



Defence
Safety Authority

DSA 03-OME Part 5 (JSP 390)- Defence Code of Practice (DCOP) and Guidance Notes for Lasers

Defence OME Safety Regulator

DOSR



DSA VISION

Protecting Defence personnel and operational capability through effective and independent HS&EP regulation, assurance, enforcement and investigation.

PREFACE

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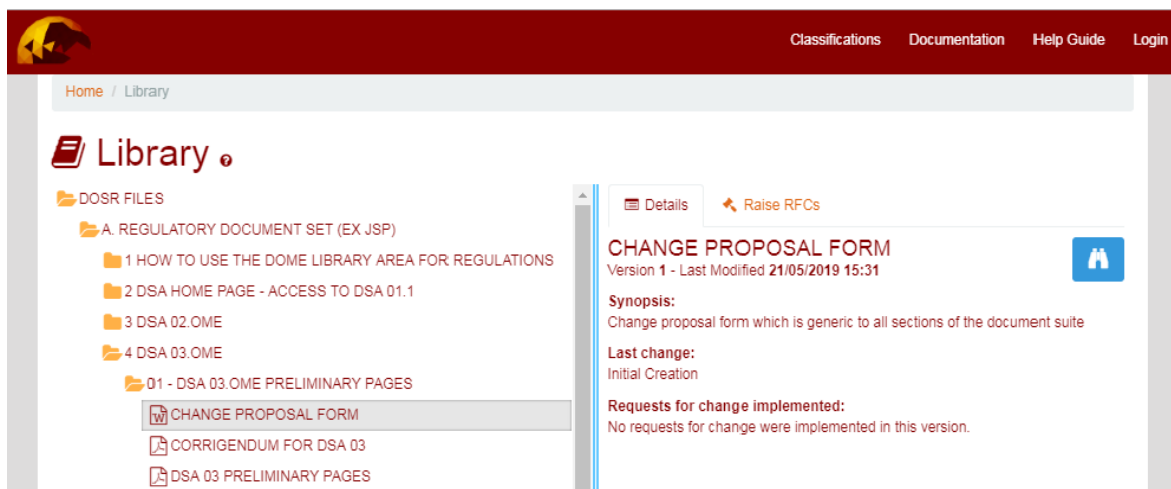


Figure 1. Change Proposal Form (Word version) Location

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AMENDMENT RECORD

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1. Introduction

1.1 Aim

1.1.1 This publication gives direction as to how the MOD's laser safety regulations shall be implemented by Crown Employees and their contractors, as well as persons operating laser equipment on Crown property. This publication forms part of the MOD's H&SEP management for Laser Safety.

1.1.2 The MOD' is responsible for ensuring that all laser use, training, test, research and trials are conducted in a safe manner which complies with or exceeds the requirements of UK Health and Safety legislation.

2. Legislation

2.1.1 The main hazard when using lasers is the beam of non-ionising radiation which can deliver large amounts of energy over a small area, and over long distances. To allow for the safe use of lasers, personnel shall be prevented from exposure to levels of laser radiation which could cause injury.

2.1.2 The Control of Artificial Optical Radiation at Work Regulations (CAOR) 2010 sets requirements for protection of employees from laser radiation. HSAW requires that employers and employees fulfil their 'duty of care' under Sections 2 and 7 of this Act and that employers comply with Regulation 3 of the Management of HSAW Regulations 1999 by conducting, recording and reporting risk assessments. In the event of an accident, failure to comply with the guidance found in harmonized standards such as IEC 60825-1:2014¹ may result in prosecution of the organisation or the individual. By following this publication users will ensure that MOD fulfils its obligations under the HSAW (1974), Management of HSAW (1992) and CAOR (2010) regulations, regardless of where the laser is used (i.e. Operations, Training etc.).

2.1.3 The MOD has a general approach of adopting best practice from industry and meeting or exceeding UK health and safety standards. The purpose of this publication is to ensure that exposure to laser radiation is kept As Low As Reasonably Practicable (ALARP), and is no greater than that required by UK legislation for all Crown employees, visitors and foreign military and civilian personnel operating on Crown Property. When lasers are used abroad, these regulations will apply unless the host nation's processes are more restrictive.

