



Good afternoon. I too welcome you to Defence Research 2010.



Why bother investing in R&D?

I'd like to start with a question, and quite a fundamental one: why do we bother to invest in Defence research and development? Why continue to put significant amounts of tax-payers' money each year into projects whose return is sometimes uncertain, when we could just let other people do all the hard work and buy the results of their labours, in off the shelf equipment? It is a question that, in current times with significant pressure on public spending, we must be able to answer.

The companies gathered here today represent almost every field within defence research, and as the person whose responsibility it is now to formulate and commission MOD's research programme – more of that later – it is incumbent upon me to help make the case for the work that you do. At the same time the range of threats and challenges faced by the UK is greater than ever before, and the pace of technological change continues to increase. It is vital to success in current operations that we are ahead of the competition – and, if we are to continue to be successful in the future, it is vital that we **STAY** ahead of that competition. And that is where Science and Technology and our investment in R&D come in. As my colleague General Macklin has said, our estimate is that our current level of R&D spend has put us around 12 years ahead (in terms of equipment and technology quality) of an opponent who is buying off the shelf. And it is exploiting that advantage effectively that saves lives and wins wars.



Current Examples of Battle-winning Technology

Current battlefield technology is, of course, the product of R&D done in the past – and the modern battlefield is increasingly shaped by and dependent on technology e.g. Robots that can go ahead of troops, armed with sensors that can see and identify what they can't; unmanned drones that can stay aloft for days at a time; armour that can react to being hit; medical technology that keeps people alive in the first instance when injured or can give close to full mobility back to those who have lost limbs on the front line.

Tarian, for example, is an innovative and robust textile-based vehicle armour which combines a range of complex interlaced fabrics and materials inside a protective outer coating which was developed by AmSafe Bridport and Dstl.

Tarian has been fitted to the Heavy Equipment Transporter and has been used on operations. We are currently assessing future utility of fitting of Tarian to other platforms. The vehicle armour is very lightweight and provides protection against rocket propelled grenades, but is typically less than half the weight of aluminium, yet just as effective.

Equally impressive is QinetiQ's Dragon Runner robot. Dragon Runner is a lightweight, man-portable Remote Controlled Vehicle delivered in rapid timescales to meet an Urgent Operational Requirement for Explosive Ordnance Disposal operators in Afghanistan. Delivered in less than 4 months, Dragon Runner entered service in 2009 and has seen significant operational use since being deployed.

Weighing approximately 20 kilograms, Dragon Runner provides the helicopter and foot mounted EOD operator with a remote capability to approach and, depending on the type, render safe an IED. It is highly manoeuvrable and has several cameras and a manipulator arm capable of digging and moving suspect devices from a safe distance. Dstl worked with QQ in putting Dragon Runner through its paces to check durability and robustness for in-theatre operations.

It's not just heavy-duty machinery that we need though. The state-of-the-art Rapid Blood and Fluid Warmer, from Prometheus Medical Limited, quickly heats up blood and vital fluids to ensure that they reach vital organs and injured areas fast, without affecting the patient's core temperature. This reduces the risk of complications such as hypothermia and the inability of the blood to clot after trauma.

We're also working with other Governments and their S&T suppliers. Many of you may have seen recent press coverage of Lance Corporal Craig Lundberg who, despite losing his sight in a rocket-propelled grenade attack, is learning to see again thanks to an ingenious device allowing light to be converted into electrical signals on his tongue. The new system - known as the BrainPort vision device - was originally developed by the Centre for Vision Restoration for the US Armed Forces Institute of Regenerative Medicine.



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The future 'battlefield'

We may even have to start to re-consider what we mean by “the battlefield” in future conflicts. The picture that is conjured up in most people’s minds, I suspect, is an Afghan desert or more up to date, the Green Zone, but the answer is increasingly often something much more familiar to most of us – the computer screen.

Future wars are likely to be fought as much through the minds of millions looking at computer and television screens than on anywhere that can be pointed to on a map.

Over the past 20 years the information age has transformed the way we see ourselves and our neighbours, our communities and our rivals. Indeed anyone with whom we have an affinity or a dispute. This can undoubtedly be used to our advantage. In conflicts such as the current one in Afghanistan, we can win only if we can get our message across and convince people of the value of that message – and that requires more than just technology.

