DSC-AD NAR

LOCAL AUTHORITY AND EMERGENCY SERVICES INFORMATION (LAESI) EDITION 6

DEFENCE NUCLEAR MATERIALS TRANSPORT CONTINGENCY ARRANGEMENTS

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SECTION A - BACKGROUND INFORMATION

1. INTRODUCTION

1.1 The purpose of this document is to provide the Emergency Services (Police, Coastguard, Fire and Ambulance), Local and Health Authorities with information on contingency arrangements for the transport of nuclear weapons, special nuclear material[1] (SNM) and new and used submarine reactor fuel. It has been prepared by the Ministry of Defence (MoD) to give information on actions in the very unlikely event of an accident or incident, including those arising out of terrorist acts, during the transportation of these materials. Throughout this document nuclear weapons, SNM and new and used reactor fuel are referred to collectively as Defence Nuclear Materials.

1.2 There will be a need to move Defence Nuclear Materials for as long as the UK maintains a nuclear deterrent and deploys nuclear powered submarines. Defence Nuclear Materials movements are kept to the minimum necessary to meet operational requirements, and rigorous safety procedures are implemented during all such operations. These safety procedures are summarised later in this document. The limited movement of Defence Nuclear Materials together with inherent safety features and procedures lead to the conclusion that the probability of a transport accident leading to a radiological hazard is not reasonably foreseeable.

1.3 MoD gives the highest priority to the safety of all aspects of Defence Nuclear Materials operations. This includes oversight by the Defence Nuclear Safety Committee (DNSC) whose membership includes eminent professionals from outside the MoD and which tenders advice directly to the Secretary of State for Defence. ***There has never been an accident involving Defence Nuclear Materials in the UK that has led to, or come anywhere near leading to, the release of radioactive material to the environment.*** In accordance with the requirements of UK domestic legislation and MoD policy, the MoD maintains a capability to respond in the event of an accident involving defence nuclear assets.

1.4. The response by the emergency services and local authorities to a transport accident involving Defence Nuclear Materials would have much in common with the response to any major incident or accident. The principles laid down in the Cabinet Office publication "*Emergency Response and Recovery*" and the Scottish Executive publication "*Preparing Scotland*" form the basis of MoD's own arrangements which are fully integrated into the overall response.

2. NUCLEAR WEAPON DESIGN AND SAFETY

2.1 Her Majesty's Government possesses nuclear weapons to effect the policy of maintaining a minimum nuclear deterrent. The Royal Navy operates Trident, the UK's only nuclear weapon system, which is a submarine-launched ballistic missile. Provision exists for our US allies to have nuclear weapons based in the UK and/or to fly through UK airspace, and the MoD Nuclear Accident Response Organisation (NARO) would lead a joint response with the US in the unlikely event of an accident involving a US nuclear weapon.

[1] Tritium, Uranium (both highly enriched and depleted) and Plutonium are used in the production of nuclear weapons and are generically termed Special Nuclear Materials.

2.2 Nuclear weapons function by compressing a sub-critical mass of fissile material to increase its density and cause it to become super-critical. A conventional chemical explosive is used to achieve this compression. To generate the shock wave necessary to achieve super-criticality the explosive must be detonated in a very precise manner by the simultaneous initiation of a number of detonators by an electrical firing signal. All electrical signals are prevented from reaching the detonators until such time as a number of internal safety breaks are closed by the weapon experiencing a unique sequence of environmental events. In a ballistic missile delivery system, it is customary to use a prescribed sequence of missile acceleration and re-entry deceleration time histories. The firing signal, generated by the fuse at the correct time for detonation, can thus only reach the detonators once the weapon system has experienced the prescribed delivery flight. It is not possible to generate the series of environmental events in any other way.

2.3 Furthermore, to protect the warhead from initiation in an accident situation, the safety breaks are purposely built and tested to be very strong and so remain safe under all credible abnormal environments. In contrast, parts of the firing chain are designed to be weak, in the sense that they will fail, thereby preventing the generation or transmission of a firing signal, before the safety breaks become unsafe.

2.4 As a further safety feature, to cater for abnormal events all UK and US nuclear weapons are designed to be “single point safe”. Under this concept, inadvertent initiation of high explosive at one point, by for example the intrusion of a spigot if the warhead were to fall from a great height on to a sharp spike, cannot produce the conditions necessary for super-criticality. An inadvertent nuclear yield greater than a few pounds of TNT equivalent is therefore not possible.

2.5 Before a warhead design enters service it is tested rigorously against both the normal environmental conditions it would be expected to meet during its operational lifetime and against a range of abnormal environments, under which it must remain safe. Each year, a sample of each weapon design in service is withdrawn from the stockpile and stripped to its components. These are carefully examined to ensure not only that the weapon would function if so required but that all its design safety features remain intact.

2.6 The UK and US’s nuclear weapons are highly robust and are specifically designed to withstand massive mechanical stress and high temperatures induced by launch and re-entry into the earth’s atmosphere. The robust design and safety features offer excellent protection against accidental mechanical shock and damage in transport.

3. DEFENCE NUCLEAR MATERIAL TRANSPORT OPERATIONS

3.1 Defence Nuclear Materials are moved using a variety of transport means. Nuclear weapons, SNM and new reactor fuel are all transported by road. Used fuel is transported by rail, but this may involve a short road journey to the railhead. SNM is also moved by air, as are US nuclear weapons.

3.2 Transport containers for nuclear weapons, SNM and new and used reactor fuel provide protection from impact, high levels of mechanical stress and fire. They are tested against International Atomic Energy Agency (IAEA) standards for abnormal environments. Container breaches are therefore highly unlikely. Intact containers would, in all cases, prevent any significant radiological hazard to personnel even if in close proximity.

3.3 All Defence Nuclear Material movements are kept to the minimum necessary to meet operational requirements and are only carried out by specially trained personnel.

The safety procedures associated with the transport of these materials are summarised in this section. Details of the operational aspects of the movements are provided. Annex A provides a list of local authorities which Defence Nuclear Materials may pass through or fly over during transportation.

Nuclear Weapon Transport by Road

3.4 When transported by road, the weapons are moved in vehicles called Truck Cargo Heavy Duty (TCHD). These vehicles have cargo bodies designed to provide a high degree of protection to a weapon container and its contents even in the environments likely to be experienced in a very severe road traffic accident.

3.5 The road movement of nuclear weapons is the responsibility of Defence Equipment and Support (DE&S). The TCHDs containing the weapons are moved in a convoy of MoD vehicles with an escort provided by the Ministry of Defence Police (MDP). A number of other vehicles make up this convoy. The highly trained crew includes a first aid team, fire fighters, mechanics to enable roadside repairs and personnel equipped to monitor for radiological hazards, although there is no credible scenario that can result in a significant release of radioactive material. The convoy maintains contact by radio and telephone with Task Control, MDP Central Control Room, Wethersfield, Essex, which monitors its movement, and with the civil police force through whose area it is passing. Police forces are always notified in advance of a convoy being routed through their area; this enables them to advise the convoy about any local traffic problems. Police forces may advise fire brigades of the presence of the convoy if it is moving into the vicinity of a fire brigade operation. By local arrangement between police and fire services, the latter may also be informed shortly before a nuclear weapon convoy enters their area of responsibility.