2.2 Laser safety bodies

2.2.1 MOD organisations whose functions are to provide advice on the health and safety of personnel working with lasers are as follows:

- a. **Defence Ordnance Munitions & Explosives Safety Committee (DOME SC)** – The DOME SC is the body which provides laser safety assurance DSA. Its function is to set laser safety policy, liaise with other MOD and external organisations, direct the MLSRP (laser WG from DOMESC) and associated working groups, and promulgate best practice to all MOD departments. It relies upon laser safety expertise from the Laser Systems Safety Advisor (LSSAs) and the Military Laser Safety Review Panel (MLSRP).
- b. **Military Laser Safety Review Panel (MLSRP)** – The MLSRP reports to and is composed of subject matter experts from MOD and industry. Its role is to act upon requirements set by the DOME SC and advise MOD departments on technical and practical aspects of safety arising from the direct and indirect non-ionizing hazards from the lasers which are in use, or being developed or considered for use, by MOD.
- c. **Subject Specific Working Groups** – Working Groups are formed at the direction of the Chairman of the DOME SC in order to address specific tasks or issues. These could be scientific investigations such as the properties of laser beams, or the assessment of a complex laser safety paper. The membership of each working group will consist of the most appropriate stakeholders. The working group will exist for the duration of the task and report to the DOME SC through the MLSRP.

¹ IEC 60825-1:2014 – Safety of Laser Products – Part 1: Equipment Classification and Requirements

d. **Defence Science and Technology Laboratory (DSTL) Environmental Sciences Department** – The Dstl Radiation Protection Advisor (RPA) Body, part of the Dstl Environmental Sciences Department, provides advice and services to the DH/Operators in non-ionizing radiological protection. Their primary functions are detailed in JSP 392 – Radiation Safety Handbook.

2.2.2 **PT.** The Project Team, managing the production and procurement of equipment employing a laser, is responsible for:

- a. The concurrent appraisal, within the development contract, of the risks of laser injury to personnel involved in operation, maintenance, inspection and development of the equipment, and to any others, including members of the public.
- b. The parallel development of laser safety precautions and safety equipment.
- c. The incorporation of such laser precautions into equipment manuals and publications.
- d. The preparation of laser training material for operating and maintenance personnel.
- e. Ensuring that a Laser Safety Paper (LSP) is prepared and presented to an Laser Safety Advisor (LSA) for review.

2.2.3 **The User** is responsible for:

- a. Ensuring that the laser is operated in accordance with the direction given.
- b. Writing laser operational and maintenance orders.
- c. Providing personnel with appropriate information, instructions, training and supervision necessary for the safe operation and maintenance of the relevant laser equipment.
- d. The promulgation of laser safety instructions in equipment's' user handbooks and any other instructions which may be issued from time to time.
- e. Seeking advice upon laser safety from the MLSRP if any change of use or technical modification is proposed during the service life of the equipment.
- f. Safe disposal of the laser
- g. Ensuring that Class 3B and Class 4 lasers are treated as weapons by storing and securing them in accordance with JSP 440; The Defence Manual of Security.

2.2.4 **Operator.** The operator's duty is to use the equipment in accordance with operating procedures and as commanded by their CO.

2.2.5 **Authorised users.** Only authorized users can operate the laser, taking account of the laser safety advice given by the LSO, having successfully completed suitable training and subject to any local safety rules.

2.2.6 **Headquarters and Commands** are responsible for ensuring that LSOs are appointed when required and that the laser safety regulation and instructions are covered as necessary in ship, unit, station, establishment, range and training area orders. LSOs for this task are to be appointed by the Commander.

2.2.7 **Commanding Officer / Head of Establishment (CO/HoE).** CO/HoEs are responsible for the health and safety of all persons, including the general public, who might be affected as a result of any work carried out at the ship, unit, station or establishment: where this includes laser safety-specific instructions included. They should appoint personnel to assist them in the exercising of these duties. Multiple appointments are permissible provided

they do not prejudice safety (e.g. combining the duties of Laser Safety Officer (LSO) with those of Radiation Safety Officer (RSO)).

2.2.8 **LSO.** A unit LSO is to be appointed by the CO or HoE in order to co-ordinate laser safety in any ship, unit, station or establishment where lasers are in use. Where the only laser devices held within an establishment are Class 1 for accessible emissions, an LSO does not need to be appointed. The duties of an LSO are detailed in Annex A.

2.2.9 **RSO.** The uses of lasers on ranges requires the Range Safety Officer RSO to attend the laser safety course at the Defence Academy of the United Kingdom (DAUK).

2.3 Civilian organizations using lasers on MOD ranges

2.3.1 Private, academic, commercial and Go Co staff carrying out laser test, research and maintenance operations on MOD Property must comply with the requirements of DSA03.OME Part 5 and all other relevant health and safety legislation whilst on MOD Property. Such persons will be subject to the full MLST approval process. The contractor shall inform the unit or establishment LSO before commencing any laser-emission activity and be in possession of the Military Laser System Safety Assessment Certificate (MLSSAC) and any other relevant operating procedures.

