treatment issues regarding targets.

This question was addressed to the HFM-Panel and the ET received verbal dispensation to depart from the strict HFM Panel mission and address all the human issues relevant to NLT. ET-4 recommended the formation of a TT to be named "The Human Effects of Non-Lethal Technologies. This TT, identified as HFM-073 and TG-012, held its first meeting in April 2001. The Terms of Reference for HFM-073 are presented in Annex C. The Members and meetings of HFM-073 are identified in Annex D.

The Goals of HFM-073: The newly formed HFM-073 agreed that Human effects information is essential to establishing the effectiveness, safety, and acceptability of NLT, yet the required data are lacking for many proposed technologies. The goals of HFM-073 were to develop data and processes to:

- Evaluate NLT effectiveness vis-à-vis the NATO definition of NLW;
- Minimize risk of injury to NATO forces and the public;
- Increase information exchange to facilitate understanding and interoperability;
- Guide/coordinate research efforts and reduce redundancy;
- Identify gaps in our knowledge and identify research needs;
- Facilitate public acceptability;
- Identify non-lethal weapons suitable for anti-terrorist activity; and
- Facilitate training, readiness, joint operations.

HFM-073 also placed its proposed activities in the context of the activities of the SAS-035 on "Measures of Effectiveness of NLWs" (see Annex F). This chart was presented during a joint meeting of the members of HFM-073 and SAS-035 held in Oslo, Norway, on 15 May 2002.

1.6 THE NATO SCIENCE COMMITTEE

The NATO Science Committee deals with issues of civilian science, in contrast with the NATO RTO, which is concerned with military science. The topic of NLW is clearly relevant to both aspects of science.

On 17-23 October 2004, the NATO Science Committee was the prime organizer of a NATO Advanced Research Workshop (ARW) titled "Integrating Human Effectiveness and Risk Characterizations of Non-Lethal Weapons (NLW) into Antiterrorism Civil Science Programs" in Prague, CZ, which included 45 participants. The Workshop started with two days of presentations on NATO, NLW, and risk assessment. Following the formal presentations, the Workshop continued with structured discussions and smaller working groups. A publication of the papers presented at the workshop is in progress.

The NATO Science Committee is open to supporting additional workshops on NLW and NLT and because of the dual applicability of NLW to both civilian and military science would be an excellent opportunity for coordination with the RTO.

1.7 REFERENCES

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1.7.2 "Non-Lethal Technologies for Peace Support Operations" CNAD report to NAC, C-M(96)38 dated 30 August 1996.

1.7.3 Technical Proceedings of the 37th DRG Seminar on Non-Lethal Weapons: Technical Proceedings AC/243-TP/10, dated 3 March 1997.

1.7.4 Final report of the NLW Policy Team, C-M(99)44.

1.7.5 NATO Non-Lethal Weapon Policy, 27 Sept. 1999; NATO Press Statement dated 13 October 1999, "NATO Policy on Non-Lethal Weapons." http://www.nato.int/docu/pr/1999/p991013e.htm

1.7.6 General information on NATO was obtained from the NATO Handbook http://www.nato.int/docu/handbook/2001/

1.7.7 NATO NAC-S(99)66; 25 April 1999.

1.7.8 Daniel, Donald C. and Caraher, Leigh C. "NATO Defence Science and Technology," available at http://www.rta.nato.int/general.htm.

1.7.9 Navarro, Arnau, "The Gap in defence research and technology between Europe and the United States," Technological and Aerospace Committee, Items 71-74, NATO Document A/17-18 December 2000.

1.7.10 SAS E-15 report to the CNAD titled "Non-Lethal Weapons" dated 8 November 2000.

1.7.11 "Non-Lethal Weapons and Future Peace Enforcement Operations," RTO-TR-SAS-040, December 2004, Downloaded from http://www.rta.nato.int/Main.asp?topic=sas.htm#.

1.7.12 Paulissen, Pascal, "SAS-040 Long Term Scientific Study on NLWs and Peace Enforcement Operations," In: Proceedings of the NATO ARW "Integrating Human Effectiveness and Risk Characterizations of Non-Lethal Weapons (NLW) into Antiterrorism Civil Science Programs," 17-23 October 2004, NATO Science Committee, in preparation.

1.7.13 "Non-Lethal Weapons Effectiveness Assessment," RTO-TR-085, Oct. 2004, see NATO RTO Website: http://www.rta.nato.int/Main.asp?topic=sas.htm for a summary and information on how to obtain a copy.

1.7.14 Nelson, John, SAS-035 "NATO NLW Effectiveness Assessment: Recent and Ongoing Efforts." In: Proceedings of the NATO ARW "Integrating Human Effectiveness and Risk Characterizations of Non-Lethal Weapons (NLW) into Antiterrorism Civil Science Programs," 17-23 October 2004, NATO Science Committee, in preparation.