

美軍提昇工業毒化物外釋應援技術與裝備譯介

The U.S. Army Chemical Corps—An Expansion in Skills and Equipment Is Needed to Support Response to TIM/HAZMAT Release Incidents

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壹、摘要

The skills of the U.S. Army Chemical Corps are beginning to expand from their long-established focus on Cold War-based nuclear, biological, and chemical (NBC) risk assessment and mitigation techniques. The expansion is now on the path of formally addressing and including toxic industrial material (TIM)/hazardous materials (HAZMAT) release events as militarily significant operational risks. TIM release hazards are typically much smaller in scope than the Cold War Era hazards posed by the massive NBC weapons attacks that were expected to strike the forces poised along the border of the former Iron Curtain. Unfortunately, individual TIM releases can occur almost anywhere that there is industrialization; hence, though TIM releases are potentially less impacting than traditional NBC attacks, their potential occurrence is widespread. TIM releases pose operational risks that require NBC defense soldiers to be competent in addressing TIM/HAZMAT releases in a military context, primarily by using civil first responder HAZMAT techniques.

美國陸軍化學兵過去從長期聚焦於冷戰時期的核生化風險評估與災後復原技術，迄今已開始擴展其技術範圍。當前技術擴展，特別強調工業毒性化學物質(或危害物)之外釋事件，導致軍事作戰產生之重大風險。工業毒性物質外釋危害範圍遠小於冷戰時期足以打破鐵幕邊界之大規模核生化武器攻擊。然而，縱使工業毒性物質外釋事件遠較傳統的核生化攻擊所造成的衝擊小，但工業區內到處都可能發生零星的外釋事件，所以其危害卻可能潛存於各地。毒性工業物質外釋造成的作戰風險，以軍事觀點而言，須有核生化防護士兵具有能力處理工業毒性物質(或危害物)之外釋事件，主要運用民間第一線應變人員之危害物質處理技術。

貳、譯文

Our most likely adversaries today may not have large stockpiles of NBC weapons or radiological materials or the intent or ability to use them to contaminate

large areas. NBC weapons attacks may be very limited in scope and occurrence, if they occur at all. However, a state- or non-state-sponsored adversary may be forced to think creatively and use easy, “quasi-NBC” attack opportunities that are truly asymmetric. Quasi-NBC attacks may mean releasing toxic materials at existing industrial facilities or dispersing toxic materials that were obtained for use as weapons. These materials might be dangerous due to their chemical toxicity, biological infectivity, or radiological intensity and persistency. TIMs are more available for ready use than NBC weapons, and they are common in the industrial world, often existing in plain sight. The Chemical Corps must be positioned to respond with TIM/HAZMAT knowledge, skills, training, and equipment.

當前我們最可能的敵人或許未儲存大量核生化武器或核輻射物質，抑或企圖(或有能力)利用其產生大範圍污染。如果發生的話，就範圍與發生機率而言，核生化武器的使用是非常有限的。然而，在核生化武器無使用之可能性時，將可能迫使政府或非政府資助的敵人去構思創新，而使用「類核生化」的不對稱攻擊。「類核生化」攻擊可能意指以現存的工業設施釋放毒性物質，或是散佈可用來作為武器的毒性物質。這些物質的危險可能來自其化學毒性、生物感染性或核輻射強度與持久性。相較於核生化武器，工業毒性物質更易獲得與使用，它們普遍存在於工業化社會且通常是顯而易見的。化學兵部隊必須被定位為具備處理工業毒性物質(或危害物)之知識、技術、訓練與裝備的單位，有能力支援此類外釋事件。

The Chemical Corps continues to be the resident expert in chemical, biological, and nuclear warfare defense for the Army. Recently, radiological weapons—those spreading radioactive contamination without a nuclear weapons yield—have emerged as credible concerns. Chemical Corps expertise and tactical force response to radiological weapons releases follow many of the same principles as those of responding to nuclear weapon yield fallout. However, radiological events are more like HAZMAT releases than nuclear detonations. These were straightforward and easily achieved expansions in doctrine, though not necessarily accompanied by a broad expansion of low-level radiation detection equipment. This has yet to fully occur, but it is in the process of occurring. That was, and is, the easy part.