2.3.2 Individual organisations or establishments involved in trials work may be permitted to self-certify laser trials at specific sites, with the DSA-DOSR acting as the laser safety auditors. To achieve this independence, the organisation concerned shall demonstrate, to the satisfaction of the LSA and DSA-DOSR, that it has a strong safety management culture and the appropriate technical skills to produce suitable and sufficient laser safety assessments. DOSR TL and LSA and the organisation or establishment concerned will produce an agreement document outlining the self-certification procedures and auditing arrangements. This does not abrogate the Commander's / HoE's responsibility under the Occupier's Liability Act (1957).

2.4 Qualifications and training

2.4.1 All Command, Unit and Establishment LSOs shall attend an approved laser safety course. The approved LSO courses are held at the DAUK Shrivenham, or alternatively, receive approved instruction as part of a career course.

2.4.2 **Laser safety course.** The two-day laser safety course, held at the DAUK Shrivenham, can accommodate up to 100 students per annum of any ranks or MOD civilian status. The courses are held 4 times per year. Applications for a course place should be submitted at least four weeks in advance through the appropriate service training officer. An LSO is required to retake this course every five years. However, those who work infrequently with lasers should retake the course every three years.

2.4.3 **Naval Laser Safety Course.** A laser safety course exists for Royal Navy personnel, particularly Weapon Engineering Officers (WEOs), and is taught at HMS Collingwood. Persons who successfully complete this course can hold the position of LSO (RN), which gives them the same duties and responsibilities as an LSO but within the naval environment only.

2.4.4 **Laser operators.** All personnel responsible for the firing of a laser are to receive appropriate laser safety training. The training is to be co-ordinated by the Service sponsoring the introduction of the equipment. The documentation for the introduction into service of any laser equipment shall include the procedures for training the user. Such procedures shall be in place before approval will be given by an LSSA.

2.4.5 More advanced training may be obtained from specialist courses; an LSSA can advise upon suitable suppliers of this training. Range procedures shall ensure that all relevant

staff have received a briefing on any laser hazard which exists and that a qualified LSO/RSO has reviewed the planned laser activity.

2.5 Laser safety certification

2.5.1 Laser operators **shall** ensure that a valid certificate (Military Laser System Safety Assessment Certificate (MLSSAC)) has been obtained and in place before a laser system can be brought into service or prior to the commencement of a laser activity.

2.5.2 Lasers falling under the classifications Class 1M, Class 2M, Class 3R, Class 3B and Class 4 according to IEC 60825-1 will require certification by an LSSA.

2.5.3 System containing laser devices that are completely enclosed such that there is no accessible emission do not require certification.

2.5.4 Instructional laser pointers shall be only Class 1 or Class 2. Pointers procured from a reputable source, and bear IEC 60825-1:2014 hazard markings are exempt from LSP and MLSSAC approval systems. If the LSO is not satisfied that any pointer is within this definition, they should withdraw it from use until the MLST has been consulted.

2.5.5 The certificate will clearly state any constraints placed upon the firing of the laser, highlight the known hazards and residual risks arising from use of the laser system and will define the Laser Hazard Zone (LHZ) of the system.

2.5.6 When laser equipment is being trialled a Military Laser Trials Safety Clearance Certificate (MLTSCC) is required. This will be provided in the form of a trials certificate. The trials certificate is only valid for a stated location, expected period of the trial, trials procedure and specified laser equipment.

2.5.7 At a minimum, a laser system shall have a laser classification and a LHZ, which will define an exclusion zone which will be used during trials and training. Where a laser system is attached to a platform, it is the responsibility of the platform PT to hold and initiate a review of the laser safety procedures, specifically (but not limited to) the associated Ocular Hazard Distance (OHD), contained in the LSP. If the LHZ is too large for the range/ Dry Training Area (DTA), advice shall be sought from an LSSA and, if appropriate, a Military Laser Range Safety Clearance Certificate (MLRSCC) may be issued.

2.5.8 Laser Certificates have a unique reference number and are copied to the following when they have reached their final edition:

- a. The project manager of the PT.
- b. The user, for use by the Laser Safety Officer, or to be incorporated in the Army Equipment Support Publication (AESP) or similar Service document.
- c. The ranges where the laser is to be used, for use by the RSO.

2.5.9 It is the responsibility of an LSO to produce a list of lasers and certificates held in his annual report to the DSTL Environmental Sciences Department. The DSTL Environmental Sciences Department currently maintains the database of laser holdings in the UK MOD.

