



## Explosives & Search Competence

Developing skills in the explosives munitions and search sector

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### Introduction

The Standards Setting Body for Explosives, Munitions and Search Occupations (SSB for EMSO) was formed in 2000 in order to develop National Occupational Standards<sup>1</sup> and National/Scottish Vocational Qualifications (N/SVQs) for those involved in munition clearance (ie bomb disposal) and search activities. These standards were launched in October 2003.

In the autumn of 2003, The Defence Ordnance Safety Board (DOSG) of the Ministry of Defence (MoD) approached the SSB and asked for help in defining the competences known at the time in the MoD as Ordnance, Munitions and Explosives (OME) but which later became known as Explosive Substances and Articles (ESA). Since the MoD ideally wished its personnel to gain national accreditation for achievement of the resulting standards, the project was therefore widened to include all organizations that employed people who needed expertise in dealing with explosives.

It became clear early in the project that many organizations in different sub-sectors of the industry wished to participate in this project and invitations to collaborate were issued both at the beginning of the project and continuously, throughout its lifetime.

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<sup>1</sup> Referred to here simply as "standards"

### ***Project objectives***

The project began late in the autumn of 2003, was finally completed in December 2005 and was launched at an event on 16 May 2006. The project sought to achieve the following:

- provide recognized competence standards for the benefit of the UK workforce and MoD civilian and military personnel;
- ensure that professional training and development is available, and wherever possible, provides individuals with recognized qualifications;
- provide a functional competence framework for the UK MoD OME community;
- set appropriate standards of performance for all levels of competence.

In addition, the project sought to:

- develop supplementary guidance on the nature of acceptable evidence;
- engage as many representatives of the industry as possible through the development process.

### **Standards Setting Body for Explosives, Munitions and Search Occupations (SSB for EMSO)**

The SSB for EMSO was the vehicle for and custodian of this development work and as Project Director, the Chairman of the SSB, Major CND Capel played an instrumental part in securing the continuing participation of key organizations and representation at meetings.

The role of the SSB is to establish and maintain standards that reflect current industry practice across the four home countries and meet UKCG<sup>2</sup> criteria in its area of responsibility and to seek to identify skills gaps and other EMSO workforce development issues and report these to government via the Science Engineering & Manufacturing Technologies Alliance (SEMTA) Sector Skills Council (SSC).

The ESA development work was carried out by the ESA Occupational Working Group (OWG) facilitated by Denise Clarke Ltd. This group comprised senior representatives of those organizations involved in ESA activities. Its composition

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<sup>2</sup> The UK Coordinating Group (UKCG) for the National Occupational Standards Board (NOSB) is the government body responsible for the development and maintenance of NOS across all industries and provides the funding that supports SEMTA's standards development work.

therefore varied according to the functional area under development and key participants were: the MoD, Army, Royal Navy, Royal Air Force, Dstl, QinetiQ and AWE.

Throughout the life of the project, a number of organizations participated including:

AWE plc	MBDA UK Ltd
Awards UK Ltd	Ministry of Defence
BAE Systems	Nobel Enterprises
BECTU	OSCEng
Black Cat Fireworks Ltd	Proskills SSC
British Army	PW Defence
British Pyrotechnists Association	QinetiQ plc
Chemring Group plc	Ridgeway International Ltd
Chemring Countermeasures	Cranfield University at the Defence Academy of the United Kingdom
COGENT SSC	Royal Air Force
Controlled Demolition Group Ltd	Royal Navy
Defence Manufacturers' Association	Skillset SSC
Defence Science Technology Laboratory	Skills for Logistics SSC
Halliburtons Manufacturing & Services Ltd	Skyburst the Firework Co
Health and Safety Executive	SOE Academy Ltd
Institute of Explosive Engineers	UK Coal plc
Kimbolton Fireworks Ltd	Wallop Defence Systems Ltd
Leaffield Engineering Ltd	Worshipful Company of Gun Makers

The support provided by participating organizations in this project included:

- a significant time investment in attending meetings, reading documents and completing questionnaires;
- consulting colleagues and participating in the validation phase;
- the provision of meeting facilities (accommodation, equipment and refreshments);

- significant amounts of photocopying;
- substantial cash donations from the DOSG MoD, Royal Engineers, QinetiQ, Dstl and the AWE.

Some UK government funding was also obtained although this represented a small proportion of the costs.

## The SSB's outputs

A summary of the key steps in the development process to achieve the SSB's outputs is set out in the table below.

