



Personal Protection

Mark Helliker, Team Leader, Physical Protection Group, Defence Science and Technology Laboratory (Dstl) discusses future trends in personal protection

In providing solutions to the challenge of personal protection designers and practitioners are faced with a number of factors. Foremost amongst them are the tasks of defeating the threat, while limiting the effects of any blunt trauma being transferred to the body. All this while simultaneously working to reduce the relative burden of protection on the soldier.

Mark Helliker, Team Leader, Physical Protection Group, Dstl said, "The priority of our research is, where possible, to prevent injury to the soldier. Where it is not possible to prevent the injury we want to mitigate its effects. By reducing the severity of injuries, we aim to improve the long term recovery of the soldier. We are not able to protect the soldier against everything on the battlefield but we can try and reduce the impact of those injuries. We believe that significant improvement to levels of soldier protection can be achieved without having to rely on revolutionary advances in technology."

Research on personal protection, conducted by Dstl has fed into large clothing programmes such as Personal

Equipment and Common Operational Clothing (PECOC), as well as developing technologies to meet future challenges. Within the work, research on the various programmes are all managed through a single point of contact, an approach put in place to ensure technical coherence with all domains being focused on providing research which, Helliker explained, "would deliver the most impact and ensure that each impact is integrated with the others."

The research areas within the Personal Physical Protection Programme include physical sciences, materials technology, biomedical sciences and analysis, human factors assessment and injury and modelling analysis.

Research by Dstl is currently grouped into several areas: reducing the burden on the soldier, increasing the areas of coverage, improve materials technology and injury modelling in order to better understand the threats, and modelling on how changes in armour will affect the soldier.

Helliker cites the seven threats he describes as

dominant to the dismounted soldier as fragments, high velocity bullets, non ballistic impacts (or bump), behind armour effects, heat, flame and environmental. He draws attention to the absence of low-velocity rounds and knives in that list. He comments, "These are not considered a high threat to the soldier, however they are to our police counterparts. This, together with the different range of ballistic threats and fragmentation are the main differences in requirement for body armour between civil police and the military."

The future

"We are looking more at how we can protect the soldiers of tomorrow as well as soldiers of today and provide a coherent technical response. It is easy to focus on the here and now but if we do not look to the future, we may find ourselves playing catch up."

Helliker believes that the burden equation, bringing together factors such as thermal burden, loss of agility, bulk, weight and lack of integration is not as well understood as it might be.

In 2009, Dstl called for submissions from industry, academia and private ventures, designed to elucidate novel concepts and ideas. Dstl is working with commercial organisations and individuals to develop ideas and technology to address these issues. Submissions through the Centre for Defence Enterprise (CDE) continue to be welcomed. Helliker said, "It is important to emphasise that we are eager to work with non-MoD organisations to ensure the best battle-winning technology in personal protection is going to reach the soldiers on the front line."

Work on the areas of cover is being conducted to identify where the biggest gains in terms of personal protection can be made. Helliker said, "Do we need to increase the protection level of the existing systems or increase where protection is placed? These are the types of questions that we are trying to answer and typically we are using modelling to help us identify where the greatest gains could be made."



A range of new head protection systems are already being fielded by the UK in Afghanistan © AJB

► The focus for blast protection is how improvements can be incorporated easily into any protection system. Helliker explained, "Previous protective technologies have suffered a number of drawbacks so work is being conducted to reduce these as well as integrate these technologies into new protection systems."

A significant outreach programme is being conducted both to develop new materials and to better exploit existing technologies, working with a number of commercial and academic organisations to develop systems that provide better protection or improve their attributes.

Helliker believes it is unlikely that there will be any revolutionary breakthroughs in terms of new materials. "We typically see materials technology evolve through the years with small improvements in isolation, which rarely provide any significant change in protection however in combination they might. As we look to protect more of the body, the small increase in protection may provide a significant difference in the severity of injuries and as we look to protect other parts of the body, other properties become more desirable such as comfort and feel."

A further thread in experimentation is in incorporating protection into the standard clothing a soldier wears. Helliker said, "We cannot always rely on traditional materials as these are often incompatible with the basic need for comfort, so we have to look to new materials or combinations. With that in mind we are trying to improve the flexibility of our systems with both soft and hard armours and look at ways in which we can incorporate systems that will provide more airflow over the body. We are also looking to reduce the bulk of armour and to develop high performance materials either to improve the protection or, if not required, to reduce its weight. At the end of the day the soldier gets better protection for his burden."

"The overriding theme of all our research is integration. It has to operate with all the other items of equipment a soldier needs. If it prevents him from using mission critical equipment a soldier simply won't wear his protection and then we will have failed. Occasionally reducing the weight by exchanging protection for extra mobility is perhaps an option that will yield higher dividends."

Assessment

The assessment of protection technologies can be broken down into three main themes; ballistic performance, behind armour effects and human factors integration. The first part of this is ballistic assessment. The current standards that are being used however have been

predominantly developed for civil police armours. As a consequence, Dstl have developed a ballistic test protocol to meet this requirement for a test regime based on a military environment. This allows the incorporation of advanced test methods such as the Dstl Behind Armour Blunt Trauma (BABT) rig.

Helliker said, "Taking requirements from stakeholders, the protocol has been developed to be more than a compliance test. It also supports research, quality assurance and extended life testing. The test protocol is continually being refined and validated as further research is conducted in this area. Dstl also provides support to the development of STANAG 2920."

A major area for work is on Behind Armour Blunt Trauma (BABT, a spectrum of injuries sustained behind an armour system even though it has defeated the incoming projectile). Helliker said, "As the threat rounds become more severe and manufacturers strive for thinner, lighter plates. However, this can increase the risk of sustaining life threatening BABT. BABT will incapacitate and in some cases it can kill. Commonly accepted static methods of measuring BABT, can only measure the difference

between armours and are not representative of real time effects. There is no scientific correlation between these static methods and the risk of injury." The Dstl BABT rig is the first biologically validated assessment method for ballistic impacts.

Dstl is working hard to improve the way that the UK assesses protection technologies, to ensure they perform to the required level across the whole range of environments our soldiers operate in. Whether this is ballistic performance, behind armour effects, integrations or comfort and ease of use.

The protection programmes run and supported by Dstl endeavour to provide the optimum protection, at the lowest burden to the wearer. Dstl is constantly working to ensure that the very best equipment and technology is available to the soldiers on the front line. Through the Centre for Defence Enterprise, Dstl is working with industry, academia and individuals to develop ideas that ultimately will help to protect our troops. ■

Mark Helliker was speaking at WBR's Soldier Technology 2010.



The UK Osprey Mk.4 body armour © AJB