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INTERNATIONAL VERIFICATION OF WMD PROLIFERATION: APPLYING UNMOVIC'S LEGACY

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INTRODUCTION

For a decade or more, proliferation of Weapons of Mass Destruction (WMD) has been recognized internationally as the preeminent threat facing the United Nations in terms of international peace and security. In its first leader of the new year (2007), the Economist magazine tackled peace and security issues and the chances of creating a safer world. Against a dismal background of go-it-alone foreign policy failures, the Economist concluded that the big powers should return to making "better use of the existing potential for multilateral, joint, lawful international actions that the United Nations uniquely provides". In a word - multilateralism.

The UN has done a better job in the area of non-proliferation than it is generally given credit for. There exists, for example, a matrix of legally binding multilateral treaties which have dealt, in a reasonably effective way, with the challenges posed by the proliferation of WMD; specifically in the agreements on nuclear, chemical and biological weapons. In each of these agreements, the central ingredient for sustained success has been creating a capability to effectively verify treaty compliance. The Non-Proliferation Treaty (NPT), the Chemical Weapons Convention (CWC) and the Comprehensive Test Ban Treaty (CTBT) all provide for discipline-specific verification mechanisms. Regrettably, the Bacteriological and Toxic Weapons Convention (BTWC) does not.

In addition, the United Nations has sponsored three significant studies by groups

of experts focusing specifically on the monitoring and verification process (1990, 1995 and 2006). The 2006 study was hobbled for partisan reasons and its tabling in the General Assembly has been delayed. All three of these studies have been sponsored and chaired by Canada. The strength of each has been in the broad fields of concept and theory. The weakness has been that each has fallen well short in relating concept and theory to practical field experience and expertise.

The United Nations Monitoring, Verification and Inspection Commission (UNMOVIC), as part of its present mandate, has seized a unique opportunity to help fill this gap. Since 2003, UNMOVIC specialists have undertaken a series of "lessons-learned" research activities through extrapolating and synthesizing field experience gained by UNSCOM, IAEA and UNMOVIC inspection teams during real time monitoring and verification operations in Iraq. In so doing, it has created a legacy of practical experience and expertise which could contribute directly to modeling a significantly improved and independent United Nations composite capability. These improvements would be based on, inter-alia, a unique approach through multidisciplinary training, the development of more effective archives management tools, the refinement of new inspection technologies and techniques and the articulation of "lessons learned" in the form of a unique comprehensive compendium.

This paper touches on certain of these aspects. It examines briefly the existing overall UN composite on-going monitoring and verification OMV capacity. It illustrates the package of technologies and techniques which was developed and employed in Iraq. One goal is to flesh out the legacy which UNMOVIC has developed and to discuss the significance which that legacy might be able to bring to remodeling and reinforcing

the NACD inspection framework of the International community. A single case study is provided as an annex to illustrate specifically the potential application of overhead imagery analysis (OHI). Muthanna State Establishment (MSE) served initially as the main chemical weapons production facility through the Iraq-Iraq war. Consequently, it was used by UNSCOM as the UN's chemical weapons destruction facility following the cessation of Gulf War I. Finally, as an abandoned site, it has been used to illustrate the consequence of the looting which took place after Gulf War II.

For purposes of this paper, MSE serves as an example of retaining an OMV capability through the selection of imagery technology. There are a number of important "lessons learned" which can be derived from the practical experience which UNSCOM, IAEA and UNMOVIC gained in field operations in Iraq 1991-2007. Collectively, these have the potential to provide a unique and quantifiable contribution to the modeling of an improved and independent international monitoring and verification capability. Applying such experience in this regard would contribute significantly in creating a less intrusive, more effective, "resource- sensitive" inspection regime.

COLLECTIVE MULTILATERAL EXPERIENCE

Seldom has there an attempt to review collectively, the multilateral monitoring and verification capabilities which have evolved within the international community on a global basis. Each year the international community continues to commit significant financial resources to monitoring and verifying WMD non-proliferation treaties; often in a not particularly "cost- effective" manner. In view of the steadily increasing threat posed by WMD proliferation, (complicated by an increasing interface with international

terrorism), it would be prudent for the world community to take stock. Rationalizing the NACD resources currently available to meet the international community's commitment to the maintenance of peace and security would be a prudent first step.

Evaluating the Task

One approach to such a task in terms of combating global WMD proliferation, would be a collective effort by the International Community (the UN, international organizations, national governments, NGO's, etc.), to review, and be prepared to radically restructure, the existing regime. An alternative might be to make the UN Security Council the central and proactive enforcer of arms control agreements and obligations integral to all those arms control agreements negotiated during the second half of the past century. Certain lessons might be deduced from an in-depth review of the on-going, agonizing and as yet uncalculated, assessment of responsibilities and costs related to reconstituting the Iraqi state. Such a review of the Iraq WMD scenario could provide benchmark elements for a good case study for such an overall endeavor.

