Local Authority & Emergency Service Information

(LAESI)
4th Edition

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 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 Material 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 risk of a transport accident leading to a radiological hazard is incredibly small.

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. ***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 "*Dealing with Disaster*" and the Scottish Executive publication "*Dealing with Disasters Together*" for Scotland apply here and 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 the

[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

MoD NARO would lead a joint response with the US in the unlikely event of an accident involving a US nuclear weapon.

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 "one 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 at the time 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. Besides this annual certification, the current Trident weapon design undergoes a very detailed design review every seven years to provide reassurance of performance and safety.

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. Consequently, there is a negligible explosive or radiological hazard from a nuclear weapon in all normal environments.

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 in all but the most abnormal environments. They are tested against International Atomic Energy Agency (IAEA) standards for abnormal environments. For example, nuclear weapon containers are designed to safeguard their contents during an unrestrained drop of 9 metres onto an unyielding surface followed by an 800°C fire for 30 minutes. Container breaches are therefore highly unlikely and would only occur in the severest of accidents. Intact containers would, in all cases, prevent any significant radiation 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 the Warship Support Agency. The TCHDs containing the weapons are escorted in a convoy of MoD vehicles commanded by a Ministry of Defence (MDP) Chief Inspector. A number of other vehicles make up this convoy; these include a fire tender, a combination of MDP traffic units, escort and support vehicles. The highly trained crew (of up to 50 people) includes a first aid team, fire crew and personnel equipped to monitor for radiological hazards. The convoy maintains contact by radio and telephone with Task Control, MDP Central Information Room, Wethersfield, Essex, which monitors its movement, and with the civil police force through whose area it is passing. Police forces are always notified at least 24 hours 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. When transported by road SNM is moved in High Security Vehicles (HSV), which comply with UK transport regulations, escorted in a convoy of MoD vehicles commanded by a MDP Inspector. The movements are the responsibility of the Warship Support Agency. The convoy is made up of highly trained crew (of up to 30) which includes personnel for the administration of first aid and the monitoring of radiological hazards. The convoy maintains contact with the MoD Police Central Information Room at 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 at least 24 hours 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 just 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. These movements are escorted by the Ministry of Defence Police Special Escort Group (MDP SEG) and specialists travelling in separate vehicles provide technical support in key areas such as radiation monitoring. The convoy crew consists of over 20 highly trained personnel. The civil police are given at least 24 hours notice prior to 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 response teams at a number of bases along the flight route which are brought to immediate readiness during the transit of the aircraft through their area. 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 SEG in a further two rail vehicles arranged at either end of the container transporter. Staff familiar with the load and capable of providing technical support during the journey, travel with the MDP SEG in the escort rolling stock. The SEG regularly communicate their position to the MDP at Wethersfield, and local police are informed well 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, uranium and tritium. 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 National Radiological Protection Board (NRPB) publication "*Living with Radiation*" gives more details on the properties of these types of radiation (see NRPB website www.nrpb.org). The main hazard would arise from alpha particles, principally from plutonium. The quantities and nature of the beta and gamma emitters are such that they present a relatively small hazard. Tritium gas would present the main beta hazard. But it would only present a hazard to personnel who approach within a few metres of a badly damaged weapon, particularly in an enclosed environment. In such circumstances, Self Contained Breathing Apparatus (SCBA) Personal Protective Equipment (PPE) should be worn.

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 chemical form 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 NRPB 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.

[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 Reponse" Documents of NRPB Vol 8 No 1, published in 1997.

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 an incredibly severe accident would present a high external gamma and beta radiation hazard and such exposure would present the principal hazard. Significant dispersion of radioactive material is highly 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 AN 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 Defence Nuclear Materials. 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 a Nuclear Accident Response Organisation (NARO), and the necessary contingency plans. These plans recognise the leading roles of the local emergency services and authorities in dealing with an accident (in accordance with the guidelines in "Dealing with Disaster" and "Dealing with Disasters Together"). 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 Ministry of Defence in London to co-ordinate the central government response. 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 The Immediate Response Forces (IRF) would be commanded by an MoD Incident Co-ordinator (IC). In the early phase of the response to an accident the IC would liaise with the police operational and/or tactical commander, and 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 emergency 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 and to co-ordinate with the police in providing information for the media. The nuclear weapon convoy also has personnel and equipment for initial fire fighting and to provide an initial basic first aid capability. Convoy personnel are cross-trained to enable them to undertake other roles should the designated personnel be incapacitated in the accident. The SSC at Ensleigh, Bath monitors all road movements of Defence Nuclear Material and would activate the NARO in the event of a Nuclear Weapon or SNM accident. The SSC are required to contact the Police immediately to inform them of the accident and to provide them with public protection advice on sheltering and evacuation. See 7.2 and 7.3.

Air

5.5 The RAF maintains Station NARO Teams (SNTs) at immediate readiness during the flight of aircraft carrying nuclear weapons or SNM. One such team would form the IRF for an air crash. Its commanding officer, a RAF Wing Commander, would become the military IC, and the team would deploy to the accident site by helicopter and/or road. Depending on the distance involved, it could take up to an hour for the IRF to arrive. The team is equipped and trained to the same high standard as the road convoy personnel, with the exception that they have no fire-fighting or first aid capability. The team does however field special advisers with expertise in these areas. The SSC at Ensleigh, Bath monitors all air movements of Defence Nuclear Material 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. See 7.6.

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 Incident Co-ordinator.

FOLLOW-ON FORCES

5.7 The FoF would be commanded by a senior MoD official who should be known as the Military or MoD (if a civilian) Coordinating Authority (MCA). The MCA would be responsible for co-ordinating the military response to any accident involving Defence Nuclear Materials 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 Level Group. In addition he/she should keep MoD HQ NARO apprised of the developing situation.

5.8 The FoF are at enhanced readiness during road, rail and air movements. Forces would be deployed by helicopter and/or road as soon as possible after the accident. Arrival in the incident area would depend upon journey time. On arrival the MCA would be briefed by the MoD IC and the police incident officer before proceeding to the strategic co-ordinating centre where he/she would be available to brief the police strategic commander. For road movements prior to arrival at the scene the MCA would despatch a liaison officer to assist the police strategic commander.

