CHAPTER 10

SECTION 5

CRITERIA FOR STORAGE AND LOADING/UNLOADING OF AIRCRAFT EXPLOSIVES HELD FORWARD ON AIRFIELDS

CONTENTS

1 SECTION FIVE

1.1 Introduction

1.1.1 To meet the operational and training requirements of the Defence Imperative, it is necessary to remove explosives from the relative safety of the normal explosives storage facility and position them on or near aircraft. This is usually for short periods of time and does not expose personnel (both Service and civilian), aircraft (ac), explosives and vital facilities to an unacceptable level of risk from the blast and fragments emanating from an explosion either as a result of an accident or, in OOA operations, by enemy action.

1.1.2 Existing prescribed Quantity Distances (QD) do not assure safety, indeed it is impracticable to prescribe distances that would guarantee absolute immunity from the risk of propagation, damage or injury. The regulations in this chapter represent a compromise between absolute safety, practical considerations of cost and operational requirements. QDs are detailed which provide the minimum degree of protection required for the loading of ac and storage of ac explosives on airfields, forward of normal explosives storage facilities. Operational commanders are also offered further choices of QD that may enhance operational posture, but at the cost of increasing the risk.

1.1.3 The facilities covered are as follows:

(1) Hardened Aircraft Shelters (HAS).

(2) Locations for loading/unloading of aircraft or parking armed aircraft.

(3) Parking areas for Explosive Dangerous Air Cargo aircraft.(DAC)

(4) Explosives cargo handling, Palletization sites and Forward weapon preparation facilities.

(5) Forward Weapon Storage (FWS) in igloos or other PES.

(6) Airfield Designated Storage Areas (ADSA).

(7) Surface to Air Missile sites on airfields

1.1.4 PES licensed under these regulations are normally to contain only the type and quantity of explosives that are specifically required to implement the activities authorised in the Statement of Unit Policy (SUP) of the unit at which the PES is located. Additionally, the On Airfield Explosives Safety precautions detailed in Annex B are to be observed.

2 LICENSING

2.1 Introduction

2.1.1 All the forward facilities referred to above are to be licensed as detailed in Chapter 9 and inspected in accordance with Chapter 20. Additionally, the RADHAZ separation distances referred to in Chapter 24 are always to be met. The processing of the explosives licences depends upon the circumstances under which the explosives are present at the facilities, as described below. All QDs are measured to/from the aircraft nosewheel or from the edge of the area for an aircraft pan. In some circumstances, also detailed below, there is a special requirement for the appropriate IE or other Service equivalent, to approve the storage of explosives either in a HAS, or loaded to ac in the open, other than for short term exercise purposes.

2.2 Licence Criteria

2.2.1 All PES are licensed as follows:

(1) Asset Preservation. Annex A, Table 1 specifies the QDs that are to be used to preserve assets. At these QDs, propagation will be prevented. An explosion in a PES may destroy it and its contents, but adjacent assets will only sustain minor damage. These QDs are to be used in peacetime, including during exercises, unless specifically relaxed.

(2) Propagation Prevention. Annex A, Table 2 specifies QDs that give a high degree of protection against propagation, but adjacent assets and storage facilities may be seriously damaged. These QDs may be used in TTW and war, but only when necessary subject to approval by the appropriate IE.

(3) Exceptionally to meet the operational commitment, the appropriate IE may authorise a further reduction of QD in accordance with Chapter 11.

2.3 Effective Net Explosive Quantity (ENEQ) and Maximum Credible Event (MCE)

2.3.1 In certain circumstances it is possible to determine that the aggregated NEQ of an Aircraft does not need to be used for the computation of QD's. This forms the MCE. The appropriate MCE values against Aircraft types and weapon loads can be obtained from DOSG/DSEA through the appropriate IE.

3 DIRECTIONAL WEAPON SYSTEMS

3.1 Definition

3.1.1 A directional weapon system is any weapon system which, when initiated or activated, could explosively propel any projectile or explosive item from the launch platform in any direction other than vertically downwards. This definition includes missiles, rockets, IR decoy flares (except mechanically dispensed countermeasures e.g. MJU52/B BOL IR), gun ammunition and other similar explosive items. This definition does not include torpedoes or those directional weapon systems where the only means of propulsion is by air breathing turbine engines e.g. Stormshadow or Meteor.

3.1.2 Directional Weapons Danger Areas are not protected by the statutory provisions for Safeguarding. However, periodic policing of the zones is to be carried out in conjunction with the policing of the unit boundary required by Chapter 22. When infringements are noted action is to be taken to realign the Danger Area or provide an approved barrier.

3.2 **Airfield Maps**

3.2.1 Units are to produce a Directional Weapons Map to an appropriate scale, as detailed in Chapter 22, showing the areas hazarded by directional weapons. In addition, units are to produce a PES Location Map to an appropriate scale, showing the location of all PES listed in para 1.1.3. This map does not have to be submitted to the appropriate IE for endorsement. Both maps are to be validated by the unit Explosives Safety Representative (ESR) in accordance with Chapter 22, and be made available to IE Inspectors and CIE(MOD) Auditors.

3.3 **Directional Weapons – Safety**

3.3.1 The risks generated by the operation of aircraft or launch platforms fitted with directional weapons are to be driven to as low a level as reasonably practicable. In practice, the most effective way of achieving this low level of risk is by the parking of aircraft loaded with directional weapons in Hardened Aircraft Shelters with the doors closed. If no HAS are available, aircraft are to be positioned on an authorised safe heading or barriers are to be used to provide protection from from the hazards of directional weapons.

3.4 **Barriers**

3.4.1 Barrier designs are available from DSEA that provide complete protection against cannon shell and rockets and cause significant break-up of missiles which, whilst not retained, should no longer be capable of sustained directed flight toward exposed sites. Barrier systems and natural features that are used as barriers are to be authorised in accordance with current procedures, and take into account the specifics at para 3.5. Some information regarding constructional requirements for Barriers can be found in Chapter 7. TA (Structures), through DSEA TS staff, can provide further information on constructional requirements if required.

3.5 **Safe Headings – Aircraft Loaded with Missiles, Rockets and Guns**

3.5.1 For missiles, rockets and guns[1], all ac arming/disarming activities (including application of power) should be carried out within a HAS with the doors closed. If no HAS are available then the ac must be positioned such that the weapon systems are directed towards safe headings that are endorsed by the relevant IE. Safe headings are to meet the criteria detailed at Paragraphs 3.5.2 & 3.5.3 or, where necessary, Paragraph 3.6.1. Where suitable safe headings are not possible, consideration is to be given to barriers. Guidance on available and suitable barriers is to be sought from the relevant IE.

