Explosives Engineering

Professional Affiliate of the Engineering Council UK

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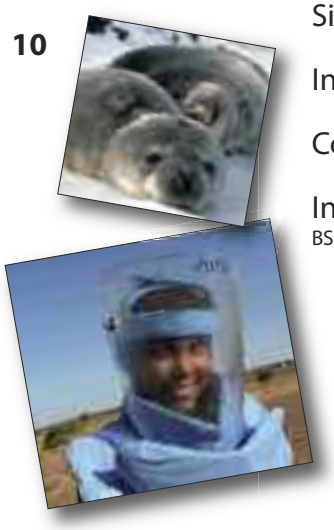

Regulars

Front cover: Operating ice-sounding radar in an Antarctic blizzard (D.G. Vaughan, BAS). See page 10.

The Institute of Explosives Engineers

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Professional Affiliate of ECUK

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The President speaks

The June Council meeting was very productive in focusing on issues of the Sector Skills Strategy Group(SSSG) and the new DOES office contract, the office IT and website , student membership and our strategy. By the time you read this, I hope that the Contract will have been approved by the SSSG who intend to take some increased levels of responsibility for their undertaking, the IT and website functional requirement will have been issued to contractors to submit their proposals. The changes to Student membership mean that training providers who are Company Members can enrol Student members for a year at a discount price of £10 per member.

In addition, a web page for the SSSG and the early Careers Focus Group has been added to our existing website to maximise the benefits generated by both these groups.

Recently I have had great pleasure in awarding the Institute Prize to Sam Lewis on his graduation from the Camborne School of Mines and had an opportunity to talk to several other graduates about the benefits of professional registration through the Institute. We are fortunate to have the Camborne School of mines and other such undergraduate facilities that can produce such well trained graduates who now have an opportunity to practice their chosen discipline all over the world.

I have also been to Liverpool docks to see Ramora, one of our Company Members, remove some redundant lock gates using a new form of cutting charge. Thank you to Dave Welch for organising my visit. Both these events reminded me that the Institute is a broad church of professionals from across all explosives disciplines from civil to military and every so often we should remind ourselves of that fact and that all our welcome. It was interesting to note in the news that three cooling towers at Didcot, the home of 11 Regiment (EOD), were demolished by explosives recently (see page 31).

Other members of Council have been equally busy, by attending the Hillhead exhibition where Alan Morley, Ian McKay and Nigel Taylor were very successful in promoting the Institute and networking with other professional bodies, companies and individuals.

Ken Cross has been to various conferences concerned with providing Government funding to support training and apprentices. At our next Council meeting to be held in Nottingham at the head offices of the Institute of Quarrying and the Mineral Products Qualification Council (MPQC), I intend to shorten the Council meeting and hold an "Open meeting" with invited parties, to address the issue of the Institute's route to membership and how that meets the requirements of the National Occupational Standards. It is my intention that this gathering of views and solutions will deliver a robust set of arrangements that is clear to all parties. It will also provide an opportunity to develop a common understanding between the Institute and the Explosives Engineers Educational and Research Trust in meeting our individual and separate strategic aims.

As I am writing this is July, I hope you all had a good summer holiday.

John Wolstenholme
CEng FIStrutE MICE MIExpE

Above: The President with Dave Welch of RAMORA on site at location of removing existing dock gates in Liverpool docks using cutting charges.

Left: The President at Camborne School of Mines presenting Sam Lewis with the Institute prize for Best Explosives study.

Calling all Student Members

Were you aware that you are entitled to an Institute ID card for the duration of your membership. The cards cost £10 and are valid for the year of your membership. If you are interested please contact the Secretariat and a have recent head and shoulders photograph available.

Emails are as follows:-

President@iexpe.org	- John Wolstenholme
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Finance.director@iexpe.org	- Ian McKay
Registrar@iexpe.org	- Ken Cross
Site.ed@iexpe.org - Web	- Dan Perkins

Institute web site

Have you looked at the web site recently and seen that much more is being placed there. When visiting the web site, if you spot something that is out of date please let the Site Editor, Dan Perkins, know.

Website: http://iexpe.org

The Sector Skills Strategy Group

The Sector Skills Strategy Group (SSSG) developed from a study known as the Tisley Report. That study investigated the skill base demographics of the explosives sector and clearly showed the work force was getting older, that there was a reduced skills investment resulting in fewer future suitably qualified people being attracted to, or retained in, the sector. At the same time there were increasing demands for greater safety and a need to demonstrate the competence of staff working in the explosives sector to the regulatory bodies.

Tisley recognised that there was a need for a common approach across the explosives sector and he recommended the establishment of an "Entity" to

- act as a focal point for the explosives, substances and articles (ESA) community
- act as a lobbying organisation for the community
- maintain a register of ESA experts
- facilitate secondments, collaborations and information flow
- organise conferences, workshops and similar events

The Sector Skills Strategy Group, a subscription-based sector representative organisation, took this forward, accepting the recommendation that the IExpE was ideally suited to represent the ESA community and champion the introduction of Standards. IExpE, assisted and funded by SSSG members, recruited a Project Manager for the Development Office for Explosives Skills (PM DOES).

The primary PM tasks were:

- Secretariat to the Sector Skills Strategy Group
- Manage the explosives sector's plan for rebuilding and sustaining explosives skills.
- Sponsor the Standards Setting Body and manage the upkeep of its outputs.

Since its inception the SSSG has established a series of Expert Working Groups covering:

- Explosives Disposal Processes Working Group (EDPWG)
- Manufacturing, Processing and Configuration Control (MPCC EWG)
- Storage
- Explosive Safety Management (ESM EWG)
- Test, Trials and Evaluation – Ranges or Laboratories (T&T EWG)

The SSSG meets four times a year normally on the same day as the Standards Setting Body, so that there is cross-fertilisation. The SSSG also has a section on the Institute web site where the work of the group will be posted and future editions of the journal will report on the work of the sub groups.

Alan Morley MSc BSc MIExpE

Registrations

Professional Registration statistics as at 21st July 2014

	CEng	IEng	Eng Tech
Qualified	21	4	3
In progress	6	1	0

Congratulations to Richard Battrick CEng, who passed his Professional Registration Interview (PRI) at Buntingford on 2nd July 2014.

Richard Battrick has been the Director of Explosive Ordnance and Disposal (EOD) for Maritime Asset Security and Training Ltd (MAST) in Malta for four years after a long career in the Royal Navy. He has 25 years of British operational, military and commercial project management experience, including advanced EOD, diving and underwater EOD qualifications, which has resulted in him supporting various initiatives to help affect industry change for the management of UXO in the near shore and offshore environments.

Professionalisation of Explosives Engineering within the MOD

There has been a surge of interest, leading to a number of application packs being sent out, from the MOD DE&S staff at Abbey Wood in Bristol. This is due to the efforts of Lt Col Chris Child and a change in policy and attitude within the Weapons Operating Centre, requiring more people in technical posts to have professional registrations.
I held an impromptu series of 1:1 meetings with interested members of staff at Abbey Wood in the afternoon of the 14th May, following on directly from the SSSG meeting at QinetiQ Bristol in the morning. The level of interest then increased and I held two further briefings and a series of 1:1s on the 16th July.

CPD is also high in the minds of engineers at Dstl Fort Halstead and I gave a lunchtime briefing there on the 15th July.

The Chairman of the Swedish Branch and I took the opportunity to brief the MD (Sales) of Dynasafe Protection Systems in Karlskoga on the benefits of membership of the Institute and professional registration while I was there on business in early June.

CPD requirements

On the subject of CPD, the members of Council been saying for many months, if not years, that we would set an expectation on our professional registrants. At the Council Meeting on the 25th June, it was agreed that "The Institute of Explosives Engineers expects our professional registrants to undertake 30 hours CPD per year and strongly recommend that our Members and Associates do the same."

The guideline CPD requirement is to undertake a minimum of 30 hours CPD per year, which could be split as follows:

Area	**Number of hours**
Personal technical knowledge/skills	Ten hours
Job role technical knowledge/skills	Ten hours
Personal soft skills	Ten hours
Number of hours	**Examples**
Planned CPD	
At least ten hours	Training courses, seminars, targeted academic or self-study or work experience opportunities such as secondments;
Unplanned CPD	
Remaining balance (up to 20 hours)	Ad-hoc opportunities and less structured activities, such as attending events and exhibitions, self-study, etc.

MyCareerPath

All IExpE Professional Registrants, applicants and other members of any grade are encouraged to make use of MyCareerPath, the Engineering Council's CPD software package that is available to you, free of charge, through the IExpE website at http://iexpe.org/professional-registration/continuous-professional-development-cpd
Candidates applying for registration through all routes are required to show evidence that they have taken steps to ensure their competence is developed and maintained. They must also show that they intend to continue with this program of recorded professional development.

CPD must be recorded and your evidence can be kept in any reasonable form, including conventional pen and paper records. However, an on-line system helps organise the record and assists applicants in realising the ongoing commitment to CPD that is required to maintain their registration. IT also enables you to have your evidence reviewed by simply sending an email to your reviewer direct from the software.

Ken Cross MBE CEng MSc BSc(Hons) FIExpE

Branch reports

South (Central and West) Branch

The quarterly branch meeting on 3 June 2014 took place at the ISSEE establishment at the Centre for Homeland Security, Chilmark, Salisbury. 22 Branch Members attended the meeting, plus five of the ISSEE staff, which was a great turnout once again. Gordon Storey and the team at ISSEE very kindly offered their facilities for the meeting, and provided some excellent demonstrations and a presentation as well.

The meeting started with the usual 15 minutes of Branch business, including a quick review of how the Institute's AGM and annual conference had gone, along with a presentation to Rob Hart for the IExpE Journal Award 2013, including a remarkably staged photograph (just for the record, of course). Rob's article was titled "Impregnate me with your wisdom: giving and asking for advice when safety management goes haywire (or: The art of salt buckets and sucking eggs when it comes to safety management)". Another branch member, Holli Kimble, also won a prize for the 40th Anniversary Journal Awards Competition, in the Members' category. Holli was presented with her award at the Institute's AGM. Her article was titled "Critical review of novel detection methods for buried explosives."

ISSEE then laid on a demonstration, a practical session and a tour of the facilities:

Demonstration: We all assembled outside for a demonstration of the effect of confinement on low explosives. A 500g pile of loose black powder was initiated, resulting in a large fireball and smoke cloud. Then 10g of black powder contained in a 35mm film cartridge with confinement provided by copious amounts of duct tape was initiated, resulting in a more violent reaction.

Practical: We were given the opportunity to set up detonators under supervision in various configurations to further demonstrate the effect of confinement on the explosive effect. The charges were: detonator in plastic container with air; detonator in plastic container with water; detonator placed in sand; detonator in contact with pig's trotter. The pig's trotter is used as a simulator for the effect of explosives on a human hand. For some it was good to get refresher training and to

Holli Kimble who won the Members' category of the 2014 IExpE Journal Awards Competition with Rob Hart, winner of the Journal Award 2013.

get 'hands on' in a range environment again, and for others it provided a great 'first look' at actual explosives handling.

Tour: The tour began in the Search House where much of the practical IED search training is conducted. The building has several different rooms which are set up as a kitchen, living room, storage area, garage, etc. These rooms can be used to demonstrate and test students on search techniques. We also saw outside search areas including a bus, a train carriage, various cars and a vehicle track, as well as an ammunition processing/storage facility. The tour concluded with a look at the collection of inert/drill/model conventional ammunition and realistic mock-ups of IEDs.

Presentation: We were also given an unexpected 'bonus presentation' about a new piece of software that allows 3D imagery to be very simply constructed from either three still digital photographs or from the videos of three moving cameras. There are clear applications for this technology in crime scene investigation (e.g. pre- and post-examination shots for comparison), search training, VVIP pre-visit checks and more.

Presentation: Steve Mockett of ISSEE, formerly SO15, gave an excellent presentation about explosive incidents that have changed the way we live and travel. We got a very interesting insight into various successful and unsuccessful plots within the UK and internationally, which have led to improved security controls and measures. This provided a great conclusion to the evening.

Thanks are once again extended to Gordon Storey and the team at ISSEE for their kind, generous support in providing the facility, refreshments and activities. This was another excellent evening.

Over the last year or so, the branch has provided a varied mix of presentations during the meeting schedule. These have been on various facets of the explosives industry including:

Branch members assembled outside.

- Pyrotechnics
- Re-enactment
- Defence applications
- Safety
- Environmental management
- Design
- Quality assurance

The branch has continued to use varied locations throughout the region, including Shrivenham, Somerset, Aldermaston, and Bristol.

Please get in touch through the Institute Secretariat if you wish to attend any of the meetings or to be added to the email distribution list.

Rob Hart CEng AIEMA MIExpE Chairman
Ian MacDonald Watson CEng MIET MIExpE Vice Chairman
Holli Kimble MEng MSc MIExpE AMIMechE Branch Secretary

West Country Branch

On the 24th April 2014 a joint meeting between the Devon and Cornwall branch of the Institute of Quarrying and the West Country branch of the Institute of Explosives Engineers was held at Launceston rugby club on the track and trace of explosive regulations that are due to come into force 2014/2015 presented by Dave Mathias (Explosive liaison officer for Devon and Cornwall constabulary). The meeting was attended by a few members of the West Country branch.

After Dave's presentation there was a very lively question and answering session from the audience regarding the new regulations. Dave was able to answer all concerns and questions on the regulations. Everyone went away feeling more informed about the upcoming regulations.

We are open to suggestions on any technical evenings that people would like. Please contact Jonathan Attwood (current Devon and Cornwall branch IOQ chairman) via email jonathanattwood@hotmail.com. If any forthcoming IOQ events happening in the area are of relevance to the Institute of Explosive Engineers, Jonathan will contact you all via the Secretariat.

Jonathan Attwood
Branch Secretary

Singapore Branch News

In the 1st and 2nd quarter of 2014, the Singapore Branch continued to focus its activities on providing education and training to the Singapore explosives community. In April this year, the Institute had engaged the fireworks guru, Dr. Tom Smith from UK, to deliver a three day training workshop on managing the safety of the major fireworks display for the 2014 National Day Fireworks Display Organising Committee. The objective was to equip the committee with the knowledge and understanding on hazard and risk of fireworks products and the international best safety practices for the fireworks display to enable the organising committee to demonstrate satisfactorily their safety management skills required to ensure the National Day Fireworks Display at the Marina Bay will pose an ALARP risk to the performers and public. The course concluded with a presentation given by Norman Yen (after his educational tour to China Fireworks Administration in Liyang Huana) on the challenges faced by China in managing the product safety of their fireworks which are exported overseas. We understand about 75% of the fireworks sold in the world are produced in China.

