# 美軍核生化戰場情報準備譯介

## 譯者簡介

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## Background

## 一、背景

This appendix provides planning considerations to support the integration of NBC reconnaissance through the four steps of the IPB process.

透過戰場情報準備(IPB)的四個步驟(戰場空間環境定義、描述戰場空間對敵我雙方能力的影響、敵情評估與決定敵可能行動方案)協助整合核生化偵搜任務。

## Define the Battlespace Environment

## 二、戰場空間環境定義

The battlespace environment is defined by—

Identifying the limits of the command AO and battlespace. The AO is the geographical area where the commander is assigned the responsibility and authority to conduct military operations. The battlespace environment can extend back to CONUS and could be impacted by terrorist or nation state use of CBRN weapons.

戰場空間環境是藉由以下三點來界定：

(一)確定作戰地區(AO)指揮與戰場空間的範圍。作戰地區(AO)是賦予指揮官指揮軍隊作戰責任及權力的地理區域。戰場空間環境可以擴展至美國本土(CONUS)，並可能受恐佈份子或國際組織使用化生放核(CBRN)武器所影響。

Identifying the limits of the AOI. The AOI is the geographical area from which information and intelligence are required to permit planning or successful conduct of the commander's operation. Sources of information may include other federal agencies (e.g., State Department, national level intelligence agencies) operating within the AOI who may have information that will help support the commander's overall SA.

(二)確定利害區(AOI)的範圍。利害區(AOI)是指必須獲得此等地理區域的資訊與情報，方能成功執行指揮官的作戰行動或計畫。資訊的來源或許可以從在利害區內作業的其他聯邦機構(例如：洲政府部門、國家層級的情報機構) 獲得，如此將有助於指揮官的整體情況的感知(SA)。

Identifying the amount of detail required and the amount feasible within the time

available. The time available for completion of the IPB process may not permit the luxury of conducting each step in detail. For example, the NBC and medical staffs must realize the time sensitivity of critical information, such as the time from the exposure of personnel to a biological agent until the onset of symptoms.

(三)確定詳細的情報需求數量，且在可用的時間內此數量是合理可行的。完成戰場情報準備的可用時間，可能不允許詳細地進行戰場情報準備的每一個步驟。舉例來說，核生化與醫學參謀必須了解重要資訊的時間敏感度，就像是人員從暴露於生物戰劑開始到徵狀出現的時間。

## Describe the Battlespace Effects on Threat and Friendly Capabilities

## 三、描述戰場空間對敵我雙方能力的影響

This is accomplished by analyzing the battlespace environment. The information supports the conduct of friendly vulnerability assessment (VA), and the evaluation begins with an analysis of the existing and projected conditions of the battlespace environment. During the evaluation, multiple considerations are evaluated. Planners identify characteristics of the battlespace that could affect friendly target vulnerability, influence the commander's decisions, or affect the COA available to US forces.

這必須藉由分析戰場環境空間來完成。戰場環境空間的資訊可以協助執行我軍損害性(VA)評估，而此評估是從現有的戰場環境空間分析開始。在評估期間，必須考慮多項因素。計畫者必須確定可能影響我軍目標、指揮官決心，或行動方案(COA)的戰場空間特性。

**(1)Terrain Analysis.**

The terrain analysis reduces the uncertainties regarding the effects of natural and man-made features on friendly NBC operations. It focuses on the military aspects of the terrain, including—

(一)地形分析

1.地形分析可以降低自然與人為特徵對核生化作戰所產生的不確定效應。軍事地形分析的重點如下：

Observation and fields of fire. Observation is the influence of terrain on reconnaissance, surveillance, and target acquisition capabilities. A field of fire is the area which a weapon or a group of weapons may cover effectively with fire from a given position.

(1)觀測與射界。觀測是地形對偵察、監視和目標獲得能力的影響。射界是指從一指定位置，以單一武器或者多種武器，能夠以火力有效涵蓋的區域。

Cover and concealment. Planners identify the cover and concealment that may be available to preclude possible targeting by an adversary.

(2)掩蔽和隱蔽。計畫者必須確定掩蔽和隱蔽位置，才有可能避免遭敵人標定。

Obstacles. Planners identify the obstacles (natural and man-made) that may be used by an adversary with capabilities (such as persistent chemical agents) to impede or delay the advance of US forces.

(3)障礙：計畫者必須確定那些可能被敵人用來妨礙或延遲美軍部隊前進的人為障礙或天然障礙(例如：持久性化學戰劑)。

Key terrain. Key terrain is any feature or area that would offer a marked tactical advantage if an adversary seized it or gained control of it.

(4)地形要點：如果敵人掌握或控制此地區，將可獲得顯著的戰術利益。

AA. An AA is a route by which a force may reach key terrain or an objective. NAIs along an AA that an enemy may target with NBC weapons are also identified.

(5)接近路線(AA)。部隊可以到達關鍵地形要點或目標的路徑。沿著接敵路線可能被敵軍以核生化武器瞄準的標示利害區域(NAIs)也必須被確定。

The terrain analysis is conducted as follows:

- The terrain is evaluated through a map analysis supplemented by NBC reconnaissance.
- Terrain factor overlays are developed and analyzed, including the identification of contaminated areas.
- Combined-obstacle overlays are developed.
- AAs are identified and analyzed.
- AA overlays are developed.