Charting and Quantifying the International/Multilateral Experience

Resources which exist now, from which the United Nations could draw in projecting an international regime for monitoring and verification of compliance for the future, are considerable. They are illustrated in Figure 1 and can be generally classified for purposes of this paper into four distinct levels. Those levels are:

- Treaty Mandated Organizations (NPT, CWC, CTBT)
- Security Council Mandated Organizations (UNSCOM, UNMOVIC, INVG)

- Special “Like Minded” Organizations (MTCR, AU, NSG)
- Coalition Created Organizations (ISG, Task Force 75,)

(Figure 1)

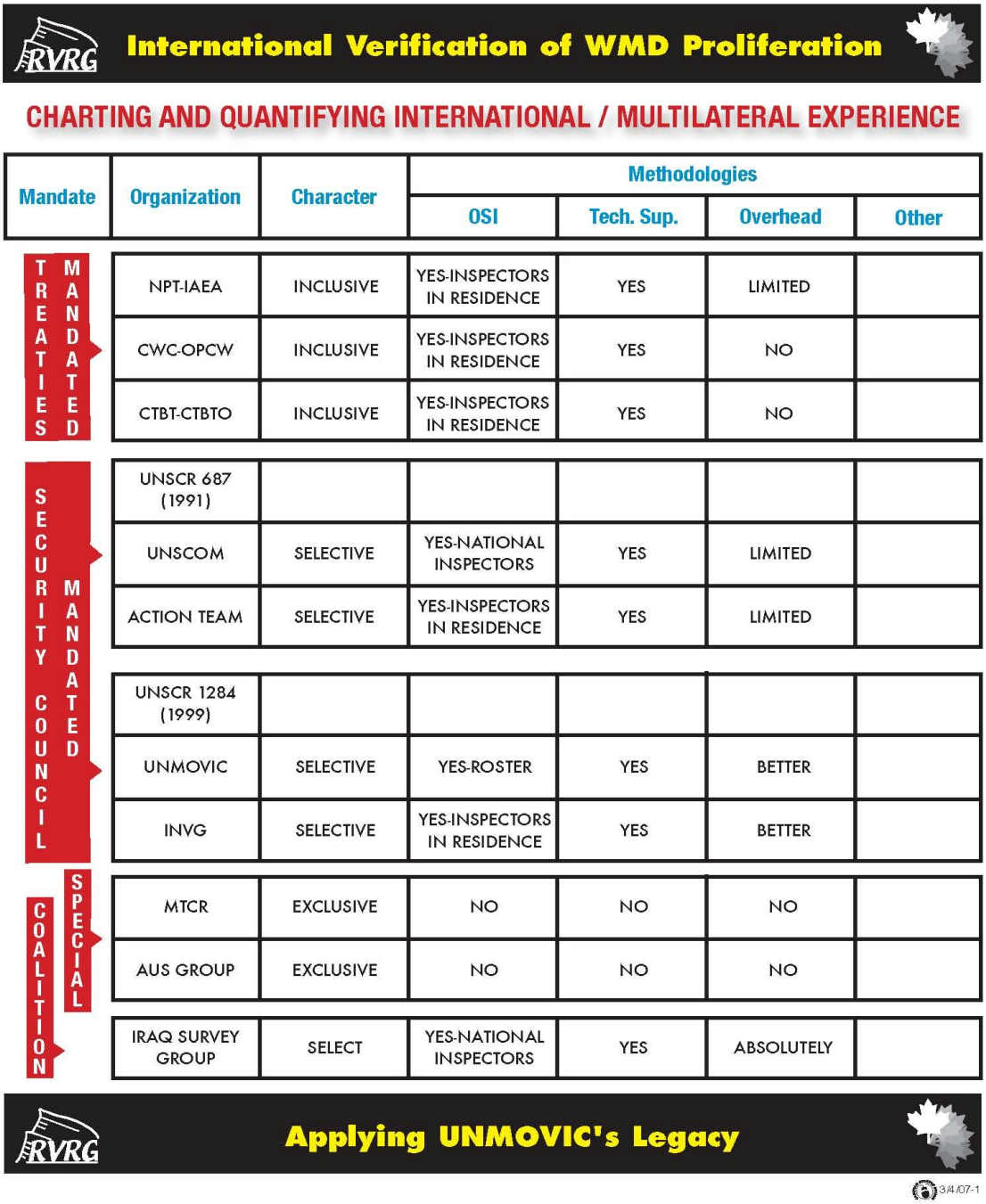


Figure 1 does reveal a number of commonalities between these levels. They include:

(a) Membership: Membership ranges from the "inclusive" mandates of multilateral treaties through the "selective" character of UN Security Council activities to the "exclusive" nature of the discipline-specific specialist groups, to the "coalition exclusive" membership of the ISG. Membership is a significant factor which deserves attention in terms of confidence-building, creditability and objectivity.

(b) Methodologies: All four levels depend almost exclusively upon the use of On-Site Inspection (OSI) as the main technology/technique employed. This means that the method of recruiting and training inspectors becomes a significant determinant. Existing treaty mandated organizations (IAEA, OPCW, CTBTO) recruit the broadest spectrum of inspectors, drawn from all member states, and maintained as a pool of "inspectors in residence". Security Council mandated organizations (UNSCOM, UNMOVIC) developed two separate methods of recruitment. UNSCOM instituted a selection approach by inviting national governments to provide inspectors on request for specific periods. UNMOVIC, on the other hand, recruited inspectors from a broader spectrum of states but provided them with specific in-house training and placed inspectors on a roster system. In the case of UNMOVIC (roster), inspectors remain in their own countries subject to recall if required. The special discipline-oriented group (MTCR, Australia Group, NSG) do not undertake international inspections as such. The Coalition's approach which cumulated in the Iraq Survey Group, operates on what can be best described as a "closed shop".

