



Defence
Safety Authority

DSA 03-OME Part 1 (JSP 520)- Defence Code of Practice (DCOP) and Guidance Notes for OME Acquisition

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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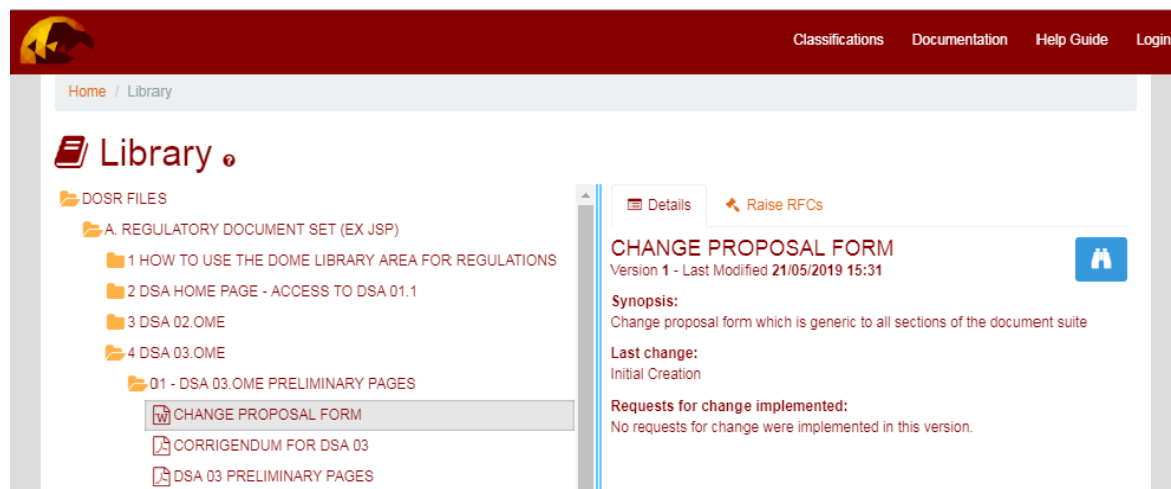


Figure 1. Change Proposal Form (Word version) Location

4. Any post and grammar change proposals can be approved or rejected by the DOSR PRG Authors without involvement of the associated Working Group.
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9. The DOSR PRG team will ensure these OME Regulations remain fit for purpose by conducting reviews through the DOSR Governance Committees, involving all Stakeholders.

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1 Overview

Overview

1. Part 1 Policy identifies the requirement to include within the Ordnance, Munition and Explosives (OME) Safety and Environmental Case Report (SECR) references to relevant clearances and certificates which support the introduction into service of OME. Guidance is provided below for:

- a. DOSR Classification of Military Explosives.
- b. Explosive qualification.
- c. Range safety measures.
- d. Laser safety certification.
- e. Insensitive Munition (IM) assessment¹.
- f. Dangerous Goods by Air Committee (DGAC) Clearance.
- g. Aircraft Weapons Air Carriage and Release
- h. Aircraft Self Damage (ASD).
- i. Thermal Effects on Airborne Conventional Armament Stores and Equipment (TEACASE).
- j. Aircraft Weapons Ballistic Committee (AWBC).
- k. Logistic Parachute Delivery Clearance, commonly known as Air Drop Code.
- l. Approval to Process.
- m. Approval to Store and Handle Explosives (ASHE).
- n. OSRP Assurance Statement²
- o. Ordnance Proof Certificate.

¹ JSP520 Part 2, Vol 11: Insensitive Munitions.

² Formally known as CSOME

2 DOSR

Classification of Military Explosives

1. The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations (2009) and The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations (amendment 2011 stipulates that, in the United Kingdom, no explosives may be conveyed, stored or supplied unless they comply with those regulations, including the requirement for classification.
2. Classifications for UK Military Explosives are awarded by the SofS for Defence. DOSR is appointed as the UK Competent Authority to fulfil this role. UK classifications for commercial explosives are awarded by the HSE.
3. The regulations are based on the classification system known as the UN International System of Classification. This system uses as its basis the UN Recommendations on the Transportation of Dangerous Goods - Model Regulations ('The Orange Book'). It should be noted that further authorisation is required if explosives are to be offered for transportation by air and sea.
4. It is important to understand that a classification is not the only requirement to permit storage or transport. Other legal and procedural requirements to enable safe storage and transport are detailed within DSA03.OME.

NOTE

The presence of an applicable DOSR classification does not infer the article / substance is safe as its safety can be compromised by many factors, including: the environment it has been subjected to, the way it has been handled and the current condition of the packaging. It must be established that any article / substance with a classification remains safe for storage or transport.

Procedure

5. The procedure requires the submission to DOSR of a completed MOD Form 1655, as detailed in DSA 03.OME PART 2. The MOD Form 1655 and a detailed set of guidance notes are available on the DOME Classification Database.
6. The classification of Military Explosives is carried out formally at Classification Panel meetings by DOSR, with advice from various technical experts as required.
7. The output from the classification process is the assigning of a Hazard Classification Code (HCC) which identifies the likely hazard from the OME in an unplanned event. A Competent Authority Document (CAD) is produced and an entry is made in the DOME Classification Database.

Review

8. The HCC of a particular type of military explosive must be reviewed when a modification has been affected which is recognised as significant by the DOSR. This usually results from:
- a. A new explosive substance, or a mixture of explosive substances, which is different from other mixtures and compositions that are already classified.
 - b. A new design of article or article containing increased explosives content, a new explosive substance, or mixture of explosive substances.
 - c. A new design of package or other change in packaging for an explosives article or substance. A minor change in the inner or outer packaging can be critical and may convert a single article risk into a mass explosion risk.
 - d. Revised configurations and changes to safety and arming arrangements.
 - b. When a Temporary classification (time limited) needs extending.