SNM Transport by Road

3.6 SNM is transported in the UK either by road or air, in containers designed in accordance with IAEA standards. When transported by road SNM is moved in High Security Vehicles (HSV), which comply with UK transport regulations. The HSVs containing the SNM are moved in a convoy of MoD vehicles with an escort provided by the MDP. A number of other vehicles make up this convoy. The movements are the responsibility of DE&S. The convoy is made up of highly trained crew including personnel for the administration of first aid and the monitoring of radiological hazards. The convoy maintains contact with the MoD Police Central Control Room, Wethersfield, Essex and with the police force responsible for the areas the convoy passes through in the course of the journey. Police forces are always notified in advance of a convoy being routed through their area thereby enabling the convoy to receive advice on any traffic problems. By local arrangement between police and fire services, the latter may be contacted shortly before the convoy enters their area of responsibility.

New Reactor Fuel Transport by Road

3.7 Reactor fuel for nuclear powered submarines is manufactured at Rolls Royce in Derby. It is transported by road to Devonport Dockyard for installation into submarines undergoing refit. In addition new reactor cores are transported to BAe Systems at Barrow-in-Furness for installation into new build submarines and very infrequently to the Naval Reactor Test Establishment (NRTE) at Vulcan, Dounreay, in the north of Scotland.

3.8 New fuel is transported in the form of separate modular units that are individually packaged into protective containers known as New Module Containers (NMC) which are

designed in accordance with IAEA standards. The movements comply with UK transport regulations and the NMCs are loaded onto standard road transport vehicles that travel in convoy. The Ministry of Defence Police escorts these movements. Specialists travelling in separate vehicles provide technical support in areas such as radiation monitoring. The civil police are given advance notice of the move and are contacted by the convoy commander when the convoy enters and leaves their respective areas of responsibility. The Fire Services would be informed by local agreement.

Used Reactor Fuel Transport by Road

3.9 Used fuel is transported by rail, but this may involve a short road journey to the railhead. Security and safety measures are equivalent to those provided during road transport of new fuel and movements comply with UK transport regulations. The used fuel consignment is transported in protective purpose-built transport containers designed in accordance with IAEA standards, and is loaded onto special wagons configured for rail as well as road use.

Nuclear Weapon and SNM Transport by Air

3.10 UK nuclear weapons are not moved by air. Occasional movements of US nuclear weapons are conducted by air under stringent safety procedures, which include careful route selection. These stringent procedures also apply to the air transport of SNM. The RAF maintains a response team along the flight route. The Special Safety Cell (SSC) at Ensleigh in Bath is staffed throughout the flight. Only multi-engined military transport aircraft are used to transport nuclear weapons or SNM by air. Aircraft selected for the task are subject to special safety checks and an enhanced maintenance regime.

Used Reactor Fuel Transport by Rail

3.11 The MoD is responsible for the consignment of used reactor fuel. It is transported by rail from Devonport (and occasionally NRTE, Dounreay) to British Nuclear Fuels Limited (BNFL) at Sellafield. The used fuel is transported in protective purpose built transport containers designed in accordance with IAEA standards and loaded onto special wagons which may be configured for rail or road use. The train will carry one or two containers with each loaded onto a separate wagon.

3.12 All used fuel movements are escorted by the MDP in a further two rail vehicles arranged at either end of the container transporter wagon. Specialists familiar with the load and capable of providing technical support during the journey travel with the MDP in the escort rolling stock. The MDP regularly communicate their position to the MDP Central Control Room at Wethersfield, Essex and local police are informed in advance of the scheduled movement. The Fire Service would be informed by local agreement with the civil police.

4. HAZARDS, PROTECTION AND RADIOACTIVITY

Nuclear Weapons

4.1 The hazards associated with a nuclear weapon accident are related to the explosive, radioactive and toxic materials that the weapons contain. ***It is important to emphasise that the conventional hazards, which may arise in the event of an accident (i.e. fire, smoke and the remote possibility of explosively propelled debris), pose a much more immediate threat to life than any hazard possibly arising from***

radioactive or toxic materials. This explosive hazard is the same as that which is associated with any chemical high explosive.

4.2 The main radioactive materials in a nuclear weapon are plutonium and uranium. Plutonium and uranium are both toxic and radioactive, and the weapon may contain other toxic (but not radioactive) materials such as beryllium and lithium. ***In the very unlikely event of a nuclear weapon accident involving the release of radioactive material, it is the release of plutonium into the environment which presents the dominant radioactive hazard. Protective measures taken against this dominant hazard will ensure adequate protection against toxic and other radioactive hazards.***

4.3 Three types of ionising radiation may emanate from Defence Nuclear Materials: alpha particles, beta particles, and gamma rays. The Health Protection Agency Radiation Protection Division (HPA RPD) publication "*Living with Radiation*" gives more details on the properties of these types of radiation (see HPA website www.hpa.org.uk). The main hazard would arise from alpha particles, principally from plutonium, with only a relatively small hazard presented by beta particles and gamma rays.

4.4 Plutonium emits alpha particles, which are unable to penetrate ordinary clothing or even the unbroken outer layer of a person's skin. Simple decontamination techniques, such as showering and washing with soap and water, are effective in removing plutonium particles and their presence on the skin should not compromise urgent medical treatment. Only if alpha emitting particles are taken into the body would any hazard to health result. The entry routes for this are inhalation (with particles lodging in the lungs), ingestion (particles in the digestive tract) or deep wounds. Plutonium and uranium in the particulate form which might be produced by a weapon accident are highly insoluble. Even if taken into the body, the vast majority of the material will be excreted through the body's natural actions for passing particles through the digestive tract or dispelling inhaled particles from the lungs. Levels may be reduced still further by medical techniques such as lung lavage to clear out the lungs, the administration of chelating agents (which encourage the body to excrete toxic materials) and deep cleansing of wounds.

4.5 Even within the body, plutonium does not pose an immediate health hazard from either its radioactivity or toxicity, but may give rise to an increased long-term risk of developing cancer. In the unlikely event of a large lung intake, there is also a possibility of developing lung fibrosis though this would be countered using the techniques described above.