對陸軍而言，化學兵部隊仍是化學、生物與核子武器防禦的專家。邇來，已將核輻射武器(不具核子武器效應的核輻射污染)視為另一種美國陸軍所關切的武器。化學兵部隊的專家及作戰部隊遵循其處理核子武器落塵的原則，來處理這類核輻射武器外釋事件。然而，比起核爆，核輻射外釋事件更像是危害物質外釋。這些原則可容易地直接從準則中獲得，且不須要擴增大量的低階輻射偵測裝備便可完成。這個現象雖然尚未完全發生，但確實已持續發生。

In 2003, the Chemical School commandant began to expand the Corps instructional programs to address more common, and therefore more likely, quasi-NBC hazard environments posed by TIM/HAZMAT events. Historically, the training of chemical soldiers in low-level radiation and low-energy alpha particle

contamination and TIM incidents was not widely conducted since the hazards were not considered militarily significant. In many ways, the process of elevating TIM releases to the status of militarily significant has begun. TIM/HAZMAT issues must be addressed by expanding the military operational doctrine, training, and equipment to span the breadth of tactical and operational levels in the Army.

2003 年，美國化校校長開始將教育計畫擴展至強調更常見且更容易造成工業毒性物質(或危害物)外釋事件的「類核生化」危害環境處理作業。過去，化學兵未針對低階輻射及低能量 α 粒子所產生之污染實施廣泛性訓練，係因這些危害尚未對軍方造成明顯的威脅。而諸多途徑促使工業毒性物質外釋事件已經提升至軍事層級狀態。必須藉由創新軍事作戰準則、訓練及裝備的研發與精進，以凸顯工業毒性物質(或危害物)外釋事件之重要性，如此方能串聯陸軍的戰術與作戰階層。

Deterrence Through Preparedness

Swift military response is a viable and often available option when responding to a state- or non-state-sponsored adversary's use of NBC weapons. Realistically, however, industrial facility or locally initiated industrial material release "accidents or incidents" will surely complicate and possibly nullify U.S. military options to attack a single adversary with a swift response. With some planning and dedication on the part of an adversary, those accidents or incidents can and will create significant and unexpected events that affect friendly operations.

透過戰備有效威懾

面對政府或非政府資助的敵人使用核生化武器時，快速的軍事反應通常是可行的方案。然而，事實上工業設施或當地的工業物質外釋事件（故），可能是複雜且可以阻止美軍快速反應之手段。敵人有計畫的製造這些事故（件）將可製造出重大且無法預期的結果，以影響作戰順利遂行。

Skills and equipment are sorely needed by chemical soldiers and all associated forces operating on or near TIM/HAZMAT industrial facilities and potential material release sites. Chemical soldiers must be prepared to address the command's TIM/HAZMAT concerns through continuous operational monitoring and evaluation—pre- and postrelease event. Friendly force TIM/HAZMAT risk assessments are then formulated along with establishing appropriate active and passive defense and response planning.

化學兵與所有位於工業毒性物質(或危害物)之工業設施及可能外釋地點附近的聯合作戰部隊，都需要有處理工業毒性物質(或危害物)的技術與裝備。化學兵必須透過持續的戰場監偵與評估外釋前後狀況，待命向指揮官說明工業毒性物質(或危害物)資訊，並結合友軍部隊對工業毒性物質(或危害物)的風險評估，隨即建立適切的主動與被動防禦及應援計畫。

The Chemical Corps is beginning to invest time and resources in formalizing TIM/HAZMAT release event training and equipment acquisition. This effort must

continue to increase in scope because there are civil HAZMAT processes and procedures that can be applied to military operations without significant invention by the Chemical Corps. Extensive civil first responder HAZMAT training, education, and equipment are available to the military right now.

化學兵部隊正投入時間與資源，使工業毒性物質(或危害物)外釋事件之教育訓練及裝備獲得成為制式化且持續擴充，如此才能將軍事作戰策略運用於民間的應援作業，而不需要有另外的太顯著的修訂。目前軍方已有效對民間第一線應變人員實施大量的應援作業訓練、教育及裝備。

The military need for civil HAZMAT response education is broad and includes HAZMAT responder training and HAZMAT incident command and control familiarization. The training levels are similar to the differences between NBC reconnaissance force missions and NBC center missions. The first deals with boots-on-the-ground incident response, and the second deals with using all sources of information to integrate (at command level) the command response to TIM/HAZMAT incidents. Lastly, training must occur parallel with equipping these same trained forces with specialized HAZMAT equipment that may be unique but must be integrated into unit equipment sets.

