

The Defence Science and Technology Laboratory

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Introduction

The Defence Science and Technology Laboratory (Dstl) is an integral part of the Ministry of Defence (MOD) and was created in 2001 to be the trusted in-house adviser on defence-related science and technology. Dstl employs some 3000 scientists and engineers and currently stands at number 76 in the Times Top 100 of graduate employers. Committed to the highest standards and scientific excellence, Dstl offers its staff a comprehensive programme of continuing professional development and is well known in the wider community for promoting both science and scientific careers. Dstl's remit is to create the winning edge for UK Forces and government through the best use of science and technology. In so doing, Dstl's expertise is used to undertake work that must be done in government and does not undertake those things that can sensibly be sourced from industry or academia. Dstl's key strength is its breadth of understanding of science and technology coupled with a clear comprehension of the defence user context. This enables Dstl to bring together solutions to the really difficult and high impact problems that really address the user's needs. Dstl continues to evolve to reflect the changing nature of warfare and the emerging concerns of its customer base. This is leading to requirements for a different balance of skills, knowledge and techniques from that of its predecessor organisations. Large-scale, high-intensity conflicts planned against long time-scales have been replaced by a wide variety of almost continuous, demanding operations typified by the recent conflicts in Bosnia, Afghanistan and Iraq. The blurring of the boundary between defence and security is increasing the requirement to counter the

asymmetric threat as well as support the fight against global terrorism. These changes, in turn, demand a more immediate and responsive pull-through of science and engineering, and a greater engagement in and support for front line operations.

In order to ensure that Dstl responds effectively to these changes, it offers a range of products and services to its users. These fall into two broad categories. Dstl's Systems work develops and assesses new operational and equipment concepts as well as providing the evidence base for major decisions. Dstl's work in the science and technology area is concerned with delivering practical solutions to defence and security related problems in areas of particular national and international sensitivity. It also underpins delivery of a range of S&T related strategic services.

More about Systems work

Systems engineering, or systems thinking, means many things to many people. In Dstl we describe Systems work as "bringing together the physical, the human and the conceptual elements necessary to achieve the best effect in the operational context". This work can be separated into two main areas, decision support and advice on innovative capability and systems concepts.

Decision support work assembles the evidence to support a key decision point in one of Dstl's customer processes. This is primarily an analysis and synthesis activity rather than a creative or innovative activity and includes deliverables such as detailed reports backed up by results from numerical and operational analysis, presentations to customers and other stakeholders in the decision, and designing and running decision support workshops. One example of



this type of systems work might be the tasking of Dstl to undertake a requirements definition study for a particular capability programme. In such a study, Dstl would analyse current assumptions and investigate the validity of these assumptions against criteria such as value for money.

Dstl's advice on innovative capability and systems concepts addresses the creation of new options, at defence capability or systems level and above, to tackle an existing or emerging capability gap. Dstl has unique access to a range of stakeholders, nationally and internationally, including government, military, industry and academia. As a result, it is well placed to offer integrated advice across the full spectrum of capabilities. The deliverables are typically a new, characterised concept for the customer to consider or some additional knowledge and understanding about existing options that advance the state of the possible. This work will usually require strong engagement with industry to cover elements such as concept development, systems engineering/integration, manufacturability, maintainability, usability, costs and whole life cycle issues.

One recent example is Dstl's support to the Future Aircraft Carrier which involved a comprehensive programme of work that included analysing the policy implications of the future capability, studying how MOD might smooth the peaks and troughs in the demands on the UK shipbuilding industry, assessing the level of technical risk in the programme and developing simulation software to explore operational concepts and tactics for the Future Joint Combat Aircraft.

Science and Technology

When people think of science and technology, they generally focus upon the exploitation of innovative technology, be that the creation of a new piece of technology or the exploitation of off-the-shelf technology in novel ways. Dstl is certainly involved in this aspect of science and technology and delivers not only the new technology but also an exploitation route that ensures the solution is available for the customer to employ directly or to use in a proof of concept or risk reduction exercise to underpin procurement. With an international track record in this area, Dstl conducts world-class fundamental research in a number of scientific disciplines. The new microbiological containment facility at Dstl's Porton Down site is an example of global best practice and allows our scientists to investigate novel medical countermeasures against biological warfare agents. Vaccines against plague and anthrax have recently been developed at Dstl and are now undergoing clinical trials through our industrial partner. Other vaccines under development include a component smallpox vaccine that is likely to have an equivalent protective effect with a significantly enhanced safety profile in man compared to the previous live vaccine offerings.