4.6 Thus in the immediate hazard area i.e. within the 600-metre evacuation cordon the major hazard is from the conventional effects of the accident, in particular from the potential for a conventional explosion and MoD would advise that this area should be evacuated in order to provide protection. Airborne plutonium particles may also be present in this area, dispersed as a result of the accident. The most effective method of protection against the dispersed radioactive material is the use of respiratory protection. Protective masks of virtually any nature placed over the nose and mouth will significantly reduce the quantity of material inhaled. Members of the emergency services closely involved with fighting fires would don appropriate personal protective equipment. Beyond the immediate hazard area the potential dispersion of airborne plutonium particles represents the major hazard and MoD would advise that people should take shelter in order to provide protection. This advice and the extent of its application is derived from HPA RPD guidelines "*Emergency Reference Levels of Dose (ERLs) for Early*

Countermeasures to Protect the Public", Documents of NRPB, Vol 1 No 4, (1990)[2]. These are described further in Section C, as is the action which would be taken to identify the extent of any plutonium contamination.

Special Nuclear Materials

4.7 Uranium, plutonium and tritium, generically termed special nuclear materials, are used in the construction of nuclear weapons. They are not transported with explosives and therefore, in a severe accident, the principal hazard would arise from their combustion and subsequent release into the environment. For fires involving plutonium and uranium consignments, the hazards and appropriate protective actions are as described above for nuclear weapons. As well as alpha particles uranium emits small quantities of beta and gamma radiation which can present a very low external hazard. The simple decontamination techniques described in Para 4.4 are effective in removing uranium particles and their presence on the skin should not compromise urgent medical treatment.

4.8 Tritium gas leaking from severely damaged containers could present a beta radiation hazard at an accident involving a tritium consignment. However, owing to its rapid dispersion, the tritium hazard would only be significant in the immediate vicinity of breached containers. This hazard would be enhanced if the tritium gas were oxidised by exposure to fire. Fire service personnel are most likely to be exposed to this hazard and should don appropriate personal protective equipment (PPE). Respirators do not offer protection against tritium because it passes directly through the protective filters. However Self-Contained Breathing Apparatus (SCBA) will provide an effective means of protection against tritium gas, oxidised or not.

New Fuel

4.9 New, un-irradiated fuel consisting of highly enriched uranium (HEU), presents only a very small external radiation hazard, even when directly exposed. Dispersion of radioactive material is very unlikely even in a severe accident, particularly as the risks from fire, the most likely dissemination mechanism, are very low. If such a release did occur, the principal hazard would be inhalation of uranium particles. Protective masks (of virtually any nature) placed over the nose and mouth would offer a high level of protection for those in the vicinity. Advice on the need for sheltering and evacuation would be provided by convoy staff to the civil police, as necessary.

4.10 In addition to alpha radiation HEU emits a small amount of beta and some gamma radiation. The hazard presented by contamination of the skin with HEU is extremely low. The simple decontamination techniques described in Para 4.4 are effective in removing uranium particles and their presence on the skin should not compromise urgent medical treatment.

Used Fuel

4.11 The exposure of used fuel following a transport accident is exceptionally unlikely. Direct contact with or close proximity to exposed used fuel following a severe accident could present a high external gamma and beta radiation hazard and such exposure would present the principal hazard. Significant dispersion of radioactive material is highly

[2] More detailed guidance on how ERLs should be applied in the development of emergency plans can be found in "Intervention for Recovery after Accidents – Application of Emergency Reference Levels of Dose in Emergency Planning and Response" Documents of NRPB Vol 8 No 1, published in 1997.

unlikely even in the event of a severe accident but any release would present a possible inhalation hazard from beta/gamma emitters.

4.12 The external radiation dose depends on how long an individual is exposed, the distance from the radiation source, and the amount of shielding between the individual and the source. In order to minimise the dose, personnel should spend as little time as possible near the source, remain as far away from it as practicable, and make use of any available shielding (buildings, rail transporters, metal structures etc). Contact with any water escaping from the container should be avoided. In the event of such contact, the area of the body affected should be washed with soap and running water as soon as possible. Further advice would be provided to the civil police on sheltering and evacuation based upon monitored radiation levels.

SECTION B - MoD RESPONSE CAPABILITIES IN THE EVENT OF A TRANSPORT ACCIDENT INVOLVING DEFENCE NUCLEAR MATERIALS

5. INTRODUCTION

5.1 The MoD is the nominated lead Government Department for co-ordinating the central government response to a transport accident involving DNM. The MoD, as owner of these materials, has the specialists required to make these assets safe and ultimately remove them from the accident site, and support site remediation operations. To these ends, the MoD maintains an Emergency Response Organisation, and the necessary contingency plans. The MoD response would be graduated depending upon the severity of the accident. These plans recognise the leading roles of the local emergency services and authorities in dealing with an accident (in accordance with the guidelines in "*Emergency Response & Recovery*" and "*Preparing Scotland*". MoD response forces at the scene of an accident would provide specialist advice and assistance to these services and authorities.

5.2 The MoD personnel who would respond in the area of an incident comprises of two elements: Immediate Response Forces (IRF) and Follow-on Forces (FoF). The Headquarters NARO (HQ NARO) would form at the MoD in London to co-ordinate the central government response, if appropriate to the level of the accident. In the event of an accident involving US nuclear weapons, the response forces would include US personnel to support the UK MoD and local emergency services.

Immediate Response Forces

5.3 A MoD Incident Co-ordinator (IC) would command the IRF. In the early phase of the response to an accident the IC would liaise with the police operational and/or tactical commander and, if appropriate, set up his/her HQ nearby. The IRF for the different forms of transport are organised as follows:

Road

5.4 The IRF is embedded within the convoy and the convoy commander would act as IC. There would be sufficient equipment and trained personnel to alert and brief the Police, Fire and Ambulance services, to assess whether or not there has been a release of radioactive material, to assist the police in establishing an initial safety and security zone. Additionally trained personnel would co-ordinate with the police in providing information for the media. Convoy personnel are cross-trained to enable them to undertake other roles should the designated personnel be incapacitated in the accident. The Special Safety Cell (SSC) at Ensleigh, Bath monitors all road movements of DNM and would activate any additional response needed to support the IRF. The SSC are required to contact the Police immediately to inform them of an accident that has or may have resulted in a release of radioactive contamination and to provide them with public protection advice on sheltering and evacuation. In the event of a serious road traffic crash (RTC) that has no radioactive contamination release, the SSC would also contact the Police to discuss any additional support requirements.

Air

5.5 The RAF maintains a Station NARO Team (SNT) at immediate readiness during the flight of aircraft carrying nuclear weapons or SNM. This team would form the IRF for an air crash. Its commanding officer would become the military IC. The team is equipped and trained to identify any radiological hazard and provide advice and support to local emergency responders. The SSC at Ensleigh, Bath monitors all air movements of DNM and would activate the SNT in the event of a nuclear weapon or SNM accident. The SSC are also required to contact the Police immediately to inform them of the accident and to provide them with public protection advice on sheltering and evacuation if appropriate.

Rail

5.6 The rail convoy, like its road equivalent, has embedded within it all the necessary equipment and personnel to alert and brief the emergency services, determine whether there has been a radioactive release, and assist the local police to set up and manage a safety cordon. The convoy commander, a MDP Inspector, would be the MoD IC.