Training workshop for managing the safety of public fireworks display, 2014.

Regarding training development, Norman Yen initiated a discussion with the military and civilian explosives regulators as well as industry players on the effort to harmonise the performance standards and training needs for military and civilian explosives workers in Singapore. Four key explosives functional roles had been identified for harmonisation; i.e. safety management, storage, transportation and disposal. Singapore Branch is exploring the option of adopting the National Occupational Standards for ESA developed by the UK SSB for EMSO. Preliminary discussion with HSQ on how to obtain approval for an appointed centre in Singapore has also been initiated during the attendance of Norman at the Institute AGM in May 2014.

Alan Morley, then President of IExpE, visited the Singapore Branch.

In May 2014, the oil well explosives industry in Brunei has asked the Singapore Branch to help to conduct an explosives safety course on storage, transport and handling. The course objective is to enable the attendees to demonstrate satisfactory knowledge and understanding of the hazards and risks of explosive substances/articles, as well as the international safety standards and best practice for the storage and transportation of explosives. The course would be organised in collaboration with the Royal Brunei Technical Services.

Norman Yen(add postnominals)
Singapore Branch

DOES PM report

The DOES PM team have been working to maintain the output normally provided by Allan Hinton, who remains on his sabbatical in the sun and sand, working towards the repatriation of all UK personnel and equipment from Afghanistan.

Since the annual review of DOES PM activities in the last Journal, there have been many diverse events taking place. The Sector Skills Steering Group (SSSG) met in Bristol on 14th May and, by the time you read this, will have met at Boscombe Down on 27th August. The Standards Setting Body (SSB), responsible for the development and management of the National Occupational Standards (NOS) had a meeting at DEMS Training Regiment, Bicester on 2nd July with the next occurring in the same location on 22nd October. These meetings are crucial to the future development of NOS and their subsequent use in underpinning the training that is required by the explosives sector. The SSSG now publishes some of its work and documents on the front page of the Institute's website. This will increase when the new website comes on line.

The Explosives Engineers Alumni are renamed the Early Careers Forum and will also have a presence on the Institute's website in the future. Membership is free and is available to all in the explosives sector; graduate, apprentice or any employee who works with explosives and who is in the first five years of their career. Holli Kimble is the Forum chairperson, and as an IExpE Council member can be contacted through the Secretariat in the first instance. The Forum is free from external review and therefore encourages a free exchange of views and ideas. It has a unique place in the sector as the chairperson now has a permanent seat at the SSSG. This allows Early Careers Forum Members to have their ideas, concerns and points, delivered direct to the senior staff in the explosives sector companies without "management filtering" en route.

The SSSG continues to sponsor a number of expert working groups who each have specific aims and outputs. The EWG chairmen are now required to provide a written update to each SSSG meeting and one or two of them will provide a personal brief to the SSSG meetings, on rotation. Dr Rhydian Harries, Qinetiq, has been developing Hazard Identification and Risk Sentencing Workshops using incidents held on the HSE/MOD database. This work will continue throughout the summer with the aim of gaining lessons from past incidents. The Test Trials & Evaluation Working Group and Explosives Disposals Processes Working Group have both been involved in this work.

Other DOES PM work included attending the "Tackling youth unemployment 2014: enhancing inclusion, education and opportunities to employment" seminar conducted by the Skills Funding Agency. This centered on what government funding (central or local) might be available to Members of the SSSG for taking on young employees. There were two young worker age brackets discussed: 16-18 and 19-24. This is about employers running a work placement or work experience scheme in conjunction with their local education providers. This will be put to the next SSSG meeting.

The DOES PM contract formally came to an end on 31st May 2014. However, residual funding remains in place to run this forward on a monthly basis for a period to allow the SSSG members to agree on a way ahead. A paper which includes objectives and required outputs is being discussed by members. It is anticipated that the way ahead will be decided at the next meeting on 27th August, which will be after publication of this article.

Finally, the OME Symposium takes place 30th September to 1st October. You are strongly encouraged to book, however late, to attend this SSSG sponsored event at Cranfield, Shrivenham. It was an excellent event last year with over 250 attendees and promises to exceed expectations this year. Provided that the SSSG continues with the DOES PM role at its 27th August meeting, you will receive regular updates in future Journals.

Paul Harris QGM FCMI FInstLM MIExpE

Using National Occupational Standards in Explosive Substances and Articles to develop competence

By **Denise Clarke** BA MA MIoD AIExpE

This paper was given in the form of a PowerPoint presentation at the annual conference of the Institute of Explosives Engineers (IExpE) that took place on 2nd May 2014 in Glasgow.

The purpose of the presentation was to explain how the Explosive Substances and Articles (ESA) National Occupational Standards (NOS) can be used as management tools for a range of purposes all relating to the measurement and development of competence in working with explosives.

What is "competence"?

Competence (ie the British spelling) is generally considered to mean functional competence ie what people do but

Competency (ie the American spelling) is generally considered to mean behavioural traits ie what you are.

However, any research that you might do on the internet will show you that there is little agreement on what either of these terms means.

The UK has adopted the Moloney & Gealy model of competence[1] when developing National Occupational Standards ie:

competence is the ability to perform consistently to occupational standards

The relationship between the ESA standards and other performance-related specifications can be described by the following model:

There are three drivers to performance: targets and objectives, technical competences and behavioural competencies. The pyramid explains the relationship between these. Targets and objectives are agreed at performance appraisals and state the quantified annual expectations of staff. These will probably change every year ie these are annuals.

However, in addition to achieving specific targets and objectives, people need to maintain the organization's good practice in what they do: in other words, they need to achieve the requirements of technical competences. The technical competences describe what people do in their jobs and the standards they should maintain continuously. These are sometimes also known as *functional competences* or *standards*. These are the ESA standards. These quality expectations are permanent – ie they are perennials.

In order to help achieve their targets and objectives and maintain the required quality expectations, people also need to exhibit certain personal qualities – what people are ie behavioural competencies (also often known as *personal qualities*). For example, if you are a sales assistant, it would be helpful to develop the quality of *customer focus*. To continue the gardening analogy, the behavioural competencies are the compost that helps the annuals and perennials grow and bloom.

The uses of standards

Standards lie at the heart of all HR processes. 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 completely separate from qualifications purposes such as:

Diagram 1.

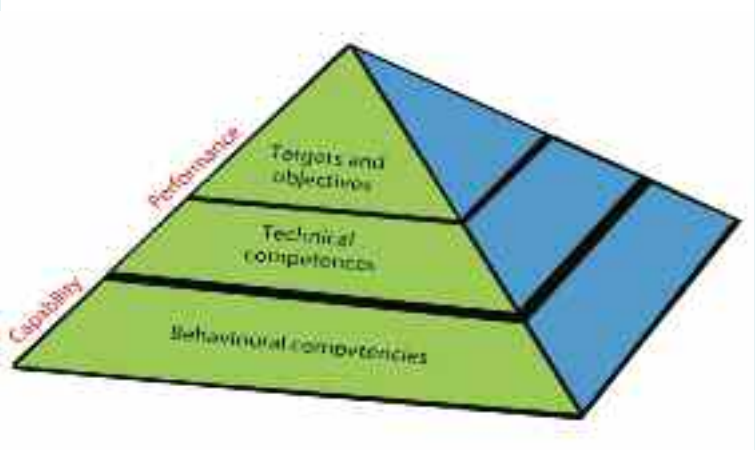

Diagram 2.

1 Moloney & Gealy (1985) The Components of Job Competence, FE Staff College, Blagdon.

- 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 and evidence-based;
- training needs analysis – through self-assessment, development discussions, 360° feedback, Personal Development Plans, audits of team strengths and 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;
- demonstration of a commitment to known quality standards, investment in people and the ability to comply with legislation, regulation and codes of practice;

… and many more specific applications within each part of the HR cycle.
So, people can be recruited, trained, measured and developed against the same objective specifications.

Coverage of the ESA standards

The National Occupational Standards (NOS) were developed by, with and for the UK explosives industry by the Standards Setting Body for Explosives, Munitions and Search Occupations (the SSB for EMSO) and were published in 2006.

There are 13 "key roles" (see below). Each key role contains a number of standards – usually, around 20 – 25. The entire suite comprises 259 explosives-specific standards. They are written so as to describe competence from basic support (UK level 1), operator (UK level 2), supervisor (UK level 3) to operational management (UK level 4).

The suite of ESA standards covers all the uses of explosives except for engineering/mineral extraction purposes (which was never fully developed) and mining and quarrying for which standards already exist.

The ESA standards cover the use of explosives in the following areas:

- Research, design and development;
- Safety management;
- Test and evaluation;
- Manufacture;
- Maintenance;
- Procurement;
- Storage;
- Transport;
- Facilities management;
- Entertainment;
- Logistic disposal;
- Munition clearance and search;
- Semi-generic supporting activities.

Unit 13.11 Hand over explosive substances and/or articles

Contexts

- Hand over: issuing; receiving
- Hand over condition: when in an acceptable condition; when not in an acceptable condition

Performance criteria

You need to:

a. work safely at all times, complying with health and safety, environmental and other relevant regulations, legislation and guidelines
b. confirm the identity of explosive substances and/or articles against the specification/documentation
c. confirm that the condition of the explosive substances and/or articles is in an acceptable handover condition
d. ensure that the information exchanged at handover is accurate, up to date and complete
e. obtain additional information if there are any areas of doubt or lack of clarity to complete the handover
f. ensure that handover recipients are authorised and qualified to receive the explosive substances and/or articles
g. ensure that safety and quality requirements are met
h. report any problems beyond your level of authority to the appropriate person
i. ensure that complete, clear and accurate records are made of the handover, and are exchanged

Knowledge requirements

You need to know and understand:

i. the health, safety and environmental legislation, regulations and safe working practices and procedures governing explosives, and their implications for your area of work
ii. the relevance of personal protective equipment (PPE)
iii. the nature, characteristics, hazards and risks of the explosive substances and/or articles
iv. the specification and classification of the explosive substances and/or articles
v. the actions to be taken in response to an unplanned event
vi. the limitations, and any specific requirements, of the explosive substances and/or articles (eg transport, storage, etc)
vii. labelling requirements
viii. any environmental considerations affecting or prohibiting handover
ix. any operational considerations affecting or prohibiting handover
x. how to carry out a risk assessment
xi. the moment of transfer of responsibility
xii. the information needed to complete the handover
xiii. the possible courses of action open to you (eg locating sources of information, refusal of handover)
xiv. recipients' qualification requirements
xv. the requirements of handover documentation
xvi. reporting lines and procedures

Structure of a standard

Each standard comprises three components:

- **"Performance criteria"** - which are the measures by which someone's competence is judged;
- **"Contexts"** - which describe the parameters of someone's competence;
- **"Knowledge"** - which relates to that essential knowledge needed for competent performance.

Each standard is written in terms of outcomes which therefore makes them measurable. An example is given above.

To prove their competence, users of a standard would need to meet all the performance criteria in all the relevant contexts.

To do this, they must have a certain amount of knowledge and understanding that cannot be inferred from competent performance. This is listed in the "Knowledge requirements". Users' knowledge would be tested against these

specifications (often verbally, by their assessor or perhaps in writing at the end of the training assessment). However, whilst the knowledge requirements could be assessed by an examination, achievement of the performance criteria and contexts could not. We have come across situations where incidents have occurred because operators did not understand what to do when something unexpected happened. In one case, the results were fatal. So, knowledge point 4 is crucial. A sad and current example of this is the recent Korean ferry disaster.

You will see that proof of knowledge or competence in some areas comes up again and again (eg performance criterion and knowledge points 1 - 4). Evidence of competence against such items can be cross-referenced and carried over to provide proof for the same statements in other standards where the context of the standard is related.

Benefits of standards and qualifications

For individuals, working to standards:

- acknowledges and accredits competence
- provides portable recognition of achievement
- clarifies what is expected of you.

For employers, working to standards:

- promotes consistency of practice
- assures employees' competence
- are useful as management and development tools.

In the main, individuals are interested in qualifications and employers are more interested in using the standards.

We have come across a whole raft of benefits attached to the implementation of standards and/or qualifications. An example is QinetiQ's experiences and the benefits they found just from the preparatory phase of implementing the standards when they were training their assessors and verifiers. This can be found as a case study on HSQ's website on the 'Documents' page.

Please go to:
http://www.homelandsecurityqualifications.co.uk/wp-content/uploads/2012/04/Business-benefits-of-operating-competence-based-qualifications.pdf

In the SAFEX newsletter, No 48, 1st Qtr. 2014, article by the author, there are descriptions of the benefits found by some of the supervisors who implement the ESA standards.

Implementing standards

If you decide that you wish to implement the ESA NOS to develop your staff's competence in working with explosives, there are a number of considerations that you would be advised to take into account.

Here are some tips on successful implementation:

- be clear about what you are going to use the standards for and why;
- run a pilot first to iron out the glitches before going live;
- people are frightened of the word "competence" because of the implications of its opposite: "incompetence". Give people a positive experience and help them manage their fears;
- you must have senior management support to implement such an initiative;
- Integrate the standards into Human Resources (HR) processes (eg building role profiles mapped to the ESA standards into performance appraisal systems;
- identify of sources of evidence;
- get managers and appraisees used to assessment against standards (this means briefing and training both groups – not just management);
- consider quality assurance – how are you going to ensure that everyone will be treated fairly and equally?
- act on your findings – for example, you might identify the need for more or different support (eg time, better systems or communications.

Role profiles

If you are going to implement the ESA NOS, you need to start by creating explosives role profiles so that you know which standards are relevant to which roles. If you create role profiles, you will have a specification of the outputs that people are expected to achieve (as opposed to the responsibilities or inputs usually listed in job descriptions) which will be measurable, ie the performance criteria, contexts and knowledge.

So, you will be able to recruit, train, appraise, develop and promote people against the same, objective specification. Working to standards will then inform people's personal development plans by identifying specific development needs.

Recruitment and selection

Assuming that you have developed role profiles, with some judicious copying and pasting, you can use the standards for all sorts of purposes.

For job advertisements, you need to use the standard title, performance criteria and contexts to form the specification of the skills and experience that you are seeking whilst the knowledge helps to inform the person specification.

For interview aide-memoires, you can use the performance criteria to suggest questions that could be asked to elicit evidence of a candidate's achievements in this area and make interviewing notes.

Performance appraisals using the standards

The same points apply to using the standards for appraisal purposes as to their general implementation (see earlier).
It is well worth running a small pilot scheme first before rolling out the system to all explosives workers. This means that you will need to brief everyone concerned ie including appraisees as well as managers. Managers and appraisees should sit down together with a copy of the standards and agree the priority standards on which appraisees will concentrate based on:

- the needs of the current job role;
- the needs of future job roles;
- operational needs and priorities;
- their personal preference and abilities.

