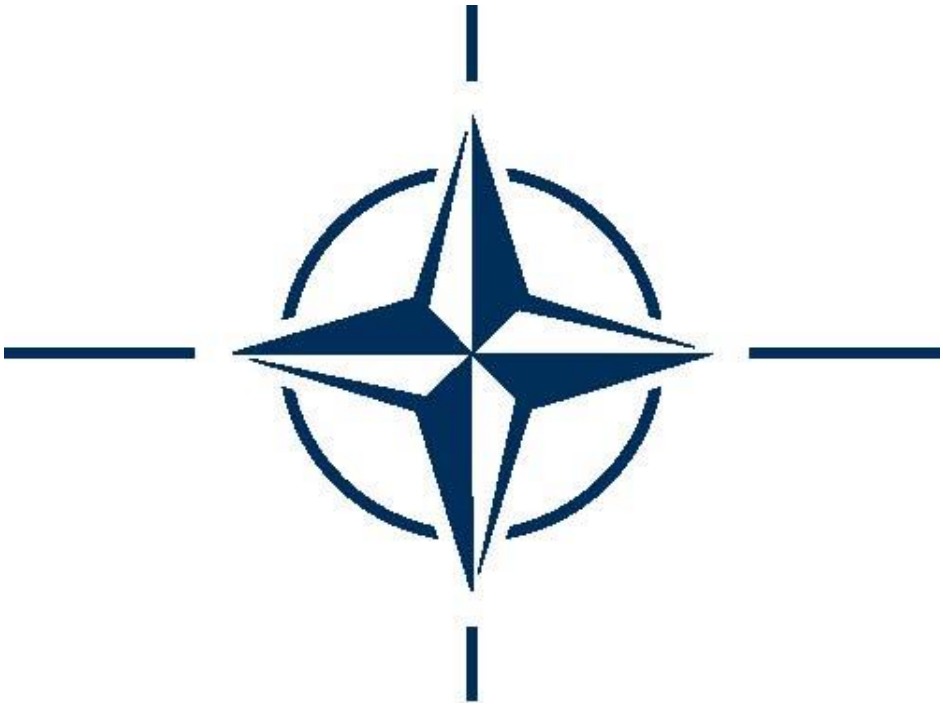
NATO STANDARD

ATP-88

Chemical, Biological, Radiological and Nuclear Hazard Management for Airlift Operations

Edition A Version 1
DECEMBER 2014



NORTH ATLANTIC TREATY ORGANIZATION

ALLIED TACTICAL PUBLICATION

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NORTH ATLANTIC TREATY ORGANIZATION (NATO)

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NATO LETTER OF PROMULGATION

2 December 2014

1. The enclosed Allied Tactical Publication ATP-88, Edition A, Version 1, CBRN Hazard Management for Airlift Operations, which has been approved by the nations in the Military Committee Joint Standardization Board, is promulgated herewith. The agreement of nations to use this publication is recorded in STANAG 2471.

2. ATP-88, Edition A, Version 1, is effective on receipt.

2. This publication shall be handled in accordance with C-M(2002)60.

Edvardas MAŽEIKIS
Major General, LTUAF
Director, NATO Standardization Office

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RESERVED FOR NATIONAL LETTER OF PROMULGATION

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RECORD OF RESERVATIONS

CHAPTER	RECORD OF RESERVATION BY NATIONS
General	ESP, EST, GBR
Note: The reservations listed on this page include only those that were recorded at time of promulgation and may not be complete. Refer to the NATO Standardization Document Database for the complete list of existing reservations.	

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RECORD OF SPECIFIC RESERVATIONS

[nation]	[detail of reservation]
ESP	The Spanish Navy will follow national doctrine on CBRN hazard management for airlift operations, in those airlift operations with aircraft operating from ships.
EST	CBRN (including decontamination) capability development.
GBR	- The UK will implement this STANAG as the appropriate CBRN capabilities are brought into service. - Paragraph 1.5 – The Scope of the ATP should cover CBRN incidents and Environmental and Industrial Hazards (EIH) – as defined in ATP 3.8.1 Vol 1. EIH is a wider than the Toxic Industrial Material (TIM) mentioned in this paragraph. The use of EIH is consistent with para 4.5 that covers disease outbreak. - Chapter 3- The definition of Hazard Management should be aligned to that given in the NTMS and in AJP 3.8 B. It is defined as “A combination of preparatory and responsive measures designed to limit the vulnerability of forces to chemical, biological, radiological, nuclear and toxic industrial hazards and to avoid, contain, control exposure to and where possible neutralize them “. For the UK EIH is used instead of toxic industrial hazards. Hazard Management consists of the following activities: (1) Hazard Reduction / Survivability; (2) Pre-hazard Precautions; (3) Hazard Avoidance; (4) Hazard Control; (5) Decontamination and (6) CBRN Waste Management. This Chapter should be re-written to reflect this definition. In particular hazard reduction/survivability should be discussed, covering hardening, decomtaminability and compatibility. Whilst many aircraft are not designed with these criteria, there is no reason why such procedures should not be carried out for ground and support equipment (AEP- 7 Edn 5 Chapter 2). Chapter 3 should be re-drafted to include the activities that make up hazard management. In particular there is no mention of CBRN Waste Management nor any mention of separate methods for the decontamination of sensitive equipment. The definitions of the decontamination levels should align to those given in AJP 3.8 B. The UK uses slightly

	different definitions, these are: a. Immediate. Decontamination performed on individuals, irrespective of dress state, with the primary aim of saving life. This may include decontamination of personal clothing and/or personal equipment using decontaminants carried on the individual. b. Operational. Decontamination performed on specific parts of operationally essential equipment, operationally essential materiel, limited terrain (including infrastructure) and individuals wearing Individual Protective Equipment (IPE) with the primary aim of sustaining operations in a CBRN contaminated environment. The minimising of contact and transfer hazards is a priority so as to reduce the challenge to IPE and limit the spread of contamination. c. Thorough. Decontamination performed on personnel, equipment, materiel and terrain (including infrastructure) with the primary aim of restoring normal operational tempo by reducing the level of CBRN IPE worn by personnel for a defined period of time. d. Clearance. Decontamination performed on personnel, equipment, materiel and terrain (including infrastructure) with the primary aim of enabling unrestricted use, handling, operation, and release from military control of contaminated items, subject to the approval of national civilian authorities. Where there is a requirement for repatriation or for the temporary or permanent removal of equipment and/or personnel from an operation, clearance decontamination must be conducted to a standard sufficient to allow, with additional safety measures where required, transportation or disposal. - Chapter 4 Para 4.6 – This should be split into 2 paragraphs: Para 4.61. – Contaminated casualties Para 4.6.2 - Contagious Casualties. The STANAG assumes casualty decontamination is 100% effective. Casualties with wound contamination could be moved with protective dressings or hazard control. There is no differentiation made between tactical and strategic aeromed and enclosed environment. Casualty moves to save life should be a priority with mitigation by hazard management (wrapping casualty) and reducing contamination burden, this should be a local command decision. Casualty protective equipment should be used to minimise cross-contamination. International Health Regulations should be applied and there is a requirement to inform countries if overflying them.

	- Chapter 4 Para 4.7 First line should just state 'the requirement for repatriation of fatalities to home nation'. This is a political decision and the paragraph omits reference to use of casualty protective equipment in the form of human remains bags / pouches. However still a requirement under International Health Regulations to inform countries overflown. The paragraph should reflect that the e decision to repatriate is a national decision in discussion with partner nations and nations overflown. - Annex B. Para B.3 – This defines formerly contaminated items as items exposed to CBRN hazard that exhibit residual contamination. These are to be marked as “formerly contaminated”. This is not clear. Items that retain residual contamination should be marked as contaminated materials and contained. The level of residual contamination and hazard posed should be clearly marked on the item(s), unless the level of residual contamination is below a level that it poses no hazard to life, as agreed on a case by case basis with national authorities. Agreement and advice on residual levels should be sought by Scientific Reachback, in accordance with the NATO MC 0590 – NATO Chemical, Biological, Radiological and Nuclear (CBRN) Reach Back and Fusion Concept. Dated 19 May 2010. For the UK this is done via the deployed Scientific Adviser under Operation VAMPER. - Annex B Para B.5.1 The term used here “Hot Site” is not a recognised term. The layout and naming of the decontamination site should follow the principles given in ATP-3.8.1 Vol 2 Annex B. - Annex C Para 8 – Spot decontamination is not a recognized NATO term. NATO documents should use NATO agreed terminology (NATO Policy for Standardization C-M(2000)54 dated 20 Sep 2000). It is operational decontamination, cleaning specific parts of operationally essential equipment. How this is to be carried out should be included in the training/operating literature for such equipments (AEP-7 Edn 5 para 0211 refers).