Follow-On Forces

5.7 The scale of the Follow-on Forces (FoF) would depend upon the severity of the accident, with a full deployment of the MoD resource only being required in the extremely unlikely event of an accident leading to a release of radioactive contamination. In the event of a deployment on this scale, the FoF would be commanded by a senior MoD official who should be known as the Military or MoD (if a civilian) Co-ordinating Authority (MCA). The MCA would be responsible for co-ordinating the military response to any accident involving DNM and has at his/her disposal a large suite of FoF response capabilities which would be called to the accident site as required. The MCA is the MoD's senior representative at strategic level, and has responsibility for liaising with the police and Local Authorities attending the Strategic Co-ordination Group. In addition he/she should keep MoD HQ NARO apprised of the developing situation. In the event of a smaller deployment associated with an accident that has not resulted in a release of radioactive contamination, a senior MoD official would be deployed to co-ordinate the MoD response on the ground if necessary or if requested by local emergency services.

5.8 The MoD response forces are at enhanced readiness during road, rail and air movements. Arrival in the incident area would depend upon journey time. The following specialist capabilities could be deployed if appropriate:

a. Radiological monitoring, health physics and radiation medicine

b. Public and media relations

c. Engineering Support

d. Security

e. Communications, logistics, catering and administrative elements

Annex B provides a diagram of MoD forces at the scene of an accident that has resulted in radioactive contamination and their recommended interaction with local response forces.

MoD Headquarters

5.9 Command of the IRF and FoF in the event of a DNM transport accident rests with the Chief of the Defence Staff (CDS) in London. The MCA or other MoD official would be responsible to CDS for military operations, and would discharge this through the operations cell of the MoD HQ NARO. A secretariat cell in MoD HQ NARO would provide advice to Ministers and the defence press office on the response as appropriate to the scale of the accident. The HQ NARO would also include a health cell (supported by personnel from other government departments) and a nuclear safety cell, as appropriate.

Central Government

5.10 Most emergencies in the United Kingdom are handled at a local level by the emergency services and by the appropriate local authority or authorities, with no direct involvement from central government. However, where the scale, nature or complexity of an incident is such that some degree of Central Government co-ordination or support becomes necessary, a designated Lead Government Department (LGD), or where appropriate a Devolved Administration department, will be made responsible for the overall management of the Central Government response to the incident.

5.11 A list of LGDs, together with their responsibilities, is maintained and up-dated where appropriate, by the Civil Contingencies Secretariat (CCS) in the Cabinet Office. The Ministry of Defence is appointed as the LGD for all accidents involving defence nuclear materials. A diagram showing the relationship between the Central Government, Other Government Departments, wider MoD forces and local organisations in the incident area is at Annex C.

SECTION C - ACTION IN THE EVENT OF A TRANSPORT ACCIDENT INVOLVING DEFENCE NUCLEAR MATERIALS

6. INTRODUCTION

6.1 As described in 5 above, the MoD response to an accident or incident would depend upon its severity and whether there had been a release of radioactive contamination. Despite the fact that an accident leading to a release of radioactive contamination is not reasonably foreseeable, the MoD maintains an Emergency Response Organisation ready to deploy.

6.2 The following section describes the actions to be taken in the unlikely event of an accident during the transportation of Defence Nuclear Materials that has resulted in a release of radioactive contamination.

6.3 For ease of reference the response has been split into three phases, immediate, medium and long term. The exact activities in the medium and long-term phases (and indeed whether there is a long-term phase) would depend on the type of consignment involved, the severity of accident and any consequent hazard.

Immediate actions

6.4 Immediate actions by their very nature have to be pre-planned and thus are prescribed in detail. It would be inappropriate to prescribe too closely the longer-term actions, as they will be largely dependent upon the actions needed to arrange recovery and remediation. It is anticipated that the civilian and MoD response forces would jointly formulate plans bearing in mind the circumstances of the accident and the principles outlined below. The immediate actions can be summarised as follows:

a. Alerting:

(1) **Road transport** - Initial alerts are passed to the control rooms of the Police, Fire and Ambulance services by both the convoy team and the SSC at Ensleigh. This alert is passed in clear speech with details of the load and suggested precautionary countermeasures and public protection advice being included. This information is also sent by FAX to the control rooms of the civil emergency services (CES) in the area.

(2) **Air transport** – The SSC at Ensleigh will notify by telephone and FAX the Police, Fire and Ambulance services in the crash area. This alert is passed in clear speech with details of the load and suggested precautionary countermeasures and public protection advice being included.

(3) **Rail transport** - For rail accidents involving used reactor fuel consignments, the MDP Commander should immediately notify the local police and the MDP Central Control Room (CCR). The local police would alert other emergency services. In the very unlikely event that all escort personnel are incapacitated during the accident, either the Network Rail Services Movement Inspector on board the train or the train driver will alert Network Rail Services Production Control.

b. Precautionary Automatic Countermeasures

In all cases the recommended countermeasures and the proposed public protection advice is passed in clear speech by the alerting authorities. These automatic countermeasures are detailed at Annexes D and E.

c. Casualty Handling

It is expected that the management of casualties will be undertaken in accordance with extant ambulance and/or LA Fire Service policy and guidance and will include arrangements for decontamination as appropriate. The overriding priority would be to treat serious casualties as quickly as possible, irrespective of any confirmed or suspected radiological contamination. If immediate hospital treatment were necessary, casualties would be taken to the nearest accident/emergency facility without prior decontamination.

d. Contaminated Casualties

Contaminated or potentially contaminated casualties would preferably be taken to a hospital, which has arrangements for receiving contaminated and/or irradiated casualties. The ambulance service should give advance notice of the transfer of contaminated casualties to the receiving hospital, as arrangements might have to be made to divert other casualties[3].

e. Radio and Mobile Telephones

In the event of an accident involving nuclear weapons, it is recommended that all radio frequency transmitters (including personal and vehicle radios, and portable cellular telephones) should be switched off within a radius of 10 metres of a weapon or any of its components, which have been scattered by the accident. Radio frequency transmitters with an Effective Radiated Power output of greater than 5 watts should be switched off within a radius of 50 metres of a weapon or any of its components which have been scattered by the accident. For simplicity, this can be taken to apply to all vehicle-mounted transmitters.

f. Debris

In the event of a nuclear weapon accident and if there has been an explosion, there would be the potential for weapon debris to be scattered in the vicinity of the damaged weapon. In addition to pieces of radioactive and toxic material, this might include pieces of explosive, possibly sensitised, which might have the appearance of wax, chalk or gravel. The FoF would undertake removal of the debris. Only if it is essential, for example to provide access to the accident location for the fire service, should non-specialist personnel move such debris and then with extreme care. In the event of a severe accident involving SNM contaminated debris may be scattered around the accident site. In the event of an aircraft crash the accident site could cover a large area.