It is a good idea for individuals to assess themselves against the standards before meeting their manager. This is more likely to lead to an informed and objective discussion. Together, they should agree whether the individual has met the requirements of the agreed standards or not met them (or maybe they have exceeded them?)

The agreed development needs can then be carried over onto a Personal Development Plan (PDP).

Obviously, as with any other process, the system needs to be managed: managers and appraisees will need time to work on the standards and assemble the evidence of their achievement and of course, there is a cost attached to this.

However, there are significant benefits to be gained: greater clarity of expectations, improved motivation, better communications and working relationships – not to mention the possibility of enhanced performance and competitiveness.

Training

The standards can be used to identify training needs in a number of ways:

- self assessment;
- appraisals;
- 360 degree feedback;
- team audits against standards.

If you add up all the individual training needs and commission future training to deliver against these needs, you will have a much better use of your training budget as it will be focused on specific and quantified needs and it will all be directed to achieving operational needs as described by the role profiles.

You can map the standards to internally and externally delivered training. This approach should make it easier to manage outsourced trainers because you will be able to poinpoint more clearly your requirements.

Remember that development needs might best be met through interventions other than formal, classroom training eg:

- better communication;
- clarification of expectations/ procedures;
- coaching;
- more practice;
- short seminars delivered by colleagues or managers;
- assignments;
- projects;
- job swaps;
- reading;
- internet/resource centre research;
- & etc & etc.

Career management and succession planning

If you add up individuals' explosives skills, competences, qualifications and achievements, you will have a clear picture of the organization's explosives-specific skill strengths – ie how many and which individuals are competent in different occupational areas.

If you add up individuals' development needs, you have a clear picture of the organization's skills weaknesses – ie how many and which individuals need training and development in different occupational areas. This can help with benchmarking against competitors.

From individuals' perspective, they will have a far clearer idea as to what they need to do to progress their careers – a very motivating factor.

Once you have this sort of information, you can develop robust career management strategies and pathways to help your organization meet future manpower challenges.

Extracts of relevant documents to help manage these processes were included in the author's last Safex newsletter article (number NL48). This can be found on HSQ's website on the 'News' page.

Please go to: http://www.homelandsecurity qualifications.co.uk/wp-content/uploads/ 2014/04/ NL48.pdf

HSQ's explosives qualifications

This paper has looked at the uses of the ESA NOS for personal development purposes and as management tools. But they have a further use which is to accredit the competence of people in their jobs when used in qualifications.

Implementing qualifications provides independent, external validation of internally assessed competence. This is the sort of assurance of competence that the Health & Safety Executive is seeking in the UK.

Homeland Security Qualifications has been recognized by the UK explosives industry through the SSB as an industry-recognized awarding body. We offer three different types of vocational qualification:

- competence-based qualifications that are compliant with the national Qualifications and Credit Framework (QCF) (they are written as Learning Outcomes and Assessment criteria and derive directly from the ESA standards);
- vocational qualifications (VQs) based on the existing, nationally accredited ESA NOS – qualifications exist between levels 1 (basic support) and level 4 (operational management). Although the standards have been nationally accredited, these qualifications have not although they are recognized by the industry. They are based directly on the ESA standards (ie they comprise performance criteria, context and knowledge);
- bespoke qualifications – probably recognized by most as awarding body-recognized company training.

Our nationally accredited qualifications cover a number of qualifications in Defence Range Safety, Munition Clearance and Search, Using Small Arms, the Movement of Explosives, Explosives Storage, Explosives Maintenance, Explosives Operations, Explosives Supervision and Relief Operations.

All HSQ's qualifications involve an occupationally competent, qualified assessor to assess the candidate and they require internal and external verification of assessment processes. Note that assessors and internal verifiers are employees of the organization but external verifiers are HSQ appointees. Thus, independent, objective external validation of internal assessment is achieved.

Evidence must be current, valid, complete, authentic, sufficient and auditable, and can be obtained by:

- direct observation of the candidate;
- photographic, audio, video or other electronic recording of candidate activity;
- the presentation of work produced by the candidate;
- previous recorded achievement;
- questioning the candidate to assess the underpinning knowledge and understanding and/or to authenticate the validity of other evidence.

Defining and measuring competence

In summary, there are many significant benefits to measuring people against objective and detailed descriptions of competence.

The use of standards and the achievement of explosives qualifications not only provides proof of competence but, if embedded in HR systems, provides organizations with systematic processes for capacity-building (both knowledge and competence) and better targeting of resources.

We have already seen the cross-industry recognition of common roles and the UK explosives industry has recognized Homeland Security Qualifications so that people moving between employers will be recognized as competent if they have achieved an explosives qualification from HSQ.

Whether we like it or not, UK regulators are taking an increasing interest in the explosives area to the point of seeking assurance that organizational policies meets competence requirements.

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Polar explosions: developing competent explosives use for Antarctic research

By **Dr Andy Smith** PhD MIExpE
British Antarctic Survey

Figure 1. A glacier draining the Antarctic Ice Sheet on its way to the ocean (D.G. Vaughan, BAS).

Introduction

This paper is not really about explosives. It resulted from a slightly liberal interpretation of the theme of The Institute of Explosives Engineers 2014 Annual Conference, namely "Developing Competency in Explosives Skills", and from a presentation there that only partly comprised the actual use of explosives as its content. Although the presentation was prompted by our use of explosives for research projects in Antarctica, it also recognised that, to allow that work to be done safely and effectively requires competencies in a number of other skills in addition to actual explosives use, many of which are not necessarily required in normal walks of life. Hence, whilst the first part of this paper outlines our work in Antarctica and our use of explosives there, most of it addresses this wider topic - the additional competencies we have found that also need to be incorporated into our operations.

Our business

The British Antarctic Survey (BAS) is a component body of the Natural Environment Research Council, one of the UK's group of national research councils, currently the responsibility of the Department of Business, Innovation and Skills. Our remit is environmental research in Earth's polar regions, both the Arctic and the Antarctic; many of our staff are academic researchers and we also provide support for researchers from UK Universities and international collaborations. To support this work we operate Antarctic stations, two icebreakers, five aircraft and field parties working away from the stations. Supporting and running these polar logistics accounts for the remainder of our staff.

Much of our work is motivated by the potential future contribution of Earth's ice sheets to sea level. Antarctica and Greenland are both large continental land masses with huge domes of ice, up to 5km thick, resting on top of them. Most of an ice sheet moves very slowly, but around the edges it is drained by fast-flowing glaciers and ice streams which take the ice from the interior and carry it into the ocean (Figure 1). As long as the ice lost to the ocean each year is balanced by snowfall, the ice sheet remains in steady state; but if it is not balanced, the result is an overall loss or gain of ice and a direct effect on sea level.

Understanding the way the ice sheet works and determining to what degree sea level is being affected is a huge subject, and many different studies are required to address it. The big questions of particular interest include: Is the ice changing? Is it likely to change in the future and if so, how and by how much? What will be the implications if it does change?

One strand of this research involves looking at what lies beneath the ice, as this is a major factor in controlling the way the ice flows and behaves. This is where the use of explosives comes in; we use explosives for conducting seismic surveys on the glaciers and ice sheets of the Polar Regions (Figure 2). With these we can map the landscape beneath the ice but, more importantly, we can determine the nature of the material the ice is resting on – is it solid rock, soft sediments or is it resting on lakes trapped beneath the ice sheet?

Ice sheet research is one of many strands

Figure 2. Detonating an explosives charge to investigate the bed of Rutford Ice Stream, Antarctica (I. Rudkin, BAS)

that feed into predictions of future sea level and the impact of extreme weather events. However, unlike the images sometimes conjured by the media, its importance is less to do with "chasing people up the beach" and more concerned with long-term planning. One example that illustrates this is the Thames Barrier which, since 1983 has been raised with increasing regularity to protect the City of London from flooding. As sea level rises and the south-east of England continues to sink in response to the end of the last Ice Age ten thousand years ago, at some stage in the future the Thames Barrier will no longer provide adequate defence and it will need replacing. Ice sheet research contributes to the predictions that guide Government with strategic planning such as this. It helps to make informed decisions on when to replace the Thames Barrier and how big that replacement needs to be. It took 30 years from the first realisation that the Thames Barrier was needed, to the time when it finally came in to operation. A replacement will need a similar period of time to bring in to operation, which highlights the long timescales involved.

Figure 3. Trainee preparing a charge (R. K. Smith, BAS).

Figure 4. Following a flag-line in an Antarctic blizzard (E.C. King, D.G. Vaughan, BAS).

Rules and governance

We work in an unusual environment in that, in Antarctica most United Kingdom legislation does not strictly apply. British Antarctic Territory is classed as an Overseas Territory and comes under the responsibility of the Foreign and Commonwealth Office (FCO). Since 1961 Antarctica has been governed by The Antarctic Treaty, a universally recognised international agreement that puts all national territorial claims into abeyance and maintains the continent for peaceful purposes and scientific research.

Although UK legislation does not strictly apply, we do use it to guide our own operations and we aim to follow it as far as is reasonably practicable. All explosives and explosives-related activities are overseen by our Explosives Advisory Group. This group reports formally to BAS's Health and Safety Committee. Although our operating procedures for using explosives are self-imposed and self-regulated, they are guided as far as possible by those that apply in the UK. The guide for all our work with explosives in Antarctica is our Explosives Code of Practice (COP), which covers all aspects of the operations and is updated at appropriate intervals. Whenever possible, we use external scrutiny to cast an independent eye over the COP to ensure we stay up-to-date with best practice and avoid developing poor procedures.

Training – developing competency in explosives use

Unfortunately, there is no off-the-shelf "How to use Explosives on Antarctic Glaciers" training course to provide necessary skills and knowledge to new members of staff. Hence, we use a combination of training and assessment activities to give people the competencies they need to use explosives for seismic surveys in Antarctica. The first step is to attend a recognised commercial course to get basic knowledge of explosives handling, storage, transport and safety. Over the years, we have used courses for the quarrying, on-shore seismic and security markets. Wherever possible, this includes hands-on experience in the UK, although this is not mandatory.

The next step for a trainee is a period of practical tuition and supervision in Antarctica, under the guidance of an experienced user. It is at this stage that they will become familiar with the actual explosives and detonators used in the work and also learn and practice the modes and procedures of operation (Figure 3). This stage ends with a period in which the trainee goes through all the operations of preparing and firing shots under the observation of the supervisor. All being well, after this stage a person is deemed safe and competent to carry out the work unsupervised.

This leaves the question of who supervises the supervisor? Our experienced users address Continuing Professional Development with a programme of refresher courses at regular intervals. Membership of the Institute of Explosives Engineers is encouraged.

Developing additional competencies

The rest of this article will concentrate on other competencies, in addition to those directly related to working with explosives. These can be characterised as other aptitudes, skills and abilities we have found are also required to allow us to do our explosives-related work effectively and safely.

Additional competencies:
1. Coping with the weather

Antarctic weather has a fearsome reputation, typified perhaps by the story of Captain Robert Scott and his companions' fateful last days, trapped by a blizzard in their tent; or that encountered on Sir Douglas Mawson's expedition and evocatively described in his book "The Home of the Blizzard". At a simplistic level, the weather in Antarctica is the same as that anywhere else on the planet – it can be good, bad, or anything in-between. However, unlike in many other circumstances, if combined with mistakes, the weather in Antarctica can potentially be a killer. Much of peoples' day-to-day living and working in Antarctica is spent in the outdoors, often far from established stations and any form of help. An overwhelming requirement is to be sure those people can be relied upon to act sensibly if the weather deteriorates – to stay safe, to make good decisions and to still get the work done wherever possible (Figure 4).

The first step in coping with the weather is to recruit the right people. When employing new staff, professional skills and qualifications are important, but equally important are an aptitude and character to be able to continue to operate well in poor weather. The next step is training and familiarity in Antarctica. There, staff can experience the full range of weather

Figure 5. Exploring a crevasse (P. Bucktrout, BAS).

Figure 7. Training in Antarctica for safe travel in glaciated areas (D. Davies, University of Edinburgh).

Figure 6. Inside a huge crevasse, looking horizontally along from just beneath a thin surface snow-bridge. The person is hanging from a rope through a hole in the bridge; beneath him, this crevasse is 50 m deep and more than 1km long (A.P. Taylor, BAS).

Figure 8. Preparing a shot hole in a snow-bridge over a crevasse (United States Antarctic Programme).

conditions and become familiar with the equipment and clothing used for working living and travelling. At that stage, we should have confidence that when faced with the wilder extremes of polar weather, people can be relied on to keep safe, to complete the work and even hopefully, to keep smiling.

Additional competencies:
2. Crevasses – Finding, avoiding and dealing with them

One of the greatest natural dangers in Antarctica is crevassing, where stresses are sufficient to fracture the ice and tear it apart. It would be wrong to give the impression that the whole of the Antarctic Ice Sheet is riddled with crevasses, but they do exist in great numbers, and often in places where we want to work or travel through. It is essential to be able to do this safely.

Safety

Crevasses come in all shapes and sizes. Some are fairly benign and can easily be entered and explored; caving in glaciers is becoming a regular pastime for a few adventurous people in the Polar Regions (Figure 5). Others crevasses can justifiably be referred to as "monsters", many kilometres long, tens of metres wide and more than 50 m deep (Figure 6). Where a crevasse is open at the surface, it is rarely dangerous; provided we know where crevasses are, they can usually be avoided. But when a crevasse is covered by a thin weak layer of snow, a "snow-bridge", and it can't be seen from the surface, then without appropriate safety measures, anyone who inadvertently stands on top of it could be in serious danger; if the snow-bridge collapses and they fall into the chasm beneath, the chance of injury or death would be high.

To mitigate this risk, we recruit professional mountaineers to keep people safe in glaciated areas. Most will have national or international qualifications and many are members of the Association of Mountaineering Instructors or of the British Mountain Guides. Often these mountaineers will begin training other staff in crevasse avoidance and crevasse rescue techniques in the UK, prior to deployment to Antarctica. This training will be continued, including experience in real crevasses and glaciated terrain, on arrival in Antarctica (Figure 7). Once completed, hopefully no-one will find themselves accidentally falling into a crevasse, but if they do, they'll be safely attached to a rope and will know how to climb back up to the surface.