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Chapter 1 INTRODUCTION

1.1. AIM

The aim of this publication is to provide specific NATO procedures for CBRN hazard management, protection of personnel and assets, and decontamination of airlift aircraft, passengers, and cargo. This publication provides “operational” direction to ensure the continuity of airlift missions undeterred by the threats and hazards of CBRN incidents. It contains guidance for employing airlift forces in a CBRN contaminated environment and measures to mitigate the effects of a CBRN incident and continue uninterrupted airlift support to the joint force commander. It is intended to complement guidance provided by CBRN specialists.

1.2. AGREEMENT

This publication is implemented when a Nation has issued the necessary orders or instructions to authorities and units concerned putting the procedures detailed in this agreement into effect.

1.3. TERMS AND DEFINITIONS

See Lexicon in Annex D.

1.4. INTRODUCTION

1. An attack with CBRN agents against NATO forces or such forces facing CBRN incidents poses unique challenges to the successful employment of airlift forces in support of the warfighter. Not all NATO airlift crews are equipped with individual protective equipment (IPE) and these unprotected aircrews may not be able to continue operations in a CBRN contaminated environment. Due to the potential for spreading CBRN contaminants beyond the immediate incident area, approval to operate contaminated airlift aircraft in the international flight regime may be difficult to obtain. These airlift missions often cross national boundaries and transit uncontaminated airfields, requiring national-level over-flight and landing clearances.

2. Once contaminated, it may be difficult to return large-frame aircraft (LFA) to a cleanliness level acceptable for international flight. Tests have indicated that once toxic chemical materials are absorbed into aircraft painted surfaces, they continue to off-gas at harmful levels following several decontamination attempts. Toxic biological materials contaminating aircraft cargo and passenger compartments are protected from environment decay and exhibit extended persistency (Anthrax spores may remain viable for decades). Radiological particles can get into cracks and crevices and be difficult to remove completely. Solutions for aircraft external decontamination [primarily the use of hot soapy water (HSW)] is largely ineffective for the decontamination of aircraft internal surfaces. Essentially, LFA decontamination may

be unachievable in the operational environment. As such, hazard management is essential to the preservation of airlift capability.

3. CBRN contamination of airlift aircraft, airfields, and cargo will pose significant challenges to mission success. It is imperative that commanders, command and control (C2) agencies, airlift mission planners, and aircrew members recognize CBRN threat characteristics and avoid exposure within the constraints of critical mission requirements.

1.5. SCOPE

This STANAG is intended to cover all CBRN incidents that affect aircraft operations – attacks by terrorists or conventional adversaries and accidental or intentional release of toxic industrial material (TIM). It applies to the full spectrum of airlift missions and operational environments to include home station as well as expeditionary operations, and is designed to enable NATO units to sustain critical operations while preparing for, protecting from, responding to, and recovering from CBRN incidents. Specific guidance is provided for senior decision makers, C2 agencies, airlift mission planners, line units, and aircrew members and address three possible CBRN contamination scenarios: (1) CBRN attacks against aircraft on the ground; (2) airlift operations into contaminated airfields; and (3) agent transfer during the airlift of contaminated cargo or passengers.

1.6. ASSUMPTIONS

1. NATO forces face the threat of CBRN incidents. Adversaries will consider fixed facilities such as ports, airfields, and logistic bases as prime targets for CBRN incident.

2. CBRN defence will be considered during all phases of airlift operations: at home station, airports of embarkation/debarkation and en route locations.

3. Large-Frame Aircraft (LFA) contamination will occur during ground operation. The possibility of airborne contamination occurring i.e., obtained while flying through a cloud of contaminants, is very remote.

4. Most NATO forces are trained and equipped to survive and operate during CBRN incidents.

5. NATO must also be able to fly missions designated as “critical” by the supported commander, regardless of CBRN threat conditions and the presence of CBRN contaminants. Within mission constraints, commanders must use CBRN hazard management guidance to preserve airlift capability.

6. Personnel will experience a degradation of duty performance (heat stress, fatigue, communications difficulties, loss of situational awareness, etc.) while wearing

IPE. These limitations will affect both ground and airlift operations and could change airlift mission durations. Mission duration is also subject to national flight safety provisions and reservations.

7. Overhead cover will not be available to protect LFA from exposure to contaminants. Aircraft, vehicles, and equipment present within the vicinity of an incident will be presumed contaminated until proven otherwise.

8. Each CBRN contaminant presents unique decontamination challenges. Generally, the guidance for chemical decontamination is also effective against biological agents and the removal of radioactive particles. However, each contaminant must be addressed individually to determine the efficacy of proposed decontamination methods. Clearance aircraft decontamination of chemical and biological agents or radiological debris may not be achievable using today's technologies and existing decontamination procedures and equipment. After a CBRN incident with persistent agents, residual contamination may remain despite aircraft weathering, air washing, and scrub down with decontamination solutions approved for use on aircraft.

9. National authorities will restrict the air movement of contaminated cargo, passengers, and casualties. Overflight and landing clearances will be negotiated through diplomatic channels. International standards of aircraft cleanliness have not been established. Any degree of detectable CBRN contamination may necessitate the removal of airlift aircraft from "unrestricted" international operations due to the possible denial of diplomatic overflight and landing clearances. Residual contamination of airlift aircraft or cargo or the presence of infected crew or passengers may jeopardize airlift mission success.

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Chapter 2 CHEMICAL, BIOLOGICAL, RADIOLOGICAL, AND NUCLEAR THREATS TO AIRLIFT FORCES

2.1. CBRN THREAT

The threat of a CBRN incident against NATO and allied airlift forces is greater today than ever before. The proliferation of CBRN hazardous materials places enormous destructive capabilities in the hands of transnational terrorist organizations and regional adversaries. In an access-denial scenario, adversary use of CBRN weapons and devices against Airports of Embarkation (APOEs), Airports of Debarkation (APODs), en route airfields, and Forward Operating Locations (FOLs) could significantly disrupt or delay the deployment, build up, and sustainment of combat power. Day to day, airlift forces operate through vulnerable civilian airfields around the world and rely on host nation security for force protection. Although the national military authorities closely monitor the CBRN threat in the area and direct protective measures as conditions warrant, all airlift forces accept an increased level of risk in today's international environment.

2.2. CBRN AGENT/ MATERIAL DISSEMINATION

Knowing how an agent can be disseminated is critical to designing appropriate countermeasures and shaping an effective response. Potential targets, defensive posture, and environmental conditions such as wind speed/direction, atmospheric stability, temperature, and humidity must be factored into CBRN incident planning. Possible delivery means include:

a. Aircraft equipped with gravity bombs or spray devices.

b. Ballistic missiles with fusing, or sub-munitions. For persistent agents, an air-burst of the missile warhead is optimal, as it allows detonation of the warhead at a sufficient altitude to maximize dissemination of the agent over a wider target area. For non-persistent agents, a near-ground burst is the most effective means of disseminating the agent, as this limits agent degradation. Sub-munitions provide an effective delivery means for disbursing non-persistent chemical or aerosolized biological agents.

c. Artillery. The full range of the artillery, rockets, and mortars are capable of delivering chemical and biological munitions. Used individually or in small numbers, artillery, rocket, and mortar rounds are only capable of delivering small quantities of agents, with localized contamination. However, in a massive barrage, significant terrain/infrastructure/asset contamination is possible.

d. Special operations or terrorist attacks. Covert agent release using canisters, bombs, or spray tanks is an effective means of CBRN attack. Biological agents can also be dispersed by the use of “vectors” (human or animal carriers of transmissible diseases). Covert release greatly reduces warning of an attack.

2.3. FORMS OF CONTAMINATION

2.3.1. Vapour

Vapours can be generated by generators bursting munitions, or from evapourating liquids. Once the source of the vapour has been expended, vapour in an open or outdoor area will generally disperse rapidly. Vapour contamination is likely to exist in the aftermath of chemical attacks. Vapours will also likely be the primary hazard following TIC and biological attacks, while not being present in radiological incidents. Non-porous portions of resources will not be affected by vapour contamination; however, very porous surfaces such as cloth can absorb chemical and TIC vapours and become a low-level residual off-gassing hazard.

2.3.2. Liquid

Chemical agents are typically disseminated as liquids, and most TICs are in the form of liquids. Liquid droplets can range from thick and sticky to the consistency of water. The removal of liquid contamination before it absorbs into materials is the primary challenge associated with the decontamination of chemical agents. Radioactive particles falling into puddles or pools will contaminate the liquid and rain falling onto radiologically contaminated surfaces may result in contaminated runoff.

2.3.3. Aerosol

An aerosol is a fine suspension of liquid or solid particles in a gaseous medium. Examples of common aerosols are mist, fog, and smoke. In limited ways, they behave much like vapours.