3.5.2 For missiles, rockets and guns, all ac arming/dis-arming activities, including application of power, are to be carried out with the ac positioned such that no places of assembly, inhabited buildings containing 12 or more inhabitants, high density main roads[2], vital service installations and assets or similar facilities exist for the first 3100m within a 5° arc either side of the line of fire or 20º arc for Brimstone. From, 3100m to maximum range of the munition , there are to be no schools, hospitals, places of religious assembly or sporting venues, etc, where large crowds may gather. Careful study will identify whether such facilities, shown on Ordnance Survey maps, are particularly active or used. Examples of maximum range include gun ammunition 27mm - 6800m, 30mm - 7400m and CRV7 - 11100m. However, munition PTs are to be contacted for specialist advice.

3.5.3 Where parallel or near-parallel safe headings are considered for use in flight line operations, they should be planned to overlap into safe areas so that

[1]Aircraft which are loaded with gun ammunition do not need to comply with the requirements of para 3.5 to 3.6 provided that all ammunition is retained within the ammunition tanks or containers and is disconnected from any gun feed mechanism. For F15 aircraft the gun is to be in the COLD gun configuration. In the case of the M134 Minigun, the ammunition is to be fed no closer than 10 cm to the feeder-delinker and the safeing sector removed.

[2] Main roads means any roads that have a traffic flow or more than 5000 vehicles in any 24 hour period.

public exposure is minimised. If doubt exists over the nature of a potentially exposed site, the IE is to be consulted. In order to reduce public exposure and lessen the administrative and financial burden, Units are to maintain the absolute minimum of safe headings consistent with the Unit business need. Where safe headings are used, they are to have been authorised by the HoE and the IE and recorded on the Unit Directional Weapons Safeguarding Map. In addition, safe headings are to be permanently marked on the ground, in the manner described at Fig 1, indicating the direction of the safe heading and showing the bearing.

3.6 Prioritisation of Use

3.6.1 Wherever possible, Units are to prioritise the use of their designated headings such that those that hazard the public least are the most often used. Advice on this prioritisation may be obtained from the appropriate IE.

3.7 IR Decoy Flare Danger Areas

3.7.1 IR decoy Flare Danger Areas are to comply with those prescribed in the relevant ac Safety and Maintenance Notes. However, when Danger Areas are not prescribed, and in the absence of any other authoritative information, an all round Danger Area of 200m is to be applied, measured from each dispenser. These Danger Areas are, where practicable, to be shown on the Directional Weapons Map.

3.8 IR Decoy Flare Catchers

3.8.1 IR decoy flare catchers may be used providing their effectiveness has been tested in trials conducted by a competent authority and the relevant ac PT has authorised their use.

3.9 Movable Weapon Systems

3.9.1 Where the weapon system can be moved on its launch platform or mounting (e.g. helicopter guns, SAM systems, etc) and a barrier or a traverse is not suitable, other precautions are to be taken (e.g. markings on the ground, indicator boards or other means) to ensure the weapon system is pointed or parked in a safe direction. The method used to ensure the weapon system remains pointing in a safe direction is to be approved by the appropriate IE and an authoritative reference entered on the Explosives Licence for the PES as additional information.

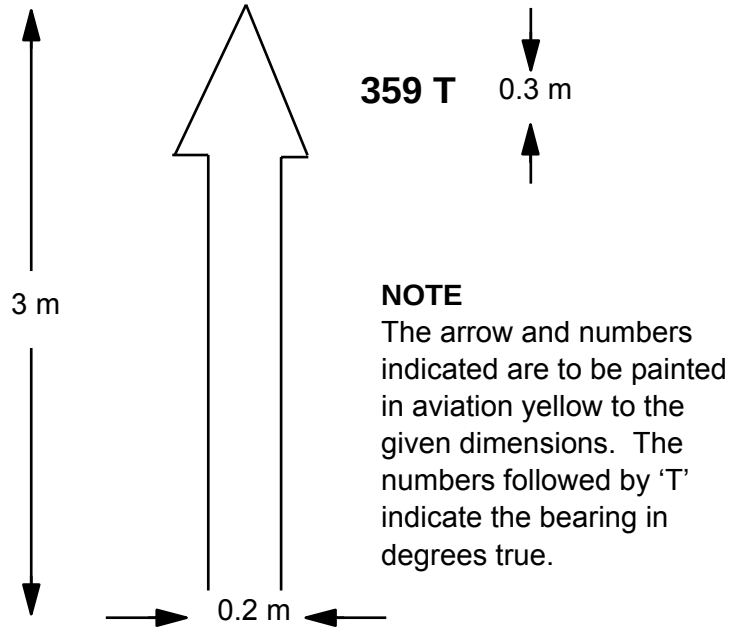

Fig 1 Directional Weapon Safe Heading Marking

4 RADIO FREQUENCY HAZARDS (RADHAZ)

4.1 General

4.1.1 The separation distances required to avoid inadvertent initiation of electro-explosive devices (EED) are specified in Chapter 24, and are mandatory, as are restrictions on the use of aircraft onboard emitters in the vicinity of EEDs detailed in the ac publication Topic-2(R)1, and in the Military Aircraft Release/Release to Service documentation for each ac type.

5 CONSTRUCTION AND SITING OF AIRFIELD EXPLOSIVE FACILITIES

5.1 General

5.1.1 Forward explosives facilities on airfields that are intended for the permanent storage of explosives are to be constructed and sited as follows:

(1) Construction. All facilities, except HAS and QRA hangars, are to be constructed to the standards required for normal explosives buildings in Chapter 6. The requirement for security fencing is to be decided by Security Staff in consultation with the appropriate IE.

(2) Siting. All facilities are to be sited as stated in this chapter. Where details are not specified, the siting regulations in Chapter 5 are to be applied.

6 QUANTITY DISTANCES FOR EXPLOSIVES ON MILITARY AIRFIELDS

6.1 General

6.1.1 The following paragraphs prescribe the QDs that are to be applied when siting and licensing facilities forward on airfields. The explosives facilities referred to are those listed in para 1.1.3. During siting, account must also be taken of the NATO Criteria for Airfields (6th Edition) and other airfield siting criteria, which may require separation distances greater than normal QDs.

6.1.2 Unless stated otherwise, the QDs stated within this section are strictly applicable for HD 1.1. All other HDs must use the tables contained in Chapter 10, Section 2, Annex A. The pictograph to be used for a HAS when considered as a PES in Chapter 10, Section 2, Annex A is the QD matrix for Non Earth Covered Heavy Storage, column (a) or (b) dependant on orientation.

6.1.3 It should be noted, that the HD of a weapon, as classified by ESTC, in its normal packaged state is not necessarily a sound guide to the hazard othe weapon is likely to exhibit when unpackaged. For instance, AMRAAM missiles are ESTC classified as HD 1.2, when in their packaged state, but HD 1.1 when unpackaged.

6.1.4 CRV-7 HE rockets are classified as HD 1.1 however when CRV-7 HE rockets are within the launcher it provides mitigation to propagation and the rocket is to be considered as Non Mass-Detonating HD 1.2.