Requirement For Information From Sponsors

9. Sponsors (usually MOD Project Teams) of Classifications are to note that for:
- a. Temporary Classification. DOSR must be notified when the explosive is formally approved, or the project is cancelled, so that the Classification can be made permanent or cancelled.
 - b. Permanent / "N" Classification. DOSR must be informed by the Sponsor / PT when a classified explosive is withdrawn from Service so that consideration may be given to cancelling or annotating the entry in the DOME Classification Database.
 - c. DOSR must be notified for all classifications where changes have been made to the energetics and / or packaging.

Procedure For The Export To Or Transit Through USA Of Military Explosives

10. The movement of UK owned Military Explosives of UN Class 1 into or through the USA is subject to authorisations known as EX Numbers or DOT Numbers, if any part of the transit involves US commercial carriers by road, rail, sea or air.
11. The only exception to the above is where the Military Explosives are transited direct from a UK Military base directly to a US Military base by UK or US Military personnel.
12. Commercial conveyance of UK Military Explosives must comply with the applicable US provisions contained in 49 Code of Federal Regulations (49 CFR) Subchapter C of the US Hazardous Materials Regulations (HMR) and International transport standards. The US Department of Transport's Pipeline and Hazardous Materials Safety Administration (DOT / PHMSA) regulates all commercial conveyance of any amount of Hazardous Class 1 (HC 1).
13. The information required by PHMSA is broadly similar to that required by DOSR when a PT applies for an DOST Military Explosives classification. PTs must ensure

they are authorised to disclose any technical information to a third party before doing so.

14. The procedure is further detailed in DSA 03.OME Part 2.

3 Explosive Qualification

Introduction

1. The purpose of carrying out the qualification of energetic materials and associated assessments is to determine that the munition will remain safe and suitable for service when exposed to the service environment throughout the service life. Qualification reduces the technical risk in the choice of an explosive for a particular application, although it does not include any tests of the explosive specific to that application. Explosive specific tests will be covered by the trials on components, sub-systems and systems. Additional associated technical assessments on the energetic and associated materials ensure that other departmental and Government directives and legislation are addressed.

Policy

2. The policy for the Qualification of energetic materials is described in:
 - a. STANAG 4170 Principles and Methodology for the Qualification of Explosive Materials for Military Use.
 - b. AOP7 Manual of Data Requirements and Tests for the Qualification of Explosives Materials for Military Use.
 - c. DefStan 07-85 Design Requirements for Weapons and Associated Systems.
3. Explosives are qualified in accordance with STANAG 4170 by making an assessment to determine whether they are safe and suitable for consideration for use in a particular role. The assessment, promulgated as a technical report, includes the characterization of the explosive in terms of its physical and chemical properties, its sensitiveness to thermal, electrical and mechanical stimuli, and its explosiveness. The tests required for the production of an Explosives Hazard Data Sheet (EHDS) in accordance with Def-Con 68³ will normally be included, together with any small-scale or large-scale tests appropriate to the intended role.
4. In an ideal case, an explosive will have been qualified before it is selected for a particular munition. Where this is not the case qualification should, wherever practicable, be completed before the start of the system trials so that any potential problems may be addressed therein. In some instances, particularly where weapons are bought off-the-shelf or from abroad, it will not be possible to qualify the explosives before the store is brought into use. In this event, systems trials will need to be augmented in extent and in numbers tested in order to provide the necessary assurance of safety.
5. Whether the energetic material has been qualified or not, Type Qualification for a specific munition will still be required.

³ DefCon 68 Supply Of Data For Hazardous Articles, Materials And Substances.

Relevant Standards

6. Standards relevant to the qualification of energetic materials and associated technical assessment are as follows:
 - a. AOP7 Manual of Data Requirements and Tests for the Qualification of Explosives Materials for Military Use.
 - b. STANAG 4170 Principles and Methodology for the Qualification of Explosive Materials for Military Use.
 - c. DefStan 07-85 Design Requirements for Weapons and Associated Systems.
 - d. STANAG 4147 Chemical Compatibility of Ammunition Components With Explosives (Non-Nuclear Applications).
 - e. STANAG 4518 Safe Disposal of Munitions, Design Principles and Requirements, and Safety Assessment.
 - f. Energetic Materials Testing Assessment Policy Manual of Tests (EMTAP).

Procedure - Methodology

7. Nations subscribing to NATO AC / 326 Sub-Group A (Energetic Materials) have adopted the methodology described in STANAG 4170. The STANAG describes the mandatory data that is required to demonstrate compliance. It should be noted that additional national requirements over and above those specified in this STANAG may be required. This additional data will be required to establish that safety or life-limiting failure modes, often associated with mechanical properties and ageing, which may make the explosive material unsuitable for UK service, are identified and quantified.
8. The following mandatory data shall be identified:
 - a. The explosive composition and its intended role.
 - b. The characteristics of the explosive material which are relevant to its intended role and any specific application that is envisaged.
 - b. The characteristics of the explosive material in its powdered state, as-used condition and after possible degradation due to ageing and the service environment.
 - c. The effect of thermal ageing, particularly on the safety and performance characteristics of explosive materials. Characteristics of particular interest include thermal, mechanical, and electrostatic discharge sensitiveness, rheological and physical properties.
 - d. For thermal sensitiveness the ignition temperature and effects of confinement, charge size and heating rate should be known.
 - e. In the case of mechanical sensitiveness, the sensitiveness to shock, friction, impact, or to a non-penetrating object, such as a crush or drop, or the effect of confinement and charge size on explosiveness should be known.
 - f. For electrostatic discharge, the materials sensitiveness to static electricity should be assessed.