2.3.4. Solids

Solid forms of contamination include radioactive particles, biological spores, and dusty agents. A dusty agent is a chemical or biological agent embedded within or adhering to microscopic particles of inert natural or manufactured materials. CBRN substances delivered in solid form do not absorb into surfaces but small particles can easily penetrate the cracks and crevices of an item and adhere to oil, grease, seam sealants, etc.

2.4. TRANSMISSION OF CONTAMINATION

2.4.1. Transfer

Some items that contact a surface contaminated with liquid or solid contamination may pick up that contamination and potentially transfer it from that object to another.

a. The probability of transfer for chemical agents is mostly dependent upon the absorbance characteristics of the agent and the type(s) of surfaces involved, although drop size also plays a role. When it comes to chemical agents, the time of contact with the residual contamination is of only minor importance in the overall transfer problem. However, different materials have different transfer potential; IPE overgarments pick up 2.5 times more agent than rubber gloves. The forms of CBRN contamination affect the disposition on or absorption of these materials by personnel, material, structures, and terrain.

b. Biological agents can be transferred from different surfaces for at least four hours. The presence of moisture increases the transfer potential from hand to hand generally more than transfer from hand to surface. The factors that influence the transfer potential for biological agents, in order of importance, are contact frequency, amount of contamination on the surface(s), duration/pressure/friction of contact, and moisture.

c. Radiological materials remain on surfaces until removed or re-suspended. They can be transferred through touch or the wind can spread the contamination further downwind.

2.4.2. Spread

Touching a surface covered with liquid or solid contamination can spread contamination on that same surface.

2.4.3. Desorption

Liquid chemical contamination absorbs into porous material. Once absorbed, it begins to produce toxic vapours as the liquid evaporates from the surface.

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Chapter 3 HAZARD MANAGEMENT

3.1. HAZARD MANAGEMENT

Hazard management combines preparatory and responsive measures designed to limit the vulnerability of forces to CBRN and toxic industrial hazards (TIH) and to avoid, contain, control exposure to and where possible neutralize them. It can include a combination of standard disease and casualty prevention measures as well as CBRN avoidance and decontamination measures. While operating in a CBRN environment, contamination control measures are designed to prevent the secondary transfer of disease and contaminants, and re-aerosolization of an agent. Disease and casualty prevention includes the steps taken to prevent casualties before exposure and minimize casualties after a CBRN incident. Good health and hygiene, vaccinations, and prophylaxis reduce the transmissibility of communicable diseases. Airlift mission planners should consult with medical authorities to determine the availability of immunizations, prophylactic and curative treatment.

3.2. DECONTAMINATION

Decontamination is the process of making any person, object, or area safe by absorbing, destroying, neutralizing, making harmless, or removing chemical or biological agents, or by removing radioactive material clinging to or around it. As a control measure, decontamination helps sustain or enhance military operations in CBRN environments by preventing or minimizing mission performance degradation, casualties, or loss of resources. Decontamination is conducted by individuals, teams, and units to reduce, remove, weather, or neutralize (render harmless) the primary hazards resulting from chemical, biological, or radiological contamination. There are three decontamination levels directly related to maintaining the operational tempo and one related to recovery and repatriation activities:

3.2.1. Immediate

Removal of visible contaminants from skin, clothing, and equipment; used to minimize casualties, save lives, and limit contamination exposure/spread.

3.2.2. Operational

Decontamination carried out by an individual and/ or a unit, restricted to specific parts of operationally essential equipment, material, and/ or working areas, in order to minimize contact and transfer hazards and to sustain operations.

3.2.3. Thorough

Decontamination carried out to reduce contamination on personnel, equipment, material, and/or working areas equal to natural background or to the lowest possible levels, to permit partial or total removal of IPE and maintain operations with minimal degradation.

3.2.4. Clearance Decontamination

Clearance decontamination is the final level of decontamination. It is the most resource-intensive. Clearance decontamination involves those actions required to bring contaminated items into full compliance with national work and occupational hazard standards. It involves eliminating contamination to restore mission-critical resources to a condition that permits unrestricted use, handling, or operation, and release from military control. Although clearance decontamination generally occurs at the completion of hostilities, clearance level decontamination may be necessary in order to obtain overflight and landing clearances for aircraft that must depart the area of hostility (i.e. international cargo aircraft). Clearance decontamination may also occur when transfer of authority has occurred and is conducted according to national arrangements. Clearance decontamination is conducted when the commander determines it is in the unit's best interest, or when directed by higher authority.

a. Decontamination at Clearance level is typically conducted at or near a shipyard, advanced base, or other industrial facility. Clearance decontamination involves factors such as suspending normal activities, withdrawing personnel, and having materials and facilities not normally present.
b. Decontamination beyond immediate and operational levels is manpower, time, and resource intensive. While thorough decontamination allows the partial removal of IPE, long-term health hazards from low-levels of exposure may persist. Therefore, it is essential to ensure that decontaminated assets/areas are properly marked and that contamination (date, type, decontamination attempts) is documented in maintenance forms and life-cycle historical records (if maintained). When working with or around formerly contaminated cargo, equipment, vehicles, and aircraft, use a buddy system to monitor for signs of exposure.
c. Generally, Nations should not attempt thorough decontamination operations for material, vehicles, munitions, equipment, aircraft, or airfield terrain under wartime conditions, unless the anticipated result significantly reduces a mission-degrading hazard or allows a mission critical dress state reduction. Theatre commanders should conduct thorough decontamination of airlift assets as far forward as possible to prevent the spread of contamination.

3.3. CONTAMINATION AVOIDANCE

This is the best passive defence measure for the preservation of airlift capability. The potential restrictions imposed on the use of contaminated assets may significantly degrade the timelines of force deployment, sustainment, and retrograde airlift. Successful avoidance measures will reduce and often prevent personnel, equipment, vehicle, aircraft, and cargo contamination. In the absence of a proven decontamination capability, it is vitally important that mission planners minimize the exposure of airlift aircraft to CBRN contaminants. The following principles should be followed:

3.3.1. Avoidance

Contamination avoidance is the best defence against adversary use of CBRN agents. Avoidance reduces the risks of being exposed to CBRN agents and minimizes the effects of associated hazards. The principal elements of pre-hazard precautions follow:

a. Detection – The discovery by any means of the presence of a chemical or biological agent or radioactive material of potential military significance.

b. Establish recognized CBRN picture (CBRN Threat Assessment) – Scopes the ability and possibility of CBRN weapon use in an operational area.

c. Identification required for more appropriate and effective levels of protection, treatment, verification, or confirmation.

d. Prediction – timely and accurate warning allows airlift operations aircrew to make accurate predictions regarding contamination locations and planned counter actions. Predictions can range from manual to sophisticated computer-based models.

e. Warning and Reporting allied doctrine requires two specific CBRN responsibilities; the first is to inform allied forces of impending or actual use of CBRN agents by the adversary and the second is to verify first use of CBRN agents for the national authorities.

3.3.2. Hazard Control

The most effective hazard control measure is to avoid hazards and the risk of becoming contaminated; this will obviate or forestall the need for any other measures. However, this may not be easy to achieve because operational demands may result in the unavoidable exposure of forces:

a. Marking – marking contamination is necessary (whenever possible) to enable avoidance of hazard areas.

b. Movement Control – Movement control measures are needed to prevent forces from moving into hazard areas or spreading contaminants to clean areas.

c. Route Planning – Informed route planning can reduce the danger of picking up hazards in transit.

d. Relocate or Reroute – relocating or rerouting is a particularly viable option for airlift operations that have wider latitude for airspace use during transit; however, this option is less likely for tactical airlift operations that involve delivery at a specific time and place. The viability of this principle is dependent on the specifics of mission.

3.3.3. Exchange Zone (EZ) Operations

When the delivery of mission critical cargo and passengers are required into airfields contaminated by a chemical, biological or radiological (CBR) warfare agent, an Exchange Zone (EZ) airbase may be designated for the transload of cargo and passengers between clean aircraft and previously contaminated aircraft for subsequent airlift into the contaminated airfield. From the EZ, the dirty aircraft shuttle to and from the contaminated airfield. Use of an EZ enables airlift forces to continue critical deliveries to the warfighter following a CBR attack, while minimizing the number of airlift aircraft exposed to the contaminants and reducing the risk of contamination spread within the airlift fleet. In establishing an EZ, consider:

a. Location- EZ airbase locations are outside threatened areas, if possible. The EZ is established on an uncontaminated (clean) en route airfield for the transload of cargo and passengers from clean to contaminated (dirty) airlift aircraft for onward movement into a dirty aerial port of debarkation (APOD). The EZ provides the warfighter with a process of “last resort” to continue “critical” deliveries into contaminated airfields.

b. Temporary Operations - Unless an APOD is subject to repeated attacks with persistent agents, weathering and absorption in the ground/concrete will reduce most tarmac hazards to allow for normal aircraft operations. Discontinue EZ operations and resume direct deliveries as soon as conditions permit.