5.9 Within 24 hours of an accident involving Defence Nuclear Materials, the FoF could, if deployed, consist of up to 800 personnel with some 150 vehicles. A nearby MoD facility would be selected as a support and deployment base from which forces would be brought forward as necessary.

a. **Radiological monitoring, health physics and radiation medicine.** Their tasks include monitoring those likely to have been contaminated and initial decontamination, establishing the extent of the dispersal of radioactive material, giving advice to health authorities and hospitals and providing health physics services for personnel responding to the accident. Health advice at a strategic level would be provided by the Health Advisory Organisation (HAO) formed from personnel with overall responsibility for implementing these tasks. Support would be provided to the group of local agencies and organisations dealing with public health matters (including public protection countermeasures, environmental, water and food issues), and subsequently with remediation considerations.

b. **Public and media relations.** These personnel would liaise and co-operate with their counterparts in the police, and local authority and other agencies in the provision of public information and keep the MoD HQ NARO informed of this aspect of the response. Co-ordination of the media strategy in the incident area is the responsibility of the civilian police who would issue information on protective measures to be taken by the public through the media. This information would be based on expert technical advice provided by the response forces.

c. **Engineering Support.** This would include a repair and salvage unit, general engineering support and a vehicle decontamination facility. Engineering support would be able to make-safe any damaged weapons/materials and arrange their safe removal from the site. Experts in container and transporter safety would also be available.

d. **Security.** The prime responsibility of the MDP security personnel is the close protection of the defence nuclear assets but they would also be available (if requested) to assist the civil police control access to the accident site.

e. **Communications, logistics, catering and administrative elements.** These elements would provide support to all the functions described above.

f. **Additional Forces.** The MCA could ask for further MoD resources and specialist help from non-MoD organisations such as the civil nuclear industry.

Annex B provides a diagram of MoD forces at the scene of an accident and their recommended interaction with local response forces.

MoD HEADQUARTERS

5.10 Command of the IRF and FoF in the event of a Defence Nuclear Material transport accident rests with the Chief of the Defence Staff (CDS) in London. The MCA 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. The HQ

NARO would also include a health cell (support by personnel from other government departments) and a nuclear safety cell.

Central Government

5.11 Central Government strategy for the response will be co-ordinated through the Nuclear Accident Information and Advisory Group (NAIAG) which would convene in the MoD in London. The main aim of the group is to issue policy advice at a national level and ensure that the action taken by each department is consistent with an overall strategy. The membership of the NAIAG would be drawn from central government departments and would always involve senior representatives from the MoD, Cabinet Office, National Radiological Protection Board, Department of Health, Department of the Environment Food and Rural Affairs, Department for Transport, Office of the Deputy Prime Minister and Health and Safety Executive. The attendance of representatives from the National Assembly for Wales or Scottish Executive or from departments with statutory responsibilities would depend on the nature and location of the accident. The NAIAG would receive timely expert advice from the four cells of HQ NARO.

5.12 Should the consequences of the accident be deemed severe enough, the Civil Contingencies Committee might be convened. This committee is a group of Ministers and officials which meets, when necessary, under the chairmanship of the Home Secretary. It is responsible for ensuring that the Lead Government Department arrangements are properly implemented when an emergency occurs. In the event of an accident in Scotland, the Scottish Executive would open the Scottish Executive Emergency Room (SEER) to assist in collating information and providing a co-ordinated government response. In the event of an accident in Wales the National Assembly for Wales would open its Emergency Room. A diagram showing the relationship between the Central Government and MoD forces and the organisations local to the incident area is at Annex C.

5.13 The Civil Contingencies Bill introduces a new regional tier of resilience. There may be exceptional circumstances where the scale and geographical extent of an incident requires the response and recovery to be coordinated at a regional level. In these circumstances a Regional Civil Contingencies Committee (RCCC) will be set up.

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

6. INTRODUCTION

6.1 This section describes the actions to be taken in the event of an accident during the transportation of Defence Nuclear Materials. An accident involving these materials is defined as "any unplanned occurrence involving destruction of or damage or suspected damage to a nuclear weapon, a SNM consignment or new or used reactor fuel which has resulted in actual or potential hazard to life or property or which may have impaired nuclear safety". There are two categories of accident:

> **Category 1:** in which there are reasonable grounds for concluding that no release of radioactive material has occurred.
>
> **Category 2:** in which the release of radioactive material has been detected or the nature or severity of the occurrence is such that the possibility of a release cannot be excluded. Within this category, there can be a **provisional** or **confirmed** caveat depending on whether or not a release has been confirmed.

6.2 It is not possible in emergency planning to predict precisely the accident scenario. There are three broad scenarios involving Defence Nuclear Materials that would lead to greatest concern, and potentially produce a category 2 accident. The first two apply to nuclear weapons and the third relates to other Defence Nuclear Materials. It is important to stress that these scenarios are highly unlikely.

> a. An accident where the container is pierced or crushed and the weapon compartment breached, leading to the detonation of the conventional explosive within the weapon, thereby facilitating dispersal of radioactive material.
>
> b. An accident, either as above or in other circumstances, causing damage to the container and nuclear weapon followed by a fire which may lead to either a conventional explosion (as above) or dispersal of radioactive material as a result of the fire.
>
> c. An accident causing damage to the container and the radioactive material inside followed by a fire which may cause dispersal of radioactive material. The MoD does not transport SNM or reactor fuel (new or used) alongside conventional explosive so dispersal of the radioactive material as the result of the detonation of conventional explosive could not occur.

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.

6.4 It is very difficult to be precise about the length of each phase as it would depend on the specific circumstances. As a broad guideline, the immediate phase would extend

to about two hours from the accident, the medium term from about 2 to 24 hours, and the long term beyond about 24 hours from the accident. It is also likely that activities associated with one phase would continue into the next or may start before the phase indicated.

6.5 Immediate actions, by their very nature, have to be pre-planned and thus are prescribed in detail. The level of prescription can be reduced as time into the response passes, and it would be inappropriate to prescribe too closely the longer term actions. 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.

6.6 The actions (immediate, medium and long-term) described cover a Category 2 accident that is confirmed during the response. A lesser category 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.

6.7 It is MoD policy neither to confirm nor deny (NCND) the presence of nuclear weapons at any particular time or place. This policy would be specifically set aside in the interests of public protection in the event of an accident where a release of radioactive material is considered possible (Category 2). NCND does not apply to SNM, or new or used reactor fuels.

IMMEDIATE ACTIONS (UP TO ABOUT 2 HOURS)

ALERTING

7.1 The alerting of local emergency services in the event of an accident involving Defence Nuclear Material is dependent on the nature of the transport operation. Alerting procedures for each of the modes of transport of Defence Nuclear Materials are detailed below.

Road Transport

7.2 **Nuclear Weapons** In the event of a road accident involving nuclear weapons Task Control MDP Central Information Room and the appropriate police force control room would be notified immediately by the convoy commander who should also give his initial assessment of the accident category. The local police would alert the other emergency services. An Instructions in Writing card, similar to that carried by drivers of hazardous loads, is carried by the convoy. This should be given to the officer in charge of the first fire appliance attending the scene. The convoy commander (or a deputy in the event that he/she is incapacitated) would become the MoD IC and should wear an appropriate dayglo jacket to identify himself/herself.