Overlapping competencies

Not surprisingly, different skills and competencies sometimes overlap directly. One example of this occurs (luckily not too often) where there is a need to conduct explosives operations in crevassed areas. In the photograph in Figure 8, the two people are on top of a large crevasse. At the surface, there are no signs to suggest the crevasse is there because it is covered by a snow-bridge. This is often the biggest problem when working in crevassed areas, crevasses can be so well hidden that there is no visual indication that they are there. The people in the photograph have drilled into the snow-bridge and are preparing to load the charges. Safety ropes attached to each person can be seen and are tied to secure anchors behind the camera. Should the snow-bridge collapse beneath them, the safety ropes will prevent them falling onto the crevasses; the worst they should experience will be some shock and excitement, rather than any serious risk of injury or death. In this way it is possible to ensure staff safety, allowing them to do whatever tasks with explosives are required, even when working in potentially dangerous crevassed areas.

Big crevasses can swallow big things!

Whilst ensuring the safety of people when working in crevassed areas is paramount, protecting infrastructure and equipment is also a significant concern. In some areas of the ice sheet, crevasses can easily be big enough to swallow large vehicles whole. Ever since the first expeditions drove tractor-trains across the ice sheet (e.g. the 1955-58 Commonwealth Trans-Antarctic Expedition, the first to drive vehicles to the South Pole and achieve a complete crossing of the Antarctic continent), stories and images abound of close shaves and vehicles perched precariously over a dark, gaping abyss. To illustrate the fact that this particular risk has not diminished over the

Figure 9. Pisten Bulley tractor after falling into a crevasse (Antarctic Logistics & Expeditions).

Figure 10a. (Above) Mountaineers using an avalanche probe, and figure 10b (Below) a radar to detect hidden crevasses (S. M. Garrod, P. Torode, BAS).

Figure 11. Blasting a snow-bridge (United States Antarctic Programme).

Figure 12. Filling a crevasse with snow to allow vehicles to drive over it (United States Antarctic Programme).

Figure 13. Polar bears on an ice floe in the Arctic Ocean (R. Mugford, BAS).

years, Figure 9 shows a modern tractor wedged part-way down a crevasse that it fell into in 2012. The people survived without serious injury and the vehicle was successfully recovered, but these examples emphasise that the risks to equipment and life are significant and appropriate safety measures are essential.

Crevasse "management" and blasting snow-bridges

There are a number of approaches we can take to working safely in crevassed areas. The first task with crevasses is to find them, a job normally done by the mountaineers (Figure 10). Standard, roped alpine mountaineering and avalanche-victim search techniques are used to safely detect crevasses hidden beneath snow-bridges. High-frequency engineering radars, used elsewhere for buildings- and road-testing, can also detect buried crevasses and measure the thickness of a snow-bridge. This approach is particularly effective at covering large distances when the radar can be towed by a snow-mobile. In this operation, the snowmobile and driver are linked to other vehicles with 22mm diameter ropes to ensure their safety, should a snow-bridge collapse beneath them.

Once crevasses are located, in most cases they can then be safely avoided or, if the snow-bridge is sufficiently thick, they don't represent a danger to people or equipment. But occasionally, a thinly-bridged crevasse cannot be avoided and some way of crossing it, with many tonnes of equipment, must be found. One option used successfully by colleagues in the United States Antarctic Program, as part of the tractor route to re-supply their South Pole station, is to blast the crevasse bridges, as shown in Figure 11. In the photograph, the hot-water drilling rig for making the shot-holes is in the foreground. Next to it, the blaster is wearing a mountaineering safety harness and is secured by ropes. When the explosives in the snow-bridge are detonated the snow briefly forms its own mushroom cloud then falls back down into the now-open crevasse. Normally, the snow wedges part-way down the crevasse, allowing the vehicles to bulldoze more snow on top of it (Figure 12), filling it up to the surface and forming a much thicker, safe bridge which the vehicles can then drive over.

Additional competencies: 3. Firearms

Although much of this article uses examples from work in Antarctica, environmental research in the Arctic is equally important and also part of our remit. The work we do in the Arctic is often very similar to that in Antarctica, both in practice and in its research goals, and many of the techniques we have developed for doing seismic surveys with explosives in one region, are easily transferred to another. However, one significant difference between the Antarctic and the Arctic that we must pay attention to involves the indigenous wildlife. The Antarctic has penguins, whereas the Arctic has polar bears (Figure 13). For work on Arctic glaciers and ice sheets in particular, this brings the need for protection against the risk of polar bear attack. Camp perimeters and regular work areas can be equipped with trip wires and flares to warn of a polar bear approach, but the most important form of personal protection is a rifle or shotgun.

For those without prior firearms experience, rifle training can be provided by shooting clubs in the UK and further practice is often possible at ranges in the Arctic region. Polar bears will often be discouraged by loud noise, so it is rarely necessary to actually shoot them. However, it is important that staff are competent in the use of firearms to enable them to defend themselves in the rare event of a bear attack. This is, however, not an excuse to turn big-game hunter! The polar bear is an endangered species and if one is shot, proof is required that it was an immediate threat to life. The bear's stomach contents are examined to determine whether or not it was likely to be hungry; a bear with a full stomach is unlikely to be a danger to people. Without convincing

Figure 14. Twin Otter aircraft landing on snow (A.M. Smith, BAS).

Figure 15. Dash 7 aircraft taxiing at a remote ice runway (I. Potten, BAS).

Figure 16. Killer whales breathing through a hole in sea ice (T. Elvin, BAS).

Figure 17. Weddell Seal pup (D. Barnes, BAS).

Figure 18. Adelie penguins (P. Bucktrout, BAS).

evidence that the bear was a direct threat, the authorities will prosecute, so rifles are only used in the most urgent of situations.

Additional competencies: 4. Radios and radars

On a typical geophysical research project in Antarctica, there normally will be many different radio transmitters, with the potential risk of accidental detonator initiation. We use radios for communications; HF radio for continent-wide communications (regular contact with our main station, for example) and VHF radios in the local work area. We also use radars for sounding through the ice sheet as part of the research experiments. These can be of many different types, depending on how deep into the snow and ice they are designed to look, but they will all contain powerful radio transmitters.

In each case, we pay particular attention to the transmitter power, frequency and antenna pattern to judge the level of risk and hence, determine appropriate safe operating procedures. People are required not only to be competent in operating the radios and radars, but also to know safe distances and procedures, and to understand where and when transmitters can, and cannot be turned on.

Additional competencies: 5. Aircraft operations

To support the work on stations and at remote field locations we operate a fleet of five aircraft, four Twin Otters and one Dash-7. The Twin Otter (Figure 14) is the bush aircraft of the Polar Regions and, being ski-equipped can land on snow as well as hard runways. Virtually all field parties are deployed to their work areas by Twin Otter.

The four-engine Dash-7 (Figure 15) is used as an inter-continental link and supports a southern operations hub located at a natural ice runway.

The only dedicated staff for the aircraft operations are the pilots and a small number of engineers at the main station, so all field personnel will get heavily and intimately involved with aircraft operations. These include loading and unloading planes (including understanding issues of hazardous, and mixed-hazard, loads), re-fuelling, communications (being a mini-air traffic control), marshalling and securing planes in the event of strong winds, meteorological observations and reporting, and actions in case of an emergency. Except for the pilots and mechanics, most people's prior experience with aircraft operations is minimal, so field staff are trained and briefed so they are competent at all these activities.

Additional competencies: 6. Wildlife and the environment – the antarctic act 1994

As an environmental research organisation, one of our basic instincts is to minimise any detrimental effect our activities have on the polar environment. However, not only is this our instinct, it is also enshrined in The Antarctic Act of 1994, one of the few items of UK legislation that actually apply specifically in Antarctica. In reality, we have a dual role and whilst environmental research is our core goal, we also represent the UK's official presence in Antarctica. In that role, the FCO keep a close eye on what we do and we work closely with them to help administer British Antarctic Territory and to ensure that UK operations and UK nationals don't break the law.

The Antarctic Act includes regulations governing wildlife and the environment with which everyone must comply. Hence, we need to ensure that all our staff and any other people we support in Antarctica are familiar with these parts of the Act, that they know and understand the regulations and that they minimise their disturbance of the Antarctic wildlife and environment. In practical terms, this puts limits on how close any wildlife can be approached; irrespective of how much someone might want to cuddle a seal pup, hug a penguin, or swim with a killer whale, they cannot, no matter how cute and appealing they may be (Figure 16, 17, 18).

It seems almost ironic that, Arctic fieldwork staff are trained in firearms so that, in an extreme situation they could shoot and kill a polar bear, yet in Antarctica they are prohibited from even approaching the wildlife. This illustrates the importance of fully understanding all the different situations we might encounter and the different requirements and regulations involved. It is also another illustration of the diversity of skills and competencies we require for our research work in the Polar Regions; many of these are not directly related at all to the use of explosives, yet without them all we would be unable to do our explosives work safely.

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Remediation of a magazine containing obsolete lead styphnate and tetrazene

By **Dirk Kotze** Explosives Manager, Rheinmetall Denel Munitions

In September 2013 SAFEX sent out a Request for Information on behalf of Rheinmetall Denel Munition in Somerset West, South Africa. The company was in in the process of relocating one of their sites and remediate it completely for property development. A magazine in which lead styphnate and tetrazene had been stored without wetting-down for four years had to be demolished as part of the remediation.

The concern was how to do it as any disturbance of the tetrazene crystals could lead to detonation. The responses from the following individuals helped RDM arrive at the process described in this article: Frank Barker (Expert Panel); Andy Begg (Individual Associate); Clark Bonner (Dyno Nobel); Maurice Bourgeois (Expert Panel); Terry Bridgewater (Chemring); Peter Cartwright (Expert Panel); Ken Cross (Corporate Associate); Janusz Drzyzga (Nitroerg); Rahul Guha (Solar India); Piet Halliday (AELMS); Jack Hedger (Expert Panel); Ian Swallow (BAE Systems); Peter Swinton (Expert Panel); Stuart Tough (Expert Panel); Mervyn Traut (Expert Panel); Richard Turcotte (Corporate Associate); Claire Vieillard (Davey Bickford); David Vince (Expert Panel); Gerhardus Vosloo (Burkan) and Jerry Wallace (Corporate Associate).

During 2008 Rheinmetall Denel Munition (RDM) was founded and required the relocation of the previously known Swartklip Products factory (now known as Philippi factory site) to the Somerset West factory site, in South Africa.

The Philippi site had been remediated and this now created the possibility of a mixed-zoned development.

The challenge was to relocate a working pyrotechnic facility and plant following the environmental guidance and EMP for both the relocation of the 64 year old factory site and to remediate it to levels acceptable to the new planned end-uses. Huge modifications were made to the under utilised recipient explosive buildings at Somerset West.

RDM successfully executed the relocation of the Philippi site via a small dedicated team. The landowners of Philippi site, Denel SOC Ltd, appointed ,via Denel Industrial Properties, members of RDM to demolish all explosive buildings at the Philippi site and to remediate all land.

The remediation entailed the cleanup, demolition and remediation of soils of more than 223 explosive buildings, various grenade and other pyrotechnic test facilities, burning grounds and surface treatment plants to mention just a few.
Part of the remediation included the remediation of a magazine containing old obsolete and redundant lead styphnate and tetrazene explosives, previously used for the manufacturing of power cartridges and .22 ammunition by the then Swartklip Products.

Like most of the sites and plants, earmarked for closure, focus and attention is normally given to the reduction of personnel and the decommissioning of processes. Obsolete and redundant inventory are normally carried for a few more years until these dated inventories become the focus of the day. In this instance the closure and remediation of the entire site required that something had to be done urgently with all obsolete and redundant stores.

The primary explosive magazine was built as a soft roof magazine with reinforced concrete mound walls. The magazine contained 50 kg lead styphnate and 27 kg tetrazene packed in five separate drums on top of copper plates and a wooden floor to provide proper earthing and anti-static characteristics.

Situated on the Cape Flats, known for its dampness and very long winter rains, the surrounding area was drenched with freestanding water in winter due to shallow calcrete layers and a vlei area in the proximity. The magazine was situated in close proximity to public roads (109m), a school (353m) and residential housing. The magazine was also situated in the approach route to Cape Town International Airport.

Due to concerns that the drums of lead styphnate, already opened, would become more sensitive, additional water was added in 2008 to all the opened lead styphnate drums. However at the time of handling two things were observed a) lead styphnate colouration on the drums and b) galvanic corrosion had started to form between the

Magazine with the dated drums of lead styphnate and tetrazen visible.

Galvanic corrosion formed between drum and copper plate.

Dried out lead styphnate tarnishing on drums.

Tetrazene oozing out of drums running down on side and underneath drums due to pit corrosion.

Tetrazene drums after desensitization with light oil.

drums and the copper plate below the drums. We wanted to remove the lead styphnate at the time but the lead styphnate has already indicated signs of caking preventing removal. The existing drums were then only placed inside new drums.

Needless to say that further requests for remedial action were placed on hold until such time that formal risk assessments could be conducted in detail. It had always been part of planning but only gained momentum when the demolition of the lead styphnate magazine was being planned

A serious attempt was made by our AIA team to assess all risks and gather additional information from all sources. During this time a new risk was noted i.e. pit corrosion that has started on the tetrazene drums resulting in tetrazene oozing out of the drum and running down the sides and underneath the drum. At this time it became clear that opening of the drums would not be possible and that chemical treatment of the lead styphnate was out of the question. Disposal through blasting became the only

alternative. This also confirmed through the communication was of the SAFEX community and emails received from members.

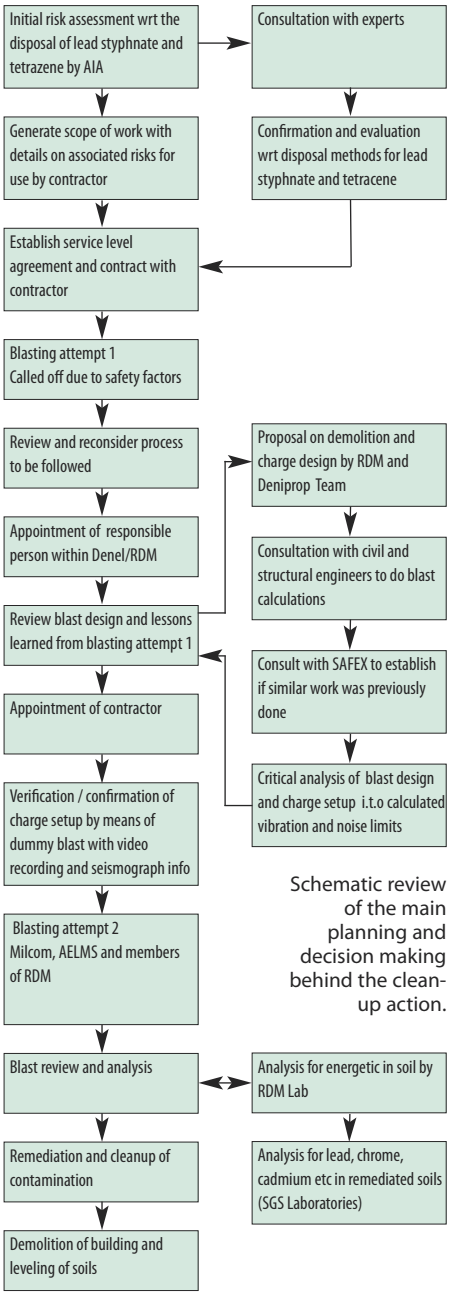
Originally it was decided to subcontract the whole demolition task to an external contractor but safety concerns and environmental risks noted by the RDM team necessitated the placement of the demolition on hold.