6.2 Aircraft Armed with Non Mass-Detonating Weapons

6.2.1 Aircraft armed exclusively with non-mass detonating weapons, do not require the prescribed QDs when these aircraft are being considered as PES. Such aircraft may be parked adjacent to each other, so long as Safe Headings and Flare Danger Areas can be achieved, as applicable. A minimum distances of 50m for PTRD/IBD and 25m for Direct Support (DS) and Indirect Support (IS) are to be applied.

6.2.2 No QD need apply to aircraft armed solely with non-mass detonating weapons when parked in a HAS, providing the HAS doors are closed. Aircraft are not to be armed with flares where 2 or more aircraft occupy the same HAS.

IS activities may be undertaken in an adjacent HAS Annex, without QD, as long as the interconnecting HAS-Annex door remains closed.

7 LOADED/ARMED AIRCRAFT IN THE OPEN

7.1 Untraversed

7.1.1 Except for the circumstances described in para 6.2.1, when considered as an Exposed Site, untraversed armed aircraft or groups of aircraft, including transport aircraft and helicopters, are normally to be separated from other PES, by 12Q⅓. At this distance adjacent unsheltered aircraft may sustain fragment damage but will, in most cases, remain operable. See Asset Preservation Annex A, Table 1. Aircraft loaded with explosive DAC are to be considered as open stacks and Section 2 tables utilised. There is, however, NO requirement to aggregate and include the NEQ of flares and gun ammunition, when calculating QDs that are loaded to an aircraft fitted with other HD 1.1 weapons.

7.1.2 Parking armed or loaded aircraft at separation distances of less than $12Q^{1/3}$ significantly increases the potential consequences of an explosive event, as follows:

(1) $7.2Q^{1/3}$. Adjacent aircraft are expected to sustain considerable structural damage from blast, fragments and burning debris. Direct propagation of munitions at this QD is considered unlikely, but there is a possibility that adjacent aircraft fuel tanks may be damaged and ignited leading to a delayed explosion of the munitions. The hazard of high-speed weapon fragments can be mitigated by parking the aircraft at a relative wing angle of 30 to 60 degrees.

(2) $4.4Q^{1/3}$. Adjacent aircraft are expected to suffer severe structural damage due to blast, heat and impact by fragments and debris. Simultaneous detonation of munitions loaded to adjacent aircraft could result from the impact of high-speed weapon fragments, but this risk can be mitigated by parking aircraft at a relative wing angle of 30 to 60 degrees. Alternatively, the use of an intervening barrier or traverse (as detailed in Chapter 7) will eliminate the risk of instantaneous propagation. However, even with effective barriers, damage to the fuel tanks on exposed aircraft is likely to result in fires, with the subsequent loss of aircraft and detonation of the explosive stores.

(3) $2.4Q^{1/3}$ (With barrier only). Adjacent aircraft will sustain major damage or be destroyed by a combination of blast, fireball thermal effects and lobbed debris. The use of suitable intervening barriers will prevent the simultaneous detonation of munitions on exposed aircraft, but delayed propagation of the explosion, caused by the ensuing fuel fires, is highly likely.

7.1.3 Where reduced QDs must be employed to meet an urgent, essential operational requirement, the Deployed Operational Base (DOB) Cdr is to promptly advise the Air Component Cdr and the responsible IE. In addition, the DOB Cdr is required to produce an Explosive Safety Case, for the appropriate IE, who will provide guidance on both the minimum requirements of the Safety Case and the need for a formal Acceptance of Risk as follows:

(1) For aircraft necessarily parked at reduced distances during overseas operational deployments, (but at not less than either $4.4Q^{1/3}$ without barriers or $2.4Q^{1/3}$ with barriers) - the Acceptance of Risk is to be authorised by the DOB/Operational Cdr (Gp Capt or equivalent). Similarly, for exercises and planned operational contingencies - the Acceptance of Risk is to be authorised by Command Air Staff (Gp Capt or equivalent).

(2) Where it is operationally essential to park armed aircraft at lesser distances than either $4.4Q^{1/3}$ without barriers or $2.4Q^{1/3}$ with barriers, or in groups of aircraft - the Acceptance of Risk is to be signed at Air Component Cdr level, as advised by the responsible IE.

7.2 Traversed

7.2.1 Traverses between adjacent aircraft will prevent simultaneous propagation caused by high velocity low angle fragments. Traversed aircraft may therefore be sited at 2.4 $Q^{1/3}$ provided that the traverses are constructed to the standard laid down in Chapter 7. It should be noted, however, that a traverse does not necessarily prevent subsequent damage caused by blast, lobbed items, debris or secondary fires.

8 OTHER AIRFIELD STORAGE FACILITIES

8.1 Weapons Preparation Facilities/Explosives Cargo Handling and Palletization Sites

8.1.1 Weapon preparation facilities, including explosives cargo loading and palletization sites forward on airfields, are normally to be separated from other PES by a Process Building Distance (PBD) of $8Q^{1/3}$. However facilities which are hardened to NATO criteria only require a PBD of $3.6Q^{1/3}$.

8.2 Runways and Taxiways

8.2.1 For the protection of aircraft operating surfaces, PES are to be separated from runways and taxiways by at least $1.8Q^{1/3}$, unless an alternative runway or taxiway is available or the loss is acceptable. For all other HDs No QD applies.

8.3 Airfield Designated Storage Areas

8.3.1 Vehicles, including towed trolleys, etc, loaded with explosives are normally to be parked in accordance with Chapter 10, Section 3. However, when it is required to park vehicles or trolleys, loaded with explosives, which are directly supporting airfield operations and it is impractical to unload such vehicles, then parking areas known as Airfield Designated Storage Areas (ADSA) are to be selected and identified for this purpose. Any suitable area adjacent to the flight line may be used provided it is acceptable to the appropriate IE and the unit Fire Officer/FFP and Security Officer. If required, permanent structures may be erected to provide weather-proofing and security.

8.3.2 ADSA containing vehicles/trolleys loaded with non mass detonating weapons, do not require the prescribed QDs when being considered as a PES. However, minimum distances of 50m for PTRD/IBD and 25m to Direct Support and Indirect Support facilities are to be applied. Additionally, ADSA are to be separated from each other, and from aircraft, by a minimum separation distance of 10m. The explosive content is to be limited to the HDs and quantities sufficient to support 1 days flying programme and are not to exceed:

1.1 **Mass Detonating Weapons**	1.2/1.3 **Non Mass Detonating Weapons**	1.4 **Weapons With No Significant External Hazard**
Nil	Aggregated 50 kg	50 kg

8.3.3 An ADSA is to comply with the following:

(1) It is to have its bounds clearly delineated on the ground (e.g. by painted markings).