2.5.10 The full laser safety certification process is outlined in figure 1

MLSSAC

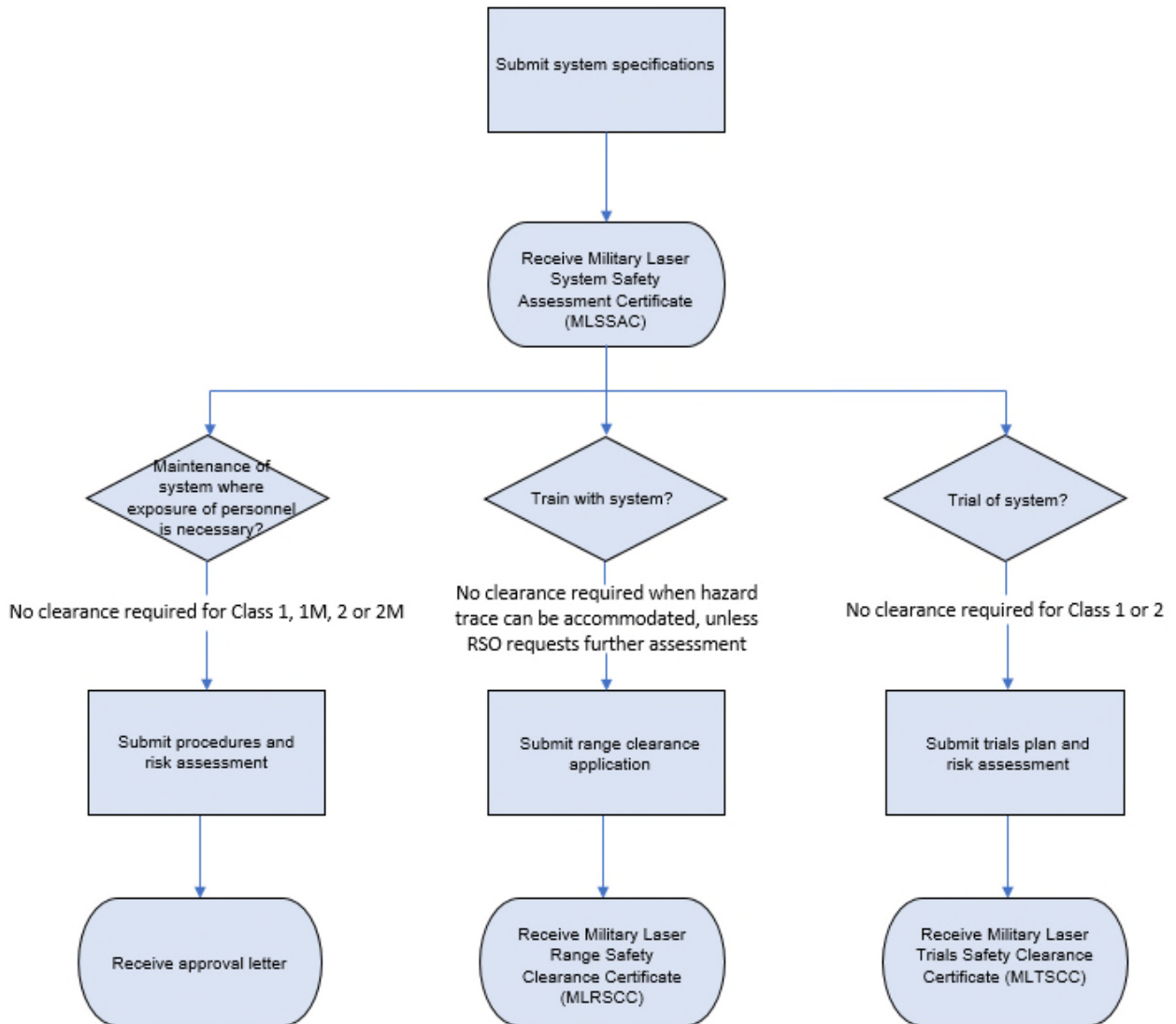


Figure 1: The Laser Safety Clearance Process

2.6 Review

2.6.1 Laser Safety Advice is reviewed:

- a. Every 3 years, but may be more frequent under special circumstances, such as devices with very high emissions or where low fidelity information is provided resulting in an overly cautious hazard distance.
- b. Due to changes to the parameters/use of the laser system.
- c. In the event of an incident or accident which may have arisen.