But other impacts are less positive: Al Qaeda’s use of technology has created a global network of loosely-linked cells united only by their common cause. Dan Rather, the veteran US journalist, has commented that AQ’s physical location is virtual: “it’s a worldwide, internet-based movement.”

And as the UK, and its economic activities, become increasingly dependent on our information systems so we become increasingly threatened by cyber-warfare – which requires a whole new line of security and defence to be developed.

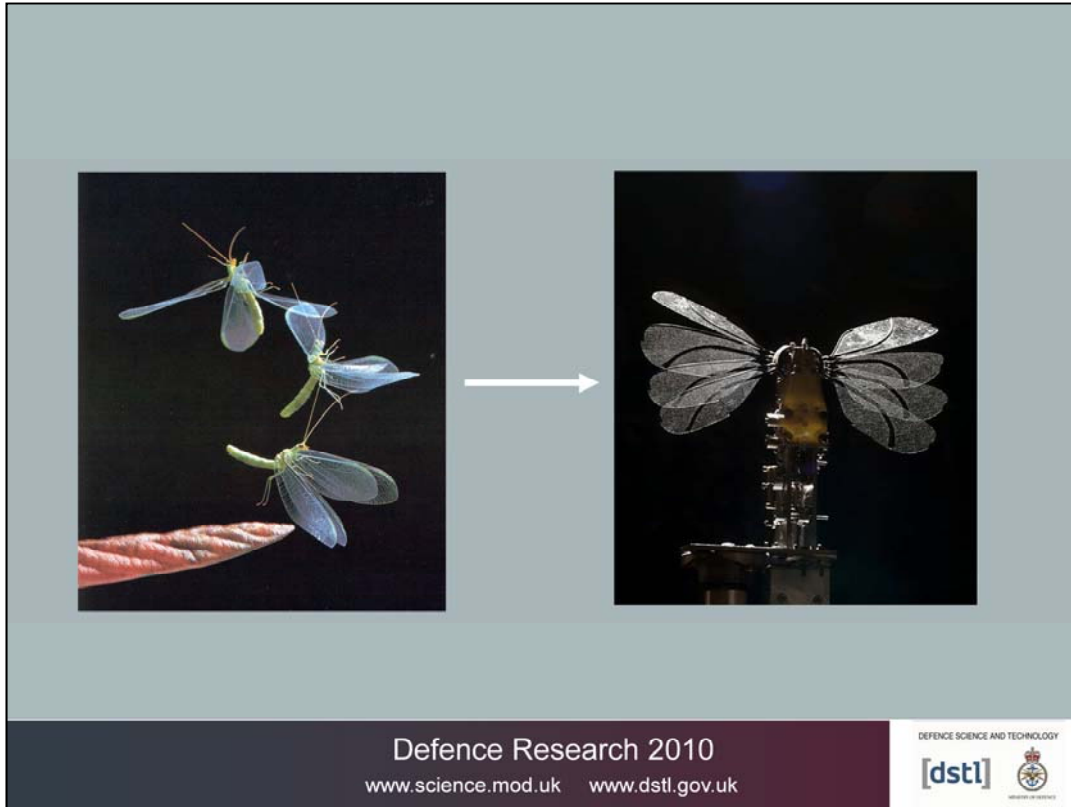
While the upcoming Strategic Defence Review will set out our priorities and expectations for Defence in the coming decades, it would be foolish to assume that we can predict every challenge that we will face. The capacity for an agile and inventive response to new threats as they emerge is therefore critical.



Social Science Challenges

There are also a range of, what could be considered, social science challenges for us to face in future. Operations in Afghanistan are just one example of how the so called “comprehensive approach” is being pursued and lessons being learned for how to conduct such operations in future, wherever they might arise. How the levers of soft power, diplomacy, influence, provision of various types of aid and engagement with government and non-government bodies, all play together in the future are, themselves, important and legitimate topics for research. The developing links between security at home and abroad are also live ones and, again, the social science dimension comes to the fore in our thinking of these future challenges.

I am sure you will have taken even more from Gen Macklin’s talk this morning.