[3] As laid down in the National Health Service (NHS) Emergency Planning guidance 2005.

g. Public Protection Advice

Whilst the MoD would pass precautionary public protection advice to the CES, the police would be responsible for issuing information relating to public safety (e.g. evacuation and sheltering). If it is necessary for Police or other members of the CES to enter a downwind shelter zone to provide information to the public they should wear PPE. The information issued by the MoD would be based on the advice on precautionary automatic countermeasures given in Annexes D and E but the CES could also include additional information specific to the area.

h. Media Liaison

The police would lead in co-ordinating the provision of information to the media. MoD personnel in the IRF carry pre-scripted press statements, including public safety information, which would be offered for agreement with the police before being issued to the press. The MoD expects the Police would wish to lead at all press conferences or media briefings.

6.5 **Medium Term Actions**

These actions lead naturally from those taken in the immediate phase and can be summarised as follows:

a. Radiation Monitoring and Review of Protection

The primary aim of the MoD would be to refine the countermeasure and public protection advice. To achieve this, monitoring for the release of radioactive contamination in the immediate vicinity of the accident would take place. Additionally as resources become available monitoring by MoD personnel would be extended. Any monitoring would be undertaken in consultation with the appropriate non-MoD authorities.

b. Hospital Actions

The treatment of contaminated casualties would be undertaken as detailed in the Strategic National Guidance and NHS Guidance[4]. The MoD FoF would deploy radiation medicine specialists who would be able to give advice and liaise with specialist facilities as necessary.

c. Fatalities

If the accident resulted in fatalities the Police (together with the coroner or the procurator fiscal in Scotland) would consider setting up facilities equipped to accept contaminated bodies. The principles for dealing with casualties set out in "*Emergency Response & Recovery*" and *"Preparing Scotland*" would apply. Anyone handling suspected contaminated bodies should protect themselves and MoD personnel will be able to provide advice on radiological aspects if required.

[4] The NHS Emergency Planning guidance 2005 is available on the Department of Health website: http://www.dh.gov.uk.

The MoD personnel are fully conversant with the need to deal with this in conjunction with the Police and other authorities.

d. Information for the Public, Media and Parliament

The Police would continue to be responsible for instructions relating to public safety with the MoD continuing to proffer advice. The MoD recognises the role of the media in reporting an accident involving DNM and would provide information to the media to enable them to report comprehensively and informatively. The MCA's Public Relations Officer would be responsible for co-ordinating the MoD input into any press and media cell put in place locally. The MoD would manage defence policy issues in London. Ministers may also wish to issue statements to Parliament (if in session) and to the media during this phase. Depending on the location of the incident, the Assembly of Wales or the Scottish Executive, as appropriate, will invoke their respective briefing and media handling arrangements.

e. Government Office Network

The Government Office (GO) Network would provide a representative to support the MCA in the delivery of his/her duties, facilitating co-ordination between Government, regional and local bodies. Where necessary the GO Officer would facilitate preparation for and implementation of a regional response through the Regional Civil Contingencies Committee (RCCC).

f. Central Government

Central Government support would continue into the medium and long-term phases.

6.6 Long Term Actions

Much of the detail of the long term response would be worked out and agreed by the responding services and forces taking into account the accident circumstances and principles stated below:

a. Management of Incident at Local Level

It is expected that at some stage during the long-term response the co-ordinating role would transfer from the Police to the local authority. The MoD would continue to support and work with the local authority in the same manner as they had with the Police. The MoD forces would remain until it was agreed that their role had ceased.

b. Reassurance Monitoring and Follow Up

MoD specialists would still be available to assist medical authorities locally. Should the local health authorities require assistance with additional monitoring of those who had been de-contaminated during evacuation, the MoD could provide advisors to assist in establishing the monitoring priorities. Additionally the MoD could assist with monitoring of members of the public who think they might have been contaminated.

c. Remediation

The MoD in conjunction with other authorities would assist in this area, being prepared to take the lead in the decontamination process if required.

d. Compensation

Whilst it might not have been responsible for the initial cause of the accident the MoD would recognise a responsibility to provide fair compensation for those who might have suffered injury or loss.

e. Formal Inquiries

A number of formal inquiries might result from a DNM accident. Advice on the precedence of such inquiries would be sought by the MoD from the Lord Chancellor's Department (or Scottish equivalent).

6.7 The actions (immediate, medium and long-term) described cover an extremely unlikely accident that has resulted in a release of radioactive material. Where no release has occurred, this would obviate the need for some actions. A summary of key emergency actions for accidents involving nuclear weapons, SNM and new and used reactor fuel is provided at Annex D.

6.8 It is MoD policy neither to confirm nor deny (NCND) the presence of nuclear weapons at any particular time or place. The Convoy Commander or MCA would set aside this policy in the interests of public protection in the following circumstances:

Where there is a potential or confirmed radiological or explosive risk to the public or emergency services;

Where there is no radiological or explosive risk, but where life and limb is imperilled, and where the emergency services request details of any hazard that may be present at the scene;

Where there is no radiological or explosive risk but where emergency action is needed to stabilise the situation i.e. fire fighting and where emergency services request details of any hazards that may be present at the scene.

NCND does not apply to SNM or new or used reactor fuels.

SECTION D – DNM TRANSPORT EXERCISES AND TRAINING

MoD Exercises

7.1 As the lead government department for the response to a defence nuclear accident, the MoD organises regular exercises to test the effectiveness of its accident response planning and arrangements. Exercises include participation by the emergency services, with other agencies participating as appropriate. A key aspect of these exercises is the co-operation of many different agencies that would contribute to the response to an accident.

MoD Participation in Emergency Service or Local Authority Exercises

7.2 In addition to the above MoD-led exercises, elements of the DE&S Emergency Response Organisation may be available to participate in tabletop or small command-post exercises at the invitation of individual emergency services or local authorities. Initial contact on exercises of this nature should be made through the HQ NARO (see Annex F).

MoD Training

7.3 The MoD recognises the knowledge and expertise of CES personnel in responding, as part of a multi-agency response to a nuclear and/or radiological safety incident. In maintaining and developing its engagement with the CES, as well as providing an overview of what the MoD's response would be to this highly unlikely event, the MoD will provide supplementary briefings, to this document, as follows:

a. Regional and Local Resilience Forums

A member of the DE&S Emergency Response Organisation is available to speak at these forums or relevant sub groups to give a short brief on DNM operations and the NARO response.

b. Police Headquarters on Convoy and other DNM Routes

A MDP Convoy Commander and DE&S NM Operations Officer visit Police HQ's and brief selective audiences of Police and other members of the CES. This will cover both convoy operational matters as well as the NARO response.

c. Police National CBRN Centre Winterbourne Gunner

A short NARO briefing explaining the similarities and differences between the NARO response and that for CBRN will now be included as part of their GOLD, SILVER and BRONZE courses.

MoD Participation in other Training

7.4 In addition to members of the DE&S Emergency Response Organisation being available, members of the MoD NARO, led by the HQ element, are also available to give lectures or talks on the MoD's Defence Nuclear Material accident response arrangements. This will include where appropriate Brigade level Study Days or any other similar forum. Initial contact would be made through the HQ NARO or DE&S Bath (see Annex F).