(2) Barriers are to be provided to prevent casual access to non-entitled persons if the unit Explosives Safety Representative considers them necessary.

(3) Written approval from the unit Security officer is to be obtained before vehicles/trolleys loaded with explosives are left unattended.

(4) The unit Explosives Safety Officer is to ensure that MT or other operating orders for those vehicles using the ADSA stipulate the permitted parking area to be used whilst they are loaded with explosives.

(5) The appropriate HD and supplementary signs are to be clearly displayed when explosives are present.

9 DIRECT AND INDIRECT SUPPORT FACILITIES (SEE - DEFINITIONS)

9.1 Introduction

9.1.1 The QDs for activities and facilities that directly and indirectly support airfield operations are as follows:

(1) Direct Support. Unhardened direct support facilities are normally to be separated from PES by $9.6Q^{1/3}$. However, facilities that are hardened to NATO criteria may be sited at $3.6Q^{1/3}$. Unhardened Direct Support facilities may be separated from PES by $7.2Q^{1/3}$ with the written agreement of the Air Staff, or other Service equivalent, who are to note that casualties and damage to unhardened buildings at this distance are likely to be serious.

(2) Indirect Support. Unhardened indirect support facilities are to be separated from PES by $16Q^{1/3}$ (except where para 9.2.2 permits lesser distances). Facilities hardened to NATO Criteria are to be separated from PES by $9.6Q^{1/3}$. In TTW and War, it is accepted that all personnel are in effect directly supporting unit operations and that the increased risk may be operationally essential. In such circumstances, QD requirements may be reduced in line with sub-para (1) above, after due consideration of asset preservation and numbers of personnel at risk.

(3) Other Facilities. To accommodate facilities that cannot be clearly assigned to direct or indirect support, and where in such circumstances protection iaw sub-paras (1) and (2) above is not warranted, the relevant IE may, after due consideration of the risks, numbers of persons involved, frequency of occupation, and importance of facility, waive or reduce the QD requirement commensurate with operational necessity, (but see para 9.2.2).

9.1.2 Construction standards for both direct and indirect support facilities shall, as a minimum, comply with Chapter 6 Table 2.

9.2 Aircraft Not Loaded With Explosives[3]

9.2.1 Aircraft operating in a support role which are not armed or loaded with explosives (e.g. tanker or military transport ac, etc) are normally to be separated from PES (including armed aircraft in the open) containing HD 1.1 by $12Q^{1/3}$ (but see paras 6.2 for distance from aircraft armed with HD 1.2, HD 1.3 and HD 1.4). At this QD, damage may be sustained from fragments.

9.2.2 Where nearly complete protection against fragments is necessary, (e.g. civilian aircraft) a minimum distance of 400m from an untraversed PES must be provided. Where operational requirements outweigh consideration of asset preservation, the QD may be reduced to 270m subject to the authority of Air Staff, or other Service equivalent. However, minimum distances of $9.6Q^{1/3}$ for embarking/disembarking Service personnel from transport aircraft and $7.2Q^{1/3}$ for tanker aircraft are to be maintained. See Table 2 propagation prevention table.

9.3 Public Traffic Routes

9.3.1 Public traffic routes are to be separated from PES by the PTRD as defined in Chapter 10 Section 2 using IBD, 2/3 IBD or 1/2 IBD depending on the type of route. Those IBD figures are to be obtained from Para 9.4.1.

(1) Armed Aircraft. For Armed/loaded (including explosive Dangerous Air Cargo) aircraft:

(a) High Density usage routes use the applicable PTRD is IBD (D13), with a minimum of 250m.

[3] For unarmed helicopters not conveying explosives, see Chapter 10, Section 7, Para 8.3.

(b) Medium Density usage routes use the D11, with a minimum of 165m.

(c) Low Density usage routes use ½ D13, with no minimum.

9.4 Inhabited Buildings

9.4.1 Buildings inhabited or used by civilians or Service personnel not directly or indirectly supporting airfield operations (see para 9.1.1) are to be separated from PES by IBD as follows:

(1) Ready Service Igloos. For Ready Service Igloos (ie those containing a maximum NEQ of 10 000 kg), an IBD of $14Q^{1/3}$ from the rear and $18Q^{1/3}$ from the front and sides is to be applied, subject to a minimum distance of 270 m.

(2) Hardened Aircraft Shelters:

(a) NEQ Less than 200 kg. Any unhardened facility near a HAS is vulnerable to debris damage from an explosion greater than one in the order of tens of kg inside the HAS. Provided no occupied unhardened buildings are situated within an 80m zone which is widened to the 15^{o} arcs, as shown at Fig 2 to the front and 20m to the side and rear of the HAS, up to 200 kg of any HD may be stored without further QD consideration. In the event of an explosion within the HAS, injuries may be expected among exposed personnel in the open all round the HAS due to overpressure, and at greater distances to the front of the HAS due to debris throw.

(b) NEQ more than 200 kg. For HAS storing over 200 kg, up to a maximum NEQ of 5000 kg, an IBD of $20Q^{1/3}$ from the front, $25Q^{1/3}$ from the sides and $16Q^{1/3}$ from the rear are to be applied subject to a minimum distance of 100m.

(3) For HD 1.1. Armed/loaded (including explosive Dangerous Air Cargo) aircraft in the open - IBD or 250m, whichever is the greater.

(4) Other PES. For all other PES the IBD detailed in Chapter 10, Section 2, Annex A Table 1A-D, D13, with the applicable minimum distances, are to be applied.

10 OTHER CONSIDERATIONS

10.1 Nuclear Weapons (NW) Aircraft NW Cargo Operations

10.1.1 Except within the provisions at Chapter 17, nuclear weapons (NW) cargo being loaded to, or already loaded on transport aircraft, are not to be hazarded by conventional weapons unless their mixing is part of an approved procedure. In all normal circumstances, the following minimum separation distances are to be applied:

(1) Conventional Explosive (HD 1.1) to Nuclear - IBD or 270m whichever is the greater.

(2) Conventional Explosives (HD 1.2, HD 1.3 and HD 1.4) to Nuclear, and Nuclear to Nuclear, - IBD with a minimum of 50m.

CHAPTER 10

SECTION 5

ANNEX A

AIRFIELD QUANTITY DISTANCE TABLES – PROPAGATION PREVENTION AND ASSET PRESERVATION

1 Quantity Distance Calculation

1.1 **Quantity Distances**

1.1.1 The distances (D) in metres quoted are a function (F) of the cube root of the net explosive quantity (NEQ) in kg (Q). These distances are tabulated from 50 kg to 10 000 kg NEQ at Annex A, Table 1 and Table 2. The distance required for a given NEQ can either be read off the table or calculated using the formula $D = F \times Q^{1/3}$. Similarly, for a given distance, the permitted NEQ can be calculated from the formula $Q = (D/F)^3$.