(c) Technical Support: All four levels of organizations have made use of a variety of technical support mechanisms but only the IAEA have developed its own in-house capacity through its laboratory complex at Seibendorf, just outside Vienna.

Technologies and Techniques General

The technologies and techniques developed by UNSCOM (1991-1998) and available to UNMOVIC to meet its OMV mandate for the brief period of operation 25 Nov. 2002 to 20 March 2003, are illustrated in *Figure 2.* They were used extensively and are depicted in terms of intrusiveness levels and application capabilities. Both are important factors for success in any future international monitoring and verification system. The short period of time in 2002/2003 before UNMOVIC was forced to withdraw did not permit the potential of the application of overhead imagery analysis to be explored in any depth.

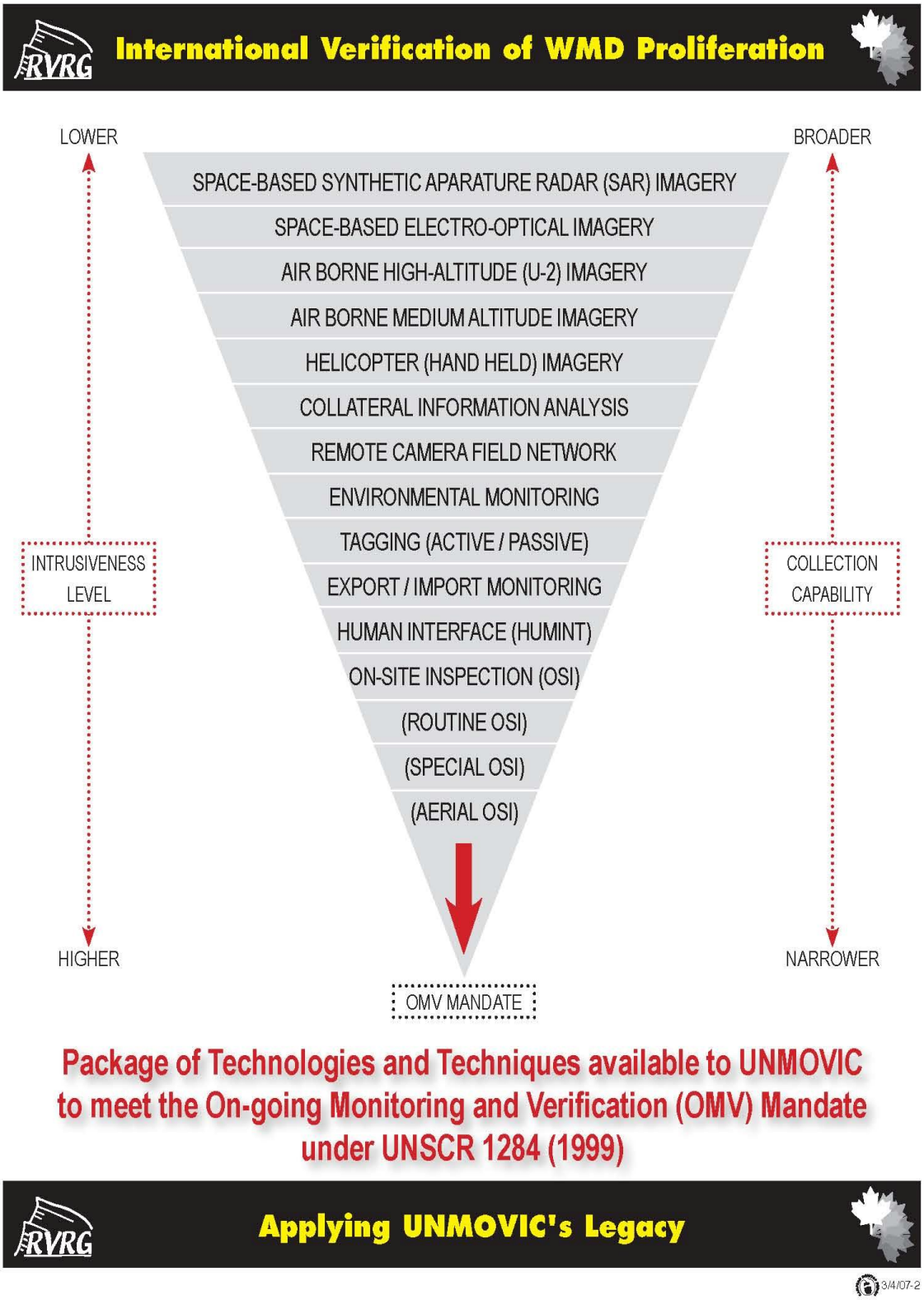
With the exception of the Iraq Survey Group, whose access to all means of OHI was unlimited, professional application of the OHI process to its full potential by other groups has been disappointingly limited. Imagery exploitation continues to be used by the IAEA as indicated in its reports to the Security Council under UNSCR 1284 (1999). It has been more creatively employed by UNMOVIC. It is the technology with the greatest potential for expanded use by the United Nations in meeting monitoring and verification requests of the future.