7.3 **SNM or New Reactor Fuel** In the event of a road transport accident involving new fuel or SNM consignments the convoy commander will immediately alert the MDP Central Information Room and the local civil police. The police would alert other emergency services as required.

Air Transport

7.4 **Nuclear Weapons or SNM** Flights are monitored at all times by the London Air Terminal Control Centre (LATCC). LATCC would notify the Chief of Defence Staff Duty Officer (CDSDO) in London and the Special Safety Cell (SSC) at Ensleigh, Bath immediately they became aware of any potential or real emergency involving an aircraft transporting nuclear weapons or SNM. The cell at Ensleigh, Bath would notify, by telephone and facsimile, the control room of the Police Force responsible for policing the area encompassing the crash site. More than one control would be contacted if there is uncertainty over the point of impact.

7.5 If the aircraft were under the local control of its departure or destination airfield, additional local contact would be made by normal channels. The police force would then pass this information to the other emergency services. The police officer taking charge at the scene would thus receive notification of the presence of nuclear weapons or SNM from his control room.

7.6 If the police were unsure whether a nuclear weapon or SNM was present in a crash involving a military transport aircraft, a check could be made directly with the SSC at Ensleigh, Bath: all police forces have details of the necessary numbers and procedures. The IRF and military IC should have been alerted and would make their way to the scene. It is possible that in an accident of this nature there may be more than one accident site; in this case, the principles for a multi-scene accident would be

followed. In all but the most benign circumstances the accident should be assumed initially to be Category 2 Provisional.

Rail Transport

7.7 **Used Fuel** For rail accidents involving used reactor fuel consignments, the convoy commander, as MoD IC, should immediately notify the local police and the MDP Central Information Room. 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.

AUTOMATIC COUNTERMEASURES

Generic Measures

7.8 The overall responsibilities of the civil emergency services would be the same for an accident involving Defence Nuclear Materials as for any other type of major incident. The police would be responsible for co-ordinating the overall local response to the incident, whilst the fire service would co-ordinate fire fighting and rescue activities. The police would also be responsible for alerting the ambulance service, local authorities and health authorities as and when they consider it appropriate. Through these latter bodies the regional offices of the relevant government departments and other authorities would also be brought into the response.

7.9 The approach to the accident site should be from the upwind direction (this is standard practice). The fire service should take all normal actions to extinguish fires and rescue casualties (see para 7.26 for further advice on casualty handling).

7.10 Fire-fighters arriving at the scene, who might have to get close to the fire to extinguish it or rescue casualties, should wear Personal Protective Equipment (PPE).

Nuclear Weapons

7.11 If an explosion of the weapon was thought to be imminent or fire was engulfing the weapon or the IRF so advised, the police should be advised to take the following **emergency** actions **immediately** in order to protect the public:

a. evacuate a zone of radius 600 metres in all directions around the accident site. [This is standard advice for any suspected explosive hazard and is not specifically related to nuclear weapons.]

b. advise the public in the downwind sector, to a distance of 5 kilometres over an arc of 45° centred on the wind direction, to shelter indoors with doors and windows closed and ventilation systems switched off. This should be a short-term measure which would provide protection against any airborne radioactive material, but standard practices for sheltering populations should be adopted while it was implemented. Specialist civil agencies would advise when the risks had reduced to the point where sheltering requirements could

be relaxed (see paragraph 8.2 below). The downwind shelter advice has been determined on the basis of NRPB ERLs for an accident occurring under average weather conditions taking account of the amount of radioactive material likely to be dispersed.

7.12 Even after fires are extinguished, the weapons/containers should continue to be cooled by water spray since this reduces the risk of further fire or explosion. Cooling jets should be fixed in position where practicable to allow fire-fighters to withdraw, and should be kept in operation until the IRF advise that this is no longer necessary. Only in exceptional circumstances would nuclear weapons (or their containers) be disturbed or moved. Personnel working within the evacuation zone should protect their mouth and nose to minimise the risk of intake of radioactive particulate. A medical facemask or preferably an industrial anti-dust mask would afford such protection, and suitable spare masks are carried by the IRF for issue at the scene.

7.13 Members of the public evacuated from the 600 metre zone will need support from the local authority and other agencies, at least initially. This is likely to involve the setting up of a Reception Centre or similar. The IRF will provide advice on the need for precautionary decontamination of evacuees, which may require showers to be available in accordance with Strategic National Guidance[3], and will provide teams to carry out radioactive contamination monitoring of people. In addition the IRF, in conjunction with the emergency services, will establish a Control Point close to the upwind boundary of the 600 metre zone in order to ensure effective liaison between all of the responding agencies, control access to the hazard zone and carry out initial contamination monitoring of response teams.

7.14. Beyond 600 metres, the MoD IRF will undertake ground contamination monitoring to establish the amount of radioactive material deposited from the plume. All results will be made available to the all agency response, including the local Health Authority and NRPB, who will consider the need for any protective actions to be continued.

7.15 It is recognised that the different situations which the emergency services may face are quite complex and that precise assessment may be difficult in the immediate aftermath of an accident. It is for this reason that the initial countermeasures described above are intended to be implemented automatically to the maximum possible extent, and refined subsequently on the basis of more detailed assessment and advice. It is stressed that any hazards are likely to arise quickly so that immediate action is required to provide protection. It is appreciated, however, that the action required is not easy to achieve, particularly in a short time-scale, and that the final decisions rest with the police.

[3] Home Office publication: The Decontamination of People Exposed to Chemical, Biological, Radiological or Nuclear (CBRN) Substances or Material. Strategic National Guidance Second Edition May 2004.

Special Nuclear Materials

7.16 Automatic countermeasures for an SNM accident depend on the nature of the SNM consignment and the mode of transport. In the event of a severe accident, where the containers may have been breached and/or a fire is engulfing the SNM consignment, the police would be advised to take the following actions **immediately** in order to protect the public:

Road Transport of all Special Nuclear Materials

Evacuate all non-essential personnel and public within 100 metres around the accident site. Members of the public downwind of the accident site should be advised to shelter out to a distance of 1 kilometre over a 45° arc. The IRF/FoF in consultation with the civil authorities would advise when the risks had reduced to the point where sheltering requirements could be relaxed.