3.4. PROTECTION

Force protection is action taken by a commander to reduce the vulnerability of personnel and assets to a CBRN incident. It provides the force with survival and sustainment measures to operate in a CBRN environment when contamination cannot be avoided. CBRN protection is afforded through the use of Collective

Protection (COLPRO) and wearing IPE. IPE consists of filter mask and suit (including gloves and boots).

1. COLPRO is designed to provide a toxic-free work and rest area for personnel in a contaminated environment. COLPRO provides an area for relief from the continuous wear of IPE. If COLPRO is not available, crew members should wear the ground crew ensemble except when proceeding directly to/from the aircraft and during flight operations. The ground crew ensemble provides increased protection from liquid chemical agents. Transition from ground to flight ensemble will be as directed by commanders. IPE prevents contact with CBRN agents that can enter the body through inhalation, ingestion, skin contact (percutaneous exposure and/or through the eyes). Agent exposure may have immediate or long-term health effects. Therefore, the protection goal is to keep the exposure As Low As Reasonably Achievable (ALARA). Operational commanders and mission planners should consult established exposure guidance (provided by medical authorities).

2. If so equipped, IPE for aircrew members protects them from exposure to chemical, biological, and alpha particle radiological contaminants. However, they may restrict, to some degree, aircrew duty performance. Limitations in vision, communications, manual dexterity, tactile perception, and overall situational awareness should be anticipated. Operational mission planners may want to factor in the additional risks associated with long-duration flights when planning for aircrew activities in IPE. Avoid, when possible, additional stress factors such as ground duties (preflight/loading), night flight, weather departures/approaches, and short field operations.

3. Risk assessments must also address hazards posed by CBRN.

In all circumstances, commanders should act to minimize the immediate and long-term health effects of toxic hazards by limiting the numbers of personnel exposed and exposure times. Protective measures include:

a. Ensure pre-deployment vaccination and prophylaxis

b. Perform medical screening

c. Relocate operations away from threatened or attacked areas

d. Provide overhead cover for supplies and equipment

e. Manage personnel rotation on high-risk missions

f. Monitor and document personnel exposure in medical records

g. Enforce correct wear of IPE and health/hygiene standards/practices

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Chapter 4 CONSIDERATIONS IN SUPPORT OF OPERATIONS

4.1. GENERAL

The purpose of this chapter is to provide hazard management guidance for key airlift decision makers, planners, and operators, and for the joint force commanders who rely heavily on NATO airlift support to successfully complete their assigned mission. Development of specific procedures to attain stated goals, within policy and budget constraints, is the responsibility of each member nation. Specific procedures shown in this chapter are provided for reference only and are included to stimulate discussion of specific actions.

4.2. OPERATING IN A CBRN CONTAMINATED ENVIRONMENT

When the combat zone includes operating in a CBRN-contaminated environment, everything not only becomes more difficult and time consuming, but the Joint Force Commander's ability to fight and win is greatly compromised. Therefore, the success of airlift missions in the face of CBRN contamination begins with thorough pre-conflict planning. Theatre planners should identify alternate operating locations to be used if the primary operating location is subjected to CBRN attack. Employing the direct delivery capabilities of tactical airlift aircraft, austere landing zones or even highway landing strips in the forward area are an option. With cargo that can be configured for airdrop, force sustainment can continue in the absence of a clean airport. Also, other delivery modes, such as overland convoy, can be employed to preclude the use of limited airlift resources in contaminated areas. The desired operational outcome (i.e., requirement) for operations in a CBRN environment becomes:

a. Eliminate CBRN-related loss of airlift aircraft and enhance the ability to safely and effectively operate in a CBRN environment

b. Maximize the resilience of airlift aircraft operations to CBRN contamination for post-sortie recovery and generation

c. Sustain airlift operations worldwide

4.3. CONTAMINATION FROM DIRECT ATTACK OR ACCIDENTAL RELEASE OF CBRN SUBSTANCES

Forward based intra-theatre forces may be in the threat envelope of adversary CBRN delivery systems, special operations forces, and terrorists. They are also more likely to transit areas of infectious disease. In the event of a CBRN attack against an airlift en route or bed-down base or the outbreak of communicable disease, NATO's deployed forces will be expected to make every effort to fight through the contaminated environment and continue the airlift mission. NATO forces may be subjected to an accidental release of TIMs at home station and locations throughout the airlift system. Base force protection planners should identify TIM threats to the

airfield (chemical plants, storage sites, road/rail networks, etc.) and use plume prediction modelling to determine the extent of the threat to airlift operations. In the event of CBRN contamination from direct attack or accidental agent release, aircraft that cannot be completely decontaminated can be used for the movement into dirty airfields and for contaminated shuttles during exchange zone operations.

4.4. SURVIVABILITY OF AIRLIFT ASSETS

Survivability of airlift assets during combat operations in a CBRN environment depends heavily on the quality of CBRN training, use of effective checklists and tactics, techniques, and procedures; and vigorous mission planning/execution. Aircraft must not only survive to accomplish the airlift mission while conducting operations in a CBRN environment, but must prevent spreading (knowingly or unknowingly) CBRN agents upon returning to forward operating sites, main operating bases or foreign airfields. Therefore, the capability of an aircrew to assess its CBRN related status is key in deciding appropriate reach back needs and recovery options of the aircraft, aircrew, and payload following contamination during airlift operations. When mission planning intelligence indicates the possibility that airlift operations may also involve exposure to a CBRN environment, the aircrew should adhere to the enabling component of CBRN defence hazard management. Therefore, the ability to implement hazard management through the basic principles of pre-hazard precautions and hazard control via avoidance, control of spread, exposure control and decontamination to mitigate CBRN exposure is essential.

4.5. AIRLIFT IN AREAS OF DISEASE OUTBREAK

During airlift operations in areas of disease outbreak following a biological attack with a transmissible agent such as Smallpox or Ebola, disease containment and the personal protection of aircrew members, support personnel, and passengers will be primary considerations. Use of pre-/post- exposure prophylaxis and therapeutics, medical surveillance for signs of illness, and quarantine/isolation of personnel are important tools in disease containment planning.

4.6. AEROMEDICAL EVACUATION OF CONTAMINATED OR CONTAGIOUS PATIENTS

The aeromedical evacuation (AE) of casualties will be challenging under CBRN conditions. To limit the spread of contamination, potentially contaminated patients must be decontaminated before entering the AE system unless national authorities, in consultation with medical authorities, direct otherwise. The consequences on patient care, aircraft contamination, and aircrew safety significantly restrict the ability to move large numbers of contaminated patients. Use of systems such as the “Air Transportable Isolator” may enable the safe movement of a small number of contaminated/contagious patients. This capability should only be exercised in extreme circumstances or when movement of “index cases” is necessary. In most situations, the recommended course of action is to move medical resources to the

geographical location of the casualties/personnel for treatment in place, rather than evacuating the contagious/contaminated patients to the rear area.

4.7. CONTAMINATED HUMAN REMAINS (CHR)

While NATO leaders are sensitive to the need to return fallen comrades to their loved ones, public health concerns must take priority over the rapid return of CHR. All efforts should be made to decontaminate CHR and return them through normal channels. It may be necessary to inter the remains in theatre until they can be rendered safe for transportation. No CHR should leave the theatre until it is safe for handling and transport. If a CBRN hazard cannot be determined on an individual basis, all HR within the affected area are treated as contaminated. The theatre combatant commander should approve temporary interment for contaminated remains. See ATP-3.8.1 Volume I and STANAG 2070 for more information on the disposition of contaminated human remains.

4.8. CONTAMINATED AIRFIELD OPERATIONS

The commitment of clean aircraft into CBRN contaminated airfields risks contamination of limited airlift resources and should be avoided. Therefore, command functions will ensure that only cargo and passengers designated as “mission critical” are airlifted into or out of contaminated airfields. When airlift missions into contaminated airfields are required, use a previously contaminated aircraft (if available) with a properly protected aircrew.

4.9. CROSS CONTAMINATION

The risk of cross contamination from the airlift of dirty cargo can be minimized by application of hazard management guidance provided in this STANAG. Cargo decontamination prior to airlift is an individual unit responsibility. As a rule, retrograde airlift of contaminated and formerly contaminated cargo is provided for only “critical” resources (as pre-identified in theatre plans).

4.10. OPERATIONAL PLANNING GUIDANCE

1. Whenever possible, bed down airlift forces outside the optimal ranges of CBRN threat weapon systems.

2. Provide redundancy by relocating or dispersing high-value airlift assets among several bases. Relocation plans should include reciprocal agreements to provide temporary support at other NATO air bases within the region.