Today, the full scope use of OHI technology and analysis with its low level of intrusiveness and its proven collection ability could contribute, in a synergistic fashion,

to maintaining the required level of effectiveness of the monitoring and verification process. UNMOVIC has demonstrated this as it continues to report to the Secretary General on changes at specific sites in Iraq without the benefit of inspection on the ground. As UNMOVIC moved to focus on the longer term OMV program, the very availability and exploitation of new monitoring technologies and techniques, as well as their various interrelationships, made it possible to consider measures previously thought unfeasible.

In this regard the application of OHI techniques would have offered the best opportunity for UNMOVIC to exploit and expand the use of relatively non-intrusive means. While imagery has been used synergistically to good effect as support to other mechanisms, its “in-house” capacity to monitor and provide data as a primary source in support of compliance verification has been hardly explored. The increased use of advanced technology to reinforce and update the OMV aspects of a WMD nonproliferation mandate will be essential.

(Figure 2)


RVRG
International Verification of WMD Proliferation
LOWER
BROADER
SPACE-BASED SYNTHETIC APARATURE RADAR (SAR) IMAGERY
SPACE-BASED ELECTRO-OPTICAL IMAGERY
AIR BORNE HIGH-ALTITUDE (U-2) IMAGERY
AIR BORNE MEDIUM ALTITUDE IMAGERY
HELICOPTER (HAND HELD) IMAGERY
COLLATERAL INFORMATION ANALYSIS
REMOTE CAMERA FIELD NETWORK
ENVIRONMENTAL MONITORING
TAGGING (ACTIVE / PASSIVE)
EXPORT / IMPORT MONITORING
HUMAN INTERFACE (HUMINT)
ON-SITE INSPECTION (OSI)
(ROUTINE OSI)
(SPECIAL OSI)
(AERIAL OSI)
INTRUSIVENESS LEVEL
COLLECTION CAPABILITY
HIGHER
NARROWER
OMV MANDATE
Package of Technologies and Techniques available to UNMOVIC to meet the On-going Monitoring and Verification (OMV) Mandate under UNSCR 1284 (1999)
RVRG
Applying UNMOVIC's Legacy
3/4/07-2

UNMOVIC's Legacy.

Elements which go to make up UNMOVIC's legacy are as varied as they are unique. Those identified below have been subjectively selected specifically for this paper. They include:

(a) Expertise: What are the elements of UNMOVIC expertise? Since l992, the UN, through UNSCOM and UNMOVIC activities, has developed valuable and unique expertise through the verification of the implementation of the disarmament of Iraq and the monitoring of its dual-use activities. This experience includes disciplines for which no international convention or verification system exists, namely biology and missiles. It also covers the export/import monitoring of dual-use goods. This means that capabilities already exist within the UN in those areas and could be utilized at the Security Council's will. Such capabilities include:

- Conducting inspections in each of the above mentioned disciplines or conducting multidiscipline inspections. The latter are of particular interest when it comes to initial inspections or fact-finding missions at complex sites. This is an area in which UNMOVIC has developed a unique background.
- Instant availability of competent experts based at UN Headquarters as a quick-reaction alert team for missions on short notice. In UNMOVIC's experience, it is of utmost importance to be present at inspection sites at the earliest possible time in order to collect unaltered evidence. The present staff, in addition to its other responsibilities, provides the critical mass for maintaining such a quick-reaction capability.
- Availability on relatively short notice of inspectors on the roster who can be sent

to reinforce a quick reaction inspection team sent on mission and/or take over from them. UNMOVIC has created and maintained a unique roster of more than 350 international specialists and experts in disciplines including biology, chemistry and missiles. They are trained specifically by UNMOVIC in the mandate-related aspects of their respective disciplines but are also trained to work as members of a team according to UN rules.

(b) Experience: Experience accrues in a number of ways. In terms of the IAEA, experience in verification operations related to the Non-Proliferation Treaty began almost 40 years ago. For UNSCOM and UNMOVIC the experience is much more recent. It manifests itself in a number of ways including:

- In the practice of screening, analysis and cross-checking of documents including declarations, open sources, export/import notifications as well as experience in specific inspection techniques such as sampling and analyses, interviews, computer exploitation, measurements and destruction of proscribed items.
- Support by a well-established logistics process in terms of equipment and materials, and an international network of approved analytical laboratories.
- A well-established and effective multidisciplinary training program especially in areas not covered by other multilateral organizations (38 training courses have been successfully conducted since the creation of UNMOVIC). These training courses have been hosted by 22 member states including Canada.
- A large technical databank related to all WMD areas, part of UNMOVIC's future archives, and an information technology system (including data storage and handling, declarations and reporting systems) able to cover present and future

needs.

(c) Legacy: UNMOVIC's collective legacy in terms of both experience and expertise, has been developed as a result of operations mainly relating to WMD in Iraq. Nevertheless, it could be of use not only in meeting the Security Council's residual responsibilities in Iraq but beyond as well including reinforcing certain capabilities ascribed to the Secretary General. There are present and possible future examples:

- **In Iraq:** There is likely to be a need for a transitional period of UNMOVIC activities in Iraq related e.g. to export/import monitoring with end-use verification even after the disarmament file is closed. This period, controlled by the Security Council, would provide an opportunity for the international community to gain confidence that Iraq has achieved the conditions to be under the same non-proliferation international legislation and regulations as any other country, and that it can monitor effectively by itself its dual-use capabilities (activities, sites, equipment, export/import, scientists and technicians). In parallel, UNMOVIC has the experience and expertise in the interim to assist Iraq in developing its own non-proliferation institutions such as a National Monitoring Directorate (NMD), legislation and regulations if requested. Such a joint effort (Iraq/UNMOVIC) to establish a thorough and accurate inventory of its dual-use capabilities would be beneficial to this process.
- **Beyond Iraq:** The issue of preserving UNMOVIC's unique experience in conducting on-site inspections and monitoring and subsequent assessment and analysis beyond Iraq, has also been the concern of many interested parties and the issue has been raised and proposals made by the Secretary-General,

authorities in member states (see below) and by non-governmental groups.