- g. Knowledge of the variation of rheological and physical properties with temperature and age of the material.
- h. The toxicity and disposal data on the explosive material, its components, and its reaction products, in-so-far-as possible.
9. The UK National Authority, DES Wpns-DOSG-ST1, shall identify the minimum data requirements which are needed to fulfil the conditions specified below and the test programme necessary. This shall include, but not be limited to, the mandatory tests (for the intended role) given in STANAG 4170⁴. *"The assessment for qualification should be completed before the decision is made to use the material in a munition. However, it is emphasised that the qualification of a new explosive material on the basis of the provisions of this STANAG does not imply Final (or Type) Qualification for a specific munition. Final (or Type) Qualification has to be considered as a part of the assessment of Safety and Suitability for Service of this munition, according to STANAG 4297⁵ and AOP15⁶. Final (or Type) Qualification is not subject to this agreement, but additional information on this topic is supplied in AOP7⁷".*
10. Additional tests may also be further referenced in AOP7. Procedures and equipment detailed in appropriate STANAGs shall be used to conduct the test methods. AOP7 contains additional guidance on procedures where STANAGs for explosive material properties are not available.
11. After completion of the test programme the qualification report shall be produced by the National Authority, or an organisation approved by a National Authority, identifying the explosive composition, developer / manufacturer, the organisation that conducted the tests, test results, intended role and Qualifying National Authority. The report shall include comparison of the test data with that of known explosive material that has proven satisfactory use in the same role.
12. If the composition characteristics are considered acceptable, the National Authority shall pronounce qualification of the explosive material as safe and suitable for military use in a given role. The National Authority should record information collected in support of advice for safety and suitability for service. In-service problems experienced by explosive materials should be analysed and, where appropriate, qualification of the material should be reconsidered. A formal qualification certificate (an example is shown in Annex A accompanied by a Divisional Note giving further information, shall be issued by the UK National Authority DES Wpns-DOSG-ST1.
13. Details of procurement problems associated with the qualification of energetic materials are detailed within Annex B.

⁴ STANAG 4170 Principles and Methodology for the Qualification of Explosive Materials for Military Use.

⁵ STANAG 4297 Guidance on the Assessment of the Safety and Suitability for Service of Non-Nuclear Munitions for NATO Armed Forces.

⁶ AOP15 Guidance On The Assessment Of The Safety And Suitability For Service Of Non-Nuclear Munitions For NATO Armed Forces.

⁷ AOP7 Manual of Data Requirements and Tests for the Qualification of Explosives Materials for Military Use.

14. Where an individual explosive material proposed for UK service application has been previously qualified by another National Authority in accordance with STANAG 4170, the test data used to support the original qualification should be presented to DES Wpns-DOSG ST1 at the earliest opportunity. Where this data is suitable and sufficient to meet the requirements of DES Wpns-DOSG ST1 with respect to the proposed UK application, it will be possible to eliminate, or at least minimise, the extent of testing required to obtain UK qualification.

15. Where development or procurement of a munition is being carried out jointly by two or more nations subscribing to STANAG 4170⁸, a joint approach to energetic material qualification is favoured. Early agreement between the respective National Authorities to share test data should prevent duplication of testing and minimise costs.

Procedure - Qualification Of In-Service Material

16. Providing there has been no change to the specification, explosive material already in service for which there is a history of satisfactory application may be considered qualified by the National Authority for use in the same role (e.g. main charge filling, booster, primary, rocket motor propellant, gun propellant, pyrotechnic, etc.), without further testing. The National Authority will define the need for any restrictions of the role and for any further testing in specific cases.

⁸ STANAG 4170 Principles and Methodology for the Qualification of Explosive Materials for Military Use.

4 Range Safety Measures

Introduction

1. For an OME system, which will be used in training as well as an operational environment, the hazards arising from the event and the impact on the area / zone within which these hazards exist should be taken into account. Similarly, the hazards arising from live firing test, evaluation, research and trial activities associated with the introduction of an OME system should be considered.
2. Where the MOD is the range authority, a duty of care exists for the safety of both authorised and unauthorised persons who may be on or in the vicinity of live firing training and trials activities. Measures for the safe use of the OME system on a range are therefore an important part of the Safety and Environmental Case.
3. When a weapon system, munition or explosive store is used on a range, persons and materiel within the Total Energy Area / Zone (TEA / Z) associated with that weapon system, munition or explosive are exposed to risk of injury or damage. The hazard will not be uniform throughout the TEA / Z and will be managed by training the user and by the application of a 'safe system'; it will usually be at a maximum at a point of burst or impact, or along the line of fire and will decrease sharply with distance from this point or line. The Weapon Danger Area / Zone (WDA / Z) is that part of the TEA / Z into which specified weapons or their fragments may travel, impact or function given normal firing conditions and becomes, effectively, an 'exclusion area' unless suitable protection is provided.

Policy

4. Defence Ranges Safety Committee(DRSC) Procedures policy is presented within JSP403⁹. On request, range safety advice is provided by DES Wpns DOSG-WS1r to the Project Team (PT) throughout the Acquisition Cycle. In the early stages of the cycle where only limited OME system information may be available interim advice can usually be offered based on related data and experience. Prior to the In-Service phase of the cycle advice will state clearly any constraints placed on the firing of the OME for range safety purposes, will summarise the known hazards arising on ranges from use of the OME and will define one or more WDA / Z applicable to the system.
5. As a minimum, an OME system shall have a WDA / Z which will ensure its safe use in trials before it enters service and in training thereafter.
6. Where an OME system is part of, or mounted on a platform it is the responsibility of the platform PT to retain and initiate review of the range safety measures, and specifically the WDA / Z, contained in the Safety and Environmental Case (see JSP454¹⁰, JSP430¹¹ and MRP¹²).

⁹ JSP403 Handbook of Defence Land Ranges Safety.

¹⁰ JSP454 Land Systems Safety and Environmental Protection.

¹¹ JSP430 Management of Ship Safety and Environmental Protection.

¹² MAA 01 Military Aviation Authority Regulatory Policy.

Data Requirements

7. In order that a complete package of range safety advice can be provided prior to the OME system entering service the following data needs to be provided by, or through, the PT to the relevant DOSG OME Safety Adviser:
- a. Ballistic / free flight information, including error budget statements.
 - b. Arena trials fragment data.
 - c. Ricochet trials data, if appropriate.
 - d. Any other data necessary for modelling the in-flight and terminal effects.