1.1.2 Areas of hazard to/from the front, side or rear, of HAS or igloos as PES or ES lie in the arcs shown at Fig 2. A particular face of a HAS as an ES is deemed to be threatened by a PES face when these faces lie within the hazard arc of the other.

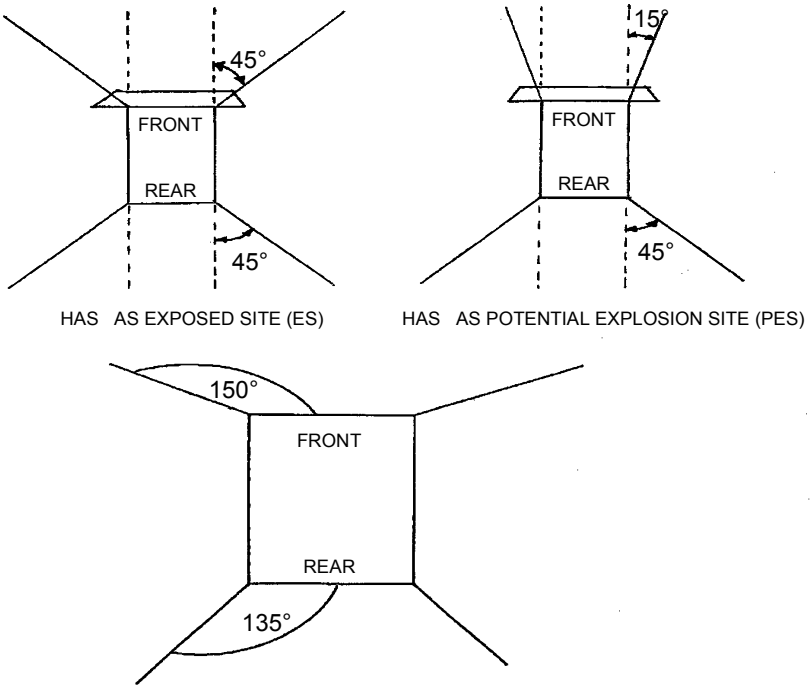

Fig 2 Arcs Of Hazard From/To Has And Igloos

TABLE 1 QUANTITY DISTANCES FOR HD 1.1 - ASSET PRESERVATION

From PES		Armed Aircraft (4)	2nd or 3rd Generation HAS (1)			Ready Use Igloo (2)			Ready Use Storehouse (3)	Igloo	Storehouse		
To ES			**Side**	**Rear**	**Front**	**Side**	**Rear**	**Front**	**Trav or U/T**	**Side**	**Rear**	**Front**	**Trav or U/T**
Armed Aircraft	**All**	12Q	12Q	12Q	12Q	12Q	12Q	12Q	12Q	12Q	12Q	12Q	12Q
2nd or 3rd Generation HAS	**Side**	**Use Chapter**	3.6	2.4	3.6	1.1	1.1	3.2	3.2	2.0	2.0	3.2	3.2
	Rear	**10 Section 2**	3.2	2.0	3.2	1.1	1.1	3.2	3.2	2.0	2.0	3.2	3.2
	Front	**Table 1**	4.4	3.6	7.2	1.1	1.1	3.2	3.2	2.0	2.0	3.2	3.2
Taxiway	**All**	1.8Q	1.8Q	1.8Q	1.8Q	1.8Q	1.8Q	1.8Q	1.8Q	1.8Q	1.8Q	1.8Q	1.8Q
Inhabited Building	**<200kg**	D13 >250m	20m	20m	80m	18Q >270m	14Q >270m	18Q >270m	**Use Chapter 10 Section 2 Table 1**				
	>200kg	D13 >250m	25Q >100m	16Q >100m	20Q >100m								
Unarmed Aircraft	**All**	12Q	12Q	12Q	12Q	12Q	12Q	12Q	12Q	12Q	12Q	12Q	12Q
PTRD	**Low**	½ x D13	**Use Chapter 10 Section 2 Table 1**										
	Med	D11 >165m											
	High	D13 >250m											
Igloo	**Side**	**Use Chapter**	3.6	2.4	3.6	**Use Chapter 10 Section 2 Table 1**							
	Rear	**10 Section 2**	3.2	2.0	3.2								
	Front	**Table 1**	4.4	3.6	7.2								
Storehouse	**Trav or U/T**		7.2	7.2	7.2								
Wpn Prep Facility (5)	**All**	8Q	8Q	8Q	8Q	8Q	8Q	8Q	8Q	8Q	8Q	8Q	8Q

NOTES

(1) Max NEQ of 5000 kg.

(2) Max NEQ of 10000 kg; max loading density of 20 kg/m^3.

(3) Max NEQ of 10000 kg.

(4) DAC ac are to be considered as an untraversed open stack and Chapter 10 Section 2 Annex A Tables, with an IBD ≥250m minimum distance, are to be applied.

(5) Includes Explosive Cargo Handling and Palletization Sites.

TABLE 1 (CONTD)

NEQ (kg)	Quantity Distances (m) ($Q^{1/3}$)																		
	0.5	0.8	1.1	1.8	2.0	2.4	3.2	3.6	4.4	7.2	8.0	9.6	12.0	14.0	16.0	18.0	5.5 or 22.2	20.0	25.0
50	2	3	4	7	7	9	12	13	16	26	30	35	44	52	59	66	39	74	92
60	2	3	4	8	8	10	13	15	17	28	32	38	47	55	63	70	43	78	98
70	3	4	5	8	8	10	13	15	18	30	33	40	49	58	66	74	46	82	103
80	3	4	5	8	9	11	14	16	19	31	35	41	52	60	69	78	49	86	108
90	3	4	5	9	9	11	14	17	20	32	36	43	54	63	72	81	52	90	112
100	3	4	6	9	10	12	15	17	21	33	38	45	56	65	74	84	55	93	116
200	3	5	7	11	12	15	19	22	26	42	47	56	70	82	94	105	78	117	146
300	4	6	8	12	13	17	21	25	29	48	54	64	80	94	107	120	95	134	167
400	4	6	9	14	15	18	24	27	32	53	59	71	88	103	118	133	110	147	184
500	5	7	9	15	16	20	25	29	35	58	64	76	95	111	127	143	123	159	198
600	5	7	10	16	17	21	27	31	38	61	68	81	101	118	135	152	135	169	211
700	5	8	10	16	18	22	28	32	40	64	72	85	107	124	142	160	146	178	222
800	5	8	11	17	19	23	30	34	41	67	75	89	111	130	149	167	156	186	232
900	5	8	11	18	19	24	31	35	43	70	78	93	116	135	154	174	165	193	241
1000	5	8	11	18	20	24	32	36	44	72	80	96	120	140	160	180	174	200	250
1200	6	9	12	19	21	26	34	39	47	77	86	102	128	149	170	191	191	213	266
1400	6	9	13	21	22	27	36	41	50	81	90	107	134	157	179	201	206	223	280
1600	6	10	13	22	23	29	37	43	52	85	94	112	140	164	187	211	220	234	292
1800	7	10	14	22	24	30	39	44	54	88	98	117	146	170	195	219	233	243	304
2000	7	11	14	23	25	31	40	46	56	91	105	121	151	176	202	227	246	252	315
2500	7	11	15	25	27	33	43	49	60	98	110	130	163	190	217	244	275	271	339
3000	8	12	16	26	29	35	46	52	64	105	120	138	173	202	231	260	301	288	361
3500	8	13	17	28	30	37	49	55	67	110	125	146	182	213	243	273	325	304	380
4000	8	13	18	29	32	39	51	58	70	115	129	152	190	222	254	286	348	317	397
4500	9	13	18	30	33	40	53	59	73	119	132	158	198	231	264	297	366	330	413
5000	9	14	19	31	34	42	55	62	76	125	136	164	205	239	273	308	380	342	427
6000	10	15	20	33	36	44	58	66	80	131	145	174	218	254	291	327	403	363	454
7000	10	16	21	35	38	46	61	69	85	140	153	184	230	268	306	344	425	383	478
8000	10	16	22	36	40	48	64	72	88	145	160	192	240	280	320	360	444	400	500
9000	11	17	23	38	42	50	67	75	92	150	166	200	250	291	332	374	462	416	520
10000	11	18	24	39	43	52	69	78	95	155	172	207	259	302	345	388	478	431	539