- **Secretary-General:** In particular, with respect to BW, the Secretary-General in his report, "In Larger Freedom", recommended that the capability assigned to him to investigate suspected use of biological agents should be strengthened to incorporate the latest technology and expertise; and the Security Council should make use of that capability, consistent with UNSCR 620 (1988). These and other non-proliferation related issues were unfortunately not addressed in the 2005 World Summit Outcome. There may be an opportunity for the General Assembly to consider these issues again in 2007 if and when it is able to receive and consider the report of the 2006 UN panel of governmental experts on the question of verification in all its aspects. This would provide an opportunity for additional supporting submissions in this general subject area.

Initiatives By Others

While the United Nations has a unique responsibility relating to the global aspects of WMD non-proliferation, other organizations such as the European Union and NATO have a role to play as well. A number of member states have also undertaken a number of unique initiatives in attempting to define and refine the WMD non-proliferation/counter-proliferation process.

- **European Union**: In 2003, the Political and Security Committee of the EU adopted the principles for an EU strategy against WMD proliferation together with a plan for their implementation. It includes mention of retaining the verification and inspection expertise of UNMOVIC, particularly in the biological and missile

areas. This was later endorsed by the EU Council which stated that the EU would consider how the unique verification and inspection experience of UNMOVIC could be retained and utilized, for example by setting up a roster of experts.

- **NATO:** While not so obvious in the political and diplomatic aspects of the WMD conundrum, NATO plays a unique role through military operations as in Afghanistan and the provision of requisite training undertaken within the NATO mandate, often in close cooperation with the UN.
- **Canadian Government:** In May 2005, in its reply to the SG's request for views regarding the UN verification study, the Canadian Government noted that in the development of the institutional capacity of the UN to support verification, the experience with UNMOVIC had clearly demonstrated the capability of the United Nations to develop and Maintain a highly professional, impartial and effective verification organization capable of operating in even the most difficult political environments. It also noted that "it is very difficult to develop new UN capacities rapidly in response to urgent requirements. It is equally clear that once such capacities have been developed, caution should be exercised regarding decisions to "abandon them". Mention should be made of Canada's long standing role in the multilateral monitoring and verification process.
- **German Parliament:** Similar views were also expressed in a resolution of the German Bundestag in June 2005 concerning strengthening the disarmament capacities of the UN and maintaining UNMOVIC competencies and work towards the creation of a standby UN capacity to conduct inspections to control biological weapons and missile programs.

- **Swedish Government:** An international commission on the threat posed by WMD proliferation was supported by the Swedish Government and chaired by Dr. Blix. In its 2006 report it recommended inter alia that BWC parties should enhance the investigative powers of the SG, ensuring that he can rely upon a regularly updated roster of experts and advice from a specialist unit, modeled on UNMOVIC. In its full report the Commission noted that there is currently no capacity to conduct inspections or monitoring that the Security Council might mandate in the fields of biological weapons and missiles. One possibility would be to convert the capability of UNMOVIC into a unit for use by the Council or by the Secretary-General. Two WMDC recommendations - numbers 33 and 56 -are of particular relevance and interest in terms of UNMOVIC's legacy of expertise and experience and its preservation for future use by the United Nations.

Practical Considerations/Future Application Under Security Council Mandates

In practical terms, the expertise residing in UNMOVIC could be used even during the period pending a review of its mandate by the Security Council. A number of UNMOVIC commissioners are serving for a period as advisors and/or members of the staff, and have provided assistance, as appropriate, in the implementation of a number of Security Council resolutions, which, to various degrees, are related to UNMOVIC's field of competence. These are notably verification in the biological, chemical, missile and in export/import areas. Some examples of other current UN Security Council resolutions which might be considered as relevant include:

- **UNSCR 1373 (2001) (Antiterrorism)**: Looking to the future and particularly to

crosscutting relationships and similarities with other global threats. This resolution criminalizes assistance for terrorist activities, denies financial support and safe haven to terrorists. It also encourages accelerating the exchange of operational information on terrorist possession of WMD. A Council Committee (the CTC) was established to monitor implementation of this resolution, with the assistance of appropriate expertise in all areas covered by the resolution. Some outside experts have been hired, but, it is clear that such a Committee could benefit from the provision of practical advice derived from the field experience of UNMOVIC experts at small prorated cost.