2.7 Accidents and incidents

2.7.1 Any incident or accident resulting from the use of lasers is to be reported in accordance with Service/Agency procedures. Each Service and MOD Agency is to pass on the details of such incidents/accidents to an LSSA as soon as practicable. The appropriate authority within the Service/Agency/MOD Centre will convene a formal inquiry into any accident resulting in damage, injury or death. Significant incidents shall be subject to a similar inquiry process. The inquiry into any accident or incident is to be conducted in accordance with the appropriate Service/MOD Agency regulations and procedures.

2.7.2 All laser ranges, workshops and establishments in which laser firing takes place have a medical evacuation plan. This should be written and agreed before laser firing operations commence. The plan for a laser incident should contain contact details for this facility and the method of transport which will be employed. In some range environments an ambulance with off-road capability or a helicopter would be required. If possible, the nearest local hospital's ophthalmology department should be consulted when the evacuation plan is being made in order to ensure that relevant staff and facilities are available.

2.8 Health monitoring and surveillance

2.8.1 Based upon the advice of the Health Protection Agency (HPA) and the Royal College of Ophthalmologists (regarding the purpose and benefit of laser eye examinations) the MOD does not mandate eye examination before commencing laser use or at termination of involvement with lasers. An eye examination will be undertaken after an accident where exposure is suspected or known to have occurred; such examinations shall be carried out by a competent person.

2.9 Procurement and disposal of lasers

2.9.1 If the MOD procures lasers from outside the European Union (EU) without using an identifiable importer and supplier, the responsibility for Conformité Européenne (CE) marking, Low Voltage Equipment classification and Laser Hazard/Classification marking are assumed by MOD. For this reason, it is not MOD practice to act as an importer or supplier of lasers.

2.9.2 When disposal of lasers is required certain precautions are to be observed:

- a. Lasers which may cause a threat to health or become a viable threat to MOD personnel shall not be re-sold. Such lasers should be destroyed by a reputable company, which is on the MOD list of registered disposal agents.
- b. There may be non-beam hazards associated with the laser, such as high voltages, noise, cryogenic systems or substances which are hazardous to health and/or the environment.
- c. The capability of MOD laser equipment is often classified; any disposal shall be conducted such that the disposal process does not permit reverse-engineering, does not compromise classified data or equipment capability.
- d. If experimental lasers which require consumables, such as lasing dyes or coolant, are to be purchased, an environmental management plan will be required. The majority of laser dyes are toxic or carcinogenic and many coolants are subject to Control Of Substances Hazardous to Health (COSHH) and environmental regulations.

2.9.3 LSSAs require that PTs disposing of lasers notify them in order that the laser's certificates can be withdrawn, and the file closed.

2.10 Probabilistic Risk Analysis (PRA)

2.10.1 In circumstances where a platform-mounted laser of Class 3B or Class 4 is assessed using deterministic risk analysis results in impractical hazard traces, a probabilistic laser safety assessment may be used. The general principle concerning probabilistic laser safety assessment provides that there will not be a greater than a 1 in 100 million probability per engagement of a laser causing ocular damage to persons outside MOD property.

2.10.2 Probabilistic safety is a commonly used technique in ballistic range safety, complex industrial processes and many areas of civilian life.

2.10.3 The MLST uses a mathematical model written specifically for the purpose and will only accept results from this model. Probabilistic modelling will incur a cost which will be passed onto the PT wishing to bring the laser into service. The MLST use probabilistic modelling only where procedures and deterministic risk analysis fail to deliver a practical solution for UK training areas.

3. Ranges, training areas, units and establishments

3.1 General

3.1.1 All laser activity on a range shall be approved by the Range Administering Unit (RAU). For the purpose of this document the term MOD Range should be understood to include Dry Training Areas (DTAs).

3.1.2 Any laser being used on a range shall have an MLSSAC issued by an LSSA. It is the duty of the RSO and the user to ensure that the details in the MLSSAC are understood and that it is extant.

3.1.3 An RSO will normally be trained as an LSO; if this is not the case, an LSO should be consulted by the RSO.

3.1.4 Laser firing can only be performed inside the range or training area boundary and from locations agreed with the RSO.

3.1.5 Lasers fall into hazard the following classifications;

- a. Class 1 and Class 2 – these lasers may be used outside of the approved areas.
- b. Class 1M and Class 2M – these lasers can be treated as Class 1 and Class 2 lasers respectively, however, they may pose a risk to observers using magnifying optics. If these lasers are used such that their Extended Ocular Hazard Distance (EOHD) does not exceed range or hazard area boundaries they may be fired from any point within the range or training area, otherwise they shall be treated as Class 3R lasers.
- c. Class 3R, Class 3B and Class 4 – can only be used under the following conditions:
 - i. On MOD ranges, Go-Co operated MOD ranges and Dry Training Areas (DTAs), provided the hazard distance template stated in the user handbook or in the MLSSAC fits within the range or training area boundary and control measures are put in place in order to ensure non-authorized personnel cannot enter the LHZ. Should the exclusion template be too large for the

range or training area, advice shall be sought from an LSSA and, if appropriate, an MLRSCC (MOD Form 2238B) may be issued.