Routes used during the Transportation of Defence Nuclear Materials in the UK

Local Authorities which Defence Nuclear Materials may pass through or fly over

1. Defence Nuclear Materials may pass through or fly over the following Local Authorities. It is not intended to imply the authorities included are the lead in the production of response plans. The attribution of such responsibilities is a matter for decision at local level between the agencies involved. Although the following list indicates the areas that will be transited most often, there may be occasions when routes need to be varied for operational reasons. **It must be stressed that this list in no way precludes the use of alternative routes if the circumstances so demand.**

England

Barnsley
Bath & North East Somerset
Bedfordshire
Birmingham
Blackburn
Bolton
Bracknell Forest
Bradford
Bristol
Buckinghamshire
Bury
Calderdale
Cambridgeshire
Cheshire
Coventry
Cumbria
Darlington
Derby City
Derbyshire
Devon
Doncaster
Dudley
Durham
East Riding of Yorkshire District
Essex
Exeter
Gateshead
Gloucestershire
Halton
Hampshire
Hartlepool
Hereford
Hertfordshire
Kingston upon Hull District
Kirklees
Knowsley
Lancashire
Leeds
Leicester City
Leicestershire
Lincolnshire
Liverpool
Manchester
Middlesbrough
Milton Keynes
Newcastle-upon-Tyne
Norfolk
North Lincolnshire District
North Somerset
North Tyneside
North Yorkshire
Northamptonshire
Northumberland
Nottinghamshire
Oldham
Oxfordshire
Plymouth
Reading
Redcar & Cleveland
Rochdale
Rotherham
Salford
Sandwell
Sheffield
Slough
Solihull
Somerset
South Gloucestershire
South Tyneside
St Helens
Staffordshire
Stockton-on-Tees Borough
Stoke-on-Trent
Suffolk
Sunderland
Surrey
Swindon
Trafford
Wakefield
Walsall
Warrington
Warwickshire
West Berkshire
Wigan
Wiltshire
Windsor & Maidenhead
Wokingham
Wolverhampton
Worcestershire
York

Wales

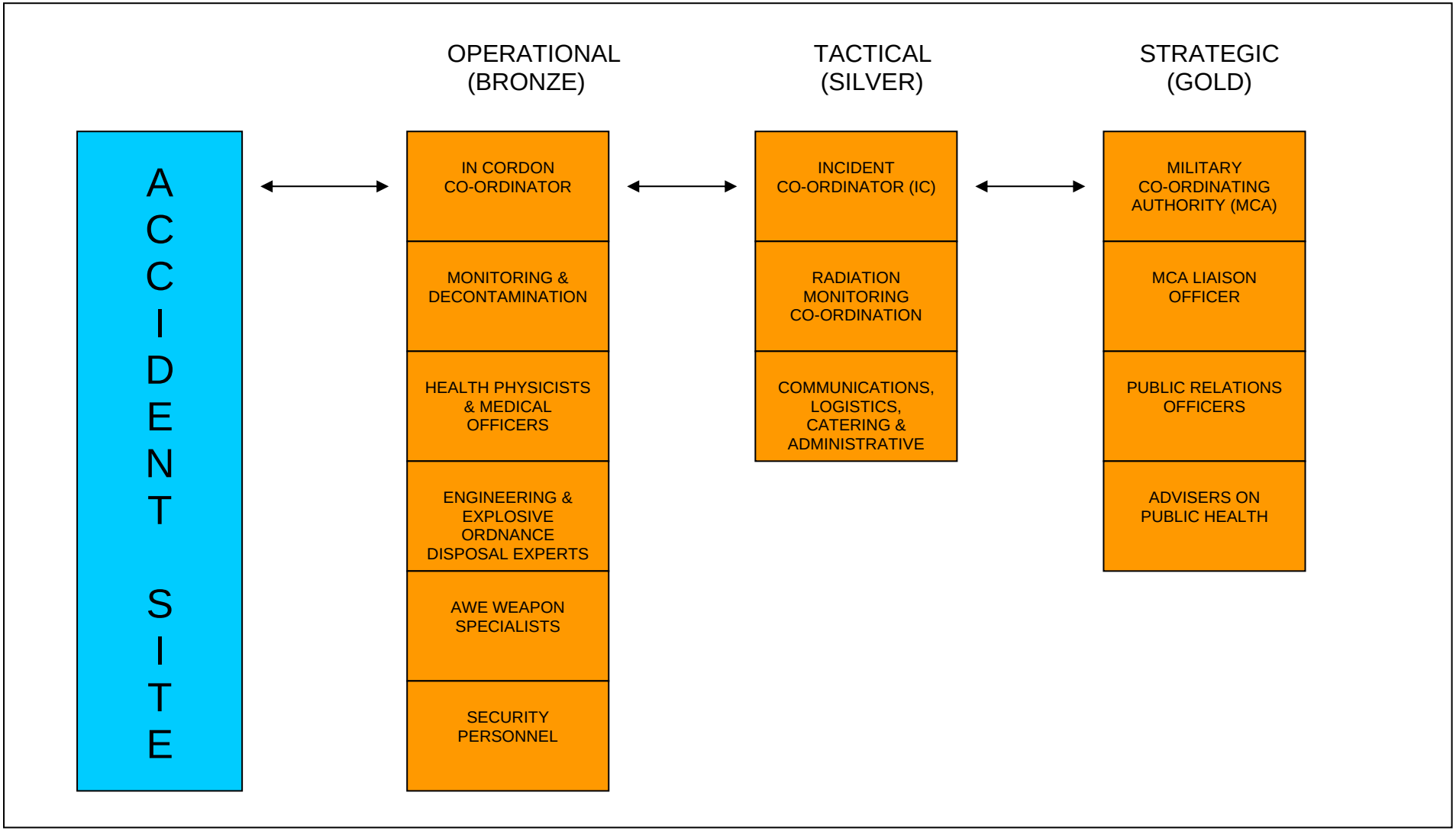
Blaenau Gwent
Bridgend
Caerphilly
Cardiff
Merthyr Tydfil
Monmouthshire
Neath Port Talbot
Newport
Powys
Rhonda Cynon Taff
Swansea
Torfaen
Vale of Glamorgan

Scotland

Argyll & Bute
City of Edinburgh
City of Glasgow
Clackmannanshire
Dumfries & Galloway
East Ayrshire
East Dunbartonshire
East Lothian
East Renfrewshire
Falkirk
Fife
Highland
Midlothian
North Lanarkshire
Perth & Kinross
Renfrewshire
Scottish Borders
South Lanarkshire
Stirling
West Dunbartonshire
West Lothian