It was then decided to run the project internally as the expertise existed within the company to do blast design and building preparation.

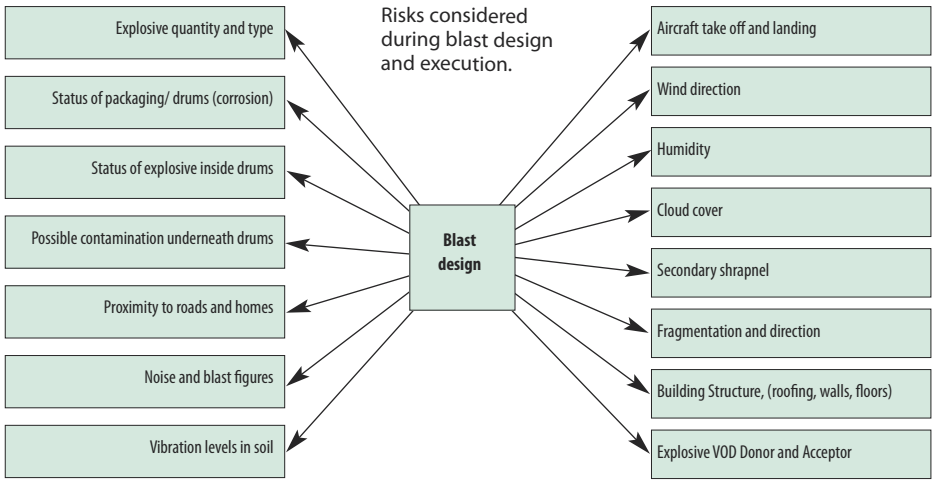
Building preparation

Building preparation and blast execution were based on three main focuses:

- risk reduction
- blast and noise deflection/reduction
- fragmentation control and deflection.



Schematic review of the main planning and decision making behind the clean-up action.



Risk reduction was achieved by conducting building reviews on all buildings in close proximity as well as the testing of charge design. Blast and noise reduction were achieved by making use of minimal quantities of explosives, deflection of sound and pressure waves away from public buildings by specific placement of gum tree poles and soil piles in pre- planned areas. Damage to the building structure was prevented by covering two thirds of the roof area with a combination of diamond mesh, gum tree poles, 10m cable, conveyer belting and mattresses filled with water. (Each mattress contained approximately 1000 litres of water).

Different size mattresses were used in the other third of the roofing area to provide weight and to form a water blanket over the entire blast area. This not only assisted in blast dissipation but also in the reduction of explosive contamination of the area. Scabbing of walls and fragments were prevented by making use of a 2m wide soil layer next to all external walls and the placement of gum tree poles and conveyer belting on the roof area.

For reasons made clear in the detonation design, the demolition charges were designed making use of military explosives, instead of mining explosives, in the form of a mask, enabling the blasting team to place the charge from a distance, without touching the open tetrazene. The explosive power to weight ratio was also more beneficial compared to mining explosives. Prior to detonation of the lead styphnate and tetrazene, the charge design and setup were tested in its current state i.e. inside two different size drums with an air gap between the drums and charges. Detonating cord rolled up in the form of a pig tail was used as a representing charge.

Although the mask design prevented the touching of tetrazene on the drum surface, all visible explosives were desensitized making use of an abundance of light oil sprayed on top of the visible explosives on the drums.

A local firm, Milcom, licensed to undertake blasting in residential areas, with access to additional seismographs, were contracted to detonate the charge

Preparation of building to withstand blast and direct sound away from community.

Water mattresses placed on top of gum tree poles and conveyer belting to resist blast and to form a water barrier during detonation.

Left: A mask consisting of detonating cord and RDX pellets were designed to assist with the placement of the charge over the drum from a distance making use of effective use of explosive force.

Middle and bottom: Charge setup for testing and verification of effectiveness.


All five charges connected without delay.

Detonation of the explosive magazine as captured by AEL Mining.

Unsupported parapet walls toppled to sides.

Lead styphnate coloration in one corner of building after the blast.

Application of flaming of soft roof remnants and colorations observed.

Greenish colouring on soil (non explosive) flamed by means of gas lance.

Levelled land ready to be developed, given a new life to contaminated land.

The maximum vector vibrations recorded were 7.21 mm/s @18.29 Hz whilst blast measurements recorded were 0.30321 kPa with a sound measurement of 144dbl @8.8 Hz

The directional travel of the conveyer belting and roofing material when ejected was as planned. The conveyer belt and soft roof roofing material were found 60 metres from explosion.

Structure damage was minimal and restricted to cracking of the supported walls and one parapet wall slid into the building. The other two parapet walls were damaged outwards due to the lack of support it received from the back. No sand was placed behind the parapet walls as concerns were that loose sand on top of undetonated explosives could increase the risk during cleanup.

A light yellow /brown colouring was visible in the corner of the most southern wall closest to the lead styphnate drums whilst a wet greenish colour was visible on the soil surrounding the building to a maximum distance of approximately 15 metres from the blast centre. This followed planned deflection directions.

Remediation and cleanup

Prior to entry of the building, a pre-burn with a paraffin/diesel mixture, sprayed onto all surfaces and ignited by means of igniter cord were undertaken. As detonations occurred during the pre-entry burn activity, due to entrapped explosives in cracks and underneath copper plates, the pre-burn should be considered one of the most important actions prior to re-entry of any building being remediated by means of detonation.

As a safety precaution, a secondary burn was also undertaken whereby all remnants of the soft roofs and broken wood were placed inside the building and burned. Only after this burn were personnel allowed to enter the facility.

Samples of the concentrated green precipitate were scraped together from the soil (in its wet state) in front of the entrance to the building, and sent for analysis of the energetic matter to the RDM Chemical Laboratories. No lead styphnate or tetrazene were present in the samples.

As it was found that the green precipitate disappeared when flamed by means of a gas lance, the lance were used to burn all soil and polystyrene granules (from the soft roof covering) found lying on the soil.

In order to check remediation effectiveness, an area 0.5 m x 0.5 m, badly stained with green precipitate, was marked prior to flashing and sent for soil analysis by a certified laboratory (SGS) to analyse for the existence of lead and other heavy metals. Analytical results have shown that lead metals were present after remediation at 112mg/kg, well within the remediation requirements of 230mg/kg for residential and 1900mg/kg for commercial industrial use.

Acknowledgments

- *Management of Denel and Denel Properties for the opportunity, beliefs and attendance on the day. Creating a total new meaning for community involvement by CEOs.*
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A safer future: how can we better protect innocent people from being hurt by explosive weapons?

By **Nigel Ellway** BA FRSA MCIPR

Atawullah, aged 8 at the ICRC limb fitting centre in Kabul. A year before, while walking to school, Atawullah stepped on a landmine, losing both an arm and a leg.

It is a cruel irony that as I sit writing this article the television news is showing images of children yet again being caught up in conflict in the Middle-East – children living and dying through a daily barrage of shells and bombs.

Just four years ago the de-mining charity MAG - the Mines Advisory Group, pulled out of Gaza, having spent two years clearing the explosive remnants of war left by Operation Cast Lead, conducted by Israel in 2008-9. And now it starts all over again.

Increasingly, explosive weapons are being used around the world both in conflict and as weapons of terror - with a devastating impact on the lives of innocent people and societies. The problem is global – explosive weapons are being used from Syria and Iraq to the Central African Republic and Columbia.

On the Monday 15th September 2014, experts and practitioners from around the world will be gathering at the Royal Geographical Society in London for the first annual conference to discuss this worrying trend, examine the current and emerging threats and consider what they mean for the future for 'mine-action'.

With the increase in use of explosive weapons comes an increasing number of victims – delegates will also discuss the mechanisms and policies surrounding victim support to ensure that those victims and their families are given the best and most effective support possible.

And finally, the delegates will be debating the political environment in which every penny of funding has to be sourced and spent with the utmost efficacy.

Why are we having this conference now?

For years mine-action organisations have, and are still doing a splendid and very worthwhile job around the world – but it has been said that it will take at least a thousand years to clear all the explosive weapons currently left around the world – and cost up to 33 billion US dollars.

Next year in 2015 the eight Millennium Development Goals are due to be reviewed and replaced by new development goals – an admirable ambition. But none of these new goals will be achievable unless there is a bed-rock of peace and security on which they can be built.

Mine-action is at the core of building that peace and security. It is a programme of activity that needs to be kept high on the political agenda, and high on the level of awareness of the general public.

Explosive weapons such as landmines and improvised explosive devices (IEDs) are impersonal and indiscriminate – IEDs are frighteningly easy to make and the components terrifyingly easy to obtain. Many explosive weapons are victim activated, which allows the perpetrator to put a distance between themselves and their victims and in their minds allows them to shun the responsibility for causing harm.

Last year 37,809 people were killed or injured by explosive weapons – 82% of these were innocent civilians1. A depressing figure indeed – but these are not the only victims.

Some explosive weapons create victims without ever being activated. For many communities the fear of these weapons is enough to disrupt their daily lives.

Landmines in particular are a weapon of denial – the fear of their presence will deny people access to land for agriculture or development, access to clean water, access to education or health care, they trap people in poverty and in fear.

The veteran British footballer Sir Bobby Charlton on a trip to Cambodia, was appalled that children could not safely play wherever they wanted, and at the time it was taking to decontaminate the land. In 2011 he set up a new charity called Find a Better Way. His vision was to encourage academics and researchers to find a more effective and faster way of clearing landmines – and to look at ways of better supporting the victims. Find a Better Way became a grant making organisation – offering research grants to academic institutions to come up with new technology, new techniques and new behaviours to help protect innocent civilians from landmines.

It was with this paradigm in mind that the London conference was conceived.

The ripple effect

According to a report by Action on Armed Violence 'Anatomy of a Suicide Bombing' two explosions in the Moon Market in Lahore, Pakistan killed 60 people and injured 130. It also put 150 market traders out of business. This one incident resulted in the local hospital using up much of its annual budget for trauma patients in a few days– no additional funds came from the government so cuts had to come from other departments. Pregnant women, malaria patients and traffic accident victims also became victims of the bombing.

Explosives used by international terrorists affect us all – as individuals, as organisations and as societies – we all bemoan the increased travel safety restrictions and increased insurance premiums. Human rights organisations worry about the increase in surveillance and the general loss of privacy. And again, it is fear that keeps us from taking our tourist dollar to certain countries that probably need it most.

In some ways that makes us all victims.

So what is 'mine-action'?

The United Nations cite five aspects or 'pillars' of mine-action.
The one most people are familiar with – thanks in part to those photographs of Princess Diana, is 'de-mining' or the clearance of the explosive legacy from past conflicts: mostly landmines and unexploded ordnance. De-mining activity is long and arduous, involving technical surveys, mapping, marking unsafe areas, clearance work and documenting areas that have been cleared.

'Past conflict' may be a somewhat misleading term – as much mine-action work is being undertaken in countries still riven by internecine and factional violence.

The second pillar is Mine Risk Education. This is aimed at reducing the risk of injury from mines and unexploded ordnance by raising awareness and encouraging behaviour change among affected communities so that economic and social development can occur. In simple terms it teaches people how to recognise, avoid and manage the risks posed by mines and unexploded ordnance.

Assistance to victims is a fundamentally important pillar of mine action.

It is obligatory for countries that have signed up to the international Antipersonnel Mine Ban Treaty to provide assistance for the care and rehabilitation, and social and economic reintegration, of mine victims.

There is a proscribed set of victim assistance actions designed to address immediate and long-term needs of mine and explosive weapon victims, their families, mine-affected communities and people with disabilities.

These actions start with emergency and continuing medical care; physical rehabilitation; psychosocial support and social inclusion; and economic reintegration.

Monitoring and evaluation of victim support requires effective information management systems. Hundreds of thousands of mine and explosive remnants of war survivors exist in over 70 countries. The actual figure is unknown as many mine victims never get to medical centres.

Yet another pillar of mine-action is weapons and stockpile management and destruction.

Stockpiled landmines far outnumber those actually laid in the ground. The Anti-Personnel Mine-Ban Convention or 'Ottawa Treaty' states that countries must destroy their stockpiled mines within four years of signing the convention. So far 65 countries have destroyed their stockpiles - a total of more than 37 million mines.

Many of the mine-action organisations offer munitions and weapons management and destruction services – badly or inappropriately stored weapons can and do on occasion, explode causing injury and damage to surrounding communities.

The technology employed in weapons destruction is dependent on materials and circumstance, ranging from: manual, mechanical or robotic disassembly to destruction by incineration or contained detonation.

The fifth pillar, and the one in which the author is involved, is Advocacy.

The United Nations, advocates for universal participation in existing international agreements or 'instruments' that ban or limit the use of landmines.

The first and best known of these agreements is the antipersonnel mine-ban or Ottawa treaty of 1997. This has been followed by further international agreements, including the Convention on Certain Conventional Weapons which focuses on the use of booby-traps and anti-tank and anti-vehicle mines, and the Convention on Cluster Munitions (CCM) or Oslo Treaty.

In the UK, mine-action falls under the responsibility of three Government Departments: The Department for International Development (DFID) who monitor and fund many of the humanitarian projects undertaken by charities such as the HALO trust and MAG. DFID also provide funding for United Nations projects through the UN Mine Action Service.

The Foreign Office (FCO) leads on international agreements and manages the contract for de-mining activity on the Falkland Islands.

The Ministry of Defence (MoD) provides technical advice to the FCO and DFID. It also takes part in negotiating international agreements.

In the UK Parliament the All Party Parliamentary Group on Explosive Weapons of Conflict & Landmines ensures that UK politicians are kept up to speed on the issues and activities of mine-action organisations – and on UK policy toward mine-action and humanitarian funding.

Three years ago, the author created the APPG on Landmines in an effort to drive the issues back up the political agenda – and was delighted to have the support of the

mine-action community and twenty-six enthusiastic members from both the House of Commons and the House of Lords.