- ii. On non-MOD ranges, after any MOD Employees involved have obtained approval from an LSSA. MOD personnel shall comply with when using lasers in the UK.
- iii. At other test or trials sites when an LSSA has been consulted and has granted written permission.

3.1.6 In the case of all trials on MOD ranges and DTAs, an MLTSCC MOD Form 2238A will be required to be issued by an LSSA before trials can commence.

3.1.7 Where magnifying optics, such as binoculars, are being used, special conditions are imposed. If there is no suitable protective filter fitted, commensurate with the laser being used, the following statements apply.

- a. No magnifying optics shall be used within the EOHD of the laser.
- b. The hazard area is now determined by the EOHD (not the OHD).

3.1.8 It should be noted that, in the case of visible lasers, outside the OHD (including for Class 1 and Class 2 devices) dazzle can still occur, and although this will not cause any permanent ocular damage, there may be safety implications due to temporary visual impairment.

3.1.9 Service personnel working or training on ranges are frequently engaged in very hazardous activities such as live weapons'-firing. The safety of individuals is normally achieved solely by the use of administrative and engineering controls (e.g. procedures and physical separation of the individual from the hazard); an example being the absolute ban on personnel from the hazard zone during firing and the physical separation of the individual from the hazard zone using signs, fences, patrols and warning flags.

3.1.10 It is not good practice solely to rely upon protective equipment to protect personnel from the effects of live firing during training activities, since faulty, damaged, incorrectly specified or employed protective equipment may fail to protect the user. Protective equipment, therefore, is not normally a primary safety methodology. Additionally, it is difficult to ensure that every person involved in the training has been issued with protective equipment, has been trained in its use, will be wearing it at the appropriate moment and has protective equipment which is pertinent to the particular hazard involved. Furthermore, there is a requirement to ensure that any Personal Protective Equipment (PPE) issued is in serviceable condition. There are considerable cost and logistical issues relating to the mass use of PPE. Many forms of PPE reduce user's situational awareness and hence can constitute a hazard in their own right.

3.1.11 All persons present, therefore, are warned of the hazards posed by lasers and protected by the implementation of procedures which should ensure no person is ever exposed to hazardous levels of laser radiation.

3.2 Targets and target areas

3.2.1 Considerable hazards may arise from reflected laser beams as a result of using targets which are specular (i.e. reflective, as in the manner of a mirror) or become so when wet. Ultimate responsibility for decisions about which targets are engaged resides with the RAU/RSO.

3.3 The hierarchy of responsibility

3.3.1 When lasers are used on a range the RAU's LSO is responsible for laying down any additional control measures pertinent to the range that shall be adhered to by laser users. The Range Conducting Officer (RCO) has a responsibility to ensure that the range's orders

are adhered to and that the laser is operated in accordance with the MLSSAC and the Range Administering Unit (RAU) procedures. The operator is also responsible for ensuring only the correct target is engaged, and that a warning is issued before laser firing commences and this warning is cancelled only after firing is complete. It is also the operator's duty to ensure laser firing is terminated if any person is seen in, or entering, the laser hazard area. If there is any accident or incident (actual or suspected) involving a laser, it is the operator's responsibility to inform the RAU immediately.

3.4 Land ranges

3.4.1 Land ranges are usually bounded by public or private property. Many ranges are bounded by Schedule 1 land which, although MOD property, is subject to use by tenants (often agricultural) and the public exercising their right to use public rights-of-way (footpaths, bridleways and off-road tracks subject to public rights of use). The prevalence of civilian activity on range boundaries and rights-of-way which cross MOD Property dictates that laser safety considers the possibility of persons viewing activity on the range using magnifying optics from these off-range positions.

3.4.2 Except where Probabilistic Risk Analysis (PRA) is employed, the policy of prohibiting laser beams exiting the range with intensities which exceed the AEL of a Class 1 laser is used, in order to ensure that persons on the range boundary cannot be subject to hazardous exposures from laser activities on the range, even when using magnifying optics. Engagements involving moving lasers require special planning to be carried out to ensure policy is adhered to; an LSSA should be consulted in these circumstances.