2.可利用以下指導進行地形分析：

(1)藉由核生化偵察所提供之地圖分析來評估地形。

(2)發展並分析地形透明圖，包括污染區域的確認。

(3)發展結合障礙透明圖。

(4)確認並分析接近路線(AA)。

(5)發展接近路線透明圖。

Terrain analysis examines the potential impact of factors on contaminants. Contamination hazards depend on the ground conditions encountered. For example, the surface and soil type affect how readily a chemical agent is absorbed into the soil. The type of surface also affects the persistency of chemical agents. Even though the actual operational environment is a combination of conditions, looking at the following general conditions separately will give an indication of what to expect:

3.藉由地形分析可以測試污染物的潛在影響。污染危害與所面對的土地狀況有關。舉例來說，表面及土壤類型影響化學戰劑的被吸收程度。地表類型也影響化學戰劑的持久性。即使真實的作戰環境是一種複雜的情況，透過以下個

別情況的描述，將可從中獲取參考指南：

Sand. Sand is generally any surface that has a large amount of sand (such as a beach), and it normally has good drainage. When chemical agents are applied to this surface, they tend to be drawn into the subsurface, lowering the quantity of contamination available for liquid detection.

(1)沙地：沙地通常是指含有大量沙子的地表（像是海灘），通常有良好的排水性。當化學戰劑被施放在此種表面時，很容易滲透至地表下，因此殘留的液態污染量不易被偵檢。

Soil. Soil is generally any surface that contains quantities of clay and loam. Depending on the relative amount of each soil component, chemical agents react differently. Normally, some percentage of the agent is absorbed into the subsurface (until saturation).

(2)土壤：土壤通常是指含有泥土及沃土的地表。化學戰劑與土壤間的反應，與土壤的成份有關。通常，土壤會吸收部分比率的戰劑，直至土壤飽和為止。

Grass. Grass is generally any surface covered with a layer of grass, from a few centimeters to a half meter in height. A portion of the chemical agent remains on the grass, while the rest is absorbed into the underlying soil. The chemical agent on the grass is available for liquid detection.

(3)草地：草地通常是指表面覆蓋著一層數公分至0.5公尺高的草皮。部份化學戰劑殘留在草皮上，其餘部份則被土壤吸收。在草皮上的化學戰劑可被液態偵檢偵測到。

Mud. Mud is generally any surface saturated with water, resulting in muddy conditions. The amount of persistent agent that can be absorbed by wet soil is inversely related to the water content of the soil (such as the more water, the less chemical agent absorbed). Under this condition, chemical agents remain on the surface longer, thus increasing the probability of detection.

(4)泥地：泥地通常是指含有飽和水量的泥濘地表。可以被潮濕土壤所吸收的持久性戰劑量與土壤裡所含的水份成反比。(也就是說水份愈多，可以被吸收的化學戰劑就愈少。)在此種情況之下，化學戰劑可以長期地停留在地表，因此增加了被偵檢出的可能性。

Artificial surfaces. Artificial surfaces (such as concrete and wood) are porous. Liquid agents are absorbed over time. The surface may initially present a contact hazard and later present a vapor hazard during agent off-gassing.

(5)人造表面：人造表面(例如：水泥和木頭)是多孔性的。液態戰劑隨著時間被吸收。此表面最初可能呈現出接觸性的危害，並且在戰劑氣化之後呈現

出蒸氣危害。

The more absorbent the soil, the less liquid remains on the surface. This decreases the probability of detection by M8/M9 detector paper. The smoother and harder the surface, the higher the probability of detection with an NBCRS. When the NBCRS is detecting on rough surfaces, the sampling wheel tends to bounce, decreasing the probability of detection. On soft or porous surfaces, the ability of the NBCRS to detect contamination can be improved by stopping to lower the probe near the surface. The heated probe causes absorbed chemical agents to vaporize. The vaporized agent can then be analyzed by NBC reconnaissance assets.

4.土壤吸收的愈多，則殘留在表面上的液態戰劑也就愈少。這降低了 M8/M9 偵檢紙檢出的可能性。愈平愈硬的地表，被核生化偵察系統(NBCRS)檢出機率也就愈高。當核生化偵察系統在粗糙的表面上進行偵檢時，採樣器容易因地面不平而振動，造成偵檢的困難。在柔軟或多孔的表面上，核生化偵察系統可藉由停車並將採樣管盡量接近地表，來改善其偵檢能力。藉由加熱的採樣探針吸附汽化的化學戰劑，接著再以核生化偵察設備進行分析。

**(2)Weather Analysis.**

Weather in the AO is analyzed to determine its effects on friendly and threat operations. The operational and tactical environments require that weather and terrain be considered simultaneously and developed as an integrated product. Weather and terrain can be graphically portrayed to indicate the possible impact of NBC weapons within an AO. For example, weather conditions influence the persistency of liquid contamination. Such contamination is detected in two ways—as a vapor (as it evaporates) or by physical contact. As wind speed and temperature increase, the evaporation of liquid contamination increases. This means that there are more vapors present to detect, thus increasing the probability of detection. The following factors should be considered when analyzing weather aspects:

(二)天氣分析。

作戰地區(AO)的天氣分析是為了要決定它對敵我雙方所產生的效應。作戰與戰術環境需要同時考慮天氣和地形，期能獲得整合性的結果。天氣與地形圖解可以指出核生化武器對作戰地區可能造成的影響。舉例來說，天氣條件影響液體污染的持久性。此種污染可以兩種形式被檢出-也就是汽態或液態。當風速和溫度增加時，則汽化的液態污染增加。這意謂有更多的蒸汽存在，也就是被檢出的機率增加。當在進行天氣分析時，可以考慮下列因素:

- Wind speed and direction can impact the downwind travel and hazard areas associated with NBC agents.
- Atmospheric stability can play a key factor in the analysis of when an adversary may

use NBC weapons.

- Temperature and humidity have a direct impact on the performance of personnel and equipment. Temperature extremes and humidity reduce the capabilities of personnel and equipment and may require the use of special personnel shelters or equipment.

1.風速和風向能夠影響核生化戰劑的下風危害區域。

2.針對敵人是否使用核生化武器進行分析時，大氣的穩定度扮演著關鍵的角色。

3.溫度和濕度對人員和設備的性能有直接的影響。極端的溫度與濕度降低人員和設備的作業能力，因此需要特殊的人員防護場所或設備。

Other Analysis. This includes all aspects of the battlefield environment that affect friendly or threat COAs not already incorporated into terrain and weather analyses.

(三)其他的分析。

包括所有影響我軍或敵方行動方案的戰場環境分析。

## Evaluate the Adversary

## 四、敵情評估

Threat evaluation is a detailed study of threat forces, their composition and organization, tactical doctrine, weapons, equipment, and supporting systems. Threat evaluation determines threat capabilities and limitations and how the threat would fight if not constrained by weather and terrain. Evaluate the adversary by—

威脅評估是針對威脅來源、組成和組織、戰術準則、武器、裝備以及支援系統的詳細研究。威脅評估決定了威脅的能力及限制，以及在無天氣及地形的限制下敵人會如何作戰。可利用以下幾點來評估敵人

**Identifying Threat Capabilities.**

**(一)**確認威脅的能力

Threat capabilities are broad COAs and supporting operations used by the threat to influence the accomplishment of the friendly mission. Planners use intelligence information to assess possible enemy offensive NBC capabilities and to assess the potential impact of agent use.

威脅能力是指敵人為影響我方任務達成，所可能使用的各種行動方案以及支援作戰。計畫者利用情資去評估敵人可能之核生化能力及其所使用戰劑的潛在效應。

Identifying Gaps in the Current Intelligence Holdings.

(二)確認當前的情報的間隙

Planners describe the prioritization of gaps in the current holdings on enemy offensive

NBC capabilities using the commander's initial IR. The early identification of gaps allows planners to initiate action to collect the NBC intelligence required to fill the gaps.

計畫者利用指揮官之初步情報需求(IR)，來描述當前針對敵核生化攻擊能力所掌握之各種情報間隙的需求優先順序。及早確認這些間隙的存在，可以使計畫者發起核生化情報蒐集行動，以便填補情報間隙。

Creating or Updating Threat Models.

(三)產生或更新威脅模式

Threat evaluation is performed by knowing the threat and using decision support tools that would portray how enemy NBC weapon use could impact the AO. The use of models and other automated decision tools provides a means to assess the potential footprint for an enemy attack. For example, the NBC and intelligence sections coordinate and determine how an adversary may use his capability to get the best spread of agent on the target. There are multiple factors to consider, including weapon fusing, direct or indirect delivery of the agent to the target, downwind hazard estimates, contamination deposition patterns, the TBM threat, radiological hazards, and TIM hazards.

威脅評估是藉由瞭解威脅來源，並利用決策支援工具描繪敵人使用核生化武器對作戰地區可能造成的影響進行分析。模式模擬與其他自動決策工具提供許多方式，可以用來評估敵可能實施攻擊的潛在跡象。例如：核生化與情報部門合作，來決定敵人將如何利用其能力將戰劑有效散佈於目標區。其中有許多因素要必須考慮，包括武器的引爆方式、直接或間接施放戰劑至目標區、下風危害評估、污染沉降圖、戰區彈道飛彈(TBM)威脅、輻射危害與工業毒化物危害。

Weapon Fusing.