3. It is unlikely that CBRN attack will contaminate an entire airbase. Consider dispersed aircraft parking, protective coverings for cargo and aerial port assets, and decontamination provisions for equipment, personnel, and aircraft. However, the

freedom to operate from and use assets in the affected areas may be significantly degraded due to the concern over spread of contaminants/disease.

4. Designate alternate APODs and plan for the relocation of cargo handling operations to alternate locations when primary APODs are attacked.

5. Evaluate patterns of CBRN attacks and delay the airlift flow or adjust arrival/departure times to coincide with periods of reduced threat.

6. Increase active defence activities to reduce threats during planned airlift arrivals/departures. Increase vigilance in upwind areas, especially in higher threat areas.

7. Enhance security at APOEs, en route locations and APODs during contingencies and periods of high-visibility civil, military, or political activities or events, when terrorist attack is more likely.

8. Within theatre, commanders will ensure that strategic mobility assets and cargo have been decontaminated or allowed to weather to negligible levels, as measured on currently fielded agent point detectors.

9. Establish theatre aircraft decontamination locations, facilities, and processes.

10. Conduct decontamination operations as far forward as possible to contain the spread of contamination.

11. Ensure that airlift direction and guidance published in mission planning documents contain provisions for operations in a CBRN contaminated environment, as provided in this STANAG.

12. Advise airlift tasking organizations of the challenges and limitations to airlift operations in a CBRN threat environment, to include the aircraft decontamination limitations and the necessity for contamination avoidance.

13. Pre-designate in the operation plans the “mission critical” equipment that, if contaminated, must receive retrograde airlift (e.g., aircraft engines, depot repair items, etc.). Ensure that aircrew protection and shipment escort requirements are met.

14. Only “critical” retrograde cargo will be moved from a contaminated to an uncontaminated airbase. Approval from national authorities may be required.

15. Pre-designate potential Exchange Zone locations and plan for the necessary resources (personnel and equipment).

4.11. COMBAT OPERATIONS

Combat airlift operations are movements of cargos and personnel through geographical airspaces established as combat zones for the conduct of combat operations. The three basic types of missions flown by airlift operations in a combat zone include infiltration, exfiltration/recovery, and resupply of personnel, equipment, and logistics support of all kinds, including evacuation of casualties to prevent loss of life and limb, and endangered personnel.

4.12. NON-COMBATANT EVACUATION OPERATIONS (NEO)

Non-combatant evacuation operations (NEO) are conducted to extract civilian non-combatants from threatened areas. Evacuations may be precipitated by civil unrest, natural disaster, outbreak of endemic/pandemic disease, or military conflicts. Civilian authorities are normally charged with conducting a NEO using commercial contract airlift. However, in times of conflict or in high-threat areas, military forces may be assigned NEO responsibilities. These evacuations may occur in response to a CBRN incident or in areas of pandemic disease. NEO airlift from a contaminated airfield should be a “last resort” scenario. Contamination avoidance guidance directs the use of uncontaminated airfields, unless mission considerations mandate otherwise. It is preferable to transport evacuees overland to uncontaminated airfields for NEO rather than attempt to operate through a contaminated environment. If use of a contaminated airfield is essential, consider the following planning guidance to reduce the risks to the evacuees and airlift forces:

1. All hazard management measures should be considered for NEO missions. For example, determine the possibility of confining operations to clean sectors of a “split dress state” airfield, minimize ground times, open aircraft doors/hatches only when required, and turn off aircraft environmental control systems during ground operations to reduce agent penetration of the aircraft interior.

2. Evacuees may be equipped with military-issued protective masks. However, in the absence of standard IPE, evacuees may have commercially available carbon filter, vapour protection masks (e.g., paint or pesticide delivery masks), or even close-knit material, wetted and fashioned over the nose and mouth. Regardless of the level of protection provided, aircrews should monitor evacuees for signs of agent exposure. Consider having medical personnel available for each NEO flight.

4.13. REDEPLOYMENT PLANNING

During redeployment planning, ensure that unit commanders provide detailed listings of any equipment that is contaminated or suspected of having been contaminated (equipment present in suspected CBRN attack areas) through their chain of command. To protect valuable airlift assets, post-conflict redeployment of contaminated or formerly contaminated equipment normally occurs by ground transport or sealift.

1. Establish a process to communicate through senior military commanders and national authorities any intent to retrograde residually contaminated cargo.

2. Ensure Host Nation clearance and overflight and landing clearances are obtained prior to contaminated flights (aircraft, cargo, or passengers (including AE patients).

3. During the retrograde of formerly contaminated assets/cargo use only military-controlled airfields and ensure that contaminated equipment is retained under NATO control until released to national authorities.

4. Airlift planners will request appropriate authorization from supporting countries for transit of formerly contaminated assets.

ANNEX A AIRCRAFT EXTERIOR AND INTERIOR CBRN HAZARD MANAGEMENT GUIDANCE

A.1. GENERAL

This annex provides useful ways for C2 agencies and aircrews to avoid and/or minimize aircraft contamination during ground and flight operations. This guidance is by no means exhaustive. Aircrew members may devise other methods to avoid contamination or prevent its spread, if avoidance is not possible. Apply the following guidance as appropriate.

A.2. AIRCRAFT EXTERIOR HAZARD MANAGEMENT

Chemical agents are absorbed into aircraft paints and continue to off gas following decontamination. Although liquid contaminants can be washed from smooth surfaces, agents tend to migrate into seams, crevices, and under rivet heads and may accumulate beneath panels, gear doors, flaps, etc. Vapour hazards may continue following weathering and all decontamination attempts. Biological agents and radioactive particles can be washed from aircraft surfaces, but they accumulate in irregular surfaces and beneath panels, posing a health risk even after extensive decontamination efforts using currently available technologies. The following hazard management procedures apply:

a. If facilities exist, hangar aircraft in high risk areas.

b. Depart airfield under risk of imminent attack, if sufficient warning is given.

c. Contact ground control to identify clean and contaminated areas (Split Dress State concept) and avoid ground operations in contaminated zones.

d. Conduct ground operations upwind of the hazard area, when possible.

e. On contaminated airfields, avoid bodies of standing water. Chemical agents readily absorb into concrete and asphalt within 10 minutes. The presence of water (rain) has no effect on the absorption of chemical agents into concrete or asphalt. However, chemical agents will remain in bodies of standing water, and although diluted, present a transfer hazard to taxiing aircraft.

f. If mission allows, avoid contaminated airfields. If airborne following an attack, divert or enter holding until airfield conditions are known. This information will be available through theatre and/or airfield C2 agencies.
NOTE: Specific authorization is required to depart or land at a contaminated airfield.

g. Keep dirty aircraft on contaminated runways, taxiways, and ramps only.

h. Keep static aircraft engine operations to the minimum required.

i. Use Engine Running On/Offload (ERO) and combat offload procedures to the maximum extent possible, if under the threat of attack. The presence of ground contamination should always be a planning factor when conducting an ERO.

A.3. AIRCRAFT INTERIOR HAZARD MANAGEMENT

Aircraft interior contamination presents a significant challenge to airlift operations. Recent decontamination testing confirms that aircraft exterior contamination may be spread to the aircraft interior during ground and air operations. Additionally, CBRN contaminants survive ingestion by the aircraft engines and environmental control systems to contaminate interior surfaces. Biological agents survive longer when shielded from sunlight, and both chemical vapours and reaerosolized biological agents pose a significant health risk to unprotected aircrew, passengers, aerial porters, and maintainers. Aircraft interior decontamination capabilities are limited. Hazard management is the best methods to ensure the preservation of airlift capability. The following guidance is provided:

a. Close doors and hatches, if attack is likely or imminent.

b. Operationally decontaminate the aircraft around doors and hatches, use shuffle boxes at aircraft doors, and limit contact with exterior contaminated items to prevent agent transfer to the aircraft interior.

c. If removal and replacement of contaminated interior fabrics (seats, insulation, etc.) is not feasible, use forced hot air from ground sources to aid in off gassing chemical agents.

d. On contaminated airfields, avoid using aircraft environment control systems during ground operations.

e. Minimize retrograde of cargo and passengers from contaminated airfields. Contaminated and formerly contaminated cargo will be retrograded by air only if the theatre commander has designated it as “mission critical”.

f. Use covered areas for retrograde cargo to minimize cargo exposure to CBRN agents. Triple wrap with plastic any cargo that cannot be placed in covered areas. Remove outer layers prior to loading onto aircraft. Then, if time, resources, and conditions permit, cover cargo with a clean layer of plastic. This cover will trap any residual, which may have penetrated the original outer covers.

g. When transporting aircrews in IPE to the aircraft, provide enclosed transport and avoid having the aircrew walk to the aircraft.

h. Any aircrew and/or passenger personal and professional items should be double sealed in plastic bags, prior to loading on contaminated aircraft.