Dstl was recently commissioned to develop an alternative to the baton round, a less-lethal weapon used by the police to control serious public order disturbances. Supported by partners in academia and industry, Dstl undertook the research and development of the Attenuating Energy Projectile (AEP) round. As the design authority for the AEP projectile and cartridge, Dstl developed a novel projectile that has a crush zone in the impact face. This zone acts to reduce the peak force on stiff structures such as the head, therefore reducing the potential for injury, whilst maintaining the impact force on intended target areas such as the abdomen. Once developed Dstl undertook the full environmental testing of the prototype. Having been authorised for deployment by the Home Office, the AEP has been in use in Northern Ireland and Great Britain since June 2005 as an alternative option to firearms against individuals exhibiting or threatening serious violence.

The concentration on fundamental defence research and technology

development at Dstl has inevitably led to civilian exploitation opportunities. In order to enable Dstl to improve its exploitation performance without compromising its core business for MOD, a wholly owned subsidiary company, Ploughshare Innovations Ltd, was created and began trading in April 2005. Ploughshare acts as Dstl's technology management company with a remit to exploit intellectual property that Dstl selects to license to it. The company's long term aim is a virtuous cycle of intellectual property generation, exploitation and re-investment which delivers the best return, both economically and scientifically, for MOD, Dstl and the British taxpayer.

A number of exciting prospects for exploitation in the civilian market have already been identified from Dstl's current IP portfolio and, following agreement from MOD, are now under commercial development by Ploughshare through licence agreements and joint ventures. Acolyte Biomedica Ltd, one of 6 such joint ventures based on Dstl intellectual property, was formed in 2000. Its BacLite flex Rapid MRSA system has recently been evaluated by the London Independent Hospital which found the system to be fast, sensitive and cost effective for universal screening of patients to ensure that those colonised with MRSA can be isolated and treated before putting themselves and others at risk. The BacLite system is built on 15 years of original development work by Dstl scientists and is a first rate example of defence technology offering life-saving benefits to the public at large.

Support to Operations

Dstl plays a vital part in supporting operations and our contribution to both military and civil defence efforts is significant. Over one hundred Dstl staff have deployed to Iraq since 2003, of whom over eighty have qualified for the campaign medal by spending more than a month in theatre. They have participated in both systems and science and technology work, including operational analysis to support the General Officer Commanding MND SE, advising on equipment procurement and training, chemical and biological detection and inspection, and collecting data on weapons effects and battle damage. A small scientific team continues to work in theatre, reaching back to the

wider Dstl knowledge base so that they can respond to urgent operational requirements.

Dstl's Forensic Explosives Laboratory provides a unique capability to support the investigation into the criminal misuse of explosives. Scientists are available round the clock to provide front-line scientific capability, technical support and expert advice to the Police Service for any incident on the UK mainland. Frequently this involves attending the scene of an explosion to advise on the collection of forensic evidence, which is subsequently sent to Dstl for rigorous and detailed forensic analysis.

The types of forensic cases fall into a relatively small number of broad categories, including the examination of improvised explosive devices (IED's) that have been rendered safe; the assessment of finds and caches of explosive materials or bomb-making equipment; examination of post-explosion material, explosion scenes and debris and finally the collection and analysis of explosives traces. Sometimes, all of these various possibilities may be included in a single investigation. Dstl is also able to examine improvised devices that use toxic chemical or biological materials.

The forensic facilities at Dstl are externally accredited to the international quality standard ISO 17025 and were the first forensic laboratory in the United Kingdom to gain such accreditation. The Dstl scientists themselves undergo a rigorous in-house training and development programme culminating in external accreditation by the Royal Society of Chemistry and Council for the Registration of Forensic Practitioners (CRFP). This ensures that operations are conducted to the highest possible standards and the exacting requirements of the Criminal Justice System are fully met.

Working with others

Dstl must work closely with other bodies in government, industry and academia in order to ensure that MOD has access to the very best science and technology. Through our ongoing international research collaborations, Dstl is able to help MOD share the burden of research costs between the UK and our collaborative partners resulting in significant financial and technological benefits for all parties.