Air Transport of Special Nuclear Materials

a. **Consignments of Plutonium and Uranium**

Evacuate all non-essential personnel and public within 100 metres around the accident site. Members of the public downwind of the accident site should be advised to shelter out to a distance of 1 kilometre over a 45° arc. The IRF/FoF in consultation with the civil authorities would advise when the risks had reduced to the point where sheltering requirements could be relaxed.

b. **Consignments of Tritium**

Evacuate all non-essential personnel and public within 100 metres around the accident site. In the downwind area, this evacuation zone should be extended to a distance of 600 metres over a 45° arc.

7.17 The evacuation zone is based on security and conventional safety considerations. Evacuation serves to provide protection against radiation exposure. As explosives are not transported alongside SNM an evacuation zone for explosive hazards is not necessary. In addition to the immediate responses given above, a control point should be established at the upwind boundary of the evacuation zone to control subsequent access. Contamination monitoring for personnel evacuated from the zone should be established in consultation with the civil authorities.

7.18 It would be essential for personnel working within the evacuation zone to wear appropriate respiratory protection. The Emergency Services response will be in accordance with Strategic National Guidance. Levels of respiratory protection for personnel within the evacuation zone depend on the nature of the SNM consignment. In the advent of an accident involving tritium, only personnel wearing SCBA Personal Protective Equipment (PPE) should enter the evacuation zone unless it is to save life. It is important to stress that particulate respirators will not afford protection against the inhalation of tritium gas. In the case of an accident involving plutonium or

uranium, a medical face mask or preferably an industrial anti-dust mask would afford suitable protection, and suitable spare masks are carried by the IRF.

New Reactor Fuel

7.19 **In contrast to an accident involving nuclear weapons, cooling of the containers with water is unnecessary and undesirable**. Personnel at the scene would be well equipped to rapidly assess any container or module damage. Even in the event of module exposure and/or mechanical damage to the fuel modules, it is highly unlikely that there will be a release of radioactive material into the environment. Nonetheless, on the basis of conventional safety and security considerations, non-essential personnel should be evacuated from a 100 metre zone around the accident site. MoD police responsible for health monitoring duties will set up an inner cordon several metres from the new module containers to ensure that entry is restricted to properly briefed personnel associated with the accident response. Personnel within this inner cordon would be equipped with respiratory protection as a precaution though an inhalation hazard is very unlikely to exist even if damage to a module is accompanied by fire. Personnel exiting the inner controlled area would be monitored for contamination.

7.20 Radiation and contamination levels will be monitored in the immediate vicinity and downwind where people may be exposed.

Used Reactor Fuel

7.21 Personnel at the scene would be well equipped to rapidly assess any possible container or module damage. In the event of a severe accident, where used fuel containers may have been breached and/or a fire was engulfing the consignment, the escort group should **immediately** set up an evacuation cordon at a distance of 100 metres in all directions. If it is confirmed that the transport flasks are severely damaged (including significant deformation of the flask structure) non-essential personnel and members of the public should be **immediately** evacuated to a distance of 500 metres. The dominant hazard from a severe accident involving used fuel is penetrating gamma radiation. Sheltering is not the most effective countermeasure against this hazard. Hence evacuation is the primary method of protection against an accident of this nature.

7.22 Owing to the potential for high gamma radiation levels around a severely damaged transport package, all personnel entering the inner cordon should wear appropriate direct reading dosimetry. The MoD escort personnel are able to provide this, if necessary, in addition to undertaking gamma radiation surveys around the fuel containers. This data would be used in the briefing of rescue parties and as the basis for any extension of the initial 100 metre cordon.

7.23 Entry to the 100 metre cordon would be restricted to personnel taking or managing emergency actions (either to stabilise the accident or recover casualties). These personnel would be briefed on the potential radiological hazards within the cordon. Fire fighters and ambulance personnel should heed advice from the convoy commander on the hazard associated with approaching the flask. Use would be made

of any shielding offered by buildings, or undamaged railcars etc. The risk of dispersal of radioactive material by fire is incredibly small particularly as used fuel is contained within a fire resistant matrix and surrounded by a body of water when transported. In the highly unlikely event of a fire, **the containers would not require cooling with water once the fire had been extinguished.**

7.24 Personnel exiting the cordon would be monitored for beta/gamma contamination and their dosimeter readings recorded. Where possible a control point should be established at the upwind boundary of the zone in order to control access. Contamination and radiation monitoring for personnel evacuated from the zone would be established in consultation with the civil authorities. Depending on gamma radiation levels the evacuation zone may need to be extended in consultation with the civil police.

Summary of Public Automatic Counter-Measures

7.25 The table at Annex E 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.

CONTAMINATED CASUALTIES

7.26 In the event of any accident involving Defence Nuclear Materials, 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 is necessary, casualties would be taken to the nearest accident/emergency facility without prior decontamination. For less serious casualties, with confirmed or suspected contamination, simple decontamination action (e.g. removal of outer clothing) might be taken before transfer to hospital. To minimise the spread of contamination, placing a sheet or blanket beneath the contaminated casualty can reduce contamination of the stretcher and vehicle. Placing a similar sheet over the patient's body can further reduce the spread of contamination. Ambulance personnel dealing directly with casualties with suspected or confirmed contamination should wear facemasks, disposable gloves and protective coveralls. "Infectious diseases" techniques and protective clothing would be suitable.

7.27 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.

OTHER PRECAUTIONS (NUCLEAR WEAPONS ONLY)

7.28 Radio transmissions can produce electrical impulses in circuits near the transmitter. This effect would not cause detonation of a weapon's high explosive even if the weapon is damaged. However, the weapon may also contain minor conventional electro-explosive devices, and if the weapon is damaged, there would be a remote possibility that these might be set off by adjacent radio transmission. This might pose a hazard to personnel in the immediate vicinity of the weapon. As a precaution, the following restrictions on radio frequency transmissions in the vicinity of the accident should be imposed immediately:

a. 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.

b. 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.

7.29 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. Removal of the debris would be undertaken by the FoF. Only if it is essential, for example to provide access to the accident location for the fire service, should such debris be moved by non-specialist personnel and then with extreme care.

INFORMATION FOR THE PUBLIC AND MEDIA

7.30 The police would be responsible for issuing information relating to public safety (e.g. evacuation and sheltering). Personnel entering the downwind evacuation zone to provide information to the public would be required to wear Personal Protective Equipment, if the police do not have such equipment at their disposal it would be necessary for specialist personnel to provide assistance with this task. The information issued might be based on the advice on automatic countermeasures given above and might also include additional and specific information (e.g. evacuation and shelter zones defined by weather conditions and topographic features).

7.31 In addition, the public affected by the emergency would receive regular advice on the steps to be taken including any health protection measures in keeping with the Radiation (Emergency Preparedness and Public Information) Regulations (REPPIR) 2001. Such information would continue to be provided throughout the medium and long term response.