Relevant Standards

8. The following standards are applied in the derivation of range safety advice:
- a. STANAG 2401 Weapon Danger Areas / Zones For Unguided Weapons For Use By NATO Forces In A Ground Role; Factors And Processes - ARSP-1 Vol I and Vol II.
 - b. STANAG 2402 Danger Area for Land Launched Unmanned aerial Vehicles for use by NATO Forces Operating in a Ground Environment on Military Ranges.
 - c. STANAG 2921 Weapon Danger Zones for Land Launched Guided Missiles for use by NATO Forces Operating in a Ground Environment
 - d. STANAG 3606 Laser Safety Evaluation for Outdoor Military Environments.
 - e. JSP403 Handbook of Defence Land Ranges Safety.
 - f. DSA 03. Part 1 Safety and Environmental Management of Ordnance, Munitions and Explosive over the Equipment Acquisition Cycle.
 - g. DefStan 00-55 Requirements for Safety Related Software in Defence.
Note: This standard although obsolescent is retained as a reference source for safety critical software.
 - h. AOP15 Guidance On The Assessment Of The Safety And Suitability For Service Of Non-Nuclear Munitions For NATO Armed Forces.
 - i. AOP52 Guidance on Software Safety Design and Assessment of Munition-Related Computing Systems.
 - j. Ordnance Board Pillar Proceeding P125(1), Small Arms Range Safety Hazard Levels and Principles for Determining Small Arms Weapon and Range Danger Areas.

Procedures And Responsibilities

9. At any stage of the acquisition cycle DOSG may be tasked for range safety advice through the DOSG OME Safety Adviser allocated to the PT. The detail of advice provided will depend on data availability and the maturity of the OME system.
10. Once data collection and calculations are complete, DOSG advice is prepared and then subjected to internal review. On completion of the review, controlled copies are issued to the tasking authority (the PT) and other interested parties. The data and review evidence is retained on the DOSG OME system file.
11. The DOSG advice forms the basis for range safety measures included in the Safety and Environmental Case and promulgated to the User by the PT. It will be normal practice for the PT to submit proposed range safety measures for approval to the appropriate equipment sponsor before sending to the Service / Agency focal point for range safety (where one exists) for endorsement. After this approval / endorsement process the PT will add the agreed range safety measures to the equipment / platform Safety and Environmental Case and issue a written authorisation for use of the WDA / Z details to the equipment sponsor.
12. The OME SECR should demonstrate that, where applicable, range safety advice has been obtained, range safety measures have been stipulated and that the relevant WDA / Z has been created.

Review

13. A requirement to produce an OME SECR should automatically generate a review by the PT of any range safety measures already contained in the Safety and Environmental Case.

5 Laser Safety Certification

Introduction

1. The MOD has a duty of care to ensure the safety of unprotected persons who may be in the vicinity of the laser firing. Therefore all laser systems shall have a Military Laser System Safety Assessment Certificate (MLSSAC) before they can be used in training and / or service. The MLSSAC will also be required to meet OME Safety Review Panel (OSRP) approval if the OME system contains a laser.
2. When a laser system is used, persons within the hazard area (known as the Laser Hazard Zone (LHZ) or the Nominal Ocular Hazard Distance (NOHD)) are exposed to the risk of eye and skin damage. The LHZ is considered to be an exclusion area which should be kept clear of unprotected persons. The hazard can be managed by training the user, operating procedures and Personal Protection Equipment (PPE). There is also an Extended NOHD (ENOHD) which needs to be considered when magnifying optics could be used.

Policy

3. Military Laser Safety policy is detailed within JSP390¹³. Laser safety advice is provided by DOSG to the PT throughout the acquisition process. The PT shall produce a Laser Safety Paper (LSP) for the system prior to the in-service phase, this paper is then reviewed by the Laser System Safety Advisor (LSSA) and a MLSSAC is issued. The certificate will state clearly any constraints placed on the firing of the laser, highlight the known hazards arising from use of the laser system and will define the systems LHZ. Depending on the size of the LHZ a Military Laser Range Safety Clearance Certificate (MLRSCC) or a Military Laser Trial Safety Clearance Certificate (MLTSCC) will be required for trials and training at specific locations.
4. As a minimum, a laser system must have a classification and a LHZ shall be defined which will ensure any exclusion zone is used in trials and in training.
5. 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 measures, and specifically the associated LHZ contained in the LSP, reference JSP454¹⁴, JSP430¹⁵ and MRP¹⁶. The PT shall also consider the safety implications of training and maintaining laser systems.
6. The following Laser Devices are exempt from the certification requirements detailed in JSP390:
 - a. Presentation pointer.
 - b. Surveying equipment, laser alignment tool, or other DIY tool.
 - c. Sports and leisure equipment.

¹³ JSP390 Military laser Safety.

¹⁴ JSP454 Land Systems Safety and Environmental Protection.

¹⁵ JSP430 Management of Ship Safety and Environmental Protection.

¹⁶ MAA 01 Military Aviation Authority Regulatory Policy.

- d. CD / DVD / Blu-ray reader / writer.
 - e. Laser printer.
 - f. Networking devices (optical switches / relays etc.).
 - g. Rangefinder / pointer.
7. Exempt devices must meet ALL of the following criteria:
- a. Be either of Class 1 or Class 2 (not including Class 1M or Class 2M) as defined by STANAG 4401¹⁷.
 - b. Be labelled in accordance with STANAG 4401.
 - c. Be CE marked.
 - d. Must in no way have been modified after purchase.
 - e. Must be legally available for purchase by the UK public.
8. These devices must only be used in accordance with their Manufacturer's Operating and Safety Instructions and care must be taken to avoid unnecessary exposure to personnel or the public.
9. Operators of such equipment must be made aware that certain devices may contain more than one laser, not all of which may meet the criteria for an exempt device.

Laser Safety Paper Requirements

10. In order that a complete MLSSAC can be issued by the Defence LASER Safety Committee (DLSC) the following information needs to be provided by, or through, the PT:
- a. Equipment details.
 - b. System safety features.
 - c. Hazard evaluation.
 - d. Operational tactics.
 - e. Laser Operation.
 - f. Range safety features.
 - g. Test and maintenance features.
 - b. Other requirements (e.g. laser eye protection).

¹⁷ STANAG 4401 Protection against Fixed-Wavelength Battlefield Lasers.