Uniquely among all party groups, the Landmines Group has full support from the three Government Departments and benefits enormously from having the participation of a military technical advisory from the MoD.

In 2013 the group decided to change its name to the APPG on Explosive Weapons of Conflict & Landmines to take into account the fact that, alongside the important work dealing with the legacy of landmines and explosive remnants of war, there is a very serious issue of continuing usage of such weapons.

The author would therefore advocate that there should be a sixth pillar of mine-action – protection of civilians from the indiscriminate use of Improvised Explosive Devices and other explosives. This will be the theme of a separate conference run by Action on Armed Violence and Chatham House following on from the conference at the Royal Geographical Society.

Explosive weapons and gender

An aspect of mine action that is steadily gaining ground is the impact on women as victims, but also their role as agents for change. In many post conflict such as Sri Lanka and Cambodia women play a vital role as mine clearance operators.

The Women's International League for Peace and Freedom (WILPF), based in Geneva, produced a study in March this year called 'Women and Explosive Weapons' that included some shocking examples.

Here are some quotes:
"I gave birth at home because I was too terrified to leave. Many pregnant women are losing their children during this war, they are bleeding out because they cannot reach help." *Maha, Syrian border, Lebanon* (Source: Save the Children)

"(W)ho do you usually find at markets during daytime? Women. Who do you find at playgrounds? Mothers and their children." *Leyla, Iraq* (Source: WILPF)

"Now, when a door bangs, I get scared. I don't go to crowded places. I suspect everyone in front or behind me of being dangerous. I stopped going out all together for a while. I was just so afraid, afraid of everything. If someone was carrying a bag in front of me, I would run back home. I felt staying at home was the solution." *Nancy, Nigeria* (Source: WILPF)

"The area that we lived in was being bombed and they had snipers on all the high buildings, so anybody who moved would be shot. [...] There were no schools, no hospitals, no electricity, no water, nothing at all. Everything was broken, ruined" *Um Ali, Syrian border, Lebanon* (Source: Save the Children)

The report goes on to make recommendations for governments and international law, but the fact is that in conflict many of these laws and agreements go out of the window.

Conflict is a male dominated activity – and this is where women come in as agents of change - what is needed is for a more powerful female voice to say, enough is enough – no more violence against the innocent.

In post conflict areas, women are often at the centre of rebuilding the economy, women as mine clearance technicians earn salaries that is pumped back into their society. Once land is cleared, women start to re-cultivate and grow food and many micro finance schemes in developing countries are aimed at women as an increasingly viable economic engine.

A growth industry

Sadly mine-action organisations have plenty of work to go round.

The Arab spring, the appalling situation in Syria and Iraq, the disintegration of Libya and the ongoing war in the Central African Republic have all contributed to the rise in use of landmines and explosive weapons and a rise in victim numbers. While the legacy of conflicts in Angola, Cambodia, Vietnam and Laos is still taking its toll.

Non-Government Organisations (NGOs) and corporate sector mine-action operators compete for contracts around the world to provide technical assistance, education programmes, clearance work and stockpile management - but the level of funding necessary just hasn't kept up with the level of demand.

A personal perspective

When I was asked to write this article – and illustrate it with photos, my first thought was to ask my friend Giles Duley if I could include some of his images. Giles has a very personal interest in this subject.

Giles is a humanitarian photographer. In 2011 while accompanying a US unit in Afghanistan he was severely injured by an explosive device.

Giles's photos tell a compelling story – in 2013 he returned to Afghanistan to photograph people who, like him, have had their lives dramatically changed by landmines and explosive weapons.

Giles says himself that as a westerner he has had the best possible treatment and high-tech prosthetics – in developing countries victims often have little more than basic treatment – and their expectations of returning to an economically useful life are very low indeed.

Photography is not Giles's only gift – when speaking at an exhibition of his photographs in the House of Commons, Giles wove his experiences, and the experiences of his photographic subjects into a powerful narrative that had hard bitten politicians spellbound.

Giles will be speaking again at the Royal Geographical Society in September with his photographs again on show.

AOAV demining team - Western Sahara.

Prosthetic limbs awaiting collection at the International Committee of the Red Cross limb-fitting centre in Kabul. Since the programme started in 1988 the service has provided around 100,000 limbs.

Two years ago the author organised a debate at the Royal Commonwealth Society to celebrate the 20th anniversary of the International Campaign to Ban Landmines – one of the prime concerns of the panel was donor fatigue.

Every humanitarian disaster – whether natural or man made – is an opportunity for charities to campaign for more funding. A typhoon in the Philippines, floods in Bangladesh, the Israeli invasion of Gaza are all terrible incidents that need our attention – but the public is a fickle beast, and mine-action is soon forgotten as each new horror hits our screens.

In 2011 when the author started talking to MPs and Peers about creating a new APPG he had two responses that left him speechless (he resists the temptation to name the individuals), one Labour Peer said that surely now we had the Ottawa treaty the job had been done. The other a Tory MP said, "Surely mine action was just a 'fad' of [Princess] Diana's".

Thankfully there were more enlightened politicians who did support the creation of the group.

The APPG has taken an active role in encouraging DFID to keep up its level of support for mine-action programmes around the world – and through mechanisms such as the Inter-Parliamentary Union – members of the group are able to use their influence with other donor countries to persuade them not to diminish their support and involvement in mine-action.

The UK has an excellent reputation in the humanitarian mine-action arena. Two of the biggest mine-action NGOs are UK based along with many others such as Action on Armed Violence and Find A Better Way – and the UK is one of the top eight contributing countries to mine-action.

The latest annual Landmine Monitor report states that:

"In 2012, 39 donors contributed $497 million in international support for mine action in 52 affected states and four other areas, representing an increase of $30 million (6.4%) from 2011. This is the largest annual total of donor contributions ever recorded by the Monitor, dating back to 1992.

The vast majority of funding came from just a few sources. Contributions from the top eight mine action donors—the United States (US), the EU, Japan, Norway, the Netherlands, Australia, Germany, and the United Kingdom (UK)—accounted for 80% of all donor funding."

The UK's commitment to mine action was set out by the Department for International Development earlier this year in the publication of its policy paper 'Clearing a path to development - The UK government's approach to landmines and explosive remnants of war in developing countries'.

As well as highlighting the success of UK funded projects in countries such as Afghanistan, Mozambique and Libya, the policy also importantly, set out the UK theory of change for mine-action.

The major assumption is that UK funding on mine action needs to have measurable and sustainable impact – the outcomes being that affected communities feel safer, that cleared land is returned to communities to improve economic activity and livelihoods, that access to services such as healthcare and education is increased, that mine-action programmes are increasingly done by national authorities rather than foreign NGOs and contractors, and that there is a measurable progress towards complying with the international agreements.

The overall impact of UK funding for mine action has to be more safety and security leading to communities moving out of poverty and more development goals being achieved.

The author's vision for the September conference is for the mine-action community to come together to share best practice – explore new thoughts and concepts and to work together to achieve the same impact.

1 Action on Armed Violence

Nigel Ellway is Co-ordinator of the All Party Parliamentary Group on Explosive Weapons of Conflict including Landmines.

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SAAB counter-IED collective trainer (CCT)

By **Don Johnstone** MIExpE

'There is no greater calling than providing the capabilities that help protect our soldiers, sailors, airmen and Marines as they execute their battlefield missions. Rapidly responding to warfighter requests and having the ability to rapidly fund and acquire counter-IED capabilities is critical to lowering effective attacks and casualties. However, the best counter-IED tool is a well-trained warfighter.'
Lt. Gen. Michael D. Barbero, Dir JIEDDO May 2013

Image above: Jordan EOD & Search Training exercise.

Introduction

In 2009 the UK MoD recoginsed that failure to train adequately in the use of counter-improvised explosive device (C-IED) equipment was placing troops at unnecessary risk as the threat from IEDs on dismounted operations continued to increase. Thus they articulated a requirement for a C-IED training capability which would validate (using in-service C-IED equipment[1]) individual and collective detection drills. It would also permit the timely development of C-IED Tactics, Techniques and Procedures (TTPs) in response to emerging threats and new in-service equipment.

Saab Training Systems (STS) invested private venture funding to develop a concept for improved C-IED training and worked along side the Warfare Development (WARDEV) at the Land Warfare Centre (LWC). Through WARDEV experimentation with the Agile Tactical Engagement System (ATES) and multi detector systems (MDS) a capability was developed to form an objective understanding of the individual and collective search procedures. In addition, it allowed the gathering of data which validates C-IED models and develops simulation to support training, validation and development.

In June 2010 the MoD placed an Urgent Statement of User Requirement which stated the user required the capability to conduct C-IED DETECT training in order to prepare personnel effectively for deployment on Operation HERRICK. This needed to include the ability to validate C-IED drills and equipment in an objective manner, to reinforce learning and increase user confidence. The capability gap to be met included:

- Objective measurements of individuals and collective performance
- Accurate emulation of threats and rapid incorporation of new TTPs and capabilities in order to enable users to keep 'one step ahead' of potential adversaries
- Detailed training records
- Process for testing and charaterising the performance of IED counter measures against evolving IED threats.

The new capability, system coherence and user confidence, was successfully demonstrated and scrutinised during a Concept Capability Demonstrated (CCD) using 2500 troops from 16 Air Assault Brigade in September 2010. This lead to an award of contract to support training within UK, mainland Europe, in-theatre and the 'rest of world' MoD training locations, using 5 CCT systems.

Overview of Counter-IED Collective Trainer System

Training and validation

The C-IED Collective Trainer[2] (CCT) is a fully instrumented tactical engagement system developed to meet the training needs for individual, collective and route clearance of current and future Improvised Explosive Device (IED) threats and the wider aspects of counter insurgency. It provides realistic, measurable training for an evolving threat. The optimal use of equipment (Individual Training) and Tactics, Techniques and Procedures (Collective Training) is the most effective counter to the IED threat.

Instrumented training and validation

The capability provides objective data which is relevant to the particular scenario or training activity. This enables the Training Advisor, military trainer or commander to make judgments on performance.

[1] ECM and HHMD
[2] Known in the USA as C-IED Clearance Trainer

Training advisor.

CCT Worldwide footprint.

Dedicated SME support

Saab's dedicated and operational current Training Advisors are on hand 24 hrs a day and can be deployed anywhere in the world should a training organisation have any special requirements.

The CCT system consists of several key components:

- **Instrumented training** Instrumented training uses specialised technology to enable the capture of individual and collective performance data.
- **Multi detector sensor (MDS)** The MDS gathers performance data on a range of hand held devices.
- **Weapons effect simulator** Saabs' eye-safe, lightweight, laser Small Arms Transmitter (SAT) accurately simulates the characteristics of the weapon to which it is paired, measuring the lethality of its use and vulnerability of its user to enemy fire
- **ECM** When the electronic counter measure simulator is used in conjunction with the IED Advanced, the ECM simulator accurately depicts the effectiveness of ECM deployment.

BASTION Training Centre.

- **EXCON** The Exercise Control EXCON system tool is a rugged, portable system used to capture, collate, analysis and playback key learning events, allowing the controller to generate objective training evidence.

ECM Bubble on EXCOM.

- **Specialist training advice/delivery** At the heart of the CCT capability is the dedicated Training Advisor. Having credible and recent operational experience, the Training Advisor can assist in exercise setup and design.

"The Saab [CCT] system removes the subjectivity of human judgement from the important task of high risk assurance, replacing it with fact and science."
[Lt Col Adam McRae, CO EOD&S TF H18, 21 May 2013]

CCT training footprint

Currently CCT is providing training support in UK, Europe, Afghanistan and Australia. The MoD contract is split over four areas across the training cycle. In addition, the company provides the manpower to the Australia CCT contract and trains them both in Australia and Afghanistan.

In Barracks Training (IBT)

CCT provide two systems to support the IBT phase for Units in their base locations. The Commanding Officer owns the training and the company generally provides a training support/ training delivery package over the week in support. This includes a round robin training cycle (ground sign awareness, team drills, confirmation and detector refresh) and is later followed by individual and team confirmation exercises. The company then leaves behind a copy of all the AARs as a training record, a training programme and the innovative Saab designed 'Golf ball collimator' dry trainer.

Operational Training Group (OPTAG).

Saab use two systems to support the Confirmatory Field Exercise (CFX) twice a year. The team is split on two sites on Thetford training area in Norfolk in support of the exercises.

Unique Saab golf ball collimator.

OPTAG – RSOI (Camp BASTION)

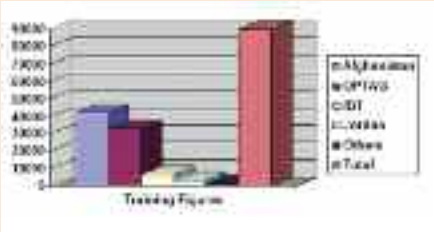
Saab has a permanent presence in Camp BASTION in support of the OPTAG Forward training team at Bastion 3. The company supports the ROSI package on training days 2 and 5 and continuation training. In addition, it supports other ISAF troops and ANSF when requested. Recently, the company also provided the objective validation training exercise for about 700 troops who received training on the new hand-held detector, via a third party contractor who had received their training, instruction and course material from Defence Explosive Munitions Search (DEMS) Training Regiment during the relief-in-place period. The training gave the deployed brigade a far better understanding of the soldier's level of performance, enabling highly effective training simulations and After Action Reviews.

29 EOD & Search Group – Jordan

A CCT system is allocated to support two EOD & Search exercises conducted in Jordan annually. The remainder of the time the system supports 29 EOD & Search Group, which was originally allocated to support DEMS Training Regiment. The purpose of the support is the Mission Rehearsal Exercise (MRX) of the TALISMAN Route Clearance Squadron and consolidation of the EOD & Search Task Force special to arms capability. The main effort is the authorization of the EOD and Search elements, with the latter being intimately supported by CCT. The exercise is centered on Jabel Batra a high plateau region some 45 kms north east of Aqaba with all activities conducted in an expeditionary manner from a tented Main Operating Base (MOB).

Training Figures

Up to October 2013 in excess of 90,000 individual training serials have been conducted by CCT, these include personnel from: UK, AUS, US, Danish, Estonian, ISAF and ANSF.



CCT Training figures as October 2013.

C-IED Pyramid.

Whilst it is difficult to gauge the overall success of CCT accurately, the introduction of the deployability of both the system and the team optimizes the training resources by focusing on enhancing skills of the individual and the coherence of the collective unit. Indeed, by focusing the effort on the 60 % of tactics and procedures to improve user use of the 30 % of equipment, as illustrated by the C-IED Pyramid, the company can leverage substance improvements and thus increase the C-IED effectiveness by investing in personnel. When a map is made of the introduction of CCT across the UK MoD operational training cycle 2010 – 2013 it can be seen that from the chart below a marked drop in UK fatalities were sustained in Afghanistan. The project would not credit itself solely for this reduction but has been part of the great solution or 'onion skin' C-IED capability approach to improve the operational capability and drive to reduce causalities due to IEDs.