- **UNSCR 1540 (2004) (WMD and non-state actors):** This resolution, which seeks to prevent non-state actors from acquiring WMD, obliges all States to inform the UN of national measures to combat the threat. A Committee was set up by the Department of Disarmament Affairs (DDA) to assess implementation of the resolution with experts examining the national reports. Two of these experts are members of UNMOVIC's College of Commissioners. In this case, the Committee is benefiting from the provision of practical advice derived by UNMOVIC from its field experience.
- **UNSCR 1718 (2006) (DPRK):** In this resolution the Council called upon North Korea to abandon all existing WMD and ballistic missile programmers in a complete, verifiable and irreversible manner. It also decided to establish a Committee to seek information on what States are doing to implement the resolution. UNMOVIC's experts and expertise with respect to control of sales and transfers of dual-use technologies and other materials covered by the resolution

could be of direct assistance to the Committee in its assessment of how member States implement their obligations.

If the Council decided that the "verifiable" abandonment by the DPRK of its existing WMD and ballistic missiles programs has to be implemented, UNMOVIC's experience and expertise could be made available immediately to conduct verification in the fields which are not already covered by any existing international binding verification regime. This would relate specifically to biology and missiles. UNMOVIC'S previous cooperative experience in Iraq with the IAEA, which would be mandated to undertake the nuclear verification part of the resolution, could prove extremely useful in smoothing the implementation of the resolution.

The latest developments with regard to the six power (multilateral) deal negotiated with the DPRK related to its disarmament, will, in all likelihood, affect the future implementation of this particular resolution. Nevertheless, UNMOVIC expertise and experience in Iraq in monitoring and verifying compliance in terms of proscribed missile systems and biological weapons (BW) could fill a void immediately and facilitate the implementation of the six-power agreement.

- **UNSCR 1737(2006) (Iran).** This resolution calls upon all States to take measures to stop the supply of materials and goods that could contribute to Iran's possible nuclear-weapons related activities and/or the development of nuclear weapon delivery systems. Regarding weapon delivery systems, the relevant items and technologies are listed in a Council document apparently

drawn from the "Equipment Software and Technology Annex" of the MTCR. UNMOVIC's expertise and experience related to proscribed ballistic missiles and technology could be usefully employed in the event that Iran came to an agreement with international authorities.

A council committee was set up to seek information on States actions to implement the measures and to report at least every 90 days on its work and on the implementation of this resolution, with its observations and recommendations, in particular on ways to strengthen the resolution's effectiveness. In the absence of any other UN body specifically devoted to the verification of missiles and missile related trade, UNMOVIC's experience and expertise especially in the area of export/import of dual use items, could assist in the analysis of the relevant information provided by the states

From the above, it is clear that interest in preserving the expertise residing in UNMOVIC extends well beyond the United Nations and the College of Commissioners. It has also been debated within the research community, by non-governmental groups, think tanks and individual researchers. Their recommendations range from the transformation of the Commission, in one form or another, into a standing UN verification structure, to just making use of UNMOVIC's Roster of experts.

Summary and Recommendation

Summary

April 2007 will mark the 15th anniversary of the Security Council's initial efforts

under UNSCR 687 (1991) to meet the challenge posed by WMD non-proliferation related to Iraq. In June 2007, it will be exactly four years since Coalition forces assumed the responsibilities of an occupying power in Iraq. Those responsibilities included the task of disarmament of Iraq (albeit with the acquiescence of the Security Council). Shortly thereafter, the Security Council, in a follow-up resolution, UNSCR 1483 (2003), declared its determination to revisit UNMOVIC's residual mandate and at the same time, underscored "the importance of the disarming of Iraq weapons of mass destruction (WMD) and the eventual confirmation of the disarmament of "Iraq".

To date, neither the revisiting of the mandate nor the confirmation of disarmament of Iraq's WMD has taken place. It is in these areas that the preservation of the UNMOVIC legacy, specifically for future use by the Security Council, and the means by which preservation can be accomplished, has taken on a unique importance. One of the main principles to be addressed in this context is whether or not the Security Council in its collectivity will insist upon retaining the independent, technically competent and effective capability that it has created to monitor and verify compliance in future contingencies.

Specifically, the legacy created by UNMOVIC and other entities represents an estimated financial investment almost USD 1 Billion over a 15 years period. In addition, following the cessation of combat in June 2003, an equivalent amount was expended in just 18 months by the Iraq Survey Group (ISG), which had been established by the United States in the aftermath of its occupation of Iraq. Overall, the collective financial investment related to WMD counter-proliferation in Iraq, is estimated in excess of the USD 2 Billion mark. Clearly, although these were officially two separate operations, the

objectives and methodologies employed were similar. Indeed, many of the specialist personnel, including David Kay and Charles Duelfer, the two leaders of the ISG, shared experience in the UN "non-proliferation" process as well as in the ISG "counter-proliferation" operations in Iraq.

UNMOVIC's staff continues to remain active in drawing "lessons-learned" from the overall experience and in identifying certain unique aspects of "multi disciplinary" operations through a continued rigorous analysis of the extensive archives. This effort is aimed at distilling and preserving that legacy to facilitate the way forward for the United Nations, particularly in terms of the multilateral Non-Proliferation, Arms Control and Disarmament (NACD) process.