Emerging Technology

Bearing this in mind, we mustn't just be ahead of our opponents in conventional fields of science and technology – we must be increasingly alert to the new ones coming along and be able to assess what they might mean for defence; whether offering an opportunity or a threat. Many of these emerging areas arise at the boundaries between more traditional fields of science. For example the boundaries between biology and physics are yielding a whole host of bio-inspired technologies ranging from novel sensors and intelligent processing, to advances in autonomous systems that mimic birds or insects, to advances in “brain operated” prosthetics or, at greater distance, enhanced integration of man and machine in remote operation.

The breadth of the role that emerging technologies can play is limited only by the uses we can imagine for them. But the competitive advantage on the battle-field will only be delivered if we can develop them from the drawing board to exploitation in military systems more quickly and efficiently than our adversaries.

It is not just new technologies that we need to be alert to but also to fields that we did not previously regard as relevant to Defence. We need inventive people to look at the research and development that is already taking place in other fields, and to see how it could be adapted to be of use to MOD. It is a characteristic of the work we do that MOD has an interest in almost every branch of science and technology, and we are therefore looking to work with people who have never worked with us before. The next big leap in defence technology, or the next small innovation that has a large impact on our soldiers' lives, could come from someone who today hasn't even thought that their work could be of interest to us.



Integration into systems

The kind of research of relevance to Defence is not only about creating niche battle-winning technologies. At least as important are issues surrounding how these technologies are integrated and engineered into systems and how we manage the potential risks during procurement that adopting new technologies can bring if not planned well. In addition we must address how the operators are trained to work with the new system, and in some cases to be an integral part of the overall system's effectiveness; how tactics and procedures need to be adapted to exploit the potential that the system offers and so on. There is no point in making available leading edge equipment if we do not understand how we will use it in anger and have not been trained in its use. This type of joined up thinking needs to start at the earliest phase of research if we are to make the correct decisions on technologies and their accelerated pull-through into service.

Working Together

- Making best use of resources
- Ensuring connections between all parts of MOD
- Creating a shared understanding of the needs and challenges



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Working Together

It is also obvious to everyone working in the public sector that, in coming years, we will have to be even better at targeting the use of the resources that we have available. We must make every pound we spend on Defence R&D count. I see a key part of my job as making sure that we maximise the impact that science and technology can have on Defence and ensuring the MOD is alert, ready and able to gain the greatest benefit from the money we spend.

At the heart of this agenda is for us to create and sustain even better connections between all the different parts of MOD that are engaged in using and exploiting technology, and forming even better links with industry and the wider science and technology base. We need to create a much better shared understanding amongst this community of both what MOD's problems and challenges are - the application requirements, or systems pull – with the opportunities or solutions that technology and innovation might be able to offer.

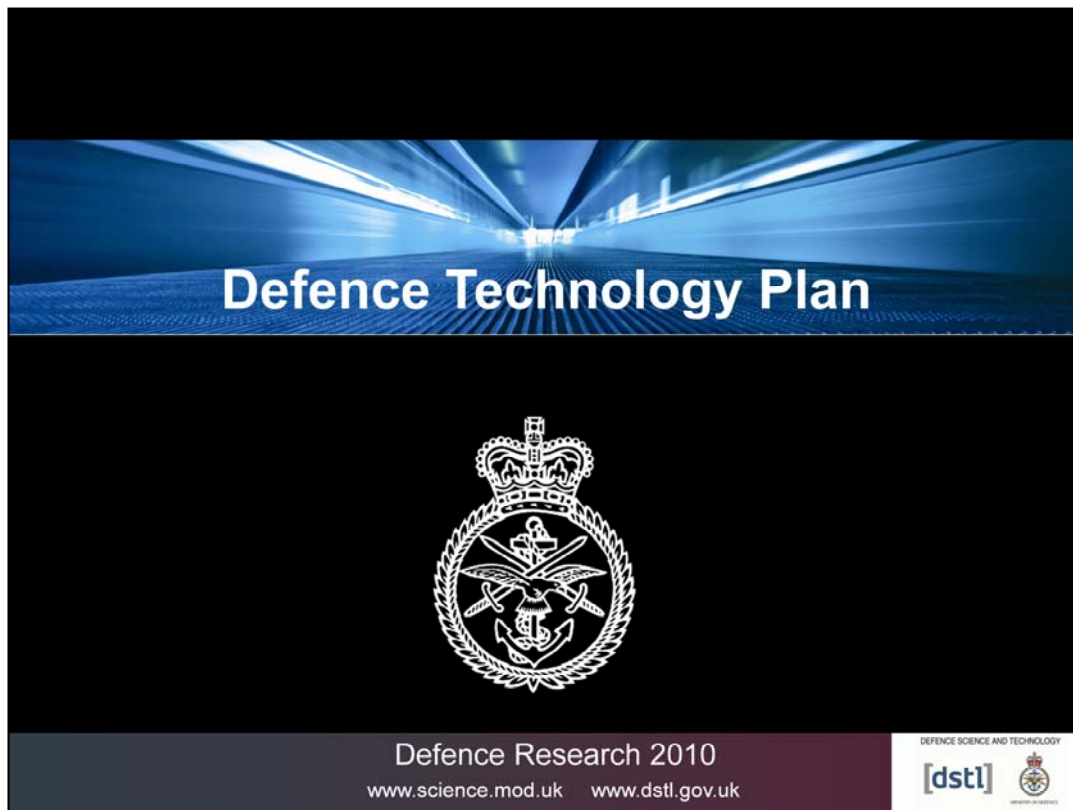
In the past some people have been put off interacting because of confusion or lack of clarity over what MOD wants; an idea that MOD is 'impenetrable', a large and daunting organisation with no easy way in; or a perception that MOD only works with big, established defence suppliers.