Relevant Standards

11. The following standards are applied in the derivation of laser safety advice:
 - a. BS EN 60825-1:2007 Safety of laser Products Part 1: Equipment classification, requirements.
 - b. JSP390 Military laser Safety.
 - c. JSP392 Radiation Safety Handbook.
 - d. JSP403 Handbook of Defence Land Ranges Safety.
 - e. STANAG 2900 Laser Radiation - Medical Surveillance and Evaluation of Over-Exposure.
 - f. STANAG 3606 Laser Safety Evaluation for Outdoor Military Environments.
 - g. STANAG 3828 Minimum Requirements for Aircrew Protection Against the Hazards of Laser Target Designators.
 - h. STANAG 3830 Aircrew Nuclear Flash Blindness Protection.
 - i. STANAG 4401 Protection against Fixed-Wavelength Battlefield Lasers.
 - j. STANAG 4451 Protection against fixed wavelength (Battlefield) Dazzling Lasers.

Procedures

12. During the acquisition process the DLSC may be tasked to produce a MLSSAC for a PT.
13. Once the LSP has been reviewed and the hazard calculations are complete, the DLSC advice is prepared and then subjected to internal review. On completion of the review, copies of the MLSSAC are issued to the PT and in certain cases the User. The LSP and review evidence is stored on the DOSG system file.
14. The MLSSAC forms the basis for the laser safety measures included in the Safety and Environmental Case and is promulgated to User by the PT. The SECR should demonstrate that, where applicable, a MLSSAC has been obtained, and that appropriate operating procedures are in place to allow safe use of the laser equipment.

Review

15. Laser Safety Advice is reviewed:
 - a. Every 3 years.
 - b. When changes to the parameters / use of the laser system are made.
 - c. In the event of an incident which may have arisen as a result of the advice given.

Responsibilities

16. The MLSC LSSA is responsible for providing advice about the safe use of lasers, by reviewing the LSP, assessing laser safety models and Issuing appropriate documentation including advice letters or MLSSACs.

6 Dangerous Goods by Air Carriage Clearance

1. All explosives that are to be transported by Service air need the additional clearance of the Dangerous Goods By Air Committee (DGAC). Stores that have been fully approved for air transport (Y), approved for transport on fixed wing aircraft only (A), approved for transport on rotary wing aircraft only (B) or approved subject to certain restrictions (R) by the DGAC are noted on the Joint Service Munitions Control Register (JSMCR). Details regarding obtaining DGAC clearance can be found in Joint Service Munitions Control Register (JSMCR)¹⁸. It must be noted that DOSR are not responsible for determining the DGAC code.
2. All UN Class 1 items, which have an identified requirement to be transported by RAF Air Transport (AT) must be assessed and adhere to the Dangerous Goods by Air Regulations, DGM¹⁹.
3. It is the responsibility of the PTL to ensure the Safety and Environmental Case addresses the air transportation environment and to specify suitable control measures. This shall include application for DGAC clearance.

7 Aircraft Weapons Air Carriage and Release Safety Advice

Introduction

1. Aircraft weapons release and air carriage Safety Advice is primarily provided by the DOSG OME Safety Advisers who can assess and advise on the S3 of Air Launched OME.
2. In addition, the Aircraft Weapon Advisory Committees (AWAC) provides information to enable the safe conduct of operations involving air-launched weapons, and for armament stores carried on fixed-wing and rotary-wing aircraft. Primarily as a legacy from when Director Air Armament was the procuring authority for Air Launched OME, the chairmanship of the Committees remains within DE&S and, following the demise of Directorate Air Armament in April 1999, resides in DOSG. The chairman of the three AWA Committees is DOSG-WS who controls, manages and co-ordinates the activities conducted by those committees.

Policy

3. Military Airworthiness Authority Regulatory Procedures, draws attention to DSA.03, DOSG and the AWAC in providing information to enable the safe conduct of operations involving the release of air weapons.
4. The following standards are applied in the derivation of advice promulgated in the outputs of DOSG:
 - a. MRP Military Airworthiness Authority Regulatory Procedures.
 - b. JSP375 MOD Health & Safety Handbook.
 - b. JSP390 Military Laser Safety.
 - c. JSP418 MOD Corporate Environmental Protection Manual.
 - d. JSP403 Handbook of Defence Land Ranges Safety.
 - e. JSP430 Management of Ship Safety and Environmental Protection.
 - f. DSA03.OME Part 1- Directive Safety and Environmental Management of Ordnance, Munitions and Explosive over the Equipment Acquisition Cycle.
 - g. Def-Stan 00-35 Environmental Handbook for Defence Material.
 - h. Def-Stan 00-56 Safety Management Requirements for Defence Systems.
 - i. Def-Stan 07-85 Design Requirements for Weapons and Associated Systems.
 - j. STANAG 4439 Policy for Introduction and Assessment of Insensitive Munitions.
 - k. AOP15 Guidance on the Assessment of the Safety & Suitability of Munitions for NATO Armed Forces service of Non-Nuclear Systems.