While awaiting the Security Council's reconsideration of its mandate, UNMOVIC has identified a series of practical and productive activities to be undertaken in 2007. These activities are designed to meet continuing responsibilities under existing mandates as well as to reinforce and build upon the legacy of experience and expertise acquired over 15 years. They include:

(a) Maintaining a quick reaction capability to undertake possible tasks that might be allocated by the Security Council principally in the context of conforming Iraq's disarmament mandate and of activities following the closure of the disarmament file. In this regard, the reduced staff of experts which is tackling much of the multifaceted work relating to archiving, compendium building and other legacy projects also constitute the core an emergency follow-on inspection capability to meet UNMOVIC's mandate as required under UNSCR 687 (1991);

(b) Editing the Compendium and completing a version designed for open access purposes in which all proliferating and other sensitive information has been deleted;

(c) Continuing work on indicators related to proscribed programs in the chemical, biological and missile areas based on experience accrued from inspection activity in Iraq (19912003);

(d) Continuing and upgrading UNMOVIC's multidisciplinary training program for inspectors on UNMOVIC's roster given the broad interest displayed in the Roster system concept;

(e) Preparing a training manual for use by UN multidisciplinary verification and monitoring inspectors in the future;

(f) Elaborating upon information technology programs aimed at facilitating the international monitoring and inspection process; and

(g) Continuing and expanding a UN capability to analyze satellite imagery of sites, previously monitored by UN onsite inspections (OSI) and reporting the changes detected to appropriate authorities in an ongoing program. UNMOVIC's unique experience in this regard could be used as the basis for an effective case study, in the application of overhead imagery analysis to a range of associated United Nations activities.

Clearly, multilateral arms control agreements such as the NPT, BTWC, CWC and CTBT have all contributed successfully, and beyond the expectation of some, to meet the proliferation threat to date. Most of the problems associated with these four WMD

treaties relate, in large measure, to the perceived degree of effectiveness of the monitoring and verification mechanisms mandated under the respective treaties.

Recommendation:

While much as been written on the twin threats posed by WMD proliferation and international terrorism, relatively little research has been undertaken on by United Nations' capability to monitor and verify treaty compliance as already stated. The latest UN Experts Group's study on verification has yet to be tabled. That practical experience and expertise has yet to be subjected to serious international professional scrutiny. There is a need, therefore, for an initiative to initiate an independent research study in this area.

Such an initiative could turn the one year delay in tabling the 2006 UN study into an advantage. As mentioned previously, it could be used as a trigger to initiate supporting research project with a subjective as well as a practical approach to the process. Such a study need not be all encompassing. Its key theme could include an assessment of the practical effects gained through a blending of technology with the human factor in an operation process. The focus of the study might encompass a practical framework for the development and application of an ubiquitous, precise and non-intrusive process for effective monitoring and verification of compliance. To set the stage, subjects for initial analysis and research might include of the following.

(a) the nexus between technology and the human factor,

(b) the quantification (in time and expenditure) between the use of inspectors resident in the country to be inspected and inspections mounted from outside the

country,

(c) the cross-cutting effect between collateral analysts and the intelligence process,

(d) the effectiveness of the multidisciplinary concept relative both to training and to operations

(e) the evaluation of full time headquarters for inspectors vs the roster of inspectors system, and

(f) the prospects for inter-agency cooperation in an ongoing monitoring and verification (OMV) agenda.

2007, as the Economist magazine suggests, could mark a tipping point in the return of the big powers to championing the multilateral NACD process once again. If that is the case, the international OMV capacity must be significantly enhanced to meet the twin challenges posed by WMD proliferation and international terrorism. It is time for a fresh and innovating input. UNMOVIC's legacy is a good source from which to draw.

ANNEX to:

INTERNATIONAL VERIFICATION OF WMD PROLIFERATION: APPLYING UNMOVIC'S LEGACY

Muthanna State Establishment: Illustrating the use of Overhead Imagery Analysis for Intersecting Arms Control and other Global UN Activities

Introduction:

The Muthanna State Establishment (MSE) was initially the major facility for the research, development and production of chemical weapons (CW) in Iraq. A sprawling enterprise, it produced and initially stored chemical weapons in the early 1980's. In the latter stages of the Iran/Iraq War, CW were delivered directly to the front for immediate use. As a major WMD facility under surveillance by UNSCOM/UNMOVIC for many years, it is used in this paper simply as an example of how on-going monitoring and verification (OMV) can be sustained by the selective use of overhead imagery (OHI) analysis.

MSE was the first site to have been visited by UNSCOM in 1991 under UNSCR 687 (1991). For the first CW inspection team, MSE presented a hazard of the first order. Thousands of barrels of CW agents and precursors dotted a barren desert holding area. Under the searing sun and in temperatures exceeding 100 degrees F, these barrels, upright and tipped over, constituted a deadly hazard to the first UNSCOM inspectors whose mandated task was to gather, destroy or render harmless, Iraq's CW inventory.

Pursuant to UNSCR 687 (1991), which inter alia required the destruction or rendering harmless of Iraq's CW inventory, a special Chemical Destruction Group

(CDG) was formed in June 1991. That group was tasked to supervise the elimination of all declared and discovered chemical munitions, bulk warfare agents, equipment precursors, and any other associated materials designated for destruction by UNSCOM. For this purpose, the main site of MSE was selected as the designated CW destruction site. Munitions at other locations that were deemed to dangerous to be transported to MSE were safely destroyed where they were found.