'IEDs have caused the majority of casualties in theatre and are expected to be an enduring threat in the future.'
UK MoD 2012

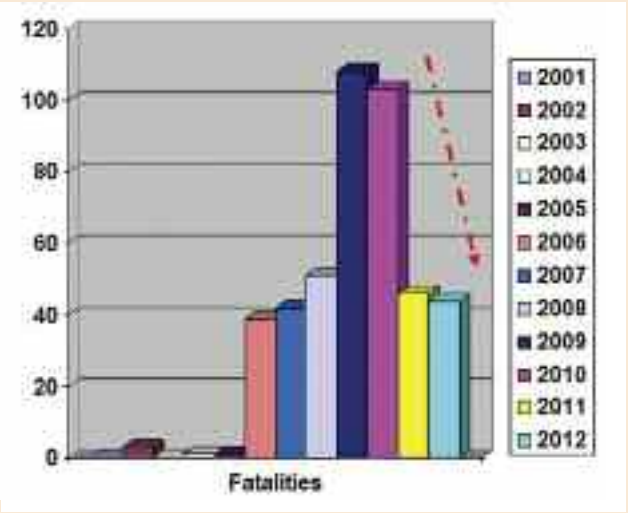
Enduring Capability

There is a danger of not 'learning the lessons' of past operations when a peace dividend meant a wholesale reduction of capability. Therefore, retention of an enduring credible C-IED capability must be an operational necessity, especially when IEDs are the preferred weapon of choice. It is clearly essential that any training must provide an objective output to provide both a performance measurement and justified cost analysis of the training benefit.

"Saab have provided an excellent service to Bastion Training Centre in Afghanistan. The availability of equipment and flexibility of the staff have been particularly impressive."
[Lt Col Steve Long, Comd BTC, 12 May 13]

Awards

In October 2011 Saab CCT won the British Ministerial Defence Award. Mr Luff, the Minister responsible for all MoD equipment, support and technology, awarded SAAB the highest honour, which can be presented to Industry by the MoD. The honour was bestowed in recognition of the significant improvements to Improvised Explosive Device (IED) detection in Afghanistan that have been delivered by mix of cutting edge training technologies, combined with a world leading training delivery service. It is the quickest Urgent Operational Requirement (UOR) ever delivered on operations.



Number of UK fatalities in Afghanistan
(source UK MoD)

Hugh Ward, Roger Lenffer, Bjorn Lindero, Mark Franklin, Alan Roan and members of the JBTSE IPT collecting the Minister for Defence Equipment, Support and Technology prize from the Rt Hon Peter Luff MP – Oct 2011.

Summary

The concept of outsourcing training to credible contractors has developed over many years and CCT programme has successfully demonstrated the advantages of contractor delivered C-IED training, providing the MoD with an attractive flexible option which manages their risk. CCT is unique in that it offers the very best training and validation coupled with being delivered at the point of need.

"CCT brings a capability that allows us to make an assessment and validation of our own C-IED search training TTPs which in turn reinforces our own instructors' subjective assessments. It has to be said that due to the experience and excellent training they deliver the IED strikes against us have remained relatively low and the team have played a huge part in that – the men deploy with the skills and confidence to do the job. It is my opinion that this capability must be retained beyond Op HERRICK to train in an enduring capacity."
UK MoD Spokesman 22nd May 2013.

Any view expressed are those of the author, and do not necessarily represent those of SAAB
http://www.youtube.com/watch?v=5z9f_ BP89rA

This paper is an edited version of a paper submitted to The Institute of Explosive Engineers Journal Awards Competition 2014.

Donald Johnstone is Countering Threats Senior Consultant at Explosive Learning Solutions, Oxford

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Case study: Arabian Explosives Company (AREX), Ras Al Khaimah, UAE

By **Paul Clark** BA FIQ MIExpE, General Manager AREX

Arabian Explosives Company LLC (AREX) is based in the United Arab Emirates supplying packaged explosives to the UAE and neighbouring GCC countries. AREX was formed in 1978 as joint venture between local partners and the EPC-Groupe. Due to AREX's geographical location within the EPC-Groupe it has always operated under slightly different rules and cultures. Health and Safety and Environmental (HSE) therefore has always been viewed slightly differently compared with the rest of the group's operations within Europe.

The philosophy within AREX is that safety is a priority, not an after-thought or bolt-on addition which restricts efficiency and productivity. The different HSE challenges faced at AREX compared to most of other explosives companies is mainly communication related.

We are operating in the Middle East where the UAE's spoken and written language is officially Arabic; therefore all of our paperwork related to the Police and other authorities is conducted in Arabic. National laws and regulations are published in Arabic without "official" translations into other languages, which can often create confusion and misinterpretation. We operate under strict Police supervision due to the sensitive nature of our business and geographical location. This supervision includes 24 hour armed Police guards at our factory, armed Police escorts for raw material imports as well as explosives deliveries. We have Police Technicians supervising our magazine storage and authorising all of our deliveries. The Police all speak in Arabic, with very few speaking little English and even less in other languages.

None of our workforce is Emirati, or has Arabic as their first language. Like all companies within the UAE and most GCC countries in general, our workforce consists of immigrant workers from India, Pakistan or Bangladesh amongst others. Their own languages vary considerably within their native country, also the standard of education in these countries is limited at times, resulting in certain individuals reading and writing skills been poor compared to Europe and other developed areas. Most of these people do not understand HSE initially; their culture doesn't recognise HSE as a fundamental value. You can see examples of a lack of HSE in business and culture everyday on the news or internet from these areas.

The countries and their citizens are still developing and HSE is still a luxury to them at times. We try to educate our employees to change their culture regarding HSE and apply best practice and awareness at work and at home.

At AREX we try to adopt and maintain European standards regarding HSE. We follow the EPC-Groupe procedures and implement their policies. We frequently translate site signage, documentation and safety data sheets for all materials into different languages for ease of use. Whenever possible we use pictorial signage so employees, Police, contractors and visitors can understand them more easily. We carry out annual HSE training in both English and various Indian languages with tests to confirm understanding. Since introducing a NEBOSH qualified HSE trainer/translator our employees understanding and implementation has increased beyond recognition. The SAFEX Incident Reports are also extremely useful as a classroom tool. We use the lessons learnt from these in our training programs and they always create discussions. These incident reports are incidents to which our employees can relate, this material is absorbed and often referred to at a later date when creating a permit to work or carrying out a risk assessment.

We have found that people are willing to learn, if we give them the necessary tools and understanding they will progress and grow as individuals. The company benefits in increased HSE performance and ultimately in the bottom line profitability, the employees are now working safer, staying healthier with better attendance records, as the HSE culture expands and positive actions create further positive reactions, all concerned benefit from the improvements.

Our employees are our greatest investment, but also our greatest asset. Let's look after them and lead our industry forward in a safe and professional manner.

This article first appeared in the SAFEX Newsletter series entitled "This is your Captain speaking", No.38, 3rd Quarter, 2011 and is republished here with permission.

Further information: paul.clark@arabex.ae

IExpE Merchandise

Online ordering

Buy Institute branded items from this location including polo shirts, soft shell and fleece jackets, mugs, and ties. All items will be posted directly to you. A link is also available on the Institute's website.

http://iexpe.weebly.com

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The Bennett file

Our columnist John Bennett tells of the demise of the Standard Pyro-Pak and others

The Standard Pyro-Pak (from Chris Pearce's collection. Photos copyright Chris Pearce).

It is now over thirty two years since I began to produce *Fireworks*, the magazine for firework enthusiasts and the trade. The differences between that first issue and the last could scarcely be greater, but more significant is the difference in the firework trade. There was a British manufacturing industry where the largest – Standard, Brock's, Astra, Pain's, Benwell to the smaller, Kimbolton – thrived – most making fireworks for the shop trade. The contrast is highlighted by the words of Rev Ronald Lancaster of his Kimbolton Fireworks in the latest issue of the magazine: '2017 will come soon enough and we may have to decide whether it is worth carrying on'. I think he is referring to manufacturing, the firework world without displays by Kimbolton would be inconceivable, but it is particularly significant since Kimbolton are the last major British manufacturer – and then no longer of shop goods.

The reasons are not difficult to determine and are little different from those affecting British, and indeed Western, industry as a whole. Cheap imports are the primary reason - particularly from the Far East where cheaper labour costs pertain and less rigorous control is exercised. There is also a perception that the Chinese can offer a range of fireworks more imaginative than that sourced at home. Many apparently modern effects have been seen in this country – ground spinners, missiles and multiple effect bangers for instance have been seen here and have emanated from British factories. There is even the story, told by Chris Pearce in the latest issue of *Fireworks*, of the Standard Pyro-Pak, a complete display in a box and the fore-runner of its modern equivalents lit by only one fuse and supplying a range of effects with minimum effort. John Woodhead, a director at Standard at the time of the Pyro-Pak, has told me that the firework was magnificent when it worked – but there was a good chance that it might not – a fact which resulted in its abandonment before it was put into wide-scale production. No doubt more effort would have been put into fine tuning if economics could have sustained its sale.

However, the Chinese have learned all there is to learn about such fireworks – reproduced them and improved upon them. But the Chinese industry is itself changing. Wages are rising, expectation among the population of a more satisfactory life-style is increasing and safety legislation is becoming more stringent; perhaps it will eventually lead to similar production difficulties experienced in the West. But that will be a long time coming. Even so, some, particularly smaller, British firms have looked at the possibilities of manufacturing on a small scale, in niche markets such as portfires. And been successful; Wells (Dartford) and Dean Fireworks being but two. And others have looked at the possibility of producing a small range of shop goods which could be marketed as, more expensive perhaps, but high-quality merchandise. There is the suspicion that these are romantics and sadly that may be the case.

Certainly the press has always been quick to jump on fireworks as a source of danger instead of pleasure and that has not helped. The recent case of the M5 crash, whatever its rights and wrongs, has shown the authorities to be very quick to blame fireworks for incidents where this has not been borne out by investigation. There have been ludicrous examples, too, of litigious culture which has resulted, in USA, in many companies adding a cost to their customers which covers claims – however bogus – and many are. Examples are those who deliberately park cars near display sites so that claims may be made. The cost of defending is just too great – compensation being cheaper.

Authorities have been quick to take measures to ensnare firework companies – particularly trading standards authorities employing under-aged 'purchasers' to trap retailers selling to those not entitled to buy fireworks because of their age. The Dutch government even have a Fireworks Task Force and this has had some success; although there is no criticism of this body's exposure of firms selling illegal fireworks. It employed a strategy, in the 2013 firework season, of luring potential buyers to purchase from websites located in Poland. Over five hundred fell into the trap. The campaign achieved its aim of spreading unease amongst purchasers who believed it was safe to order illegal fireworks online. It is one entrapment campaign that would probably receive the support of legitimate firework suppliers.

It is not easy being a 'firework man' and it is getting harder all the time. It is sad to report – returning to Ron Lancaster – that he has admitted discouraging enthusiastic young people from starting their own concerns – as he did so successfully many years ago.

John Bennett is editor of Fireworks, a magazine for enthusiasts and the trade. It is obtainable, by credit card on the website www.fireworks-mag.org or, by post, from Fireworks, PO Box 40, Bexhill TN40 1GX Telephone: 01424 733050; email: editor@fireworks-mag.org. £10 annual subscription payable to Fireworks Magazine.

Defence Academy of the United Kingdom

Cranfield UNIVERSITY

Ordnance Munitions and Explosives Symposium
30 September – 1 October 2014

The Defence Academy of the United Kingdom at Shrivenham is hosting a symposium on **Ordnance, Munitions and Explosives**, on behalf of the Sector Skills Strategy Group (SSSG) of the explosives industry and Cranfield Defence and Security.

The theme of the symposium will be 'Design for Safety of ordnance, munitions and explosives and their associated facilities". There will be four strands to this theme; equipment, facilities, people and policy. For event updates please register your interest
by email to caroline@symposiaatshrivenham.com.

For more information please visit www.symposiaatshrivenham.com

The views expressed are those of the author:

Our columnist Sidney Alford MSc PhD recounts the story of the 'wonder shot'....

The Vulcan – a small user-filled shaped charge, injection moulded in plastic, loaded with varying amounts of plastic explosive and provided with a projectile selected from several of various shapes and materials – serves widely as a tool for the disruption of mainly conventional munitions[1], but it is also a convenient tool for experimenting with new explosives or innovative projectiles, such as a marshmallow on one occasion. Its sales attest to its usefulness.

In one recent shot using the Vulcan I used about twenty grams of plastic explosive to fire a conventional copper cone normal to the surface of a large steel cylinder, some 185mm in outer diameter and with a wall thickness of 6.4mm. The result was absolutely characteristic of the charge thus used: a small entry hole 8.6mm in diameter and an exit hole on the opposite side of 5mm diameter.

That shot had been preceded by what was intended to be an identical shot against the same cylinder but that result amazed me. If I could ascertain the difference and repeat the first shot I could certainly patent an invention describing a new class of shaped charge and I would become rich and at least infamous.

The wonder shot had proceeded thus: upon pressing the button the target was instantaneously obscured by an intense white cloud which disappeared almost as quickly as it had formed. When I examined the target I saw that the round entry hole was an astonishing approximation to 50mm in diameter and the exit hole a no less impressive 35mm. Thus the amount of obvious damage to the target was approximately thirty times greater than I had ever inflicted with such a charge before. The edges of the hole were not rough and smeared with copper but showed clean, shiny steel. The cylinder suffered no other distortion.

My brain whirled – or, at least, ticked faster. Explosive charges are thermally pretty inefficient tools but it is the remarkable concentration of a small part of that energy that endows shaped charges with their quite remarkable properties. Had I unwittingly increased the proportion of useful energy? Had my charge gone nuclear? Then the sad truth dawned on me.

The high quality steel target had come from a scrap yard and was none other than a large gas cylinder which had originally contained oxygen. The dealer had assured me that it was empty but he told me that such cylinders needed a visible perforation before he could pass them on for melting down. In return for some useful, high quality and consistent targetry, I returned them suitably perforated for further processing.