TABLE 2 QUANTITY DISTANCES FOR HD 1.1 - PROPAGATION PREVENTION

From PES		Armed Aircraft (4)		2nd or 3rd Generation HAS (1)			Ready Use Igloo (2)			Ready Use Storehouse (3)	Igloo			Storehouse
To ES				**Side**	**Rear**	**Front**	**Side**	**Rear**	**Front**	**Trav or U/T**	**Side**	**Rear**	**Front**	**Trav or U/T**
Armed Aircraft		**All**		7.2Q	7.2Q	7.2Q	7.2Q	7.2Q	7.2Q	7.2Q	7.2Q	7.2Q	7.2Q	7.2Q
2nd or 3rd Generation HAS	**Side**	**Use Chapter 10 Section 2 Table 1**		0.8.	0.8	1.1	0.5	0.5	1.1	1.1	**Use Chapter 10 Section 2 Table 1**			
	Rear			0.8	0.8	1.1	0.5	0.5	1.1	1.1				
	Front			1.8	1.1	2.4	0.5	0.5	1.1	1.1				
Taxiway	**All**	No QD		No QD	No QD	No QD	No QD	No QD	No QD	No QD	No QD	No QD	No QD	No QD
Inhabited Building	**<200kg**	D13 >250m		20m	20m	80m	18Q	14Q	18Q	**Use Chapter 10 Section 2 Table 1**				
	>200kg	D13 >250m		25Q >100m	16Q >100m	20Q >100m	>270m	>270m	>270m					
Unarmed Aircraft	**All**	7.2Q		7.2Q	7.2Q	7.2Q	7.2Q	7.2Q	7.2Q	7.2Q	7.2Q	7.2Q	7.2Q	7.2Q
PTRD	**Low**	½ x D13		**Use Chapter 10 Section 2 Table 1**										
	Med	D11 >165m												
	High	D13 >250m												
Igloo	**Side**	**Use Chapter 10 Section 2 Table 1**		0.8	0.8	1.1	**Use Chapter 10 Section 2 Table 1**							
	Rear			0.8	0.8	1.1								
	Front Trav			1.1	1.1	2.4								
	Front U/T			2.4	1.8	3.6								
Storehouse	**Trav**			1.1	1.1	1.1								
	U/T			4.4	4.4	4.4								
Wpn Prep Facility (5)	**All**	8Q	8Q	8Q		8Q	8Q	8Q	8Q	8Q	8Q	8Q		8Q

(1) Max NEQ of 5000 kg.

(2) Max NEQ of 10000 kg; max loading density of 20 kg/m^3.

(3) Max NEQ of 10000 kg.

(4) DAC ac are to be considered as an untraversed open stack and Chapter 10 Section 2 Annex A Tables, with an IBD ≥250m minimum distance, are to be applied.

(5) Includes Explosive Cargo Handling and Palletization Sites.

TABLE 2 (CONTD)

NEQ (kg)	Quantity Distances (m) ($Q^{1/3}$)																		
	0.5	**0.8**	**1.1**	**1.8**	**2.0**	**2.4**	**3.2**	**3.6**	**4.4**	**7.2**	**8.0**	**9.6**	**12.0**	**14.0**	**16.0**	**18.0**	**5.5 or 22.2**	**20.0**	**25.0**
50	2	3	4	7	7	9	12	13	16	26	30	35	44	52	59	66	39	74	92
60	2	3	4	8	8	10	13	15	17	28	32	38	47	55	63	70	43	78	98
70	3	4	5	8	8	10	13	15	18	30	33	40	49	58	66	74	46	82	103
80	3	4	5	8	9	11	14	16	19	31	35	41	52	60	69	78	49	86	108
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900	5	8	11	18	19	24	31	35	43	70	78	93	116	135	154	174	165	193	241
1000	5	8	11	18	20	24	32	36	44	72	80	96	120	140	160	180	174	200	250
1200	6	9	12	19	21	26	34	39	47	77	86	102	128	149	170	191	191	213	266
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1600	6	10	13	22	23	29	37	43	52	85	94	112	140	164	187	211	220	234	292
1800	7	10	14	22	24	30	39	44	54	88	98	117	146	170	195	219	233	243	304
2000	7	11	14	23	25	31	40	46	56	91	105	121	151	176	202	227	246	252	315
2500	7	11	15	25	27	33	43	49	60	98	110	130	163	190	217	244	275	271	339
3000	8	12	16	26	29	35	46	52	64	105	120	138	173	202	231	260	301	288	361
3500	8	13	17	28	30	37	49	55	67	110	125	146	182	213	243	273	325	304	380
4000	8	13	18	29	32	39	51	58	70	115	129	152	190	222	254	286	348	317	397
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6000	10	15	20	33	36	44	58	66	80	131	145	174	218	254	291	327	403	363	454
7000	10	16	21	35	38	46	61	69	85	140	153	184	230	268	306	344	425	383	478
8000	10	16	22	36	40	48	64	72	88	145	160	192	240	280	320	360	444	400	500
9000	11	17	23	38	42	50	67	75	92	150	166	200	250	291	332	374	462	416	520
10 000	11	18	24	39	43	52	69	78	95	155	172	207	259	302	345	388	478	431	539

CHAPTER 10

SECTION 5

ANNEX B

ON AIRFIELD EXPLOSIVES SAFETY

CONTENTS

1 ON AIRFIELD EXPLOSIVES SAFETY

1.1 Display of Hazard Division and Safety Signs

1.1.1 When armed aircraft or transport aircraft loaded with explosive freight are present on flight lines, dispersal's HAS and hangars the appropriate hazard division, supplementary and armed aircraft warning signs are to be displayed. There is no requirement to display safety signs for aircraft fitted only with installed explosives, e.g. explosive bolts, cartridges in aircraft assisted escape systems, explosive start valves, ejector release units, fire suppression equipment and similar items associated with the operating of an aircraft system.