軍方對於民間應援訓練的需求極為廣泛，其中包括工業毒性物質應援人員的訓練及熟悉工業毒性物質外釋事件的指揮程序與管制作法。其訓練層級不同，就如核生化偵搜部隊任務與核生化作業中心任務之間的差異。首先要處理的是應援事件的兵力部署，其次是整合所有資訊提供給指揮官(指揮層級)，以應援工業毒性物質(或危害物)之外釋事件。最後，必須將這些專業應援裝備納入編裝，並同時對配賦部隊實施教育訓練。

TIM Release Threats as Real-World Operational Concerns

The entire category of TIM/HAZMAT release scenarios is reflective of a very present asymmetric attack means capable of producing operationally impacting hazards on friendly forces. As a reality, TIM facilities are known to exist in virtually every industrial area in the world, but little has been institutionally taught about them as a professional education topic in the Chemical Corps. Some believed that subject was to be executed by individual chemical soldiers as self-study. Thankfully, the Chemical Corps has begun—through educational efforts at the Chemical School—to become the commander's expert in TIM release events. This expertise is also required for chemical soldiers who have not had the benefit of the Chemical School's addition of TIM/HAZMAT training. In the balance, lives and credibility are on the line, and Corps-led formal education and expertise are required as part of the resident and nonresident educational opportunities.

工業毒性物質外釋威脅為現實世界作戰關切議題

各類型工業毒性物質(或危害物)外釋事件的演習想定，均反映其為明顯的不對稱攻擊，意指其能對友軍部隊造成衝擊。事實上，大家都知道工業毒性物質設施存在於世界各地的工業區，但在化學兵部隊中，卻鮮少提及這類專門教育

主題。有些人認為這類主題應由化學兵自我學習，慶幸的是，透過學校教育的努力，化學兵部隊已逐漸成為工業毒性物質外釋事件的專家。未接受化校工業毒性物質(或危害物)教育訓練的化學兵也需要這些專業技術。未來，因應核子武器威懾狀況下，來自部隊正式的訓練與專業，將成為人民存活機會的一種教育。

TIM/HAZMAT: Threat or Reality?

Worldwide TIM/HAZMAT release incidents happen often and most go unnoticed. TIM release incidents are not significant events, with rare exceptions. Headlines only capture the big TIM release incidents. Russia's Chernobyl nuclear power reactor fire and destruction occurred in 1986 during a power system test. The Bhopal, India, industrial chemical release occurred because a disgruntled worker placed a small quantity of contamination in a chemical production tank and caused a chemical reaction and toxic release. The results were in the headlines. Thousands of people were permanently evacuated near Chernobyl. Highlevel radioactive contamination existed in many areas, and plumes of low-level contamination traveled downwind, across Europe, signaling the eventual entombment of the reactor. In India's incident, thousands died and many more were injured in a silent, killing fog that followed the wind.

工業毒性物質(或危害物)是威脅抑或是事實？

全世界的工業毒性物質(或危害物)外釋事件之發生通常(或幾乎)均未受到重視。TIM 外釋事件並非為值得注意的重大事件(僅有少數例外)，頭版頭條新聞也僅會列出較為重大的工業毒性物質外釋事件。如蘇聯的車諾比爾核子反應爐，在 1986 年電力系統測試期間，發生火災後摧毀；再如印度波帕爾發生工業化學物質外釋，係因某位對工廠不滿的工人於化學槽內放入少量污染物，造成化學反應與毒性物質外釋，這些重大事件都曾出現在頭版頭條新聞中，車諾比爾附近數以千計的民眾必須永久撤離。高階輻射污染存在於許多地區，低階污染雲的下風危害更橫跨歐洲，最後銷毀的反應爐仍有輻射訊號。在印度的工業化學物質外釋事件中，數千人死亡，其中許多人是遭到隨風飄散的煙霧所傷害致死。

However, does anyone recall hearing in recent years of the major chlorine release near Las Vegas, Nevada, that required large areas of evacuation due to tons of chlorine being released from a storage facility? Not likely. That is because HAZMAT events of this type come and go with the evening news. How many times have you heard a radio or television news sound bite like this one? At 8:37 a.m. today, a train with ten HAZMAT cars carrying hydrogen fluoride derailed in the vicinity of Anytown, USA, requiring twenty city blocks to be evacuated for four hours. This headline gains little attention because civil first responders are trained and equipped to assess the situation properly, estimate the effects, determine the level of protection needed, and produce a hazard estimation of these incidents. The Chemical Corps must be (and will be with continued expansion into TIM/HAZMAT operations) the military expert in this field when it has a similar capability based on training,

equipment, expertise, and confidence like that held by civil first responders.