Role Of DOSG

5. The role of the DOSG Weapon Systems Division is to provide advice to PTs and the User as summarised below:

- a. **Safe & Suitable for Service.** The S3 of Air Launched OME is assessed by DOSG based upon the results of tests or trials established to determine the safe operation and safe operating life of the store through the Manufacture to Target or Disposal Sequence (MTDS) in accordance with DSA 03.OME Part 1²⁰. These activities are complementary to the role of the Platform PT and are additional to the Manufacturers Certificate of Design (CofD) in that they assess the suitability of OME energetic components to withstand the air environment. The maximum design, carriage and release envelope may differ from that assessed by DOSG due to the limitations imposed by the platform and shall be assessed independently for each platform to be used. Formal advice from the OSRP Assurance statement (plus any other source(s) considered relevant) is provided to inform the Air Launched Weapons Release Certificate (ALWRC) of the clearances, restrictions and limitations associated with the OME system as required²¹.
- b. **OME Safety and Environmental Management System.** The OME Safety Advisers are able to provide advice on the OME Safety and Environmental Management System (SEMS) where it applies to the production of a Safety and Environmental Case for Air Launched OME. This advice is to support Weapons Integration activities for new, Commercially-Off-The-Shelf (COTS) and in-service systems. DOSG OME Safety Advisers are nominated to support PTs in the production of their Safety and Environmental Case and SECRs submitted to the OSRP.
- c. **Aircraft Self Damage (ASD).** An assessment of the risk of damage to the aircraft during release (near field) phase and consequent limiting release parameters shall be included in the overall release assessment of the safety of aircraft bombs or dispenser systems. The ASD from Aircraft Weapons Committee (ASDAWC) conducts the risk determination using an approved modelling suite. ASD assessments are approved by the ASDAWC and published in aircraft specific ASD manuals. For further advice, including the methodology for conducting such assessments refer to DOSG-WS3a.
- d. **Thermal Effects on Airborne Conventional Armament Stores and Equipment (TEACASE).** The TEACASE committee considers the thermal effects of flight and the on-aircraft carriage environment on weapons. The committee provides advice on carriage limitations of weapons and explosive release equipment to be included in an aircraft Release To Service (RTS) through the ALWRC.
- e. **Aircraft Weapons Ballistics.** The Aircraft Weapons Ballistic Committee (AWBC) provides advisory information for the production of ballistics tables and algorithms for aircraft weapon aiming. In addition, Hazard Impact Area Traces (HIAT) are developed from the ballistic data and issued to HQ AIR Command A3 who authorises Range Safety Officers to use the traces on air-to ground ranges.

²⁰ DSA03.OME Chapter 9: Safety and Environmental Case Development.

²¹ MAA 01 Military Aviation Authority Regulatory Policy. Annex S

- f. **Hazards of Electromagnetic Radiation to Ordnance (HERO).** Although not a purely air related subject, a HERO assessment is to be made for every OME that may be fitted to every air platform. This assessment can be conducted by a number of agencies but shall be included in the OME Safety and Environmental Case. DOSG can advise on suitable tests and provide analysis and advice in support of SECR submissions to the OSRP.
 - g. **Electro-Magnetic Compatibility (EMC).** The EMC tests will be carried out to levels relevant to the platform and operational scenario defined for the system in the MTDS. For further advice contact DES Wpns.
6. DOSG-WS can support activities in order to:
- a. Maintain the databases that support PT development and performance trials and early project clearances.
 - b. Undertake the analyses leading to recommendations and clearances for users throughout the life of a weapons platform.
 - c. To establish and define assessment methods.
 - d. Provision of subject matter experts supporting committees and PTs.
 - e. Provide advice in support of SECRs for submission to the OSRP.
 - f. Provide advice in support of Aircraft Weapons Integration.
 - g. Issue the following reference documentation:
 - 1) TEACASE Working Notes for each aircraft type, leading to RTS limitations.
 - 2) Manual of Aircraft / Weapons Ballistic Models.
 - 3) Aircraft Ballistic Tables.
 - 4) Electronic Manual of Hazard Impact Area Traces (eHIATs) for use on RAF air to surface ranges.
 - 5) Aircraft Self-Damage Manuals for each fixed-wing armed aircraft as well as RSAF manuals underwritten by UK MOD under the terms of the UK / Saudi Memorandum of Understanding.

Emergency Clearances

7. The continuing change in UK's weapons employment caused by changing operational activity produces requests to DOSG for amendments to clearances in the carriage and operational use of In-service weapons. The procedures are as follows:
- a. Clearance on Limited Evidence and Operational Emergency Clearances (OEC) Procedures. For the Air Environment the ever changing role of the UK armed forces demand that on occasion aircraft equipment and material may require clearance at short notice and where the operating risk is greater than that normally acceptable. MRP RA1330²² caters for Special Clearances. This still requires a formal clearance process. An Operational Emergency Clearance (OEC) shall be raised when the risk to life associated with its usage is considered too high for normal day-to-day operations. The PTL must subject

²² RA1330 Special Clearances.

the suggested OEC to a safety analysis and update the existing Safety Case²³ as appropriate. Subject to further trials a CLE-based OEC may be later developed to a full RTS standard. (Note an OEC can be a fully developed RTS clearance or exist at the CLE level; a CLE can never be a fully developed RTS clearance). A Clearance with Limited Evidence (CLE) shall be raised when insufficient evidence is available to support the normal standards required for an RTS clearance. A CLE can become a fully authorized RTS clearance only with the provision of suitable additional evidence.

b. For AWAC consideration User, normally HQ AIR or the Air Warfare Centre, defines the requirement or confirms a change of tactics:

- 1) The Requirement is passed to the OME PT who sets priority in consultation with Director Joint Capabilities (DJtCap).
- 2) The requirement should then be forwarded to DOSG-WS3 who ensures the requirement specification detail is adequately defined. DOSG-WS3a, following consultation with the contractor, approves contract amendment for the work and deliverable.
- 3) The deliverable, will be considered, approved and recommended by the relevant committee for use and incorporated into the relevant manual as an amendment.

8. HIAT requirements are made through HQ AIR Command SO2 Ranges to DOSG-WS3a. Following approval and recommendation of the HIAT by the AWBC that are authorised for use on Air Weapon ranges by HQ AIR SO2 Ranges under his 2 Star delegation.

9. Outputs which have used mathematical models or data not validated by trials will be prefixed 'provisional' until a full data set is available to confirm the output.

Responsibilities

10. DOSG is not responsible for assessing or limiting risk for development or release for clearance trials and will not subsume any of the responsibilities of the platform PTL or platform safety committee.

²³ MAA RA1220 Project Team Airworthiness and Safety.

8 Logistic Parachute Delivery Clearance

1. Logistic Parachute Delivery is to be taken as parachute delivery of munitions using low velocity parachute delivery methods and is identified for clearance by the allocation of an appropriate Air Drop Code.
2. The process to apply in assessing and applying an appropriate Air Drop Code can be found in JSP762²⁴.
3. The Joint Services Munitions Control Register (JSMCR) is the means of promulgating information on whether ammunition natures are cleared for air drop and if so what constraints apply.
4. It is to be noted that Authority for air drop does not imply authority for DGAC.