7.32 The police would also lead in co-ordinating the provision of information to the media. The MoD IC would be available to support the police (for example by being present at any press conference). This responsibility will subsequently be taken over by the

MCA. The MoD IC carries pre-scripted press statements, including public safety information, which would be offered for agreement with the police before being issued to the press.

MEDIUM TERM ACTIONS (FROM ABOUT 2-24 HOURS)

Radiation Monitoring and Review of Protection

8.1 The primary aim of MoD forces in the medium term would be to refine the automatic countermeasures implemented in the immediate phase. The IRF would promptly monitor for radioactive material in the vicinity of the accident location in order to confirm (or otherwise) a release. In parallel with these activities IRF personnel would undertake additional ground monitoring in the downwind zone out to several kilometres initially, subsequently extending further if required, in order fully to characterise any hazards arising. All results would be made available to the all-agency response, including the appropriate health authorities and NRPB, who would consider the status of protective actions. FoF personnel would be available to assist the police in maintaining any control cordon.

8.2 Once the accident site had been stabilised (fire extinguished etc.), a further release would be very unlikely to occur, and the specialist civil agencies would advise on relaxation of the shelter requirement. Even though sheltering may no longer be required, low levels of contamination may be present on ground and other surfaces, and additional advice may be issued to avoid disturbing this contamination (for example by avoiding lawn mowing and other gardening activities), until a more detailed assessment could be carried out.

8.3 Consideration would need to be given during this phase to the radiological hazard to food and water supplies. The Food Standards Agency (FSA) and the Department of Environment, Food & Rural Affairs (DEFRA) (or its Scottish and Welsh equivalents[4]), would be responsible for handling food and agriculture issues respectively. MoD FoF personnel would be available to collect samples for analysis if required to do so. Advice on water hazards would be given by the various organisations concerned with the safety of water supply and the discharge of water used in fighting fires. However, mains water supplies are very unlikely to represent a hazard as a result of any defence nuclear accident. The FoF would again assist in collecting any samples required. All monitoring information collected by the MoD would be made available to all agencies via the Radioactive Incident Monitoring Network (RIMNET) and other systems.

Hospital Actions

8.4 The treatment of patients contaminated with radioactive material is detailed in the Strategic National Guidance and NHS Guidance[5] This guidance would be followed by hospitals receiving casualties. The UK has specialised facilities for monitoring and treating serious cases of internal contamination. MoD FoF would include radiation medicine specialists who would be able to give any further advice and liaise with these specialist facilities as necessary. The MoD would deploy specialist monitoring teams to hospitals to assist if required. NRPB would co-ordinate the use of

[4] In Scotland: Food Standards Agency Scotland and the Scottish Executive Environment and Rural Affairs Department. In Wales: Food Standards Agency Wales and the National Assembly for Wales Department of Environment Planning and Countryside.

[5] 'Planning for Major Incidents - The NHS Guidance dated November 1998, http://www.dh.gov.uk/PolicyAndGuidance/EmergencyPlanning/NHSGuidance1998/fs/en.htm

other relevant monitoring resources made available, such as those from the UK civil nuclear industry.

Fatalities

8.5 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 "*Dealing with Disaster*" and *"Dealing with Disasters Together"* would apply here. Anyone handling suspected contaminated bodies should protect themselves in the same manner as indicated for ambulance staff in para 7.26. MoD FoF could provide advice on radiological aspects if required.

Equipment and Vehicle Recovery

8.6 Where possible the emergency services would avoid committing equipment and vehicles into the radiological evacuation zone since they would then need to be monitored and decontaminated and this can take time. However, it is recognised that fire appliances would have deployed within the zone and that ambulances might carry contaminated casualties. These vehicles would be "quarantined" unless it is considered essential that they be used for other duties. If the emergency services do not have the capability to monitor and decontaminate, this would be done by the FoF who in any circumstances would be able to offer advice. Senior officers would identify their requirements to the MCA or other senior members of the FoF.

Assessment of Damage to Defence Nuclear Assets

8.7 The IRF (and later the FoF) should establish and maintain a security cordon around the accident location within the evacuation zone in consultation with the police. This would be distinct from the evacuation zone cordon. A detailed assessment of the status of damage to the nuclear defence assets following an accident would be carried out by:

a. FoF members from AWE for nuclear weapons or SNM containers.

b. FoF members from Rolls Royce Marine, Derby for new reactor fuel.

c. FoF members from Devonport, supported by representatives from Devonport Dockyard Company for used reactor fuel.

This would enable a further refinement to be made of the prediction of dispersed material (see para 8.2). They would advise the MCA of any hazard that might still exist, and begin to formulate plans for making the nuclear defence assets safe. This advice would be passed on by the MCA to the emergency services and other civil authorities.

Information for the Public, Parliament and Media

8.8 As in the immediate phase the police would continue to be responsible for instructions relating to public safety, and MoD forces would continue to supply advice to the police on this matter. They would also co-operate with the police and local authorities in the provision of information to those affected by the accident. It is anticipated that local media (e.g. radio) would be used to achieve this. Information on food and water restrictions would be issued by the appropriate authorities.

8.9 The MoD recognises the legitimate rights of the media to report a nuclear defence accident and should seek to gain co-operation by providing as much information as requested without compromising national security. In order to avoid potentially conflicting information being given to the media, the MoD would wish to provide briefings at only two locations: one near the incident area and the other at MoD in London. The MCA's public relations officer would be responsible for co-ordinating information between the two locations. In broad terms, information concerned with the accident, the management of the response and any technical issues would be handled at the incident area and defence policy issues would be managed in London. It should be recognised that MoD Ministers would almost certainly wish to make statements to Parliament (if in session) and to the media. Depending on the location of the incident Secretaries to the Assembly of Wales or the Scottish Executive may also wish to make media statements.

8.10 The police would continue to lead in the provision of information and facilities to the media near to the incident area. MoD forces would co-operate in agreeing a vantage point for photography, but they might request that time be allowed for them to cover any classified items. They would also co-operate in the establishment of a media centre. The MCA and other senior specialists in the FoF, and officials from other government departments, would be available to support the senior police officer in giving press conferences. The FoF have further statements and information on MoD nuclear accident response arrangements that might be given to the media.

Central Government Support

8.11 Central Government support, as previously described in section B, would continue into the medium and long term phases.

LONG TERM ACTIONS (FROM ABOUT 24 HOURS ONWARDS)

Introduction

9.1 This section is necessarily much less prescriptive than those dealing with the more immediate 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 circumstances of the accident and the principles stated below.