1.1.2 The positioning of signs is to be agreed with the Unit fire Officer and senior Air Traffic Control Officer but as a minimum they are to be on all the normal approach routes to the PES used by personnel or the emergency services.

1.2 Armed Aircraft Safety Precautions

1.2.1 This topic is covered in Maintenance and Airworthiness Processes (MAP-01)

Fig 1 Example of an Aircraft sign for armed aircraft

Fig 2 Example of an Aircraft sign for freight aircraft

1.3 **Weapons in Hardened aircraft shelters (HAS) safety precautions**

1.3.1 Areas within HAS are to be designated for weapons; the areas are to be clearly demarcated and are to be:

(1) Positioned clear of jet efflux.

(2) Positioned as far away as practicable from electrically or mechanically powered Ground Support Equipment (GSE), hydraulic rigs etc and areas used for GSE storage.

(3) Positioned as far away as practicable from areas or routes used in the day to day handling and maintenance of aircraft in HAS.

(4) Positioned outside the RADHAZ danger area of those aircraft emitters whose operation is permitted within the HAS.

(5) Positioned such that no electrical installation of less that CAT C standard can hazard the weapons by being within 1metre.

(6) A lockable metal container is to be used for the storage of small explosives items.

1.4 **Security**

1.4.1 Normally, when weapons are present in HAS the doors are to be closed. Whenever HAS are left unoccupied they are to be secured with approved locks (JSP440). Station Security officers are to specify additional security measures as required.

1.5 **Fire**

1.5.1 Unit fire officers are to be aware of the actual or planned presence of weapons in HAS and are to specify any additional measures considered necessary to minimise the risk of fire depending on local circumstances.

1.6 **Liquid Oxygen**

1.6.1 Liquid oxygen is not to be stored in HAS whilst weapons are present.

1.7 **Ground Support Equipment**

1.7.1 Refuelling of GSE is not permitted in HAS whilst weapons are present.

1.8 **Management of Aircraft (AC) Flare Safety on Non Mod Airfields**

1.8.1 The risks generated by ac fitted with directional weapons are to be driven to 'As Low As Reasonably Practicable' (ALARP). In terms of management of flare safety, observance of the Flare Danger Areas, which are published in the relevant (ac) Safety, and Maintenance Notes best achieve this. However, the ability to maintain the prescribed flare Danger Area is invariably compromised during Out of Area (OOA) operations or when exercising on foreign airfields due to restrictions on ac parking imposed by the Host Nation (HN). Information on the storage and preparation of aircraft countermeasure flares in deployed or field conditions is contained in Appendix 1 to this annex.

1.8.2 Guidance on measures to be put in place for local management of flare safety on those occasions where it is impossible to maintain the flare Danger Areas is therefore required. This information is only applicable for use to non-MOD airfields and is not to be used to relax the safety standards set on UK Main Operating Bases where flare Danger Areas are to be observed. It is accepted that on certain operations such as SF, timescales will be short and communication with outside agencies will be limited; in these cases, the senior engineering officer, Detachment Commander, ac Captain or NCO present should follow local procedures, but adhering where possible to the spirit of this information. The test for adequacy of any such safety provision will be the rigorous application of reasonable practicability as currently understood. Where the MOD is granted exemption to normal rules, it is only for the purpose of the defence imperative and this has to be taken into account in determining what is reasonably practicable.

1.9 **Risk Assessment and Control**

1.9.1 Risk is defined as the product of the probability and consequence of an event. In managing risk, the MOD adopts the HSE position that risk should ideally be removed

but otherwise must be assessed and controlled to an acceptable level. What constitutes an acceptable level varies depending on the operational tempo of the task and there will clearly be circumstances where the operational tempo may otherwise negate measures that would be put in place for peacetime operations. However, that is not to say that the operational caveat throws caution to the wind and a position of defensible risk would perhaps be more meaningful. Defensible risk requires that line managers and Commanders assume responsibility for the measures put in place to mitigate the risk resulting from their activity.

1.9.2 Probability. Ac countermeasures flares are particularly sensitive to initiation through static electricity and the effects of RF emissions. Whilst the primary risk of accidental initiation of installed flares is mitigated in part by the ac armament safety systems, countermeasure flare, invariably being post design fits, are often not fully protected. Moreover, the systems remain susceptible to the effects of RADHAZ, degradation of the integrity of the firing system, maintenance and user error.

1.9.3 Although the probability of an accidental initiation may be low, the consequences of an Infra Red flare, burning at temperatures in excess of 1000^{o}C, being released in the locality of ac, personnel, refuelling bowsers, or technical accommodation warrant further mitigation.

1.10 **Safety Case**

1.10.1 Where the flare hazard cannot be managed through the use of the Flare Danger Area, the senior engineering officer is to prepare a safety case, which is to identify suitable controls to be put in place to mitigate the risk. The safety case is to draw on a local risk assessment, which should identify those facilities, personnel or equipment that fall within the flare Danger Area. Where the control measures do not fully protect personnel from the risk, and a residual risk remains, then an acceptance of risk should be prepared for endorsement by the DOB/Operational Commander(minimum of Gp Capt or equivalent). Where other HN personnel or assets fall within the ac Flare Danger Area, then the safety case is to include an acceptance or risk from that appropriate nation's command staff or safety authority.

1.10.2 The primary means of mitigating the risk generated by ac on flare operations is through application of the flare Danger Area. Ac should be parked such that the flare Danger Area can be accommodated without impacting on personnel, vehicles, equipment, accommodation or other ac. Clearly engineering personnel engaged on first line maintenance, servicing and handling activities might be required to enter the flare Danger Area to carry out essential tasks. Here the normal rules of keeping exposure to risk to an absolute minimum both in terms of number of personnel exposed and duration of exposure apply. Whilst exposure of personnel to the flare risk during see off would be defensible, positioning ac such that technical accommodation, rest facilities or equipment were permanently positioned within the ac flare Danger Area would clearly be difficult to defend.