²⁴ JSP762 Weapons and Munitions Through Life Capability.

9 Approval to Process

1. The requirements of DSA03.OME Part 2²⁵ require Safe Systems of Work (SSOW) to be established for all munitions processing activities. With Defence Munitions, the application of the SSOW is achieved through the application of Munitions Engineering Control Procedure²⁶ (MECP). MECP 020 applies to munitions (general and complex munitions) that are complete or in sub assembly form that contains stored energy. DM Processing Approvals include:
 2. **Approval to Process (ATP).** An ATP is required before any DM site can process a munition, either complete or in sub assembly form that contains stored energy. The ATP is the DM Head of Establishment (HoE) SSOW, certified by Defence Munitions Team Leader (DM-TL), supported by a Safety Submission that all risks associated with the processing or disposal activity have been reduced to either Broadly Acceptable or tolerable and ALARP.
 3. **Contractors Processing Approval (CPA).** There are occasions when commercial companies or other MOD authorities are required to carry out work on munitions in DM Sites or whilst the munitions are in DM custody. For processing where DM staff are involved then an ATP is required. For those where DM staff are not involved in work on the munitions, the commercial company (or other MOD Authority) are required to conduct such work within the constraints of a CPA. The CPA is the DM HoE SSOW, certified by DM-TL, supported by a Method Statement and Safety Submission, that all risks associated with the processing or disposal activity have been reduced to either Broadly Acceptable or tolerable and ALARP.
 4. **Munitions Engineering Processing Clearance Certificate (MEPCC).** A MEPCC is to be raised for processing assemblies that do not contain stored energy, but once processed will be integrated into a munition that does contain such stored energy.
 5. **Non Intrusive Processing Approval (NIPA).** A NIPA is raised where DM sites have Customer Service Agreements which require DM staff to visit customer sites for the purposes of undertaking non-intrusive work on munitions to certify them safe to move by road to DM establishments consisting of:
 - a. Safety Inspection.
 - b. Stock recording / confirmation.
 - c. Unpacking and re-packing routines.
 - d. Ensuring safety for handling and transportation prior to return to establishment.
 6. **Personnel Safety Certificate (PSC).** A PSC is required for munitions processing activities, either complete or in sub assembly form that contains stored energy, undertaken by DM staff at sites not under the HoE's control, e.g. AUTEK,

²⁵ JSP862 MOD Maritime Explosives Regulations.(chapter 19)

²⁶ Defence Munitions MECP 020 – Munitions Engineering Processing Management System (MEPRMS).

BUTEC. The PSC is the DM HoE SSOW, certified by DM-TL, supported by a Safety Submission, that all risks associated with the processing or disposal activity have been reduced to either Broadly Acceptable or Tolerable and ALARP.

10 Approval to Store and Handle Explosives (ASHE)

1. With certain exceptions granted by IE Defence Equipment and Support (DE&S), service and commercial explosives stores to be handled and stored by Defence Munitions (DM) are subject to, a prior to acceptance for storage and handling formal approval procedure, known as ASHE (Approval to Store and Handle Explosives). ASHE approval is also required for explosives stores passing through DM sites for other destinations e.g. to be embarked on HM Ships, Royal Fleet Auxiliaries (RFA) or commercial ships. ASHE also includes the Replenishment in Harbour of HM Ships, Submarines and RFAs. The acceptance of munitions into a DM site is conditional on ASHE clearance being in place prior to its receipt. Further details on ASHE requirements can be found in DSA03.OME Part 2²⁷

²⁷ DSA03.OME Part 2(Chapter 13, Annex A)

Annex A: Format for an Explosive Qualification Certificate

EXPLOSIVE QUALIFICATION CERTIFICATE	
Explosive Name :	
Spécification Number:	
Manufacturer:	
Composition Details (With percentages):	
Is it one of the following:	
a Completely New Composition (yes or no)	
b Modified Composition: (yes or no) (Name of reference composition)	
c In Service Composition: (yes or no)	
Country of Origin :	
National Authority :	
Qualified Role :	
Restrictions on use :	
Test Results / Assessment References :	

Annex B: Procurement Problems Associated with the Qualification of Energetic Materials

Introduction

1. All Energetic Material (EM) that is intended for Military Service use shall be Type Qualified and may also be Qualified in accordance with STANAG 4170²⁸. This also satisfies the MOD's legal obligations under the UK Health & Safety at Work etc. Act and its daughter directives. Further information on the requirements for the Qualification of EM for use in military weapons can be found in Def-Stan 07-85²⁹.
2. DOSG-ST should be invited to assess the effect on safety of any EM before procurement action is taken. The early involvement of DOSG-ST will be critical to the safe introduction into service of new or significantly modified munitions.
3. The advice that DOSG-ST gives on the safety of an explosive composition relates to a defined specification from a particular manufacturer and manufacturing site. When there is a change in manufacture it cannot be assumed that the original advice is still valid. The Project Team Leader (PTL) responsible for the EM within a munition which is subject to a change in manufacture should be aware that this may affect its safety.
4. Procurement policy is now more likely to see open competition for repeat production of EM. Changes in manufacture are likely to occur with increased frequency. DOSG-ST's advice only applies to a particular specification; any significant change may render that advice invalid.
5. The attention of PT staff and Contracts staff should be drawn to the implications for safety that may arise from any changes in the assessed specification, manufacturer, ingredients or basic design of a munition during conduct of the competitive tendering process.

Background

6. There are three broad categories under which EM might be procured:
 - a. Manufacture of EM to the original specification by the design authority or manufacturer.
 - b. Manufacture of EM to the original specification by an alternative supplier.
 - c. Manufacture of EM to a different or changed specification.
7. DOSG-ST advice about safety which follows the principles of NATO document AOP15³⁰ applies specifically to a particular specification of EM supplied by a particular manufacturer.

²⁸ STANAG 4170 Principles and Methodology for the Qualification of Explosive Materials for Military Use.

²⁹ DefStan 07-85 Design Requirements for Weapons and Associated Systems.