1.武器的引爆方式:

Weapon fusing affects when a munition detonates. For example, if a munition detonates at ground level, it deposits most of the agent in the shell crater, minimizing the contaminated area. When munitions burst above the target, wind speed and direction directly influence the spread of the agent. As a munition bursts, the heavier droplets fall faster and the smaller ones drift downwind. The most heavily contaminated area is near the attack area. The chemical agent radiates in a bell shape in the direction of the wind, creating a contamination footprint. A unit conducting NBC reconnaissance has a higher probability of detecting contamination when traveling crosswind to the footprint. The higher the concentration of the agent, the higher the probability of detection. The concentration of the agent on the ground depends on the type of agent, the time since delivery, the delivery method, and the type of ground surfaces

武器所使用的引信會影響彈藥的爆炸。例如：若彈藥在地面引爆，則大部份的戰劑將沉積在彈殼上，造成最小的汙染區域。當彈體在目標上方引爆時，則風速和風向直接影響了戰劑的擴散。一旦彈體爆炸，較重的戰劑液滴較快落下，而

較小的液滴則被帶至下風處。最嚴重的汙染區是最接近攻擊地區。化學戰劑順著風向以鐘形向外擴散，產生一個汙染區域。當核生化偵察單位以側風方向穿越污染區，則愈容易偵檢到污染。戰劑濃度越高，偵測到的機率越大。地面上戰劑的濃度與戰劑的型態、施放後所歷經的時間、施放方式與地表型態有關。

Delivery of the Agent.

2.戰劑的施放:

Delivery of the agent may be direct or indirect. Indirect (off-target) delivery is generally upwind of the target area, and the resulting aerosol/vapor cloud or spray stream drifts onto the target. Direct or indirect types of attack can be delivered from a bursting munition or from a spray device. A radiological dispersal device (RDD) can also use a spray device. Munitions or spray tanks can be filled for dissemination as—

戰劑的施放可能是直接的或是間接的。間接施放通常是於目標區的上風處，而後將產生的煙雲飄向目標區上方。可以藉由彈藥爆炸或噴灑裝置來實施直接或間接的。輻射散佈裝置(RDD)也可被用來當作灑佈裝置。可以將戰劑裝填至彈體或噴灑容器內，進行灑佈，期能產生以下的效果：

• A finely divided powder in aerosol suspension.

(1)懸浮在空中的細微粉末

• Liquid splashes or droplets or as a finely divided liquid in aerosol suspension.

(2)懸浮在空中的液滴或微滴

• A volatile liquid that quickly evaporates into a vapor when released as an aerosol (explosively or from a spray).

(3)具揮發性的液體快速揮發為蒸氣〈經爆炸或噴灑〉。

NOTE: Solid agents are unlikely to evaporate quickly enough to form a vapor, although frozen liquids will evaporate when the temperature rises.

注意: 縱然凝固的液體會隨溫度的上升而蒸發，但是固態戰劑不可能在短時間內揮發形成足夠的煙雲。

Bursting Munition.

A.爆炸彈體:

A bursting munition has a thin outside layer filled with an agent; the agent is dispersed by an air or ground burst. An airburst covers a large area; a ground burst impacts directly on the target. In a ground burst, the explosion drives some of the agent into the crater, where it can persist and remain a hazard (vapor, percutaneous, or ingestion). The types of munitions used are point source and multiple point source.

爆炸彈藥在其厚的彈體外層內填充戰劑；可藉由空炸或面炸的方式進行戰劑的灑佈。空炸可涵蓋廣大地區，而面炸則直接影響目標。在面炸的情況下，爆炸威力可以把部份的戰劑打進彈坑中，形成持久性的危害效果。彈體的使用型態可分

為單點與多點兩種:

Point source. A point source munition disseminates an agent from a single point. Delivery can be an air burst, a surface burst, or a penetrating round. A massive chemical bomb delivered by aircraft, missile, or artillery shell is an example of a point source delivery.

(A)單點源:單點彈體就是由單一地點散佈戰劑。施放方式可為空炸、面炸或穿透炸。經由飛機、導彈或自走炮彈所遞送之大形化學彈頭即為一例。

Multiple point source. A number of point source munitions are distributed in an irregular pattern over a target area. Each point source munition spreads the agent as an aerosol or a vapor that merges with other aerosols and vapors downwind. Cluster bombs and multiple rocket launchers are examples of multiple point source delivery systems.

(B)多點源:以不規則形狀將許多單點源散佈於目標地區。每一個單點源以氣凝膠或蒸氣的方式散佈戰劑，並與其他點源結合形成下風危害。集束炸彈與多管火箭即為多點灑佈的例子。

Spray Device. Spray devices release chemicals from storage tanks or from containers carried by systems, such as aircraft, submarines, patrol boats, missiles, and other vehicles. The degree of dispersion is varied, thus influencing the duration of effectiveness. Spray device delivery is characterized as a line source, which simply means that it disseminates agents along a line of release. An aircraft spray system (internally or externally mounted) is an example of a line source delivery system.

B.噴灑裝置:

由儲存槽或裝於飛機、潛艇、巡邏艇、飛彈及其他載具系統內的噴灑裝置釋放化學戰劑。由於噴灑的程度不同，因此影響戰劑持續時間。噴灑裝置的施放被歸類為線性源，意味著其施放方式是沿著一條線進行灑布。飛機的噴灑系統〈內裝或外掛〉即為線狀源施放的例子。

Downwind Hazard Estimates. Downwind hazards from biological weapons have a significantly larger potential area of effect than chemical weapons. If weather conditions are optimal, a downwind hazard can extend to a few hundred kilometers. The quantities required for BW are small compared to those required for chemical weapons, and BW agents can be disseminated crosswind with few, if any, indications of hostile intent. Key variables that affect the downwind hazard area include weather, terrain, the type of agent, particle size, and the type of delivery system.