i. When carrying contaminated or formerly contaminated cargo, passengers, or casualties, place aircraft interior items in plastic bags and cover aircraft interior items with plastic. Seal areas with tape to the maximum extent possible consistent with safety and mission. Exterior items such as grounding cables and communication cords should be bagged as well. Be aware of the effects of cabin altitude on sealed bags.

j. When carrying contaminated or formerly contaminated cargo, use drip pans or line the cargo floor with a barrier material such as plywood or plastic to catch dripping liquid contaminants. If the cargo floor is lined with plywood, consideration must be given to the methods of securing the rolling stock as well as any loose sections of plywood. If the plywood becomes contaminated, use a bleach solution to decontaminate and/or seal in the contaminant with paint.

k. In flight, assume that contaminants in the cargo compartment will enter the crew compartment. Consider smoke and fumes elimination or depressurizing and use of standard aircraft ventilation procedures to help clear vapours. This may require extra oxygen and fuel depending on the altitude and flying time. Do not use auxiliary vent for interior purging if the aircraft has extensive exterior contamination as this could draw more contamination into the aircraft.

l. Reducing the cargo compartment temperature will slow the off gassing of chemical agent contamination and reduce vapour generation inside the aircraft. Keeping the aircraft as cool as possible best protects the crew from toxic vapours.

m. Consult CBRN defence specialists for the availability of CBRN detectors that are flight tested to periodically test the cockpit and cargo compartment for contamination. If necessary, crew members should seek specialized training or assistance in use of the detectors. Minimize movement between cockpit and cargo compartment.

n. When airlifting contaminated cargo, ensure the requirements for airtight shipping containers, agent detection capability, and CBRN defence specialists are met.

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ANNEX B CONTAMINATED CARGO MOVEMENT OPERATIONS

B.1. GENERAL

This annex provides hazard management guidance for ground movement and processing of cargo for air shipment. They apply primarily to intra-theatre cargo movement or the movement of retrograde cargo. Three separate areas are designated for cargo movement and processing: the entrance area, the decontamination area, and the marshalling area. A “hot line” divides the area between clean and dirty.

B.2. CONTAMINATED CARGO MOVEMENT OPERATIONS

The basic procedures associated with cargo movement are:

1. Monitor and mark the cargo at the reception point (entrance area).

2. Ensure the cargo is moved to the appropriate area (weathering, decontamination, or remain in holding) based on the assigned mission criticality factor.

3. Process the cargo through the system appropriately (combination of assessment, decontamination, and packaging), and upload the cargo onto the aircraft.

B.3. RETROGRADE/REDEPLOYMENT OF “FORMERLY CONTAMINATED” CARGO

1. Post conflict redeployment of formerly contaminated cargo normally goes via ground or sea transportation. Contaminated or formerly contaminated cargo must be pre-identified as “emergency” or “mission critical” in theatre war plans to be eligible for retrograde airlift.

2. Hazard management measures should also be extended to the retrograde or redeployment airlift of contaminated and what is termed “formerly contaminated” cargo. The term “formerly contaminated” refers to items exposed to CBRN hazard, that exhibit residual contamination following all decontamination attempts. This cargo will be marked “formerly contaminated” in 0.5 inch red letters on all four sides and the top of the cargo.

3. Cargo shippers are responsible for the decontamination of their cargo prior to shipment, and commanders must specifically identify all contaminated or formerly contaminated equipment (equipment in the suspected CBRN incident area) prior to redeployment. Due to the threat of residual contamination, all decontaminated assets must be clearly marked as “formerly contaminated.”

4. Residual contamination poses potential long-term health risk to those who handle or work with this equipment. Residual contamination also presents a greater vapour hazard when the equipment is aggregated and enclosed in a confined area (such as an aircraft cargo compartment). Air shipment requires use of airtight containers, and the cargo must be accompanied by trained CBRN defence specialists, equipped with agent detectors.

5. In addition to normal overflight and landing clearances, contaminated flights (contaminated aircraft, cargo, or personnel) crossing international borders will require the approval of the appropriate national authorities. All efforts will be taken to preclude the spread of contamination or contagion.

6. Establish procedures at reception airfields to isolate, cordon, and decontaminate arriving evacuees and aircrews. Aircraft departing contaminated airfields will be considered contaminated until chemical, biological, or radiological detection devices confirm the absence of contaminants. As no international cleanliness standards have been established, any degree of contamination will mandate the use of contaminated asset control and documentation procedures.

B.4. Entrance Areas

Experts trained in the detection, identification, and safe handling of contaminated cargo must be assigned at the cargo entrance area. Hazard category level for each pallet/item is assessed prior to cargo acceptance. Keep detailed logs concerning the composition, location, and hazard category status of each piece of cargo. Set up the entrance area IAW local requirements, considering the following:

1. Locate the entrance and holding area downwind of the payload waiting and marshalling area to preclude spread of contaminants and minimize vapour hazards.

2. Ensure access routes are available for delivery of cargo to entrance and holding areas and movement to/from decontamination areas and waiting/marshalling areas.

3. Locate the reception area and assessment station where cargo priority and hazard levels are determined. Communications with command authorities is needed at this station.

4. Delineate and mark the boundaries of two “holding” areas within the reception area.

5. Clean holding area for uncontaminated cargo awaiting transportation or further processing. Ensure to locate the clean holding area upwind of the dirty holding area.

6. Dirty holding area for contaminated cargo with a “Critical” or “Priority” mission criticality level that is awaiting transfer to the decontamination area.

7. Ensure sufficient attendants, detection equipment, packaging materials, cargo movement equipment, communications, decontamination supplies, and administrative materials are in place.

8. If available, place detection equipment around the site (open areas, horizontal configuration) to serve as alarms and hazardous area delineation purposes.

9. Establish contamination control area (CCA) to process personnel out of the decontamination area.

B.5. DECONTAMINATION AREA

There are two segments associated with the decontamination area. These are the “hot” and “weathering” sites.

B.5.1. Hot Site

This is the area where contaminated cargo is transferred from either the entrance or weathering area as directed by the cargo’s mission criticality level and scheduled flight departure. Dispose of contaminated wrapping materials in a temporary waste disposal area. Routinely transfer these materials to the installation’s contaminated waste disposal site.

a. The site should have room for storage and use of detection, decontamination, marking, and pallet repackaging materials; ease of access for cargo movement equipment/vehicles; adequate water supply; a temporary contaminated waste disposal area; and the ability to control runoff, in the event contaminated items are being decontaminated on an otherwise clean installation.

b. Site this area downwind from the payload waiting/marshalling area. It does not have to be collocated with the weathering site, although it must have easy access to this location.

c. Ensure sufficient attendants, detection equipment, packaging materials, CBRN marking kits, cargo movement equipment, communications, decontamination supplies, and administrative materials are in place.

d. If available, place detection equipment around the site (open areas, horizontal configuration) to serve as alarms and hazardous area delineation purposes.

B.5.2. Weathering Site

The location where contamination cargo is taken either from the entrance area or hot site to allow chemical agent off gassing or biological agent degradation, as part of the

overall decontamination process.

a. Cargo handlers remove and properly dispose of contaminated covers (sheeting, tarps, etc.) in order to allow the elements to dissipate the chemical and biological (CB) agents through exposure to sun (ultra violet) light, wind, air temperature, humidity, etc.

b. Location must be carefully evaluated to ensure it does not endanger the base population as a whole. Only items known to be contaminated are moved to this site. No active decontamination is conducted at this site.

c. The site should have adequate security, easy access, and be downwind from the installations primary work centres/areas. If available, automatic agent detectors should be placed between the weathering site and the installation's primary work centres/areas in order to preclude unnecessary exposure of unprotected personnel.

d. Weathering site access includes routes to/from the entrance/holding area and to/from the hot site area.

e. Physical delineation between four segments of the weathering site. If time and conditions permit, separate cargo by hazard level, then by criticality level.

f. When a pallet/item is brought to the weathering site for processing take the following actions:

(1) Verify the "mission criticality level" and "hazard category level" (paperwork as opposed to monitoring) at the reception point.

(2) Transfer the cargo to either the "accelerated," "routine," or "negligible" holding segments and expose the contents to the open air (preferably in an area that provides overhead cover--the covering will help protect from subsequent attacks).

B.6. MARSHALLING AREA

Cargo handlers move the assets to this area when the item is ready for upload IAW the procedures associated with the "Cargo Movement Decision Matrix." The cargo is maintained in this area until it is physically uploaded onto the aircraft. Set up payload waiting/marshalling area IAW local requirements, considering the following:

a. Placement of payload waiting/marshalling area in relation to other parts of cargo movement area (should be upwind of prevailing winds from all other components).

b. Size and access requirements. Access includes routes to/from the entrance/holding area and to/from the decontamination area.

c. Location of “reception” station where mission criticality level, hazard level, proper marking of the cargo are verified. This is also the station that ensures the cargo is on the airlift schedule.

d. Location of payload waiting area where cargo is held until it can be moved into the marshalling area.

e. Location of payload marshalling area where cargo is pre-positioned in anticipated “load plan configuration.”

f. Location of aircraft upload operations.

g. Ensure sufficient attendants, cargo movement equipment, communications, and administrative materials are in place.

h. If available, place detection equipment around the site (open areas, horizontal configuration) to serve for alarms and hazard area delineation purposes.