然而，有誰記得最近幾年在拉斯維加斯附近發生的重大氯氣外釋事件，肇因於數噸的氯氣從儲存槽外釋，導致大地區的撤離行動？似乎沒有人記得。那是因為這類的工業毒化物外釋事件，都出現在夜間新聞。你曾經有多少次從電視或電台聽到：今日早上 8：37，一列運送 10 輛工業毒性物質（氟化氫）的列車於美國某個城市出軌，要求 20 個城市撤離 4 小時。這類頭條很少被關注，因為訓練有素的民間第一線應變人員能夠適當地評估狀況、估計效應，決定所需的防護等級，並預判這些事件的危害範圍。化學兵部隊必須成為這領域的專家，並能持續擴展關於處理工業毒性物質或危害物之技術。換言之，在訓練、裝備、專業知識與自信的基礎上，擁有與民間第一線應變人員的相同能力。

Incorporating Civil First Responder Training Into the Chemical Corps Skill Set

The Chemical Corps can and must continue to review and take advantage of the TIM/HAZMAT operations knowledge that exists in the civil first responder community. In civil HAZMAT operations, TIM release expertise must be professionally obtained from programs of instruction that include course completion standards. HAZMAT first responder skill sets at varying levels of responsibility and action are clearly required by chemical soldiers. There are varying levels of training available to meet the needs of the members of the HAZMAT response force—from the first person on the scene to the person in charge of a civil HAZMAT response: the incident commander. Most notably, these varying levels of civil HAZMAT training may be available and further imported directly into the Chemical School and/or offered via distributed learning courses.

將民間第一線應變人員的訓練整合至化學兵部隊的技術能量

化學兵部隊須可持續不斷探討並從現有民間第一線應變組織去學習處理工業毒性物質（或危害物）的作業知識。在民間危害物質應援作業中，必須透過教育計畫與結訓標準，獲取處理工業毒性物質（或危害物）外釋的專業知識，化學兵確須要有各種不同層級的處理這類危害物質的第一線應變人員的技術、責任與行動要領。可以運用不同的教育訓練，滿足應援作業成員的需要，從事故現場第一線作業人員至現場指揮官。要特別注意的是，這些不同程度的民間處理危害物質訓練，可直接引入化校或透過不同的教育學習課程提供訓練。

Civil HAZMAT Incident Command

HAZMAT incident command in the United States uses a common basis in standardization among emergency responders. It has a specialized language and structure, but its way of organizing, controlling, and responding to HAZMAT scenes is clearly based on the military aspects of situational awareness, response planning, and asset command and control. It should be no surprise that fire and rescue units organize and operate much like military combat units, with their command posts, reconnaissance forces, commanders, decontamination stations, and casualty evacuation pipelines. However, civil methods and language of operations are often unique and must be understood by and familiar to chemical soldiers. The civil

Incident Command System used by first responders makes the senior responding leader the incident commander, and that commander is in charge. Chemical soldiers are well positioned to be the military force command's expert, advising on military support to civil HAZMAT incidents. Chemical soldiers are the right individuals in staffs and headquarters to facilitate a military response to TIM/HAZMAT releases. The concept of response and responsibility for civil incident command must be understood by chemical soldiers in order to facilitate any military force response to a TIM/HAZMAT release incident.

民間危害物質外釋事件指揮

美國的危險物質外釋事件指揮是以緊急應變人員的標準作為運用基礎，具有特定的代號與架構，然其工業毒性物質災害現場應援的組織與管制方法，很明顯的是以軍方的狀況--覺知、應變計畫及部隊的指揮與管制為基礎。消防與救援單位的組織與操作方式與軍方的戰鬥單位非常類似。也就是它們同樣有指揮所、偵搜部隊、指揮官、除污站及傷患撤離路線。然而，民間的作業方法與語言經常是獨特的，因此，化學兵必須確實瞭解與熟悉，民間事件指揮系統是由第一線應變人員中較資深之應變領導者擔任現場指揮官，並負責主導掌控全局，化學兵肯定是軍事部隊指揮專家，可以提供必要的建言給軍事支援民間處理工業毒性物質事件之參考。

U.S. military operations that occur outside the United States may occur in regions with an operating emergency response infrastructure. Again, chemical soldiers must be educated in the basics of HAZMAT incident response and command to be of value in planning for any military support to a TIM/HAZMAT incident. A clear understanding of U.S. civil HAZMAT response command structure clearly empowers chemical soldiers to recommend ways to maximize the U.S. force response, provide credible assistance in a given situation, and preserve the force protection of committed forces.