3.下風危害評估:

由生物武器所造成的下風危害比化學武器所造成的具有更大的潛在影響區域。若天氣狀況理想，則下風危害區域可以延伸至數百公里。相較於化學武器，生物武器僅需要少許的量就能造成相同的下風危害，且生物戰劑可在隱藏敵意的狀態下於側風施放。影響下風危害區域的重要因素為天氣、地形、

戰劑種類、顆粒大小以及施放系統的型態。

Contamination Deposition Patterns. Contamination deposition patterns could result from a bursting artillery attack (Figur).

4.污染沉降圖案:

污染沉降型態可能是迫砲攻擊的結果，如圖所示。


以迫砲實施液態攻擊的圖案

The sample surface contamination pattern provides the basis for some general conclusions as follows:

樣品表面的污染型態可作為部份基本結論的基礎，例如:

• Agent deposition generally radiates in a bell shape in the downwind direction.

(1)戰劑的沉降一般是以鐘狀(扇形)向下風方向擴散。

• The heaviest concentrations usually occur closest to where the warhead functions.

(2)濃度最高的地方通常出現在彈著點附近。

• The deposition of the agent is uneven. Deposition concentrations generally decrease in crosswind directions from the downwind path of the agent.

(3)戰劑的沉降是不均勻的。沉降濃度通常是由戰劑的下風路徑向側風方向遞減。

The contamination deposition footprint lessens over time, and the concentration levels decrease.

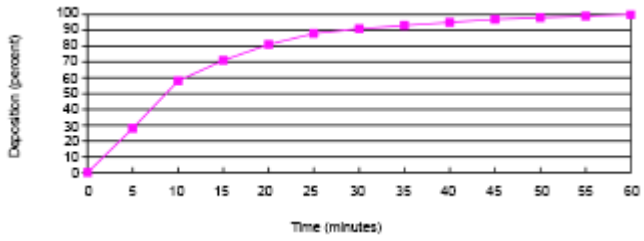
(4)汙染沉降型態隨著時間縮少，且濃度也逐漸下降。

TBM Threat.

TBMs have unique characteristics that must be considered when planning defensive actions. For example, no other target system can put a warhead into the theater rear area or threaten neutral countries within a matter of minutes. Airburst warheads from a TBM provide effective area coverage and dispersion patterns for CB agents. When released at optimal burst heights, agents fall to the ground within 5 to 60 minutes (Figure) in the direction of the prevailing wind.

5.戰區彈道飛彈(TBM)威脅:

(1)當在計畫防禦行動時，務必考慮戰區彈道飛彈的獨特性質。例如：除了戰區彈道飛彈之外，沒有其他瞄準系統可以在幾分鐘內將彈頭發射至戰區周遭，或威脅中立國家。戰區彈道飛彈的空炸型彈頭可提供生化戰劑有效的涵蓋面積以及散佈型態。當釋放於最佳爆炸高度時，戰劑將順著風勢於5至60分鐘內落於地面，如下圖所示。




空爆彈頭沉降時間概念

Large agent droplets or solids fall more quickly; small droplets fall further downwind at a slower rate. Similarly, the vapor released as these agents evaporate moves from the point of release toward the ground in a downwind direction.

(2)大的戰劑液滴或固態顆粒降落較快，小的液滴則會以較慢的速度落於下風處。同樣的，這些戰劑蒸發的蒸氣也是從釋放點向下風處飄散。

Secondary threats may also exist during and after some TBM attacks. TBMs may have warheads that do not separate from the missile body until the warhead functions or the missile hits the ground.

(3)二次威脅也可能存在於某些戰區彈道飛彈攻擊中或攻擊後。某些戰區彈道

飛彈的彈頭於空中不會與彈體分離，必須碰觸地面或爆炸後才會與彈體分離。

In addition to the explosive, chemical, or biological hazards, the missile may impact a building or create a crater. When this happens, the impact site may contain hazards from the remaining missile fuel and oxidizer or from the facility or structure the missile hits (e. g., fuel, power lines, munitions). Depending on the quantity remaining, the residual fuel and oxidizer (red, fuming nitric acid) can cause M8 detector paper to falsely indicate the presence of chemical agents or to mask the presence of an agent.

(4)除了爆炸、化學或生物危害外，導彈可能撞擊到建築物或產生彈坑。當此種情況發生時，撞擊點可能會產生殘餘飛彈燃料、氧化劑　或遭破壞建築物(內含燃料、電線、彈藥)所造成的危害。殘留的燃料或氧化劑(紅色的發煙硝酸)可能會使M8偵檢紙產生錯誤的呈色反應或無法判斷戰劑的存在與否，這與殘留量有關。

Radiological Hazards. Radiological hazards can include alpha, beta, and gamma radiation that must be considered when planning reconnaissance missions. The threat to US forces could include the radiological hazards from nuclear facilities, radiological dispersion, improvised nuclear devices, sealed sources, reactor fuel production, or luminescent military commodities.