	Output	Development method
1	Occupational map	A descriptive report of the industry, its size and composition; skills and training issues; roles employed; numbers employed and other notable related issues (carried out by desk research, telephone and face-to-face interviews and surveys)
2	Functional map	Initially, two two-day workshops took place to carry out the preliminary scoping work to identify the main areas of activity (the "key roles"), followed by further workshops specific to each key role
3	Standards development	A series of 3-day workshops for twelve of the thirteen key roles identified <sup>3</sup> . In several cases, further workshops needed to be convened in order to complete the development of the draft standards
4	Editing meetings	A series of one-day editing meetings to review and refine the functional map and draft standards

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<sup>3</sup> key role 12 *Munition Clearance and Search* was developed prior to the ESA project although since it has been updated, it now forms key role 12 of the ESA suite.

5	Validation	Once the third draft standards were completed (ie following the editing meetings), a wider group of consultees (352 people from 16 sites) were consulted on their views of the standards, proposed qualifications and possible evidence. This began with a plenary briefing and was followed by individual visits to each validation site and ended with a final plenary.
6	Qualifications designs	A series of one-day meetings to define the critical and desirable competences for each of 24 roles defined in eleven of the twelve technical (ie explosives-specific) key roles <sup>4</sup> . A further 7 munition clearance and search qualifications have also been updated and are now included in this suite, resulting in 31 qualifications designs at levels 1 – 4 (ie basic support, operator, supervisor/technician and operational manager
7	Evidence specifications	A series of two-day workshops to define the acceptable evidence that might attest to a candidate's competence. Acceptable evidence was defined for each of the ESA-specific standards (c.250) and further work was completed to define that evidence that would be common to all candidates irrespective of their functional expertise
8	Glossary	Two workshops were convened to agree on specific definitions of words that would apply to all standards
9	Key skills maps	This was carried out as a desk exercise
10	Launch event May 06	This event for 150 guests, held at the Old Royal Naval College, Greenwich

The scale of this work was so substantial that – unusually – two workshops were needed (item 2 in the table above) to scope the work for later development in smaller, more specific stages. Once the main key roles had been identified, more detailed functional mapping took place in the subsequent 3-day standards development workshops (item 3).

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<sup>4</sup> ibid but note also that the standards contained in key role 13 *Generic functions* were used only to combine with explosives-specific standards in other key roles to form qualifications

The 3-day workshops (item 3) were the primary focus for developing the draft standards for each of the 13 separate key roles. Each workshop began by reviewing the suitability and fitness for purpose of existing standards that were already accredited in the national framework. In some cases (eg Laboratory Technicians), whole suites of existing standards were felt to be entirely fit for purpose without change. These standards were therefore recognized in the functional map purely as a signposting exercise. In other cases, new standards needed to be written either by adapting existing standards that were partially fit for purpose, or by writing them ab initio. Including the updated munition clearance and search standards, around 250 explosives-specific standards were written.

Some key roles required more than one workshop before they were ready for editing (item 4). These one-day workshops reviewed and edited the standards to ensure that they were as accurate, succinct and easy to understand as possible.

The purpose of the validation exercise (item 5) was to ensure the robustness and fitness for purpose of the standards by testing them with people who had not been involved in the development process.

The qualifications design workshops (item 6) needed to design qualifications that would be achievable by everyone in the industry irrespective of their employer. In addition, it was necessary to provide for a degree of flexibility and choice so that candidates would be able to recognize any particular requirements in their job role eg management or supervision of others. It was also necessary to design qualifications that were challenging and credible. This was a particular concern when considering progression issues from lower to higher level qualifications. As an accreditation requirement, the qualifications structures included generic standards so that candidates could prove their breadth of competence as well as the depth of their technical expertise. Key role 13 *Generic functions* provided a pool of commonly occurring generic functions from which certain standards were selected and combined with technical functions to form the qualifications.

When the standards and qualifications designs were complete, evidence specifications were developed (item 7) to explain to candidates and assessors what kind of evidence would be acceptable as attesting to the candidate's competence. Example evidence specifications have been included in this report, but readers are asked to note that – unlike the standards and qualifications designs, the copyright of these documents rests with the SSB.

The definitions of words had been developed on a comparatively ad hoc basis key role by key role throughout the lifespan of the project. When all the development work was complete, two two-day workshops were convened (item 8) in order to agree definitions that would have the same meaning across all key roles.

A further accreditation requirement was that each standard should be mapped to relevant Key Skills (item 9). This was completed by desk work following the completion of the development work. Each newly developed standard has been mapped to the 6 English key skills of *Communication, Application of Number, IT, Working with others, Improving Own Learning and Problem Solving* and their Scottish counterparts.