B.7. PROCESSING

When a pallet/item is brought to the payload waiting/ marshalling area for processing, take the following actions:

a. Verify the mission criticality level (shown through inclusion of the cargo on a projected airlift manifest), hazard level, and proper marking of the cargo at the reception station.

b. If the item is not listed on any projected airlift worksheets, attempt to resolve the issue with competent authorities.

c. In the event the cargo is not, and will not be scheduled for timely airlift, the cargo handlers will move it back to the appropriate segment of the entrance/holding area.

d. If the cargo is contaminated, individually assess the projected load plan configuration and determine if the load plan can be adjusted (as allowed by weight and balance requirements of the aircraft) to meet the following principles.

(1) The least contaminated cargo is loaded first.

(2) The most hazardous cargo is loaded last, thereby maximizing weathering effects, minimizing the possibility of cross-contamination, and aiding in-flight decontamination operations, should they be employed.

e. Upload the aircraft with the loads waiting in the marshalling area, transfer the cargo in the waiting area to the marshalling area, and bring the next load of cargo into the waiting area.

f. When necessary, the cargo handlers should monitor and decontaminate the critical portions of their cargo movement equipment. This includes forklift tines and ramp rollers.

g. Keep detailed logs concerning the composition, location, and hazard category status of each piece of cargo.

ANNEX C LARGE-FRAME AIRCRAFT DECONTAMINATION GUIDANCE

C.1. GENERAL

The large-frame aircraft (LFA) decontamination guidance contained in this annex is intended to enable LFA employment in a CBRN contaminated environment while minimizing the spread of contaminants and the hazards of exposure to aircrew, passengers, and support personnel.

C.2. LARGE FRAME AIRCRAFT DECONTAMINATION CHALLENGES

Each CBRN contaminant presents unique decontamination challenges. However, each contaminant must be addressed individually to determine the efficacy of proposed decontamination methods.

1. Post-incident decontamination procedures must be initiated promptly (generally, within one hour) to prevent the absorption of chemical agents into aircraft painted surfaces and polycarbonate-based seals. Contaminants migrate into seams, crevices, and rivet heads where they are difficult to remove. Chemical agent decontamination will not have a significant effect unless it takes place within one hour of exposure.

2. Exterior aircraft decontamination guidance cannot be used for interior decontamination due to the detrimental effects of decontamination fluids on aircraft sensitive electronic equipment.

3. Certain biological agents can survive for long periods when protected from the elements (as in cargo and passenger compartments of airlift aircraft). Due to the small particle size of the typical biological agent, some agents can adhere to internal equipment surfaces, creating a risk to unwarned Maintenance personnel in contact with these internal surfaces.

4. The LFA decontamination guidance described below is intended to reduce contamination. Whether this guidance (or any of today's decontamination methods) can decontaminate an LFA to the extent that it can be used for unrestricted international operations remains to be seen.

C.3. DECONTAMINATION RESPONSIBILITIES

The protection of aircrews and aircraft is of utmost importance in a CBRN threat environment. The ultimate goal of airlift operations is to minimize delay or disruption of force deployment, sustainment, and redeployment support to the warfighter.

C.4. DOCUMENTATION OF AIRCRAFT/EQUIPMENT CONTAMINATION

CBRN contamination poses significant risks to aircraft maintainers. Even following thorough decontamination, a vapour and/or contact hazard may remain. Proper marking and documentation of formerly contaminated equipment and aircraft is crucial. Historical records, maintained throughout the life cycle of the equipment/aircraft will help ensure that precautions are taken when working in or around the contaminated items and final disposition is handled in accordance with the appropriate hazardous waste disposal procedures.

C.5. CBRN DECONTAMINATION LEVELS

When contamination cannot be avoided, decontamination of LFA and associated equipment (material handling equipment (MHE), aerospace ground equipment, aircraft servicing vehicles, etc.) must be accomplished to reduce or eliminate the risk to personnel and to make equipment serviceable. The levels of decontamination are immediate, operational, thorough, and clearance. The clearance level of decontamination is required for unrestricted international airlift operations.

C.6. METHODS OF DECONTAMINATION

C.6.1. Neutralization

This is the most widely used method of decontamination, particularly for chemical agents and biological agents. Neutralization is the reaction of the contaminating agent with other chemicals to render the agent less toxic or nontoxic. The reactive decontaminant may be a commonly available material (e.g., household bleach) or a specifically designed decontaminating solution.

C.6.2. Physical Removal

Physical removal involves the relocation of the contamination from one mission critical surface to another less important location. Physical removal generally leaves the contamination in hazardous form. It often requires the subsequent neutralization of the contamination. For example, if HSW is used to remove the agent, the runoff may be drained into a pit containing bleaching powder. However, depending on mission requirements, physical removal can be an effective technique without subsequent neutralization. Due to materiel compatibility issues, HSW is the only approved decontamination fluid for LFA decontamination.

C.6.3. Weathering

Weathering involves such processes as evapouration and irradiation to remove or destroy the contaminant. The contaminated item is exposed to natural elements (e.g., sun, wind, heat, precipitation) to dilute or destroy the contaminant to the point

of reduced or negligible hazard. Weathering will reduce the presence of most chemical agents (HD, thickened HD, GB, GD, and thickened GD) and most biological agents (except Anthrax spores). It is important to note that VX is absorbed into painted aircraft surfaces and may continue to off gas following decontamination and weathering.

C.6.4. Air Washing

Flight provides an effective method of removing contaminants from the exterior surfaces of aircraft. The aircraft should remain airborne for 60 minutes or longer, and configured flights at lower altitudes (below 3000 meters) are more effective than higher altitudes. Test results indicate that air washing removes visible contamination from most external surfaces, reducing the contact hazards. However, small pockets of higher levels of contamination may persist in cracks or around rivets or screws, and remaining vapour hazards will be greater in areas where airflow characteristics prevent complete off gassing (i.e., wheel wells, flap wells, beneath access panels, etc.). Air washing will not remove chemical agents absorbed into aircraft painted surfaces and may force external contaminants into the aircraft due to ingestion by the aircraft environmental control systems.

C.7. PRINCIPLES OF DECONTAMINATION

The following principles apply to the decontamination of all personnel and equipment. Consider these principles in LFA decontamination:

a. Speed. Conduct decontamination operations as quickly as possible. Direct exposure to some CBRN agents, toxic industrial materials (TIMs) will create casualties and could be fatal within minutes. The sooner LFA and equipment surfaces are decontaminated, the less likely they are to absorb the agent or allow it to spread to other surfaces.

b. Need. Decontaminate only what is necessary. Expend limited resources only where they are needed. Under wartime conditions, only spot and operational decontamination should be attempted to enable aircraft use in a contaminated environment. More extensive decontamination efforts at the unit level are not warranted as they are unlikely to achieve the clearance decontamination level needed for unrestricted use of airlift assets.

c. Priorities. Decontaminate the most essential items first (foremost will be exposed skin, if contact occurs). After donning IPE, personnel should begin spot and operational decontamination of frequently touched/handled LFA and cargo surfaces.

d. Limited Area. Perform decontamination near the area where the contamination occurs. This limits the spread of contamination to other areas and reduces the time spent travelling.

C.8. OPERATIONAL DECONTAMINATION

LFA spot decontamination is conducted by the aircrew, maintenance, aerial port, and work sections providing aircraft servicing. It is conducted in the area where contaminated aircraft are parked for servicing. All personnel involved in spot decontamination should wear appropriate non-aircrew IPE. Wet-weather clothing may be worn over IPE to prevent the saturation of the IPE. Areas where spot decontamination should be performed:

a. Refueling access

b. Ordnance, armament, and equipment

c. Ingress and egress (ladders, handholds, footholds, steps, etc.)

d. Preflight and post-flight check areas

e. Inspection areas

f. Canopies, windscreens, windows, and optical sensors

g. Support equipment (seats, controls, chocks, chains, etc.)

h. Aircraft tie-down and tow points

C.9. AIRCRAFT EXTERIOR OPERATIONAL DECONTAMINATION PROCEDURES

Aircraft returning from missions may present little or no threat of cross contamination to the airfield or facility. However, to ensure contamination is not spread, contaminated aircraft will be directed to an alternate (contaminated) airfield before landing, if possible. Otherwise, park the aircraft on the “contaminated ramp” (downwind of other facilities) at clean airfields.