6.輻射危害:

當在計畫偵察任務時，必須考慮可能的輻射危害，計有α、β與γ射線。可能對美軍造成輻射危害威脅的來源計有核能設施、輻射散佈、急造核子裝置(髒彈)、密封式的射源、反應爐燃料產物(核廢料)或相關含有螢光的軍事物資(指北針)。

Nuclear Facilities. Nuclear facilities may release radioactive material to the environment as a result of an attack on the installation, sabotage, or an accident (e.g., Chernobyl). A damaged reactor can release large amounts of radioactive material, composed of many different radionuclides, over an extended period of time. Radioactive materials of concern include noble gases, halogens (radioiodines), mixed particulate fission products, and transuranics (e.g., uranium and plutonium). Consequently, forces downwind from an incident may face the possibility of external and internal exposure over a large affected area and for an extended period of time. The hazard posed by internal exposure to radiation is radionuclide-specific. Therefore, estimates of an effective dosage (i.e., the dosage from internally deposited nuclides) highly depend on the identification and quantification of the environmental contamination, particularly airborne contamination.

(1)核能設施:

核能設施可能因攻擊、蓄意破壞或意外而散佈核輻射物質到環境中(例如：

車諾比爾事故)。一個受損的反應器，可以持續一段很長的時間，釋放大量核輻射活性物質，而這些物質是由許多不同的放射性核種所組成。主要的放射性物質包括惰性氣體、鹵素(放射性碘)、混合的粒狀分裂產物以及鈾的衍生物(鈾、鈽)。因此，位於事件下風處的部隊，可能會位於一個廣大的影響區內，遭受長時間的外在或內在暴露。內在輻射暴露所造成的危害，是由特殊的核種輻射所造成。因此，有效劑量的評估(也就是內部沉積的核種劑量)與環境污染的種類及污染量高度相關，特別是空氣污染。

Radiological Dispersion. Radiological materials are used in many industrial, research, and medical applications and are increasingly available. Dispersal falls into two categories—simple radiological dispersal and RDDs.

(2)核輻射散布:

應用在許多工業、研究及醫學方面的核輻射物質越來越容易取得。散佈的方式分為單純輻射散佈與射線散布裝置(RDDs)。

Simple radiological dispersal. Simple radiological dispersal could be any dissemination of radioactive material other than that produced by a nuclear explosive device. It is specifically designed to cause damage, injury, or area denial by means of the radiation produced following dissemination. For example, an adversary could create a perceived or real health threat by securing a supply of radioactive material from a medical lab, an industry, or another site and dispersing the material into the public water supply or via an aircraft over a troop staging area.

A.單純核輻射散布。

單純的輻射散佈可以是任何除了由核爆裝置之外所產生的放射性物質輻射散佈。它的設計通常是利用核輻射物質所產生的放射線，造成危害、傷亡或地區禁用。例如:敵人可能會從醫療實驗室、工廠或其他地方取得輻射活性物資，再將其散佈到公共供水系統或經由飛機，噴灑在部隊駐紮地上空，造成我方的心理壓力或實際的健康威脅。

RDD. An RDD can be defined as any device (including a weapon or equipment) other than a nuclear explosive device that is specifically designed to disseminate radioactive materials to cause damage, injury, or area denial via the radiation produced by decaying radionuclides in the material. The use of the explosive or incendiary, mixed with radioactive materials, could create an incident in which the initial explosion would kill persons in the immediate vicinity of the device. The radionuclide decay would continue to threaten first responders and others near the incident site.

B.射線散布裝置(RDD)。

射線散佈裝置(包括武器或設備)可以被定義為除了核爆裝置以外，專門設計用來散佈核輻射物質，利用輻射物質內衰變的核種所產生的射線，企圖造成危害、

傷亡或地區禁用的裝置。利用爆裂物或燃燒劑與輻射活性物質混合，就能夠在裝置爆炸初期，造成附近人員立即死亡的事件。而放射性核種的衰變將持續地威脅第一線應變人員，以及事件附近的其他人員。

Improvised Nuclear Devices. A nuclear detonation is the sudden release of energy from nuclear fission or fusion. The prompt, initial radiation poses a severe external radiation hazard, while fallout poses serious external and internal radiation hazards. The radioactive material produced by a nuclear explosion is composed of the same fission products as those from a reactor accident and may also include activation products produced when neutrons from the fission interact with the surrounding environment. Plutonium and/or uranium not fissioned during the nuclear reaction will also be dispersed by the explosion. Because of the large amounts of energy released from a nuclear explosion, the plumes of fallout and airborne contamination can impact massive geographic regions.