³⁰ AOP15 Guidance On The Assessment Of The Safety And Suitability For Service Of Non-Nuclear Munitions For NATO Armed Forces.

8. A manufacturer when tendering for production of an EM should be required to provide evidence that they can satisfactorily produce that material to the original specification and maintain it throughout production. This requirement can apply to the original manufacturer when re-starting production after the line has been closed for 6 months or longer. Experience has shown however that second source manufacture is fraught with special problems of which the following are typical:

- a. **Manufacturing Environment.** Differences in manufacturing capability result in differing tolerances in manufacturing processes and make it difficult for one manufacturer to produce an identical product to another from the same specification. Often local "know how", not well documented, plays an important part in manufacturing processes thus exacerbating the difficulties experienced by the subsequent manufacturer. Hence the product of the second (or subsequent) manufacturer may exhibit different properties.
- b. **Intellectual Property Rights (IPR).** Design Authorities / Original Manufacturers usually reserve their IPR so a competitor may experience difficulty in producing an identical product because certain "in house" techniques used by the original manufacturer are not disclosed to competitors.
- c. **Overseas Production.** Changes in design / raw material / manufacturing processes in UK manufacture can still cause problems. Such problems are multiplied for overseas procurement where differences in national philosophy controlling specifications and manufacturing data usually means that prime and subcontractor production is less easily monitored and the product difficult to replicate.

Factors In Competitive Tendering

9. The following are some of the factors which DOSG-ST consider have to be taken into account where procurement of EM or munitions containing EM by competitive tender is proposed:

10. PTLs should be acutely aware of the need for new or differently manufactured EM to meet the safety criteria to the specification. Differences may invalidate DOSG-ST's advice.

11. Any further request for tender should include a comprehensive specification of the required energetic material including manufacturing processes for explosive components and any MOD possible requirement for a trial.

- a. Prime contractors should be reminded of their responsibility for ensuring that sub-contracted materials meet the specification requirements.
- b. Any change proposals submitted to the PT for the procurement of EM should be referred to DOSG-ST for reassessment.
- c. Significant changes to manufacturing processes identified by MOD at the prime or sub-contractor level should lead to further DOSG-ST involvement for an assessment to be made of their effect on the safety of the material.

- d. EM procured from overseas sources shall be the subject of approved safety assessment in accordance with STANAG 4170³¹ and the necessary data provided for review by DOSG-ST.
- e. The cost of DOSG-ST assessment and testing in terms of time, money and other resources should be included in the comparison of alternative production sources.

Changes

12. It is the PTL's responsibility to ensure that changes which might invalidate earlier DOSG-ST advice are identified and when necessary DOSG-ST are invited to review their advice so that the need for any further testing can be assessed. There should be a re-qualification test programme put into place if there is a change of manufacturer.

13. The timing for test programmes is the responsibility of PTLs but ought to be completed satisfactorily before a full production contract is let. DOSG-ST would be available to assist PTLs in the formulation of any necessary tests.

Resource Allocation

14. In the case of competitive procurement of EM it would be expensive and time consuming to test all options and DOSG-ST may not have the resources to complete the individual assessments. The amount of DOSG-ST work required for the assessment will depend upon the history of development of the energetic material, design safety assessment, manufacturers' trials evidence and the reputation of the manufacturer and whether or not it has already met qualification or type qualification in the UK or NATO countries.

15. DOSG-ST recognises a number of problems associated with competition philosophy, the lessening of national skill resources and the extent to which competition could be introduced. Already the difficulties that Defence Science and Technology Laboratory (DSTL) faces in providing the DOSG-ST with direct technical support has led to a wider use of appropriate technical resources from commercial sources.

16. If the UK is to maintain the current NATO agreed levels of assurance of the safety and suitability for service of munitions, qualification will be required; this may involve additional support staffs internal and external to MOD. The resource factor is critical to the assessment of products from competing manufacturers.

³¹ STANAG 4170 Principles and Methodology for the Qualification of Explosive Materials for Military Use.

Change In Manufacture

17. DOSG-ST consider a change in manufacture has occurred when one or more of the following apply:

- a. A change in the drawings or specifications or manufacturing process.
- b. A change in the source or type of raw materials.
- c. A change in the manufacturer or manufacturing site.
- d. A break in production which has led to a loss of manufacturing "know-how".

18. It is appreciated that all changes to specifications and manufacturing processes are recorded and should be assessed and approved by the MOD QA authority and / or technical authority, prior to implementation. However, there will be occasions when DOSG-ST advice should also be sought.

19. When a change in manufacture is first proposed the PTL should discuss the problem with DOSG-ST. Small changes in technique, (e.g. alteration in filling method), can have a major effect on the safety of explosives and explosive filled stores.

Principles

20. In reaching a decision on whether their original advice on safety needs to be amended DOSG will be guided by the following principles:

- a. The EM subject to a change in manufacture should remain safe.
- b. The EM should continue to have an acceptable service life.
- c. The EM subject to a change in manufacture may not be to the same standard as the original.

Procedure

21. DOSG-ST will determine and assess the following:

- a. The complexity of the formulation and the degree of difficulty of manufacturing it to specification.
- b. The completeness of the specification, including critical processes.
- c. The extent and adequacy of the manufacturer's tests and assessments.
- d. The requirement for trials to demonstrate that the material meets the specification.
- e. The importance to overall safety of the material subject to a change in manufacture.
- f. The experience of the new manufacturer / site personnel compared to the manufacturer / site personnel of the original material.

- g. The extent to which the new manufacturer uses the same sources of raw material, equipment and processes as the original manufacturer, and the same personnel.
- h. The extent to which personnel involved in the original manufacture make available their expertise to the new site.
- i. The consequences of any new raw materials, processes or revised tolerances being introduced.
- j. The duration of the interruption and the probable loss of staff and know-how in the interim if interruption of production is involved.

Funding

22. DOSG-ST assume that any trials required will be funded by the project or manufacturer.

Advice

23. DOSG-ST advice should be sought early in the procurement cycle to ensure that costs of any trials required are included in the contract.