1. Chemical agent off gassing may present a vapour hazard to personnel downwind of the aircraft. Use detection devices to determine the extent of chemical agent off gassing, establish a security cordon, and monitor all personnel in the area for chemical agent exposure symptoms.

2. Use detection/monitoring equipment to detect contamination on the aircraft and aircrew, and report the results.

3. Aircrew, support personnel, and passengers will remain in IPE until decontaminated and the absence of contaminants is confirmed.

4. Be aware of the locations of nonporous surfaces where liquid chemical agents are not absorbed (i.e., landing gear struts) and areas beneath panels where the air wash effect may have produced higher concentrations of agents. Though these surfaces are the most receptive to decontamination, they also represent the most dangerous areas for liquid transfer and vapour hazard.

5. Avoid exposing personnel to porous surfaces (e.g., painted metal or rubber) that will absorb chemical agents. Although sorption minimizes the liquid transfer hazard, the vapour hazard remains.

6. Use an operational decontamination kit or HSW applied by brush or spray to decontaminate areas of the aircraft exterior, which are most likely to create a transfer hazard for passenger, crew members, and maintenance personnel. Regardless of the decontamination technique used, it will not be difficult to remove liquid agents from smooth panels however, chemical agents tend to remain at low levels in crevices, rivet heads, and joints.

7. Hot air, focused from no more than one meter away for approximately 10 minutes, may be an option for neutralization of chemical agents/biological agents. It is not effective against VX. Additionally, the use of hot, forced air is not an effective decontamination process for radiological particles and some biological agents in spore forms – forced air increases the risk of re-suspending the particles and exposing personnel/material/aircraft to cross contamination. Characteristics of hot air decontamination are as follows:

a. Agent should breakup into smaller drops before evapourating.

b. Most effective on smooth polyurethane painted surfaces.

c. Less effective in crevices and on greasy areas.

8. Document aircraft contamination and all decontamination efforts in maintenance aircraft forms and aircraft historical records. Include the date and time of the contamination, agent type and location, and decontamination attempts.

9. Although LFA spot decontamination is an expedient procedure to prevent casualties and reduce agent transfer, it may be prudent to also include a quick hose down of the aircraft during spot decontamination. Immediate removal of chemical agents contaminants may minimize agent absorption into aircraft paint and prevent chemical agent degradation of the high-tensile steel found in landing gear struts and engine pylons. Containment of the hazardous run-off may be necessary.

C.10. AIRCRAFT INTERIOR OPERATIONAL DECONTAMINATION PROCEDURES

Vapour and aerosolized agents (ingested by the aircraft Environmental Control Systems (ECS) and entering through passenger and cargo doors during ground

operations) pose the most likely interior threat. The highest and most likely indications of chemical vapour contamination will probably exist in wire bundles and ECS insulation. The highest readings will likely occur in the cockpit near the floor next to the rudder pedals. The sensitivity of electrical equipment to chlorine or other water-based solutions limits their feasibility for interior decontamination. Weathering may be the only realistic interior decontamination method, in which case, all aircrew and passengers must be in IPE during aircraft operations. LFA interior spot decontamination should still be attempted to reduce biological agent presence or eliminate/neutralize chemical agent contact hazards transferred from contaminated cargo or passengers. Use the following guidance:

a. Use shuffle boxes and decontaminate gloves prior to entering the aircraft.

b. Scan the aircraft cargo and crew compartments with CBRN detectors and/or use detector paper to identify chemical contact hazards. CBRN defence specialists will provide CBRN detector training or detector operators.

c. Use an operational decontamination kit or HSW wipes to remove visible contaminants and contact hazards. Some limited field decontamination may be possible by blowing compressed air on sensitive electronic equipment and washing all surfaces repeatedly with warm soapy water. Remember, everything used to clean the interior is now contaminated and must be treated as such.

d. There are no effective, operationally feasible methods for decontaminating leather items, canvas storage covers, webbing, fabric seat coverings, curtains, safety harnesses and restraints, floor coverings, and other textile materials contaminated with liquid agents. Place barrier materials over the item(s) or remove and replace them.

e. During interior spot decontamination, avoid spraying or splashing decontamination solutions on sensitive electronic equipment to prevent damage to aircraft systems. Wipe down is the preferred method of interior decontamination.

C.11. AIRCRAFT SERVICING OPERATIONAL DECONTAMINATION PROCEDURES

1. Make available sufficient quantities of HSW, wipe-down rags, and fresh water.

2. Scrub the service areas using brushes, rags, or sponges with HSW until deposited CBRN material, dirt, and grime are removed.

3. Rinse with fresh water from a bucket or hose.

4. Decontaminate gloves.

5. Perform aircraft servicing.

6. Scrub equipment connection points that come in contact with the contaminated aircraft.

7. Hose off ramp, as needed, to move contaminated cleaning fluid into waste collection point.

C.12. LAUNCHING THE AIRCRAFT

Aircraft launch procedures will be in accordance with applicable aircraft technical orders. In addition, accomplish the following actions:

a. Ensure toolboxes, especially handles, and tools are free of contamination and decontaminate, if necessary.

b. Perform a final check of personnel and decontaminate if necessary. Take a hand-held radio and proceed to board aircraft. Interface with flight crew and relay any maintenance needs.

c. After removing landing gear pins, place pins in clean plastic bags for stowing aboard aircraft.

d. Ensure aircraft chocks and grounding wires are retained by maintenance and NOT put on the aircraft

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ANNEX D LEXICON

D.1. ACRONYMS AND ABBREVIATIONS

The Lexicon contains abbreviations relevant to this document and is not meant to be exhaustive. The definitive and more comprehensive list of abbreviations is in AAP-15.

AE	Aeromedical Evacuation
ALARA	As Low As Reasonably Achievable
APOE	Airports of Embarkation
APOD	Airports of Debarkation
C2	Command and Control
CB	Chemical and Biological
CBR	Chemical, Biological, and Radiological
CBRN	Chemical, Biological, Radiological, and Nuclear
CCS	Contamination Control Station
CHR	Contaminated Human Remains
COLPRO	Collective Protection
CONOPs	Concept of Operations
FOLs	Forward Operating Locations
HAZMAT	Hazardous Material
IAW	In Accordance With
IPE	Individual Protective Equipment
LFA	Large-Framed Aircraft
NEO	Non-Combatant Evacuation Operations
ROM	Restriction of Movement

D.2. TERMS AND DEFINITIONS

Aerial Port of Embarkation: An airfield that has been designated for the sustained air movement of personnel and materiel as well as an authorized port for entrance into the country where located.

Aerial Port of Debarkation: An airfield that has been designated for the sustained air movement of personnel and materiel as well as an authorized port for departing the country where located.

Aeromedical Evacuation: The movement of patients under medical supervision to and between medical treatment facilities by air transportation.

Antibiotic: A medicine that inhibits the growth of or destroys microorganisms.

Bacteria: Small single-celled microorganisms, some of which are dependent upon host cells whilst others may survive independently in adverse conditions.

Contagious: Spread from one person or organism to another by direct or indirect contact.

Disease: A disorder of structure or function in a human, animal, or plant, especially one that produces specific signs or symptoms or that affects a specific location and is not simply a direct result of physical injury.

Endemic: Regularly found among particular people or in a certain area.

Forward Operating Location: Primarily used for counterdrug operations. Similar to a forward operating base (FOB) but without the in-place infrastructure associated with a FOB.

Hygiene: Conditions or practices conducive to maintaining health and preventing disease, especially through cleanliness.

Large Frame Aircraft: Aircraft such as transport or bombers that have a larger frame than fighter aircraft.

Medical Surveillance: The ongoing, systematic collection, analysis, and interpretation of data derived from instances of medical care or medical evaluation, and the reporting of population-based information for characterizing and countering threats to a population's health, well-being and performance.

Mission Critical: Having a decisive or crucial importance in the success or failure of something.

Noncombatant Evacuation Operations: Operations whereby noncombatants are evacuated from foreign countries when their lives are endangered by war, civil unrest, or natural disaster to safe havens.

Pandemic: Denoting a disease affecting or attacking the population of an extensive region, country, continent, global; extensively epidemic.

Percutaneous: Made, done, or effected through the skin.

Prophylaxis: Action taken to prevent disease, especially by specified means or against a specified disease.

Shuffle box: A container of HSW or 5% chlorine/water used to reduce contamination present on gloves or footwear. Container is placed at decontamination entry points.

Spore: A rounded resistant form adopted by a bacterial cell in adverse conditions.

Vaccine: A substance used to stimulate the production of antibodies and provide immunity against one or several diseases, prepared from the causative agent of a disease, its products, or a synthetic substitute, treated to act as an antigen without inducing the disease.

Vector: An organism, typically a biting insect or tick that transmits a disease or parasite from one animal or plant to another.

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