Management

9.2 It is expected that, at some stage during the long term response which may last for weeks, the local authority would adopt the co-ordination role that would hitherto have been the police's responsibility. The method and timing of this change would be very much a matter for local decision makers. The MoD would support and work with the local authority in the same way as they had with the police, and MoD forces would remain until it was agreed that their role had ceased.

Reassurance Monitoring and Follow Up

9.3 It is anticipated that, in the days and weeks following a Defence Nuclear Materials accident, there would be a continuing need for medical care of anyone found to have taken radioactive material into the body. As before, MoD specialists would be available to assist medical authorities in this work; they have knowledge of the medical techniques mentioned in Section A (para 4.4).

9.4. It would also be a requirement to follow up and give counselling to those who have been monitored and decontaminated during evacuation from the radiological evacuation zone. The lead responsibility would be with the local health authorities. The FoF could provide advisors, if required, to assist in prioritising further monitoring. If necessary, MoD would also arrange for additional personnel monitoring and access to whole-body monitors.

9.5 It is further anticipated that there would be a substantial demand for access to monitoring facilities from members of the public who might fear that they had been contaminated as a result of the accident. Again local health authorities would lead, with assistance provided by MOD, similar to that detailed above and by NRPB who would provide resources to assist in reassurance monitoring.

Defence Nuclear Material Recovery

9.6 FoF would proceed in consultation with civil authorities. The safety of the public and personnel in response forces would always be of paramount importance. In order to ensure high levels of safety, the recovery team would cross-check, at each stage, its plans with their parent organisation as well as the nuclear safety cell in the HQ NARO at each step. Depending on circumstances the recovery process could take some days to complete. Whilst unlikely, it is possible that the MCA might advise the police that precautionary evacuation and/or sheltering might be necessary during particular operations.

Remediation

9.7 Remediation is the combination of activities associated with the return of the incident area to normality as far as is possible and agreed. Recovery from the accident would have many aspects, some of which might have started in the earlier phases (e.g. relaxation of sheltering). Removal of radioactive material contaminating the area would be likely to be a lengthy process. As a first step the level of contamination would have to be established. FoF personnel would continue to conduct monitoring of the ground and other surfaces over a wide area not just within the radiological evacuation zone (this would include any reception centres used for monitoring and decontamination - see para 7.13). NRPB (in conjunction with the MoD) co-ordinate the national monitoring effort. Additional resources within MoD and from the nuclear industry might be called in to assist in this process. Results of this monitoring would be available for scrutiny by independent bodies (e.g. NRPB and local authorities). NRPB has published advice on measures that may be taken to aid remediation in the aftermath of an accident ("Intervention for recovery after accidents", Documents of NRPB Vol 8 No 1, 1997). MoD would recognise its lead responsibility for decontamination operations which might be conducted by the military and/or contractors. Current techniques include removal (and disposal) of material, washing down (with careful control of effluent) or fixing contamination to avoid re-suspension of radioactive material. The Environment Agency (or in Scotland, the Scottish Environment Protection Agency) should provide advice on radioactive waste management.

Compensation

9.8 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 loss or injury as a result. This would include compensation for local authorities who might have incurred expenditure in carrying out their responsibilities. Claims for compensation would be dealt with under the principles set out in the Nuclear Installations Act (1965). Claims forms would be published in the press and would also be made available at local Post Offices. A claims officer from MoD would be attached to the FoF to deal with matters arising from claims for compensation.

Formal Inquiries

9.9 A number of formal inquiries might be necessary as a result of a Defence Nuclear Materials accident. Potentially these might include a criminal inquiry (if suspected as the initiating event), a coroner's inquiry (or procurator fiscal in Scotland), an inquiry by the armed services or MoD and a broader public or similar inquiry. Advice on the precedence of such inquiries would be sought by MoD from the Lord Chancellor's Department (or Scottish equivalent).

SECTION D - EXERCISES AND TRAINING

MoD Exercises

10.1 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. These are organised at a number of levels ranging from dedicated exercises of the immediate response only, to large-scale exercises of the all-agency response at Operational, Tactical, Strategic and central Government levels, lasting for several days. All 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. As much advance warning as possible is given, and contact is normally established initially with the police force in whose area it is proposed to exercise.

MoD Participation in other Exercises

10.2 In addition to the above MoD-led exercises, elements of the NARO may be available to participate in table-top 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

10.3 The MoD organises a three day training course covering nuclear weapon and SNM transport accident response arrangements. The course is called the Nuclear Accident Procedures Course (Transport) NAPC(T), and it is delivered by the Warship Support Agency in Bath. The aim of the course is to provide a comprehensive understanding of overall strategy for transporting defence nuclear material and associated emergency arrangements to enable personnel (both military and civilian) with a management role in planning and responding to such events to be better prepared to discharge their responsibilities. In addition to the provision of training for MoD NARO personnel, the course has places for officers of the emergency services and local authorities who may be involved in emergency planning in their own organisations. Four courses per year are run, and nominations for the courses should be forwarded through emergency service and local authority associations/societies (details at Annex F).

MoD Participation in other Training

10.4 Members of the MoD NARO, led by the HQ element, are available to give lectures or talks on the MoD's Defence Nuclear Material accident response arrangements. Initial contact would be made through the HQ NARO (see Annex J).

Annex A

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.

2. Nuclear weapons and SNM are usually transported by road convoy. New submarine reactor fuel is solely transported by road and used fuel is transported by rail. On each occasion the proposed route is discussed and agreed in advance with the relevant police forces. 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
Hartlepool
Hereford
Hertfordshire
Kingston upon Hull District
Kirklees
Knowsley
Lancashire
Leeds
Leicester City
Leicestershire
Lincolnshire
Liverpool
Manchester
Middlesborough
Milton Keynes
Newcastle-upon-Tyne
Norfolk
North Lincolnshire District
North Somerset
North Tyneside
North Yorkshire
Northamptonshire
Northumberland
Nottinghamshire
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

Essex
Exeter
Gateshead
Gloucestershire
Halton
Hampshire
Oldham
Oxfordshire
Plymouth
Reading
Redcar & Cleveland
Rochdale
Wiltshire
Windsor & Maidenhead
Wokingham
Wolverhampton
Worcestershire
York