Once upon a time there was some truth in this perception – and the impression has lingered even after MOD began to change. It has been our determined aim in recent years to change our culture and to dispel these impressions.

We must make it easier for small and medium-sized businesses, academia and even individual inventors to understand MOD's requirements; to approach us with their solutions; and to receive help, advice and funding to develop their ideas and bring them into service. The Centre for Defence Enterprise demonstrates the considerable success we have already enjoyed in achieving these aims – although there will always be further improvement to be made.

Since its inception the CDE has received over 1000 proposals, of which it has funded nearly 200. Approximately 60% of these funded proposals were placed with Small and Medium-sized Enterprises (SMEs), many of which are new to defence.

The Head of the CDE, Helen Almey, will give you much more later this afternoon.



Creating the Shared Understanding of MOD's needs and challenges - The Defence Technology Plan (DTP)

In 2005, the Defence Industrial Strategy set out a comprehensive statement of how the Government would engage with industry on the acquisition of equipment, support, and services. This will be updated during the next Strategic Defence Review, in the light of future military capability requirements. As part of that, in February 2009 we published the Defence Technology Plan, the first time MOD has publicly announced its detailed research needs to the entire UK science and technology community. The DTP allows the whole of the potential supplier base to see what MOD needs, and thus allows them to plan and align their own work with our requirements. It was recently updated, and it will continue to be a living document where we maintain an up-to-date picture of MOD's needs.



Capability Planning

An important part of maintaining the DTP is some of the research projects that we do to support Capability Planning. We need to work with our military colleagues across MOD to investigate emerging gaps in military Capability and translate them into areas for further study and, potentially, into research goals. This helps us understand how best to target research investment, identifying those areas where increased performance from leading edge technology will deliver the biggest bang for the buck. Increasingly we recognise that we cannot do this alone in MOD but need to engage with suppliers at this early stage when we start to plan our future Capabilities. We have a growing number of examples of where we are doing this via a range of collaborative processes, from so called Capability Investigations, which are part of MOD's approach to Through Life Capability Management, to Defence Systems Partnership projects which Dstl has led in areas such as UAV concept development, to show and tell workshops with industry and academia. In managing the research programme, it is my intention to build on these kinds of collaborative activities to increase our engagement, at the earliest stages, in research thinking and make those important connections.

Our current priorities identify those programme areas that are particularly important in supporting current operations in Afghanistan. In addition, there are some enduring themes that run through these priorities. For example the importance of agility and survivability of dismounted troops and the protection of major platforms, on land, at sea or in the air, and the force elements made up from those platforms and people. Information, its collection, dissemination and exploitation continue to be topics of continuing technical challenge, particularly from a systems integration perspective so that we really achieve the greatest benefit from pulling together our research investments in particular sensors, platforms, computing architectures and techniques. Autonomous Systems are

Capability Visions

- Electronics defeat
- Future protected vehicle
- Novel air concept
- Reducing operational dependency on fossil fuels
- Reducing the burden on the dismounted soldier