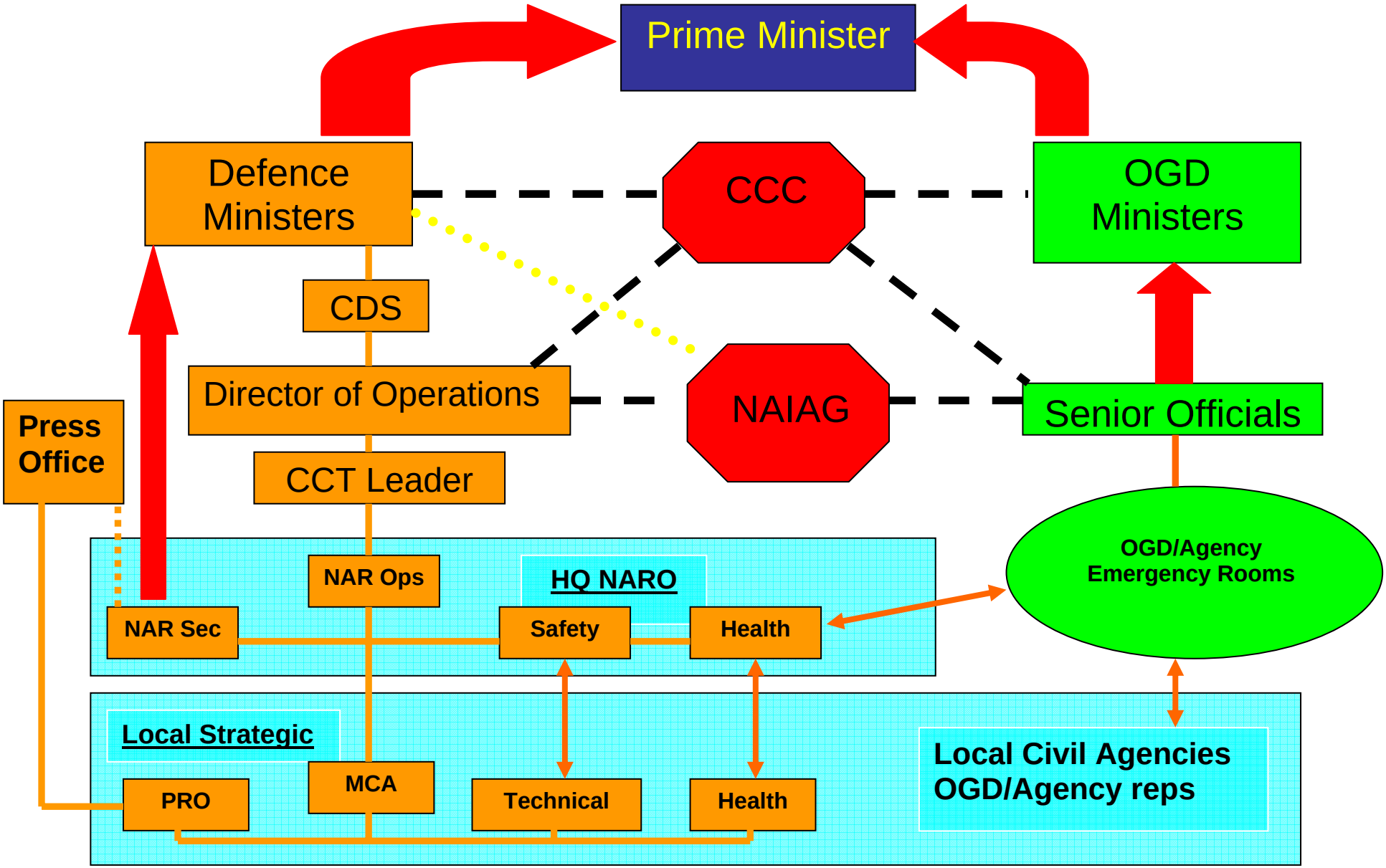
ANNEX B

MoD Forces at the Scene of an Accident Involving the Release of Radioactive Material and their Recommended Interaction with Local Response Forces



ANNEX C

Central Government Organisation and its Interaction with Local Forces at the Incident Area



ANNEX D

Summary of Key Emergency Actions for a Nuclear Weapon Accident

1. Immediate actions in the event of:
   a) explosion of weapon thought to be imminent
   b) fire was engulfing the weapon
   c) the IRF so advised:

   - **Evacuate non-essential personnel to 600 metres**
   - **Shelter public to 5 kilometres downwind in a 45° arc centred on the wind direction**
   - **Approach from upwind if possible**
   - **Protect the nose and mouth**
   - **Extinguish any fires**

2. Continue to operate as follows:

   - **Cool weapons/containers by water spray**
   - **Do not move weapon or container**
   - **Restrict radio frequency transmissions within 50 metres**

3. Key points for the public announcement are:

   - **An accident occurred at (TIME) (PLACE) which involved a nuclear weapon.**
   - **There is no risk of an "atomic bomb" type of explosion.**
   - **There is a risk of radioactive particles being carried downwind.**
   - **People in the following areas (....name locations....) should take these precautions to minimise the hazard from inhaling or ingesting radioactive particles.**
   - **Go indoors and stay there.**
   - **Close all doors, windows and ventilators. Switch off any ventilation or air conditioning systems drawing air from outside the building.**
   - **Do not leave the shelter of a building until advised that you may do so by the police.**

- **Do not try to collect children from school unless told to do so. The school authorities will look after them.**

- **Keep tuned to local radio/TV (names stations, frequencies). Emergency services and MoD forces are responding to the accident. You will be informed when these precautions are no longer necessary.**

Summary of Key Emergency Actions for a Tritium SNM Accident during Transport by Air

1. At all times:

   - **Evacuate non-essential personnel to 100 metres**

   - **Approach from upwind if possible**

   - **Only personnel wearing personal protective equipment (PPE) should enter the evacuation zone**

   - **Extinguish any fires**

   - **Extend evacuation zone to 600 metres downwind from the hazard over a 45° arc**

   - **Do not touch damaged containers or spilt material**

   - **Remove undamaged containers from heat source**

2. Key points for the public announcement are:

   - **An accident occurred at (TIME) (PLACE) which involved Special Nuclear Material.**

   - **There is no risk of an "atomic bomb" type of explosion.**

Summary of Key Emergency Actions for a Tritium SNM Accident during Transport by Road

1. At all times:

   - **Evacuate non-essential personnel to 100 metres**
   - **Approach from upwind if possible**
   - **Only personnel wearing personal protective equipment (PPE) should enter the evacuation zone**
   - **Extinguish any fires**
   - **Shelter public to 1 kilometre downwind in a 45° arc centred on the wind direction**
   - **Do not touch damaged containers or spilt material**
   - **Remove undamaged containers from heat source**