Wales

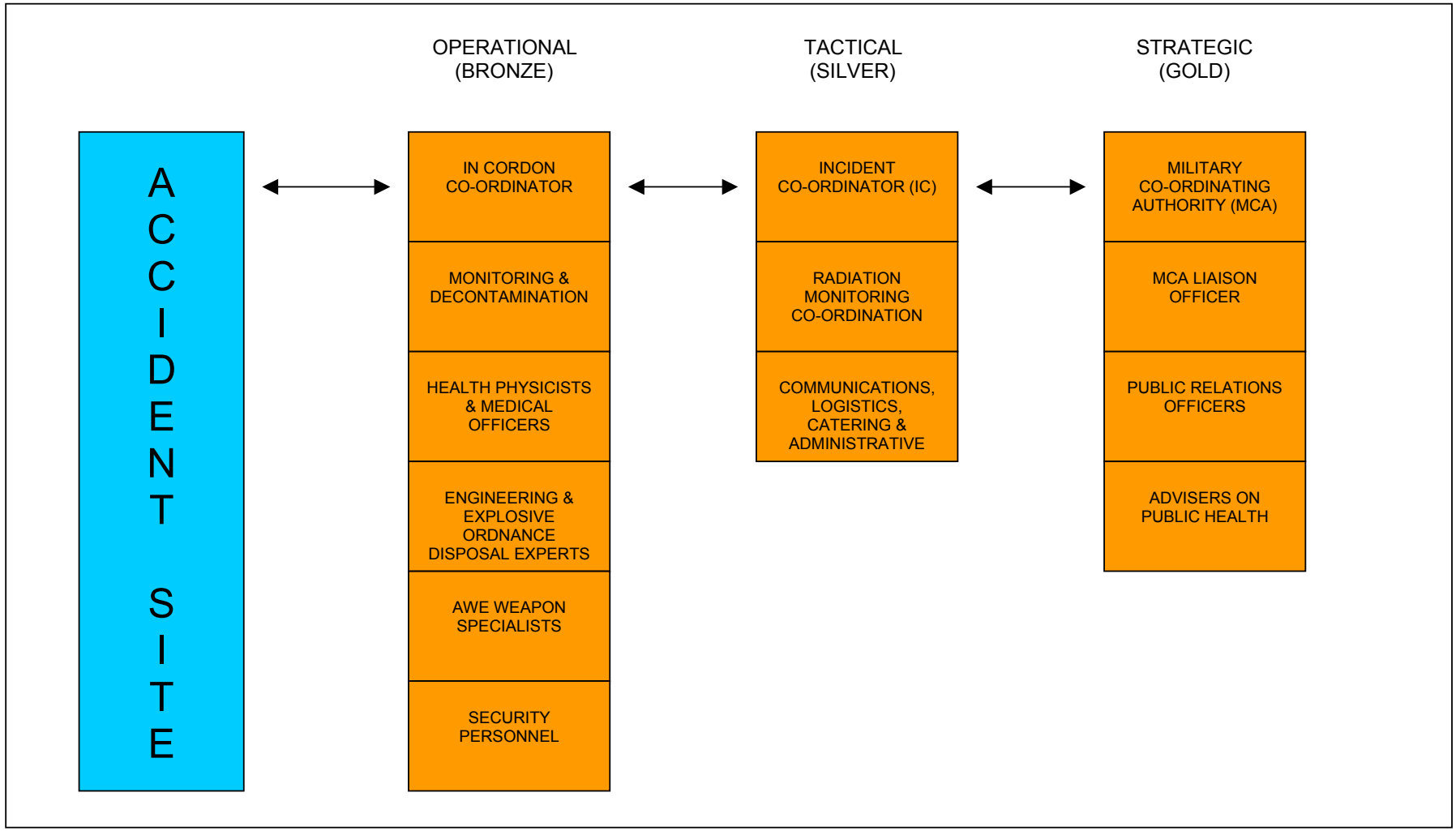
Blaenau Gwent
Bridgend
Caerphilly
Cardiff
Merthyr Tydfil
Monmouthshire
Neath Port Talbot
Newport
Powys
Rhonda Cynon Taff
Swansea
Torfaen
Vale of Glamorgan