An event (item 10) was held on 16 May 2006 at the Old Royal Naval College, Greenwich to announce the launch of the standards.

## National Occupational Standards

The standards describe what people need to be able to do to carry out their job well. If someone is “competent”, it means that they are able to carry out their work tasks to a prescribed standard. In other words, they achieve the expected results. Competence is usually a mixture of three things: skills, knowledge and approach. For example, *7.9 Supervise the selection, preparation and despatch of explosive substances and articles* which involves:

- skills (eg calculating the requirements accurately, ensuring that the workflow is managed efficiently)
- knowledge (eg characteristics of the explosive substance or article, what to do in the event of problems arising, the availability of staff and resources needed to complete the task, applicable health and safety requirements etc)
- attitude (eg conducting the procedure in a manner consistent with organizational values and goals, protecting life and property, observing health and safety requirements, ensuring tools and equipment are well-maintained).

If competence is defined as the ability to do something “well”, the word “well” suggests that a certain standard has been reached. This is something that can usually be observed directly by an assessor, but other relevant forms of evidence may also be assessed. Taking the above example, the requirements for the competent supervision of the selection, preparation and despatch of explosive substances and/or articles are clearly specified in unit 7.9 of the Explosive Substances and Articles (ESA) National

Occupational Standards (NOS). Using this standard, someone assessing this competence should have no difficulty in recognizing the competence in this function or task. The assessor would observe that the following had been done efficiently and effectively in accordance with both the standard and organizational procedures:

- work was conducted safely at all times, complying with health and safety, environmental and other relevant regulations, legislation and guidelines
- the correct items were selected, prepared and despatched in accordance with the order
- shortfalls in the order were reported to the right person
- sufficient manpower and equipment were available to enable the goods to be selected and despatched on time
- any requirements for pre-issue inspection, fractioning, re-work and repackaging were determined accurately
- pre-issue activity was completed to meet pipeline times
- appropriate action was taken in accordance with organizational procedures where explosive substances and/or articles are reported to be in a suspect or damaged state
- all documentation was fully and accurately completed
- the order was correctly packaged and labelled to comply with relevant legislation
- any problems were resolved within the agreed level of authority.

The “contexts” describe the critical parameters of competent performance, which may include internal and external factors, options or situations. Personnel cannot be deemed to be competent unless they can meet the relevant performance criteria in all the situations described in the “contexts”. Furthermore, proof of all critical knowledge and understanding is essential to meet performance requirements against National Occupational Standards.

See the following page for a sample ESA National Occupational Standard.

## ***A sample standard***

### **7.9 Supervise the selection, preparation and despatch of explosive substances and/or articles**

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#### **Contexts**

- 1 Orders: single; mixed
- 2 Consignments: single; multiple
- 3 Fulfilment of orders: in part; in full
- 4 Resources: full; limited

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#### **Criteria**

You need to:

- a work safely at all times, complying with health and safety, environmental and other relevant regulations, legislation and guidelines
- b ensure that the correct items are selected, prepared and despatched in accordance with the order
- c report any shortfalls in the order to the right person
- d ensure that sufficient manpower and equipment are available to enable the goods to be selected and despatched on time
- e determine accurately any requirements for pre-issue inspection, fractioning, re-work and repackaging
- f ensure that any pre-issue activity is completed to meet pipeline times
- g ensure that appropriate action is taken in accordance with organizational procedures where explosive substances and/or articles are reported to be in a suspect or damaged state
- h ensure that all documentation is fully and accurately completed
- i ensure that the order is correctly packaged and labelled to comply with relevant legislation
- j resolve any problems within your level of authority

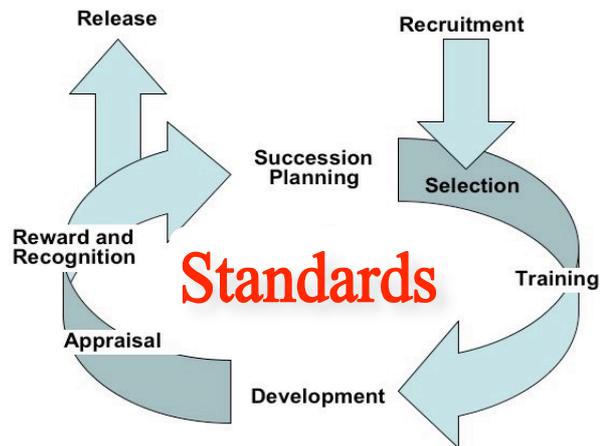
#### **Knowledge**

You need to know and understand:

- i health, safety and environmental and other statutory legislation, regulations and safe working practices and procedures governing explosives and their implications for your area of work
- ii the relevance of PPE
- iii the nature, characteristics, hazards and risks of the explosive substance and/or article
- iv the actions to be taken in response to an unplanned event
- v how to identify alternative sources of supply to accommodate any potential shortfalls
- vi the importance of fulfilling orders accurately and on time
- vii how long it takes to assemble orders
- viii how to identify if pre-issue activity is required
- ix how to progress pre-issue activity
- x the procedure to follow if an order cannot be fulfilled or discrepancies exist
- xi the rules governing mixing hazard divisions and compatibility groups
- xii the staff and resource requirements for the task and the information they need to perform effectively
- xiii how to implement contingency plans
- xiv how to give and receive constructive feedback
- xv your level of authority and to whom to refer for advice or decisions

## **Uses of standards**

Whilst most people usually focus on the use of National Occupational Standards for qualifications purposes (they are the building blocks of UK vocational competence-based qualifications), there are in fact many possible uses of standards in a range of HR processes as described by the diagram below.



By describing what an organization expects of its staff, standards can be used for many different purposes such as:

- recruitment and selection - eg job adverts, interview aide memoires, job descriptions, role profiles
- appraisal – standards amplify an organization’s expectations; appraisals can be more objective & evidence-based
- training needs analysis – through self-assessment, development discussions, 360° feedback, Personal Development Plans, audits of team strengths & development needs
- training syllabus design – based on the requirements of the standards
- career management – eg career maps, career planning tools
- succession planning – systematic approaches to talent management based on an organization’s analysis of development needs

... and many more specific applications within each part of the HR cycle.

## Qualifications designs

The SSB has developed 31 Explosive Substances and Articles qualifications and latterly, a further 4 qualifications (listed at the bottom of the table below). These are:

### ***Research, Design and Development***

Research into Explosive Substances and/or Articles	Level 4
Design and/or Development of Explosive Substances and/or Articles	Level 4
Research, Design and Development of Explosive Substances and/or Articles	Level 3

### ***Safety Management***

Explosives Safety Management and/or Advice and/or Regulation	Level 4
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### ***Test & Evaluation***

Test and Evaluation Management of Explosive Substances and/or Articles	Level 4
Test and Evaluation Supervision of Explosive Substances and/or Articles	Level 3
Test and Evaluation Operations of Explosive Substances and/or Articles	Level 2

### ***Manufacture***

Explosive Substances and Articles Manufacturing Management	Level 4
Explosive Substances and Articles Manufacturing Supervision	Level 3
Explosive Substances and Articles Manufacturing Operations	Level 2

### ***Maintenance***

Explosives Maintenance Management	Level 4
Explosives Maintenance Supervision	Level 3
Explosives Maintenance Operations	Level 2

### ***Procurement***

Explosive Substances and/or Articles Procurement Management	Level 4
Explosive Substances and Articles Procurement	Level 3

### ***Storage***

Explosives Storage Management	Level 4
Explosives Storage Supervision	Level 3
Explosives Storage Operations	Level 2

### ***Transport***

Explosives Transport Supervision	Level 3
Explosives Road Transport Operations	Level 2

### ***Disposal***

Explosive Substances and/or Articles Disposal Management	Level 4
Explosive Substances and/or Articles Disposal Supervision/Operations	Level 3
Explosive Substances and/or Articles Disposal Operations	Level 2

### ***Munition Clearance & Search***

Planning and management of munition clearance operations	Level 4
Planning and management of specified targets search operations	Level 4
Supervisory management of munition clearance and/or specified targets operations	Level 3
Search for and disposal of munitions	Level 3
Search for munitions and/or specified targets	Level 3
Contribute to the search and/or disposal function	Level 2
Provide support for search or munition clearance operations	Level 1

### ***Hybrid***

General Explosives Operations	Level 2
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### ***Defence Range Safety***

L4 Diploma in Defence Range Safety	Level 4
L3 Diploma in Defence Range Safety	Level 3
L3 Certificate in Defence Range Safety	Level 3

### ***HAZMAT***

Level 2 Award in the Movement of Explosives	Level 2
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## **Defence Science & Technology Laboratory (Dstl): a case study**

### ***Achievements to date***

Dstl is an agency of the MoD and is concerned with research, development, test and evaluation of explosives. Dstl has been quick to recognize the value of the ESA standards to assist with its succession plans and has been working to pilot the implementation of the ESA standards in one of its departments.