2. Key points for the public announcement are:

   - **An accident occurred at (TIME) (PLACE) which involved Special Nuclear Material.**
   - **There is no risk of an "atomic bomb" type of explosion.**
   - **There is a risk of a plume of radioactive gas being carried downwind.**
   - **People in the following areas (….name locations….) should take these precautions to minimise the hazard.**
   - **Go indoors and stay there.**
   - **Close all doors, windows and ventilators. Switch off any ventilation or air conditioning systems drawing air from outside the building.**
   - **Do not try to collect children from school unless told to do so. The school authorities will look after them.**
   - **Keep tuned to local radio/TV (names stations, frequencies). Emergency services and MoD forces are responding to the accident. You will be informed when these precautions are no longer necessary.**

Summary of Key Emergency Actions for a Uranium/Plutonium SNM Accident

1. At all times:

   - **Evacuate non-essential personnel to 100 metres**
   - **Shelter public to 1 kilometre downwind in a 45° arc centred on the wind direction**
   - **Approach from upwind if possible**
   - **Protect the nose and mouth**
   - **Remove undamaged containers from heat source**
   - **Do not touch damaged containers or spilt material**

2. Key points for the public announcement are:

   - **An accident occurred at (TIME) (PLACE) which involved a Special Nuclear Material consignment.**
   - **There is no risk of an "atomic bomb" type of explosion.**
   - **There is a risk of a plume of radioactive particles being carried downwind.**
   - **People in the following areas (....name locations....) should take these precautions to minimise the hazard from inhaling or ingesting radioactive particles.**
   - **Go indoors and stay there.**
   - **Close all doors, windows and ventilators. Switch off any ventilation or air conditioning systems drawing air from outside the building.**
   - **Do not leave the shelter of a building until advised that you may do so by the police.**
   - **Do not try to collect children from school unless told to do so. The school authorities will look after them.**
   - **Keep tuned to local radio/TV (names stations, frequencies). Emergency services and MoD forces are responding to the accident. You will be informed when these precautions are no longer necessary.**

Summary of Key Emergency Actions for a New Reactor Fuel Accident

1. At all times:

   - **Evacuate non-essential personnel to 100 metres**
   - **Approach from upwind if possible**
   - **Protect the nose and mouth**
   - **The use of water to cool flasks is strictly prohibited**
   - **Heed MoD advice on other necessary protective countermeasures**

2. Key points for the public announcement are:

   - **An accident occurred at (TIME) (PLACE) which involved Special Nuclear Material.**
   - **There is no risk of an “atomic bomb” type explosion.**

Summary of Key Emergency Actions for a Used Reactor Fuel Accident

1. At all times:

   - **Evacuate non-essential personnel to 100 metres**
   - **Approach from upwind if possible**
   - **Protect the nose and mouth**
   - **Heed MoD advice on likely radiation hazard before approaching flask**
   - **If a flask is severely damaged and fuel modules are exposed evacuate to 500 metres**
   - **Make use of available shielding (buildings, rail cars etc) when approaching flask**
   - **The use of water to cool flasks is strictly prohibited**

2. Key points for the public announcement are:

   - **An accident occurred at (TIME) (PLACE) which involved Special Nuclear Material.**
   - **There is no risk of an “atomic bomb” type of explosion.**

ANNEX E

Summary of Public Automatic Counter- Measures

This table summarises advice that would be provided to the civil police by MoD response forces on public protection zones for road, air and rail accidents involving Defence Nuclear Materials where either radioactive material is released or the severity of the occurrence is such the possibility of a release cannot be excluded.

Transport Details	Evacuation Zone (360º)	Downwind Shelter Zone (45º)
<u>Road</u>		
Weapon	600 metres	5 kilometres
SNM (all consignments)	100 metres	1 kilometre
New fuel	100 metres*	-
<u>Air</u>		
Weapon	600 metres	5 kilometres
SNM shipments of plutonium or uranium	100 metres	1 kilometre
SNM shipments of tritium	100 metres plus downwind evacuation to 600 metres over a 45º arc	-
<u>Rail</u>		
Used fuel	100 metres	-
In case of severe damage to flasks	500 metres	-

* Cooling of the containers with water is unnecessary and undesirable.

ANNEX F

Contact Details for Exercises and Training

1. Requests for elements of the NARO to participate in table-top/small command post exercises, or for lectures or talks on the MoD NARO, should be forwarded to:

Assistant Director Nuclear Accident Response
Ministry of Defence
6-C-10
Main Building
Whitehall
London
SW1A 2HB

Or

NW IPT
Emergency Response Manager
Spur 11, Crescent
Ensleigh
Bath BA1 5AB

ANNEX G

Glossary of Terms and Abbreviations

ACPO TAM	Association of Chief Police Officer Terrorist and Allied Matters
AWE	Atomic Weapons Establishment
CBRN	Chemical Biological Radiological Nuclear
CCC	Civil Contingencies Committee
CCR	Central Control Room
CCS	Cabinet Office, Civil Contingencies Secretariat
CCT	Current Commitments Team
CDS	Chief of Defence Staff
CES	Civil Emergency Services
DEFRA	Department of the Environment, Food and Rural Affairs
DE&S	Defence Equipment and Support
DfT	Department for Transport
DNM	Defence Nuclear Materials
DNSC	Defence Nuclear Safety Committee
DoH	Department of Health
ERL	Emergency Reference Levels
FoF	Follow on Forces
HEU	Highly Enriched Uranium
HPA RPD	Health Protection Agency Radiation Protection Division
HSV	High Security Vehicle
HQ	Headquarters
HSE	Health and Safety Executive
IAEA	International Atomic Energy Agency
IC	MoD Incident Co-ordinator
IRF	Immediate Response Force
LA	Local Authority
LAESI	Local Authority and Emergency Service Information on Defence Nuclear Material Transport Contingency Arrangements
LGD	Lead Government Department

LA	Local Authority
MCA	Military/MoD Co-ordinating Authority
MDP	Ministry of Defence Police
MoD	Ministry of Defence
NAIAG	Nuclear Accident Information and Advisory Group
NARO	Nuclear Accident Response Organisation
NAR Sec	NAR Secretariat Cell
NAR Ops	NAR Operational Cell
NCND	Neither Confirm nor Deny
NHS	National Health Service
NMC	New Module Containers
NM Ops Officer	Nuclear Movements Operations Officer
NRTE	Naval Reactor Test Establishment
NW	Nuclear Weapon
OGD	Other Government Department(s)
PPE	Personal Protective Equipment
PRO	Public Relations Officer
RADHAZ	Radio frequency Hazard
RAF	Royal Air Force
RCCC	Regional Civil Contingency Committee
REMEDIATION	A combination of activities associated with the return of the incident area to normality as far as is possible and agreed.
REPPIR	Radiation (Emergency Preparedness and Public Information) Regulations 2001
SCBA	Self Contained Breathing Apparatus
SEER	Scottish Executive Emergency Room
SNM	Special Nuclear Material
SNT	Station NARO Team
SSC	Special Safety Cell
TCHD	Truck Cargo Heavy Duty
TC MDP CCR	Task Control, Ministry of Defence Police, Central Control Room
UK	United Kingdom
US	United States