在境外可能發生的緊急應變作戰中，美軍再次應證，化學兵必須接受工業毒性物質外釋事件應變與指揮的基礎教育，方能有效規畫，以軍事支援任何工業毒性物質(或危害物)外釋事件。清楚瞭解美國民間危害物質外釋應變指揮架構，化學兵就能將美軍應援能力最大化，在任何狀況下提供可靠的協助，並參與部隊防護。

Civil HAZMAT Incident Training

The Department of Defense has published its own HAZMAT response guidelines for installation response that includes TIMs: Department of Defense Instruction 2000.1.8, Department of Defense Installation Chemical, Biological, Radiological, Nuclear, and High-Yield Explosive Emergency Response Guidelines. Varying skills for HAZMAT response and an overview of the civil Incident Command System must be incorporated into chemical soldier training as much as possible.

民間危害物質外釋事件訓練現況

美國國防部已經出版針對固定設施的危害物質應變指南，包括危害物質—國防部指導方針（2000.1.8.）及國防部化學、生物、輻射、核子與高產量爆裂物緊急應變指南，必須儘可能將不同的危害物質因應技術與民間事件指揮系統的概要，納入化學兵教育訓練中。

One of many sources of managing HAZMAT training is described in a HAZMAT Emergency Preparedness Grant Program document entitled Guidelines for Public Sector Hazardous Materials Training. It describes the complex, though attainable, skills required to properly implement HAZMAT training and the levels of HAZMAT training. The document is intended to be a reference manual for training managers and public sector employers and is an excellent overview of HAZMAT training requirements. Its introduction is available on the Internet at <<http://www.usfa.fema.gov/downloads/pdf/hmep/HMEPIntro.pdf>>.

公共部門危害物質訓練指南是一本描述危害物質緊急教育整備的文件，屬於管理危害物質處理訓練的參考來源之一，它說明執行各階層危害物質處理訓練須要有適當的複雜技術。這文件可作為訓練管理員與公共部門主管的參考手冊，它是一本有關危害物質處理訓練需求之綜合性文件，各位可從以下網站獲得相關介紹：< www.usfa.fema.gov/downloads/pdf/hmep/HMEPIntro.pdf >。

Guidelines (as this document is known) is organized into subsections that address the broad, general training issues. It describes incident response and first responder awareness with detailed explanations of the roles, responsibilities, and capabilities of first responders, HAZMAT technicians, on-scene incident commanders, and about a dozen other HAZMAT emergency response special topics, including health worker and emergency medical concerns. The Planning Curriculum Guidelines section describes how to broaden the knowledge, skills, and attitudes of the broad spectrum of training personnel who are developing or contributing to the development of local HAZMAT response plans. As is clear, the civil first responder community has extensive requirements and training available to address TIM/HAZMAT incidents. Operationally, chemical soldiers must also continue to receive, at various grades, increased levels of this same TIM/HAZMAT training as part of institutional and continuing education.

《公共部門危害物質訓練指南》有系統的說明一些廣泛性且一般性的訓練議題，它描述事件應援第一線應變人員的角色與責任、第一線應變人員的能力、危害物質處理技術、事故現場指揮官及其它危害物質緊急應援的特殊主題，包括工作者健康及緊急醫療考量。《計畫課程指南》則描述如何擴展知識、技巧及訓練人員全方位的態度，期有助於局部危害物質應援計畫的發展。很明顯的，民間第一線應變組織須要有足夠的訓練來因應工業毒性物質(或危害物)外釋事件之處理。以作戰觀點而言，化學兵也必須持續接受不同程度的工業毒性物質(或危害物)訓練，使其成為進階教育的一部份。

Equipping Forces to Assess TIM/HAZMAT Releases

Training provides for proper assessment of possible or actual TIM/HAZMAT

release incidents. Of critical importance are the “proper tools of the trade.” Specialized detection, protection, decontamination, and hazard assessment equipment must be considered for augmentation to unit NBC defense equipment sets and the associated training. Much of the available equipment is ruggedized for firefighter/first responder use. Much of this equipment could be of great use in NBC defense equipment sets in units if it is acquired and trained on before it is needed as additional equipment. This requirement is especially important when contingency plan mission analyses of potential or likely operating areas—from garrison to the forward deployment areas—have significant TIM facility concerns.