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

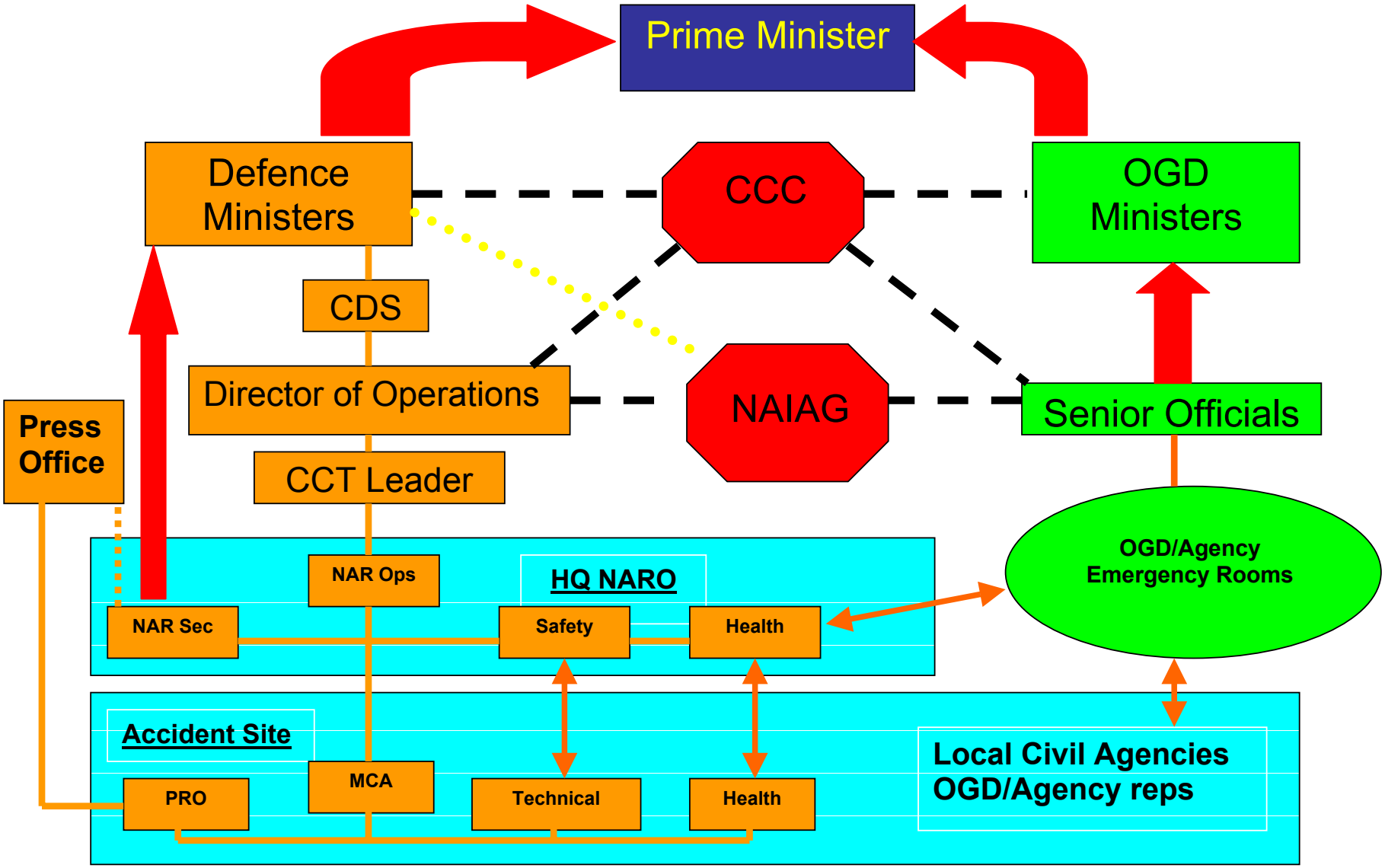
Annex B

MoD Forces at the Scene of an Accident 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^{o} 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 of public shelter announcement are:

   4.1 An accident occurred at (TIME) (PLACE) which involved a nuclear weapon.

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

   4.3 There is a risk of radioactive particles being carried downwind.

   4.4 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^{o} ARC**
   - **DO NOT TOUCH DAMAGED CONTAINERS OR SPILT MATERIAL**
   - **REMOVE UNDAMAGED CONTAINERS FROM HEAT SOURCE**

2. Key points for public are:

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

   2.2 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^{o} ARC CENTRED ON THE WIND DIRECTION**
   - **DO NOT TOUCH DAMAGED CONTAINERS OR SPILT MATERIAL**
   - **REMOVE UNDAMAGED CONTAINERS FROM HEAT SOURCE**

2. Key points for public are:

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

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

3. Key points of public shelter announcement for a tritium SNM accident during transport by road are:

   3.1 There is a risk of a plume of radioactive gas being carried downwind.

   3.2 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^{o} 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 of public shelter announcement are:

2.1 An accident occurred at (TIME) (PLACE) which involved a Special Nuclear Material consignment.

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

2.3 There is a risk of a plume of radioactive particles being carried downwind.

2.4 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**
   - **DO NOT COOL FLASKS WITH WATER**
   - **HEED MoD ADVICE ON OTHER NECESSARY PROTECTIVE COUNTERMEASURES**

2. Key points for public are:

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

   2.2 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 SEVERLY 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 public are:

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

   2.2 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)
Road		
Weapon	600 metres	5 kilometres
SNM (all consignments)	100 metres	1 kilometre
New fuel	100 metres	-
Air		
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	-
Rail		
Used fuel	100 metres	-
In case of severe damage to flasks	500 metres	-

ANNEX F

CONTACT DETAILS FOR EXERCISES & TRAINING

1. Applications from members of the emergency services and local authority emergency planning officers to attend the Nuclear Accident Procedures Course (Transport) are co-ordinated by the following:

Emergency Planning

Chief Emergency Planning Officer
Hampshire County Council
Emergency Planning Office
The Castle
Winchester
SO23 8UT

BT: (01962) 846840
FAX: (01962) 855020

Police

ACPO TAM
Metropolitan Police Service
Room 1717
New Scotland Yard
Broadway
London
SW1H OBG

BT: (020) 7230 0987
FAX: (020) 7230 4326

Fire Service

Office of the Deputy Prime Minister
Civil Resilience Directorate
Zone 18/c
Stag Place
London
SW1E 5LP

BT: (020) 7944 5694
FAX: (020) 7217 8270

Health Protection Agency

Health Protection Agency
New Court
48 Carey Street
London
WC2A 2JE

BT: (020) 7492 0443
or (020) 7492 0446
FAX: (020) 7492 0483

Ambulance Service

Ambulance Service Association
Friars House
157-168 Blackfriars Road
London
SE1 8EZ

BT: (020) 7928 9620 ext 21
FAX: (020) 7928 9502

Scottish Executive

Scottish Executive
Emergency Management Unit
Room 1WR
St Andrews House
Regent Road
Edinburgh
EH1 3GD

BT: (0131) 244 2184
FAX: (0131) 244 2189

Environment Agency

Environment Agency
Rio House
Waterside Drive
Aztec West
Almonsbury
Bristol
BS32 4UD

BT: (01454) 624493
FAX: (01454) 624479

NRPB

Emergency Response Group
National Radiological Protection Board
Chiltern
Didcot
Oxfordshire
OX11 0RQ

BT: (01235) 822773
FAX: (01235) 833891

Other Government Department Nominations

2. 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:

MoD HQ NARO

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

ANNEX G

GLOSSARY OF TERMS AND ABBREVIATIONS

AWE	Atomic Weapons Establishment
BNFL	British Nuclear Fuels Limited
CDS	Chief of Defence Staff
CDSDO	Chief of Defence Staff Duty Officer
DEFRA	Department of the Environment, Food and Rural Affairs
DfT	Department for Transport
DNSC	Defence Nuclear Safety Committee
DoH	Department of Health
ERL	Emergency Reference Levels
ESF	Engineering Support Force
FoF	Follow on Forces
FSA	Food Standards Agency
HAO	Health Advisory Organisation
HEU	Highly Enriched Uranium
HSV	High Security Vehicle
HQ	Headquarters
IAEA	International Atomic Energy Agency
IC	Military Incident Co-ordinator
IRF	Immediate Response Force
LAESI	Local Authority and Emergency Service Information on Defence Nuclear Material Transport Contingency Arrangements
LATCC	London Air Terminal Control Centre
MACA	Military Aid to the Civil Authorities
MCA	Military/MoD Co-ordinating Authority
MDP	Ministry of Defence Police
MDP SEG	Ministry of Defence Police Special Escort Group
MoD	Ministry of Defence
NAIAG	Nuclear Accident Information and Advisory Group
NAPC(T)	Nuclear Accident Procedures Course (Transport)

NARO	Nuclear Accident Response Organisation
NCND	Neither Confirm nor Deny
NHS	National Health Service
NMC	New Module Containers
NRTE	Naval Reactor Test Establishment
NRPB	National Radiological Protection Board
ODPM	Office of the Deputy Prime Minister
PPE	Personal Protective Equipment
RADHAZ	Radio frequency Hazard
RAF	Royal Air Force
RCCC	Regional Civil Contingency Committee
RECOVERY	Recovery of nuclear weapon or Special Nuclear Material.
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
RIMNET	Radioactive Incident Monitoring Network
RN	Royal Navy
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 CIR	Task Control, Ministry of Defence Police, Central Information Room
UK	United Kingdom
US	United States
WSA	Warship Support Agency