3.5 Air to ground ranges

3.5.1 Many airborne laser devices pose a hazard to personnel on the ground, in-flight or to the public. The aircrew shall operate in accordance with Air Command Air Weapon and Electronic Warfare Range Orders (ACAWEWROs).

3.5.2 In order to use a laser device in a scenario not explicitly permitted by the ACAWEWROs, a MOD Form 2238B (MLRSCC) shall be sought from an LSSA providing clearance for the requested scenario.

3.5.3 A MOD Form 2238B can only be issued for systems with an extant MOD Form 2237 (MLSSAC). Assessing the scenario in order to provide a MOD Form 2238B may require PRA and provision of resources.

3.5.4 Once a MOD Form 2238B has been issued, the aircrew can apply it immediately and it will be incorporated into the next edition of the ACAWEWROs.

3.5.5 An exception to the above procedure is granted when an airborne laser is used when its Extended Ocular Hazard Distance (EOHD) is smaller than the minimum height Above Ground Level (AGL) at which it can be fired. There shall be sufficient engineering or procedural controls which will limit laser firing to times when the platform is above the EOHD and at least the EOHD from another aircraft or occupied building. This also applies off-range within the UK, provided local procedures are met.

3.6 Air to air ranges

3.6.1 There are relatively few air-to-air engagements using lasers. The MLST will develop guidance as and when the need to operate such systems arises. Generally, those at risk from exposure will be aircrew and, if procedural laser safety is not possible, PPE or platform-protective equipment will be employed.

3.7 Naval laser range safety

3.7.1 The naval environment is at variance with land range laser safety, as there are no identifiable range boundaries for most ranges or training scenarios. It is also likely that the engaged target will be a ship, submarine or aircraft, which has the added problem of manned

targets. The naval environment also involves wet targets and seawater-reflected laser beams, and hence increases the probability of unpredictable specular reflections. The rules contained in BR 1043B Gunnery and Guided Weapon User Instructions apply to all Class 3R, Class 3B and Class 4 lasers.

3.7.2 The responsibility for laser safety lies with the Captain of the vessel firing its laser. The Captain may delegate other matters of laser safety to the appointed LSO.

4. Personal Protective Equipment (PPE)

- 4.1 You shall ensure that if necessary, suitable and sufficient PPE has been provided to ensure that risks to personnel from laser exposure are tolerable.
- 4.2 Any PPE issued is to be used only for the specific laser system or systems for which it was obtained.
- 4.3 PPE shall be CE marked in compliance with the Personal Protective Equipment Regulations 2002 except where exempt under HSE L25 – Personal Protective Equipment at Work. This document further states that:
 - a. PPE is provided where necessary.
 - b. It provides adequate protection for its intended use.
 - c. Those using it are adequately trained in its safe use.
 - d. It is properly maintained, and any defects are reported.
 - e. It is returned to its proper storage after use.

5. Procurement and disposal of MOD laser equipment

5.1 Procurement

5.1.1 Lasers, or associated laser safety orders, may be not introduced into service (including all trials and development) without the approval from an LSA. Each project manager (or procurement authority where there is no official project manager) should approach an LSSA at the earliest opportunity in the procurement process; in particular, to establish the level of detail in any required documentation and the level of funding which the project shall provide.

5.1.2 The LSSA cannot provide laser safety clearance without adequate notice, technical detail and financial resources. There are very few security-cleared and technically-competent laser safety experts which can be called upon – even if funding were not an issue. This makes it imperative that the project manager or procurement authorities contact an LSSA as soon as any laser procurement cycle begins.

5.1.3 Because the impact of laser safety upon training and maintenance is not usually well-understood by those procuring laser-based equipment, early involvement by an LSSA can often provide valuable advice about the suitability of such equipment for use in UK peacetime training, this may save considerable unplanned expenditure at later stages in the procurement.

5.2 Disposal of lasers

5.2.1 All military laser systems must be disposed of in a manner which assures that safety and environmental risks are broadly acceptable or ALARP and taking into account relevant local procedures and rules.

5.2.2 The user of a laser system is responsible for the safe disposal of the system.

5.2.3 PTs disposing of lasers shall notify the MLST in order that the laser's certificates can be withdrawn, and the file closed.

5.2.4 When disposal of lasers is required certain precautions are to be observed:

- a. Lasers which may cause a threat to health or become a viable threat to MoD personnel shall not be re-sold. Such lasers shall be destroyed by a reputable company, which is on the MoD list of registered disposal agents.
- b. The capability of MoD laser equipment is often classified; any disposal shall be conducted such that the disposal process does not permit reverse-engineering, does not compromise classified data or equipment capability.