The first step was to develop an Explosives Capability Strategy. This strategy sets out Dstl's expectations and entitlements for explosives workers from the most junior level up to the Group Leader. It describes linkages with academic and practical training and the career development that explosives workers might expect in order to achieve their career ambitions whilst simultaneously providing Dstl with a systematic succession planning process.

Following the appointment of a specialist co-ordinator, work has now progressed apace and a number of activities have been completed.

Role profiles now exist for all personnel in the pilot Group and have been published on Dstl's Intranet. The role profiles describe each role's purpose and agreed authority levels; the required explosives competences and are mapped to the ESA standards; they include references to Dstl's own behavioural competences and they reference the training relevant to each role and relevant

available qualifications. The role profiles are currently being embedded into the appraisal process.

Dstl's role profile for a Trials Officer is recognized by the MoD and QinetiQ as effectively the same as their own organizations. Thus, the creation of the role profiles will assist with the definition of a common language and a commonly agreed description of functional competence. In doing so, it can ultimately help with the mobility of labour through the recognition of skills and competences across the industry.

A small scale pilot was carried out to test the feasibility of implementing the ESA standards. Pilot participants:

- assessed themselves against the standards;
- agreed their performance and development needs with their managers;
- developed an explosives Personal Development Plan to address a limited number of development needs;
- carried out developmental activities in support of meeting those identified needs;
- gathered evidence of their competence and created a portfolio.

Internally delivered and externally commissioned explosives training has now been mapped to the ESA standards.

An analysis of current competence and competence gaps has been carried out for each named role holder and a training plan has been drawn up for the forthcoming year, listing the numbers and names of individuals each requiring specific explosives training and development.

### ***Future plans***

Dstl plans to roll out the use of the ESA standards to other teams that use explosives and everyone will:

- have an explosives role profile;
- be assessed against the ESA standards listed in their role profile;
- need to create an explosives Personal Development Plan;
- need to create a portfolio of evidence showing how they have reached the required standards of competence

- be able to use that evidence to gain an explosives qualification.

Dstl also plans to rationalize the explosives practices and terminology that diverge slightly between different sites and views the ESA standards as a useful tool to help achieve these objectives.

Training over the coming years will be prioritized and targeted more effectively by analysing training requirements against the role profiles and against individual role occupants and compiled to provide a Dstl-wide explosives training plan. This systematic approach is building a sound foundation for Dstl's future career management and succession planning arrangements.

## **E&SC future plans**

The ESA standards were accredited over 2 years ago. However, no national awarding body expressed an interest in awarding these “niche” qualifications (by UK standards, the modest numbers of expected qualifications uptake presented a very small market which was not considered to be of commercial interest). So, Explosives & Search Competence (E&SC) – a company set up to generate the funds necessary to carry out development work on behalf of the SSB – is working to establish itself as an industry-recognized awarding body. Ultimately, E&SC aspires to become an accredited national awarding body, recognized by the UK government to deliver the 31 qualifications designed by the ESA project and a 4 additional qualifications that have been developed since.

There is a further complication in that the UK National Qualifications Framework (NQF) is changing and will be replaced by 2010 with a completely new system – the Qualifications and Credit Framework (QCF). The SSB will therefore need to convert all the existing ESA standards into QCF-compliant units and create new qualifications structures that conform with the new rules. Ultimately, the SSB hopes to offer international qualifications that will be compliant with the new UK system. The SSB's continuing aspiration is to help the industry not just maintain its current skills and competence levels, but to develop and enhance these. The SSB will therefore continue to develop standards, units, tools and measures for systematic and continuous professional development to help ensure that the UK explosives industry grows the next generation of competent personnel at a time when the existing pool of explosives competence is diminishing.

## Useful contacts

Denise Clarke Ltd	<a href="http://www.deniseclarke.co.uk">www.deniseclarke.co.uk</a>
Dstl	<a href="http://www.dstl.gov.uk">www.dstl.gov.uk</a>
E&SC	<a href="http://www.eandsc.co.uk">www.eandsc.co.uk</a> (site under construction)
QCA	<a href="http://www.qca.org.uk">www.qca.org.uk</a>
SSB for EMSO	<a href="http://www.ssbforemso.org.uk">www.ssbforemso.org.uk</a>
UK NOS Directory	<a href="http://www.ukstandards.org">www.ukstandards.org</a>