(3)急造核子裝置:

核爆是透過核子分裂或融合，瞬間釋放大量的能量。其立即、初始的輻射，產生嚴重的外部輻射危害，而輻射落塵則造成嚴重的外部和內部的輻射危害。核爆所產生的輻射活性物質，其組成與核電廠意外所釋放的分裂產物是相同的，其還有可能包含周遭環境遭核分裂釋出的中子所激化的物質。在核子反應期間，未發生分裂反應的鈽和鈾也會因爆炸而散佈。由於核爆所釋放的大量能量，羽狀落塵雲及懸浮污染物可以影響廣大的地理區域。

Sealed Sources. It is conceivable that personnel may enter areas where radioactive materials have been left (intentionally or unintentionally). Breakdown in normal control mechanisms, collateral damage caused by combat, or malicious use by adversaries able to acquire medical or industrial sources of radioactive material could result in significant radiation dosages to forces. Sealed sources, by definition, are designed to contain radioactive material inside (e.g., radioactive gases in glass vials, radioactive powders double-encapsulated in stainless steel, metal impregnated with radionuclides and then encapsulated). When such sources maintain their structural integrity, they pose an external exposure hazard from the penetrating radiation (neutrons or gamma rays). However, when the integrity of a source is compromised, the source can present a contamination problem and an internal hazard from the nonpenetrating radiation (beta or alpha particles). Commonly found, sealed sources that may pose a significant gamma radiation exposure hazard include iridium-192 industrial radiography sources, cobalt-60 medical teletherapy sources, and cesium-137 calibration irradiator sources.

(4)封閉式射源:

人員可能進入輻射物質遺留(無意或有意)的地區是可以想像的事。平時控

管機制的失效、戰爭所造成的附帶傷害或敵人的惡意破壞，企圖能夠獲取足以造成部隊大量輻射累積劑量的醫療或工業的射源物質。密封式射源的定義就是將輻射活性物質封閉於某種容器內(放射性氣體封閉於玻璃瓶中、放射性粉末則封閉於雙層的不銹鋼瓶中、將混有放射核種的金屬膠囊化)。當這類射源維持其結構完整時，它們只會藉由穿透射線(中子或γ射線)造成外在暴露的危害。但是，當射源的結構完整性遭到破壞，其便可能產生污染問題以及非穿透性射線(β、α射線)所造成的內部暴露危害。易造成嚴重γ射線暴露危害的常見封閉射源有銥-192工業顯像射源、鈷-60醫學放射療法射源以及銫-137校正射源。

Reactor Fuel Production. Uranium is a naturally occurring, low-level radioactive metal that has many civilian and military applications. Natural uranium metal is processed by the nuclear-power industry to produce uranium enriched in the isotope uranium-235, which is then suitable for use as nuclear reactor fuel. The inadvertent release of reactor fuel (e.g., terrorist incident) could cause exposure to gamma and beta radiation.

(5)反應爐燃料產物:

鈾是一種天然、低階輻射活性金屬，可應用在許多民生以及軍事用途。天然的鈾金屬經由核能工業的處理，產生富含鈾-235同位素的鈾原料，適於作為核子反應爐的燃料。反應爐燃料的意外釋放(恐怖攻擊事件)，可以造成β與γ射線的暴露。

Luminescent Military Commodities. Tritium is widely used in the military to create self-luminescent displays on compasses, weapon sights, and other items. Tritium is also used in some nuclear devices. Generally, exposure to this nuclide is not a serious threat because tritium is a very low-energy beta emitter that disperses quickly in the environment if released. As a low-energy beta emitter, it is an internal exposure concern. Tritium detection requires special monitoring and sampling techniques.

(6)螢光軍用物資:

在軍事上，氚被廣泛用於指南針、瞄準具及其他物品的自發光儀錶。氚也用於某些核子裝置。一般而言，暴露在此種放射性核種下並不是一個很嚴重的威脅，因為氚只是能量非常低的β射源，且萬一發生外釋，也很快就消失在環境中。如同其他低階β射源，也必須考量其具有內部暴露的風險。氚的偵測需要靠特殊的監測與取樣技術。

TIM Hazards. Given the prevalence of TIM throughout the world, a significant hazard to US forces exists. Area studies, intelligence estimates, and economic studies can also be used to indicate the type and level of TIM hazard in a specific AO. TIM hazards must be determined at the local level, based on local activities (industrial, agricultural). A TIM assessment of an area must include commercial transportation routes (highway and rail),

chemical production and storage areas, pipelines, and temporary storage areas (such as ports, rail yards, and airfields). In the field, it is common practice to ship hazardous, useful, and valuable materials in mismarked or unmarked containers, railcars, and drums. TIM releases should be considered in the following four categories:

7.毒性工業化學物質(TIM)危害:

由於毒性工業化學物質在世界上是非常普遍的，亦對美軍造成重大的威脅。戰區調查、情資評估及經濟研究，均可據以判斷在特定作戰區可能遭遇到的毒性工業化學物質種類與危害等級。毒性工業化學物質的危害程度是由當地工業、農業發展狀況來決定。一個地區的毒性工業化學物質的危害評估項目，包括商業運輸路徑(高速公路和鐵路)、化學生產、儲存地區、管線及暫存區(例如：港口、鐵道儲物區和機場)。在戰區，利用假標示或未標示的容器、火車或桶子，運送有毒的、有用的及有價值的物資是常見的方法。必須考慮以下四類毒性工業化學物質的外釋:

Intentional release. This is the intentional use of TIM against US or allied forces and/or civilians in the AO.

(1)刻意洩漏：企圖以毒性工業化學物質對付作戰地區的美軍、盟軍或平民。

Collateral damage. This is the unintentional release of TIM caused by friendly or enemy military action in the AO.