5.2.5 Disposal of lasers requires compliance with the Project Oriented Safety Management Procedures (POSMS). Any sales of surplus lasers shall be directed through the DSA. The environmental impact of laser procurement and disposal is subject to the Project Orientated Environmental Management Systems (POEMS) process. Guidance on these issues can be found on the following website; www.asems.mod.uk

ANNEX A**DUTIES OF A LASER SAFETY OFFICER (LSO)**

1. The duties of a unit/establishment LSO will be laid down by the CO or head of establishment and may include the following:

General duties

- a. Providing the CO/HoE with advice on laser safety matters.
- b. The preparation and publication of laser safety standing orders and operating procedures.
- c. Ensuring that relevant laser safety standing orders and operating procedures applicable to all items of laser equipment are correctly applied when the equipment is in store, undergoing maintenance/repair or in use.
- d. Ensuring that frequent inspections of laser protective enclosures, adherence to laser equipment operating procedures, and laser protective eyewear and clothing are carried out and recorded.
- e. Ensuring that the name of the LSO and a list of authorized laser users are prominently displayed within each laser work area (not applicable to in-service laser devices).
- f. The immediate reporting and investigation of any possible/suspected overexposure to laser radiation.
- g. Ensuring that any individual suspected of having received a hazardous exposure is promptly referred to a qualified ophthalmologist.

Laser laboratories and maintenance units

2. In laboratories and maintenance units, the LSO would also have duties of:
 - a. Ensuring that, for every Class 3B and Class 4 laser, strict laser key control is observed and system safety equipment integrity for each system is maintained.
 - b. Ensuring that protective enclosures are provided for each laser product installation such that the laser beam is fully enclosed. Where this is not possible, ensuring that beam attenuators or beam stops are used and are properly maintained.
 - c. Advising on the prevention of unintentional specular reflections within the laboratory/maintenance area.
 - d. Ensuring that the approved type of protective eyewear is available in compliance with the current MLSSAC or locally produced operating procedures and is in serviceable condition.
 - e. Ensuring that suitable protective clothing is provided where it is required by laboratory or maintenance personnel.

- f. Ensuring that correct laser warning signs, as detailed in IEC 60825-1:2007, are used with every laser system.

ANNEX B

HAZARD CLASSIFICATIONS OF LASERS

1. Laser products are categorised in a hierarchy of increasing AEL, and hence hazard, from Class 1 to Class 4 under IEC 60825-1:2007. The MLST has adopted an approach to laser safety hazard assessment such that:
 - a. If a laser product (such as a laser printer or CD/DVD player) is marked as being Class 1 and is entirely enclosed, such that no laser energy can be emitted outside of the product, then an MLSSAC is not required.
 - b. Instructional pointers should ideally be Class 1 products. If this is not practicable because of ambient lighting conditions, then Class 2 laser pointers may be used, providing they are from a reputable source and have a hazard classification of Class 2 and marking compliant with IEC 60825-1:2007.c.
 - c. Any laser which does not meet the stated in points 1 and 2 above will require an MLSSAC or trials certificate.
 - d. Should there be any doubt about the requirement for an MLSSAC then advice from an LSSA shall be sought.
2. The ascending order of laser hazard classes defined under IEC 60825-1:2007 are:
 - a. Class 1 – Safe under all reasonably foreseeable conditions because the AEL is believed to always be less than that which can cause eye damage, or to contain a laser that could be hazardous but is prevented from doing so by engineering and interlocks.
 - b. Class 1M – Safe under all reasonably foreseeable conditions except when any kind of focussing or collimating optics are used.
 - c. Class 2 – Are limited in AEL to 1mW of output power in the waveband 400-700 nm and will be safe for accidental exposure due to the natural aversion response.
 - d. Class 2M – Are also limited to an AEL of 1mW and a wavelength of 400-700 nm, these lasers are safe for accidental viewing as per Class 2 lasers but are not safe if magnifying or collimating optics are used.
 - e. Class 3R – These lasers have an AEL limit of 5mW (5 times that of Class 2) and may be hazardous if viewed by the human eye.
 - f. Class 3B – These lasers have an AEL limit of 500mW and can cause eye damage from both direct and reflected beams, in addition they may cause skin burns.
 - g. Class 4 – This class of laser has no upper limit for AEL. Class 4 lasers can cause eye and skin injuries from reflected beams even if the reflector is not

particularly specular (mirror like) and may start fires or cause explosives to deflagrate or detonate.