1.10.3 Where the flare Danger Area cannot be achieved then other physical and procedural controls may be used to form the safety case. Suitable controls will vary with ac type, nature of operation and location as well as the operational tempo. It is ultimately the detachment commander who must defend the level of control used to mitigate the flare risk. Suitable controls may include:

(1) Physical Controls. Barriers positioned to intercept or deflect a flare from an exposed or vulnerable asset may be formed from concrete road blocks, 45 gallon drums filled with sand or sand bag walls. Where barriers are used they should be positioned such that there is no danger of the flare bouncing back such that they may come to rest underneath the ac. Note that effective barriers need not be more that a few feet high as flares invariably bounce along at ground level after clearing approximately 10 m from the point of ejection. Flare catchers may also be used providing they have been authorised by the relevant ac authority.

(2) Procedural Controls. Procedural controls may take the form of simple orders highlighting the risk to personnel, warning of the hazard, restricting movement within the flare Danger Area and use of armed ac signs.

Consideration should be given to minimising the length of time the ac is loaded with flares to the absolute minimum. More sophisticated procedural controls would involve the use of Operational Arming where the ac is taxied to a point where the flare Danger Area can be met before final arming the flare system.

1.11 **Authorisation**

1.11.1 On completion, the safety case is to be staffed through the appropriate Inspector of Explosives. The safety case is to include:

(1) The risk assessment identifying those assets/personnel within the flare Danger Area.

(2) Description of risk mitigation - what procedural and physical controls have been put in place to mitigate the risk?

(3) Acceptance of risk to those assets/facilities which remain unprotected by the risk control measures including where HN or other nations assets are being placed at risk and acceptance from the appropriate Cdr or safety representative.

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CHAPTER 10

SECTION 5

ANNEX B APPENDIX 1

STORAGE AND PREPARATION OF AIRCRAFT COUNTERMEASURE FLARES IN DEPLOYED OR FIELD CONDITIONS

CONTENTS

1 AIRCRAFT COUNTERMEASURE FLARES

1.1 Introduction

1.1.1 The increased frequency of short-notice operations, exercises and field deployments have introduced situations that differ considerably from normal licensed and properly constructed facilities for the storage and preparation of aircraft countermeasure flares.

1.1.2 The aim of this appendix is to provide guidance to personnel engaged in operations or exercises in conditions that differ considerably from Main Operating Base facilities.

1.2 Storage and Preparation

1.2.1 Chapter 17 describes safety precautions that must be implemented when handling electrically initiated explosive devices (EEDs). While Chapter 17 is primarily concerned with the use of licensed processing facilities, the safety precautions described are equally relevant when handling EEDs in field or deployed operation scenarios. The conditions encountered may vary from full support facilities with dedicated explosives buildings through to unlicensed, misappropriated structures (HASS, ISO containers or tents) to open air preparation. Therefore a pragmatic approach to handling and preparation is required with the aim of providing as safe an environment as the local conditions and operational imperatives permit.

1.2.2 In all cases the following measures are to be applied when processing countermeasure flares in field conditions:

(1) Prior to any EED preparation work, a risk assessment should be carried out at the proposed preparation site. The Local Commander is to be made aware of the risks involved and endorse the precautions that are to be taken to mitigate any risks that can not be removed.

(2) In general, field or deployed operating conditions will not provide the conductive regime described in Chapter 8. However, a field expedient conductive regime can be constructed using an earthed metal plate as a work surface on a table or workbench. Units supporting regular deployments should consider local manufacture of a suitably sized metal plate with bonding lead and earth spike/connection. Personnel must be connected to this earthing system by leg or wrist strap prior to work beginning.

(3) Where deployment facilities offer a conductive processing room then conductive footwear must be worn. If the task has to be carried out on a non conductive floor, personnel are to earth themselves as frequently as practicable and are to restrict movement to a minimum when processing, as excessive movement can lead to an accumulation of static charge.

(4) Personal safety is to be afforded by wearing suitable clothing that is not liable to generate static electricity. Flash protection will be afforded by ensuring that clothing is properly fitting and fastened with shirtsleeves rolled down. Gloves are not to be worn.

NOTE

In situations where uniform can not be worn (Low profile SF operations), clothing should be of a fibre that will provide static and flash protection e.g. welder's coveralls with long sleeves or casual clothing that provides equivalent protection. Unit Standard Operating Procedures (SOPs) should consider the possible requirement dependent upon type of role.

(5) Only those flares that are required for immediate preparation should be held in the preparation area. As a general rule a processing distance of 60 metres should be maintained from all other occupied facilities including aircraft and vehicles. Where this is not possible consideration should be given to any topographical features that will have a mitigating effect on flares that may inadvertently function e.g. orientation of ISO doors, intervening buildings or natural features.

(6) In the event that operational requirements create a situation where safety distances are compromised the proposed course of action must be discussed with the deployment commander or aircraft captain. The full implications of any relaxation on standard procedures must be impressed upon commanders in order that risk can be balanced against mission priority.

(7) There is no currently approved ammunition container assembly available for the transport of prepared flares. Any reload requirement must be prepared prior to use bearing in mind that unused flares will present an air transport recovery problem if they can not be loaded in dispensers.

1.3 **RadHaz**

1.3.1 It is generally not possible to conduct a thorough RadHaz assessment at a deployed location. Where possible, a visual reconnaissance should be made to identify the main airfield transmitters (communication and navigational aids). EEDs are at their most sensitive to RadHaz when being processed and every attempt must be made, within the constraints of the operation, to site processing areas as distant from main transmitters as possible. Where this is not possible because of operational emergencies, the principles of paragraph 4.6 are to be applied.

1.4 **Licensing**

1.4.1 Where a deployment is likely to exceed more than 30 days explosive licenses are to be in place. If required, license applications should be made through the appropriate IE.

1.5 **Unit Preparedness Measures**

1.5.1 Units, tasked to support deployed operations and exercises, should prepare in advance plans and training to cope with the task. The following considerations are not exhaustive and will depend on the unit role and task:

(1) Preparation of deployable equipment suitable to duration and nature of the task. Consideration should be given to night time preparation and the lighting that may be required. Headband torches meeting safety criteria provide an easily portable solution in the absence of generators and safety lamps.

(2) Training and authorisation of personnel. Training should include an element of scenario-based initiative exercises to prepare personnel for unusual eventualities. Such as selection of processing sites, erection of facilities and aircraft parking etc.

(3) Production of SOPs that address anticipated eventualities.

(4) First Aid resources. Both medical and fire fighting must be provisioned for anticipated eventualities. Bearing in mind that fire will result in burn injury and damage to property, the simple expedient of provisioning a copious water supply will help mitigate the effect of any inadvertent flare operation.

1.6 **Control, Accountability and Communication**

1.6.1 Deployed conditions will invariably present obstacles to full compliance with regulations. However this must not be seen as licence to dispense with safety precautions. Where risks are accepted it is especially important that safety measures are not further eroded. Firm leadership and effective communication must be demonstrated to meet the task and minimise risk. Operators must be advised, and regularly reminded, of the hazards associated with ammunition natures and that failure to consider safe practices could catastrophically affect mission success.

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