部隊整備以評估工業毒性物質(或危害物)外釋

對可能或實際工業毒性物質(或危害物)外釋事件，訓練可提供適當的評估，特別重要的是「適當的工具」。必須考慮增加專業的偵檢、防護、除污與危害評估裝備，納入單位核生化防護編制裝備及加入組合訓練。其中大部份有用的裝備，必須結實且耐碰撞，以滿足消防員或第一線應變人員實需。如果可以，儘量能在單位獲得動員裝備前，先行規劃完成教育訓練。在潛在或可能之作戰地區，須考量是否有明顯的工業毒性物質設施(從駐地到戰術位置)，對實施應變計畫的任務分析時，此項需求就顯得特別重要。

Chemical Corps TIM/HAZMAT Release Skills

Chemical Corps HAZMAT expertise and fielding of specialized equipment are needed for adequate military force protection, detection, and decontamination in TIM release incidents. In the civil fire-fighting world, these are HAZMAT incidents. The civil fire-fighting world has training requirements as well as procedures for all who are involved in HAZMAT response, from the first responder conducting on-scene reconnaissance to the on-scene incident commander. These varying levels of expertise are required in the Chemical Corps. The civil firefighting HAZMAT response and control training programs can be the Chemical Corps's viable and tactically employable method of HAZMAT/TIM response and control.

化學兵部隊工業毒性物質(或危害物)外釋應援技術

化學兵部隊需要危害物質外釋處理專家與特殊設備的部署，方能於工業毒性物質外釋事件中，提供部隊適當的防護、偵檢與消除，在民間消防界，皆屬處理危害物質外釋事件的範疇。民間消防界對於處理危害物質應援的所有人員，包括第一線執行現場偵搜的應變人員到現場指揮官均要有訓練需求與程序，化學兵部隊當然也需要這些不同層級的專業知識。民間消防的危害物質應援與管制訓練課程，可作為化學兵部隊處理工業毒性物質(或危害物)應援與管制作業戰術運用之參考。

Summary

There has been some growth in the Chemical Corps's technical TIM/HAZMAT training or materiel development and acquisition since the Cold War ended. A continued expansion of the Chemical Corps's competencies is required to assess and facilitate an appropriate response to TIM/HAZMAT threats and events.

Future Chemical Corps TIM/HAZMAT expertise will complement the existing medical occupational safety and health operational background surveys that are given to assess and document the low levels of former TIM/HAZMAT/NBC materials in our deployment areas. Such training benefits all our forces serving at home and abroad. The expansion of training for all soldiers at the Chemical School has included, for the first time to my knowledge, HAZMAT training. Including this training is an appropriate start in educating our field forces to prepare for and respond to TIM/HAZMAT events. This is clearly due to our current threat environment and our adversaries' use of expedient means to create significant events with toxic materials that are much more available than are traditional NBC weapons and delivery systems.

結論

冷戰結束後，化學兵部隊對於工業毒性物質(或危害物)的技術訓練或消除物質的發展已獲得些許成效。持續擴展化學兵部隊能力是必須的課題，如此才能適當的評估與因應工業毒性物質(或危害物)外釋之威脅與結果。未來化學兵部隊有關工業毒性物質(或危害物)之專業知識，將充實現行的醫療與作業安全及環境背景值的監控，以作為以往我作戰區內低階工業毒性物質、危害物質或核生化物質的評估。很清楚地，由於我們目前的威脅環境改變，比起傳統核生化武器與投射系統，敵人可輕易地利用更容易簡便的方法，造成重大的毒性物質外釋事件，所以，對於這類事件的應援訓練對於國內外所有的部隊都會有所助益；而化學兵學校已針對所有士兵展開訓練，野戰部隊也建議從適當的訓練開始，為應援工業毒性物質(或危害物)事件作好妥善準備。