(2)附帶損害：由作戰地區內友軍或敵軍的活動所造成的非刻意洩漏。

Accidental release. This type of release dramatically increases if qualified, trained plant or storage operators flee an area.

(3)意外洩漏：在合格或受過訓練的工廠人員或倉儲人員逃離後，此種洩漏的機率會大幅增加。

Sabotage. Sabotage may be carried out by individuals with a political agenda or by disgruntled employees at a facility. Although the intent of the sabotage may be to disrupt the production of a specific product, TIM releases may cause an unintentional hazard.

(4)蓄意破壞：蓄意破壞可能是由個人懷抱著政治因素或受雇者的不滿而造成。雖然蓄意破壞的目的通常是用來阻礙生產，但是毒性工業化學物質的外釋，卻可能造成意外的傷害。

Creating Templates. This process converts the threat doctrine or patterns of operation to graphics (doctrinal templates). Doctrinal templates convert the threat order of battle (OB) data into graphics that show how the threat might use its offensive NBC capability according to doctrine and training, without the constraints of weather and terrain. A template includes a description of threat offensive NBC capabilities, tactics, and options. It also lists or describes the options available to the threat if the operation fails or if subsequent operations succeed. A template can identify high-value targets (HVTs), which

are assets that the threat commander requires for successful mission completion.

(四)產生圖解

此過程是將敵軍準則或作戰類型轉化為圖解(敵軍戰術圖解)。敵軍戰術圖解將敵軍戰鬥序列(OB)的參數，在不考慮天候地形的限制下，轉換成敵方將如何利用其準則與訓練進行核生化攻擊的圖解。它包含了敵方的核生化攻擊能力、戰術與作戰的說明。同時也列出或描述當行動失敗或後續行動成功時，可以採取的行動選項。圖解可以確認出高價值目標 (HVTs)，此目標即為敵指揮官為達成任務所必須獲得的重要資產。

## Determine Adversary Courses of Action

## 五、決定敵可能行動方案

a. Commanders determine the adversary COAs that will influence the accomplishment of the friendly mission. They—

(一)指揮官決定會影響友軍達成任務的敵軍行動方案。指揮官必須執行下列事項：

Identify the likely objectives of the threat and the desired end state.

1.確認敵可能目標及其所望戰果。

Identify the full set of COAs and associated NBC offensive capabilities available to the threat.

2.確認敵可利用之所有行動方案及其相關之核生化攻擊能力。

Evaluate and prioritize each COA. Use judgment to rank the threat COAs in their likely order of adoption.

3.根據各行動方案威脅的可能性排序，評估及確認各行動方案的優先順序。

Develop each COA in the amount of detail that time allows. To ensure completeness, integrate the following NBC considerations:

4.在時間許可下儘量蒐集敵行動方案的細節。為了確保資訊的完整性,必須整合以下的核生化考慮事項:

What. Identify the type of agent(s) that may be used to support adversary COAs.

(1)何事：確認可能用以支援敵行動方案的戰劑類型。

When. Identify the time the adversary may use his offensive NBC capability.

(2)何時：確認敵可能使用核生化能力攻擊的時機。

Where. Identify the sectors or zones where NBC agents may be used.

(3)何地：確認可能遭核生化戰劑攻擊的區域。

How. Identify the method by which the threat will employ its offensive NBC capability.

(4)如何：確認敵將運用何種方法，實施核生化攻擊。

Why. Identify the objective or end state that the threat intends to accomplish.

(5)為何：確認敵欲達成的目標或戰果。

For each COA, commanders develop the following products for follow-on analysis and comparison:

(二)針對每一個行動方案，指揮官必須獲得以下結果，以利後續的分析與比較：

Situation Template. The situation template is a doctrinal template with terrain and weather constraints applied. It is a graphic depiction of expected threat dispositions for each possible threat COA. It usually depicts the most critical point in the operation as agreed upon by the intelligence and operations officers.

1.敵可能行動圖解：敵軍戰術圖解係考慮天氣地形限制的敵軍戰術圖解。它以圖示表示敵每一個可能行動方案的意圖。它通常描述最重要的且為情報與作戰軍官所同意的作戰環節。

Event Template. The event template is a guide for NBC reconnaissance collection planning. The event template depicts the NAI where activity or the lack of activity may indicate which COA the threat has adopted.

2.徵侯圖解：徵侯圖解是核生化偵蒐計畫的指導。徵侯圖解說明標示利害區(NAI)內敵軍活動或無活動的狀況，來判斷其所可能採取的行動方案。

Event Matrix. The event matrix provides details on the type of NBC activity expected in each NAI, the times the NAI is expected to be active, and its relationship to other activities on the battlefield.

3.徵侯分析表：徵侯分析表提供了每個標示利害區預期發生核生化活動類型的細節、標示利害區內預期活動發生的時間，以及戰場上與其他活動之間的關係。

Decision Support Template. The decision support template is a combined intelligence and operations estimate in graphic form. It indicates the points where a decision from the commander may be required, based on input from multiple sources, including NBC reconnaissance information.

4.決心支援圖解：決心支援圖解是以圖像來表示情報與作戰的評估。基於多種情資來源(包括核生化偵察資訊)，指出指揮官可能需要下決心的地點。