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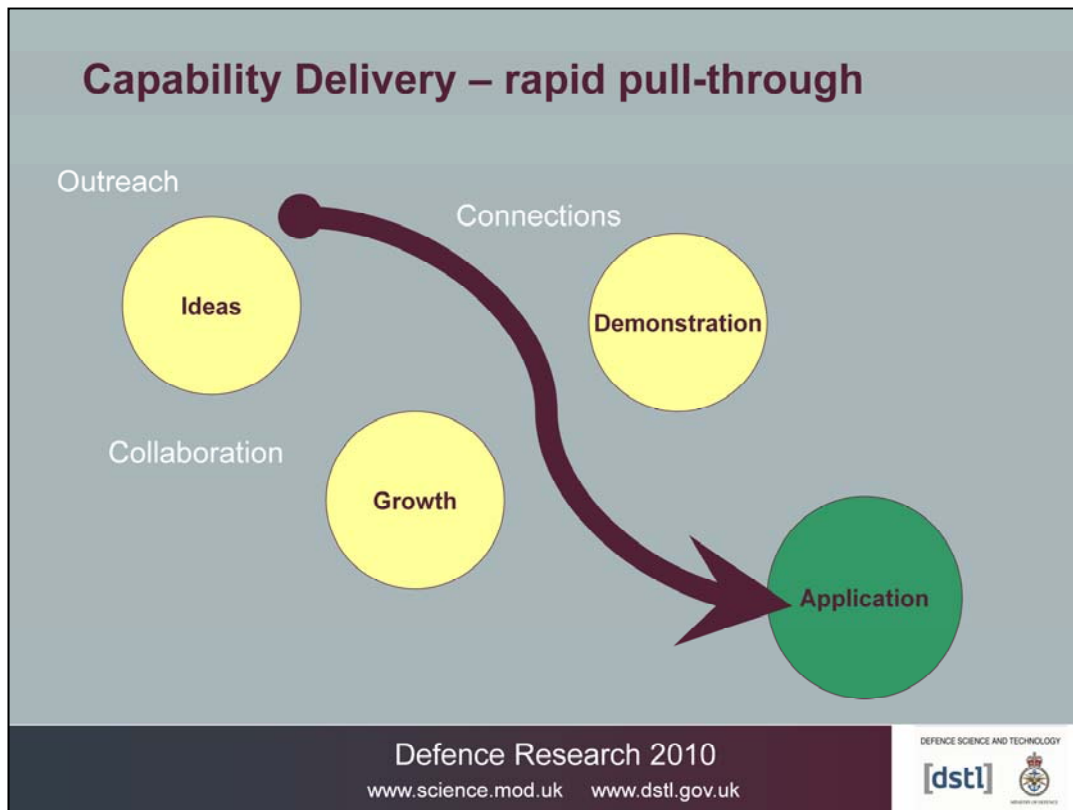
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Capability Visions

The DTP also looks to the future – it contains five Capability Visions, which are more loosely-defined, open-ended projects designed to promote a longer term perspective. As an example, these include for example, reducing our operational dependency on fossil fuels, which is a major aim of MOD.

We want to do this not only for vital environmental and national-security reasons, but for important logistical and financial ones as well. MOD currently spends around £1 billion per year on fuel, and the challenge presented by the need to get that fuel to the right place is considerable. We envisage a future in which bases and vehicles are capable of producing their own power by sustainable methods, allowing them to operate independently of vulnerable supply chains.

This is undoubtedly an area in which there is scope for innovation at all levels, and where the civilian technology being developed by numerous small green-tech companies could rapidly and easily be adapted for military use. This is still a relatively young branch of science, with much of its potential still untapped and much of its direction still to be decided.



I have talked about the need to engage earlier in the Capability Planning cycle and there is an equally important set of interactions required for Capability Delivery.

(Talk through diagram)



Science and Engineering in Defence

The foundation for the UK defence and security industry's technological edge is its highly-skilled workforce of scientists and engineers. You represent one of the most innovative scientific communities in the world. This is an exciting and a testing time, but I firmly believe that MOD and the scientists it depends upon will rise to the challenge.

Today's event follows National Science & Engineering Week (NSEW), a national celebration of science, engineering and technology and its importance to our lives.