UNSCOM's CW destruction program was massive and complex by any standard. Mustard agent and other liquid flammable chemicals were destroyed by incineration in a special retrofitted unit at Muthanna. Nerve agents and some of their precursors were destroyed by hydrolysis in another plant at the site. Contaminated hardware and non-toxic chemicals were also destroyed with explosives. The following was destroyed by Iraqi personnel at MSE under UN supervision:

(a) over 38000 filled and unfilled chemical munitions;

(b) almost 700 tons of CW agents;

(c) in excess of 3,000 tons of precursor chemicals; and,

(d) more than 100 pieces of major chemical weapons production equipment.

The site presented many hazards, some of which were magnified by damage as a result of both Gulf Wars. In those early days, destruction activities were carried out in a cooperative manner by Iraqi personnel under UNSCOM/CDG direct supervision. UNMOVIC has maintained elaborate files on MSE which included a responsibility for OMV.

Continuing Concern:

At the end of the Gulf War II in 2003, MSE was left unsecured by Coalition forces and it was looted. UNSCOM seals were breached. The presence of various chemical compounds, resulting from destruction operations, buried in the underground structures concentrated at the bunker area made the land potentially unsafe for agricultural activities. The US-led Iraq Survey Group (ISG), in its unsuccessful search for WMD in Iraq, reported that sealed structures at Muthanna had been breached and that bunkers tested positive.

By May 2003, the United Nations had withdrawn its personnel from Iraq. Nevertheless UNMOVIC's imagery analysts in New York were able to continue a form of OMV for the most significant WMD related sties at MSE. They were able to determine which areas might be heavily and toxically contaminated. They were able also to detect that agricultural activities continued to encroach upon land originally part of the MSE complex.

In this case, the sequential analysis of such imagery focused on the detection of continued, and possibly expanded, agricultural activities outside and within the Muthanna perimeter close to bunkers in which a variety of chemical munitions filled with nerve agents were known to have been buried. The analysis of recent satellite sequential imagery indicated as well that work was in progress at the Muthanna site including the creation of a perimeter at the bunker area. The same analysis also revealed new objects, including possible containers, sheds and perimeter fencing at a bunker which had been confirmed as empty when UN inspectors were withdrawn in March 2003. The continued spread of agricultural activity into such areas of possible

high contamination was clearly evident.

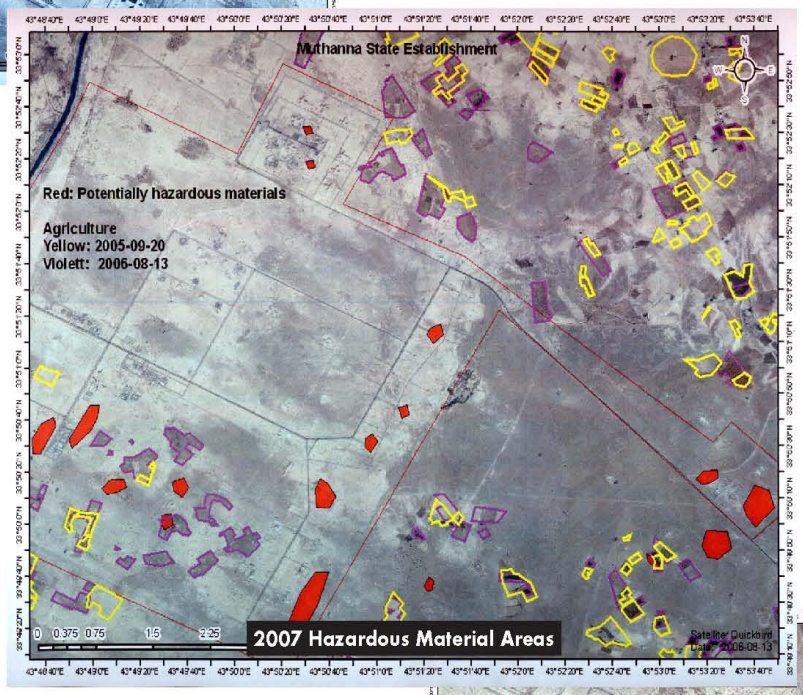
This is just one of a number of scenarios in which UNMOVIC's imager5y analysis, initially designed for WMD purposes, has been applied pragmatically to other areas of immediate humanitarian concern to the United Nations. *Figure 3* illustrates how imagery analysts, using comparative analysis techniques in sequential imagery, are able to translate that data for dual use purposes and display it graphically using false colour. This type of monitoring using overhead imagery has potential to significantly improve the monitoring and verification process. It lessens intrusiveness, improves effectiveness and reduces overall costs. These images and expert analysis demonstrates graphically why such a capability should be preserved by the Security Council in its quest to find improved, independent and non-intrusive means of meeting its present and future commitments in areas of international peace and security.

UNMOVIC On-Going Monitoring and Verification (OMV)

(Derived from 2007 Comparative Analysis of Sequential Satellite Coverage)

February 2007

By use of false colours imagery, UNMOVIC imagery analysts can develop composites such as this for Arms Control monitoring purposes but also to warn of encroachments into hazardous materials area by agriculture workers.



Muthanna State Establishment (MSE)

(Bunker Area Upper Center)

MSE was the main Iraqi chemical weapon production center and after the first Gulf War, was used by UNSCOM as a CW destruction facility. Highly contaminated, these images show how UNMOVIC can continue its monitoring role of sites without inspectors "in-country".

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