The dealer was quite right about its original content but he was less correct – indeed, he was downright wrong – about the cylinder being empty: despite its rusty outside, it was as full of high pressure oxygen as regulations permit. Thus the impact of the hot jet of copper from the shaped charge no doubt pierced no more than the 8mm hole expected. About one square centimetre of the impacted steel was instantaneously raised to a temperature at which it would oxidize superficially quickly in oxygen at one atmosphere pressure and, not surprisingly, ignites and burns with remarkable rapidity at about two hundred atmospheres. I remember that the divers used thermic lance rods to burn through the hull of HMS Edinburgh in order to recover its cargo of gold. The ship had been sunk in 800 feet of water. They initially found that their lances were violently consumed in about two seconds, obliging them to feed them with, I believe, ordinary air which, at the ambient pressure at that extreme depth, had a more appropriate partial pressure of oxygen for burning steel at a manageable rate.

The initial shot holes in my cylinder (one on entry and one on exit) grew rapidly as their peripheries burned away in a flash in the outrush of oxygen, allowing the compressed gas to leave the cylinder extremely quickly and adiabatic cooling upon expansion caused the transient dense, white cloud. Once the oxygen had escaped, the ambient air could no longer sustain the combustion and the conduction of heat from the burning surface cooled the burning surface to an extent that it was left shiny and untarnished.

The morals of this story are, first, that the most spectacular of unexpected observations do not automatically lead to fame and riches and, second, that redundant oxygen cylinders should be disposed of while full rather than empty and made available to inquisitive explosives engineers and their children at a reasonable price.

The company which recently blew down the first batch of Didcot's cooling towers announced a demolition time between 3am and 5am *"in the hope of keeping the gawpers away"*[2]. About 500 people nevertheless turned up. One wonders what the demolition company feared might befall them.

The event reminded me of the felling of the huge Piper Alpha platform[3]. When I was asked by the press whether I knew at what time it would be demolished, I replied that, knowing that six tons of plastic explosive were being sought for the operation, a spectacular splash was to be expected and a wealth of dead fish would be floating on the surface and resting on the seabed for the gathering up. If they were going to hire a helicopter to film the event they would be well advised to turn up at least an hour earlier than whatever time they had been given and just hover because the company carrying out the operation would surely not wish it to be broadcast on that evening's television. My advice was not taken but Occidental kindly provided them with film showing a row of gentle splashes presumably resulting from the small charges used to separate the twin towers standing on the seabed before the "real" charges were fired.

The through and through perforation of the cylinder. The insert shows the size of the charge behaving normally.

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1 Ibid. September 2004

2 The Independent , 28th July 2014

3 Explosives Engineering, Summer 1989

Industry News

The Explosive Regulations, 2014.

The HSE Explosive Legislative Review team have confirmed that the new regulations (Statutory Instrument 1638 of 2014) have been made. Having been laid before Parliament on July 1st and managed the 28 days without being prayed against, they are now confirmed. You can find a copy of these regulations at http://www.legislation.gov.uk/uksi/2014/1638/contents/made and this document can be downloaded as a pdf.

The regulations come into force on 1st October, 2014 with the exception of Regulation 33(7) - repackaging of a civil explosive and Regulation 36 – record keeping in relation to civil explosives, together with the enforcement of these two provisions, which come into force on 5th April, 2015. This is in line with the present timescale for these provisions in the Identification and Traceability of Explosives Regulations 2013 which will then be no more.

On the operative dates, the new regulations revoke and will replace :

- The Control of Explosive Regulations, 1991(COER)
- The Placing on the Market and Supervision of Transfers of Explosives Regulations, 1993 (POMSTER)
- The Marking of Plastic Explosives for Detection Regulations 1996 (MoPEDR)
- The Manufacture and Storage of Explosives Regulations 2005 (MSER)
- The Identification and Traceability of Explosives Regulations 2013 (ITOER).
- The security of explosives requirements made previously under Section 23 of the Explosives Act, 1875.

As the new regulations come into effect, the existing HSE guide to POMSTER and the Approved Code of Practice to MSER are also to be withdrawn. HSE have been working with interested parties in the explosive sector and the other regulators on appropriate guidance to the explosive sector. These consultations have resulted in the compiling of an overarching safety guidance document and a separate overarching guidance document specifically addressing the security features in the regulations. To assist the different sub-sectors, guidance documents on the regulations as they apply to that sector have also been prepared. There are about 7 which include areas such as Manufacture and Storage, Fireworks, Shooting etc. and it is the intention these guides will be made available over the summer, before the regulations are in operation.

Given the new regulations, of necessity, have re-arranged how we presently relate to the legislation in the above areas, we are planning to compile explanatory notes. These will focus on what the changes, both in terminology and in approach, have been made during the consolidation of the above pieces of legislation. These will be placed in both future copies of *Explosives Engineering* and on the Institute website.

HSE have added a 'landing page' for the new regulations to their website at www.hse.gov.uk/explosives/news/new-regulations.htm. It has links to the legislation and published guidance as well as a description of how the guidance framework is expected to fit together and be used.

It is safe to say that much in the new regulations will be familiar both in requirements and the words used. There is a need to make the transition as problem free as possible and the legal and procedural sub-committee will be fielding any queries that may arise from the regulations and subsequent guidance.

Tony Slate AIExpE Legal and Procedural Sub-committee

The review of standards for thermal protection PPE in the Explosives Industry

This review (Research Report RR1002), {http://www.hse.gov.uk/research/rrhtm/rr1002.htm}, by Peter Watkins of HSL is a welcome and important addition to the explosives operators' library. For the first time in a long time it addresses the issue of a massive thermal dose delivered to a worker over probably an extremely short period of time. This is a vastly different regime from the lower dose delivered over a significantly longer time, which forms the basis of the selection criteria for many PPE items. The report shows that the thermal output from a fairly small amount of propellant is several times larger than the standard thermal dose used in PPE assessment for routine industrial use.

Burn injury severity is typically estimated by the medical profession as a Baux score, in which age plus percentage of body burn area equals likelihood of mortality. So, a 40 year old worker with 10% area of his body having suffered burns will have a 50:50 chance of survival. Significantly the report has also recognised the importance of an assessment of the inhalation of hot or burning combustion products. It cites an important reference which shows that this often-neglected effect is responsible for a 17% increase in burn severity. It makes it clear in the review that previous work shows that when inhalation injury is present, as little as 30% burn area can result in a 50% mortality rate.
The review compares the explosives industry worker with workers in the offshore oil industry, where a thermal dose lethality criterion has already been suggested. There is a comparison made between offshore workers and explosives workers - this comparison serves to show just how carefully any assumptions about one's own work force must be made, especially if the selection of PPE is based on these assumptions.

The deadline for sugggestions is by 20th October 2014.The important recommendations which Peter Watkins makes are that PPE, whether made from traditional materials or newer ones such as semi-carbon composites, should be carefully tested against the threat which they are intended to mitigate. The test results should then be examined in the light of the human vulnerability data and the explosives processing conditions so that an informed decision may be made regarding the selection of appropriate PPE for the task.

Ian McKay CEng MPhil BSc DipH&S FIMM FIExpE

Didcot power station towers demolished

Three enormous cooling towers at the disused Didcot A power station in Oxfordshire were demolished on 27th July 2014. The blast conducted with more than 180kg of explosives, flattened 36,000 tonnes of material in seconds and was streamed live online. The coal-fired power station had ceased generating in March 2013 and had dominated the skyline around the town since 1970. The towers stood at 375 ft (114m) and were designed to cool 9 million gallons of water per hour.

Hundreds of people had gathered to watch the towers come down at 05.01 BST, despite warnings of a huge dust cloud. The decision to carry out the demolition before sunrise was criticised by some residents. The HSE, Thames Valley Police and Network Rail had advised that the demolition should take place at an early time as safety had to come first.

Mark Coleman, managing director of demolition firm Coleman and Company said well done to all involved and thanked the local citizens.

Further information: www.bbc.co.uk/news/uk-england-oxfordshire

Ammunition Technical Officers Course – invitation for project titles

Each year the Ammunition Technical Officers' (ATO) Course, at the Defence Academy, conducts MSc level projects in Syndicate. The allocated projects are funded (just £1500 each) and supervised by Cranfield University and Military instructors.

The Course Leader requires challenging and interesting project suggestions, preferably with a real Defence or Civil requirement which will inspire the students to 'make a difference' by the results of what they do. The projects often, but not always, include live explosive or ballistic trials (of their own design) and may include:

- The design, build and test a new complete munition, warhead, pyrotechnic or propulsion system.
- Investigate explosive phenomena.
- Design/test novel armour.
- Build and assess a munition design (possibly historical).
- Devise and test new render safe or demil' techniques.
- Test and/or enhance explosive safety or mitigation systems.

Blast mitigation trial using Dyed Blastsax©

In principle, the projects should be interesting and inspiring. Those suggesting a project will receive an invitation to the project presentations on 10 Jun 2015 and will usually receive a copy of the project report and relevant data. No funding is required, although some sponsors may offer guidance and assistance of some kind. The output quality has been very high in recent years: In 2014, all four projects led to inspire further work in DSTL and Defence.

Already this year we are already considering explosive related projects in the fields of a civil aviation protection and maritime smoke screening, which may be of interested to some. If you are interested in offering assistance or suggesting a project title please contact Ian Scattergood (iscattergood.cmt@da.mod.uk).

The deadline for sugggestions is 20th October 2014.

Fake bomb detectors

A couple face jail after being found guilty of making bogus bomb detectors in their garden shed. Husband and wife Samuel and Joan Tree made "outlandish claims" that their devices could track down explosives and drugs. Alpha 6, marketed through company Keygrove, were simply plastic boxes made in China with an antennae strapped onto them and torn-up pieces of paper inside, and sold for US$2000 (£1,171). About 1500 devices were made in their back garden and sold to agents, suppliers and to Police and security services around the world. They claimed that the Alpha 6 could detect substances as small as 15 billionths of a gram at a range of up to 500 metres, powered simply by static electricity from the user's body.

They were found guilty at the Old Bailey on 1st August 2014 for making an article for use in a fraud between January 2007 and July 2012 and have been released on bail prior to sentencing. They have been warned they face a custodial sentence.

This follows a long line of British con artists making fake bomb detectors which include Garry Bolton, James McCormick and Anthony Williamson, all brought to justice.

Conferences
Exhibition Diary

ORDNANCE MUNITIONS AND EXPLOSIVES SYMPOSIUM
Defence Academy of the United Kingdom, Shrivenham, 30th September to 1st October, 2014
On behalf of the Sector Skills Strategy Group (SSSSG) of the explosives Industry and Cranfield Defence and Security, the theme will be "Design for safety of ordnance, munitions and explosives and their associated facilities". There will be four strands to this theme: equipment, facilities, people and policy.
Further information: www.symposiaatshrivenham.com
See details on page 28.

A SAFER FUTURE: INNOVATION IN MINE ACTION INTERNATIONAL CONFERENCE
London, Royal Geographical Society, 15th September 2014
Further information: Nigel Ellway, Co-ordinator All Party Parliamentary Group on explosive weapons of conflict including landmines, email: nigel@appglandmines.co.uk

ICAO 2014 SYMPOSIUM ON INNOVATION IN AVIATION SECURITY
International Civil Aviation Organisation Headquarters, Montreal, Canada, 21st to 23rd October 2014
Further information: www.icao.int/Meetings/SIAS

TRANSPORT SECURITY EXPO
Olympia, London, 2nd and 3rd December 2014
Further information: info@nineteen-events.com

IMEMTS INSENSITIVE MUNITIONS & ENERGETIC MATERIALS TECHNOLOGY SYMPOSIUM
Sheraton Roma Hotel and Conference Centre, Rome, Italy, 18th to 21st May 2015
Further information: www.imemts2015.com

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The Institute of Explosives Engineers, IExpE, Journal Awards Competition 2015

Competition Prize Categories
- Student Members and Non-Members of IExpE
- Associate Members of IExpE
- Members of IExpE
- Fellows of IExpE

Four cash prizes of £500 plus an engraved tankard each

Deadline for submission for the Journal Awards: 14th November 2014

Further information: www.iexpe.org

In a flash: Bob Woolley

BSc MIQ MIExpE

Your age: 51

Occupation: Employed at EPC-UK

Current position: Services Manager North

Responsibilities in job/work activities: I am responsible for maintaining and developing the business across the region, including the utilisation of bulk explosives trucks, drilling rigs and personnel.

Why are you involved in IExpE? I work in the explosives industry and being a member was the natural thing to do.

What are the benefits for you of the IExpE? For me the main benefits are keeping abreast of new developments and technology. It also helps me to maintain my CPD and keep in touch with others in the industry.

What alternative career might you have followed? As a child I always wanted to be a pilot in the Royal Air Force.

Who do you most admire on the current world stage and why? I admire all the individuals who travel to the world's trouble spots and disaster areas to care for refugees and other displaced people.

Who would you most like to meet from any century and why? I would like to meet some of the early geologists from the 18th and 19th centuries. This was a time of great discovery when the accepted teachings about the history of the earth were starting to be challenged and overturned.

What are your favourite activities/ hobbies? When time and weather permits I enjoy a round of golf.

What is your ideal holiday? Staying with friends in the Ras al Khaimah, where you have the mountains, the beach and the desert all within a few minutes drive.

What is your favourite type of food? Indian, but I also enjoy a traditional Sunday lunch.

Explosives Engineers Educational and Research Trust

The Trust was formed in 1982 to advance the theoretical and practical education and training of persons engaged in the explosives engineering industry by the provision of training courses and the publication of technical, educational and informative material together with the financing of research and the provision of scholarships to assist with courses of study in the field of explosives engineering.

For more information and how to apply for a grant visit:
info@explosivesengineerstrust.com

A Safer Future:

Innovation in Mine-Action International Conference

Royal Geographical Society, London
Monday 15th September 2014

"Millions of people live with the fear of landmines. And every day people die or suffer horrific injuries from abandoned weapons left behind after conflict".

Mine-action is at the bedrock of delivering a safer environment for communities blighted by conflict and creates an environment in which reconstruction and development can then take place. No Millennium Development Goal can be achieved without the peace and security that mine-action delivers.

With new conflicts and new usage of weapons the environment in which mine-action takes place is changing.

This conference will bring together mine-action and associated organisations, academics, victim support and international development groups to discuss and plan for a safer and faster way to deliver the pillars of 'mine-action'.

Ticket prices
Entrance to conference and evening reception hosted by Find a Better Way. Delegates £150, Students & Members of the Institute of Explosive Engineers £75
Places are strictly limited - to book your place please visit:
https://www.eventbrite.com/e/a-safer-future-innovation-in-mine-action-tickets-12414751857

IExpE Journal calls for papers

Deadline for December 2014 issue is October 31st.
1500 - 3000 word articles and papers will be considered for publication
and should be accompanied by digital illustrations eg. photographs, drawings and tables.

E mail the Editor: editor@iexpe.org

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