The UK is a world leader in science and research, second only to the US in research output.

Research & Development is helping to provide battle-winning technology for the UK Armed Forces on current operations. That is why the MoD spends some £2Bn a year on it. But to succeed in a rapidly changing world we must match our world class science and research with an ability to innovate to translate discoveries and ideas into new goods and services, driving our economy and improving our lives.



NEW STRUCTURE FOR DEFENCE SCIENCE AND TECHNOLOGY

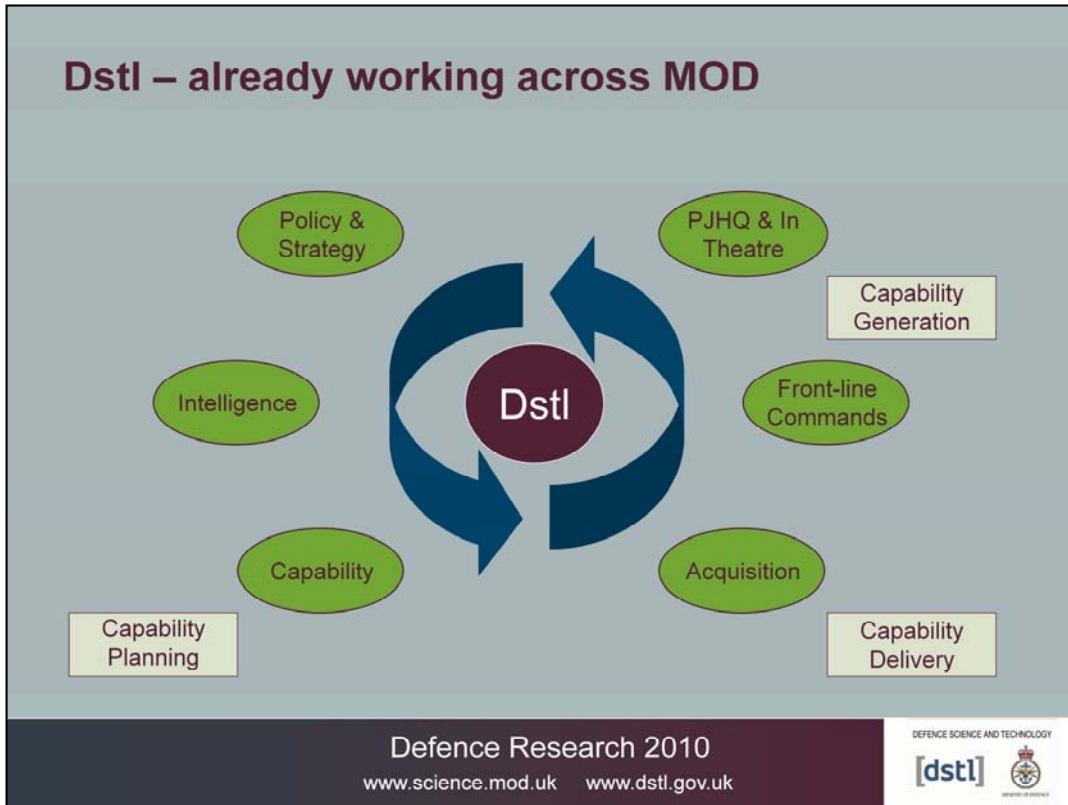
As many of you will be aware, a major review into the way S&T is delivered within the MOD was commissioned by Mark Welland, our Chief Scientific Adviser, early last year. The review team recommended a new structure for MOD S&T in order to deliver efficiency and improvements in S&T. This structure will be in place by the 1st of April this year.

The Defence Science and Technology Laboratory (Dstl), of which I am the Chief Executive, becomes the key focus for S&T, within the MOD, working with industry and academia. SIT, (Science | Innovation | Technology) will step down and be replaced with a small head office team working directly within the Ministry of Defence.

This Head Office team will set MOD's S&T policy and strategy and be the main point of contact for Ministers and other Government departments.

Dstl will now incorporate a new Defence Science and Technology Programme Office, which will be responsible for the planning and delivery of Defence's overall S&T requirement as directed by MOD's R&D Board. These changes will reduce Defence S&T overheads, which will be reinvested back into the research programme. But to our suppliers you should see a simpler set of communication routes into MOD, and as a consequence a better service.

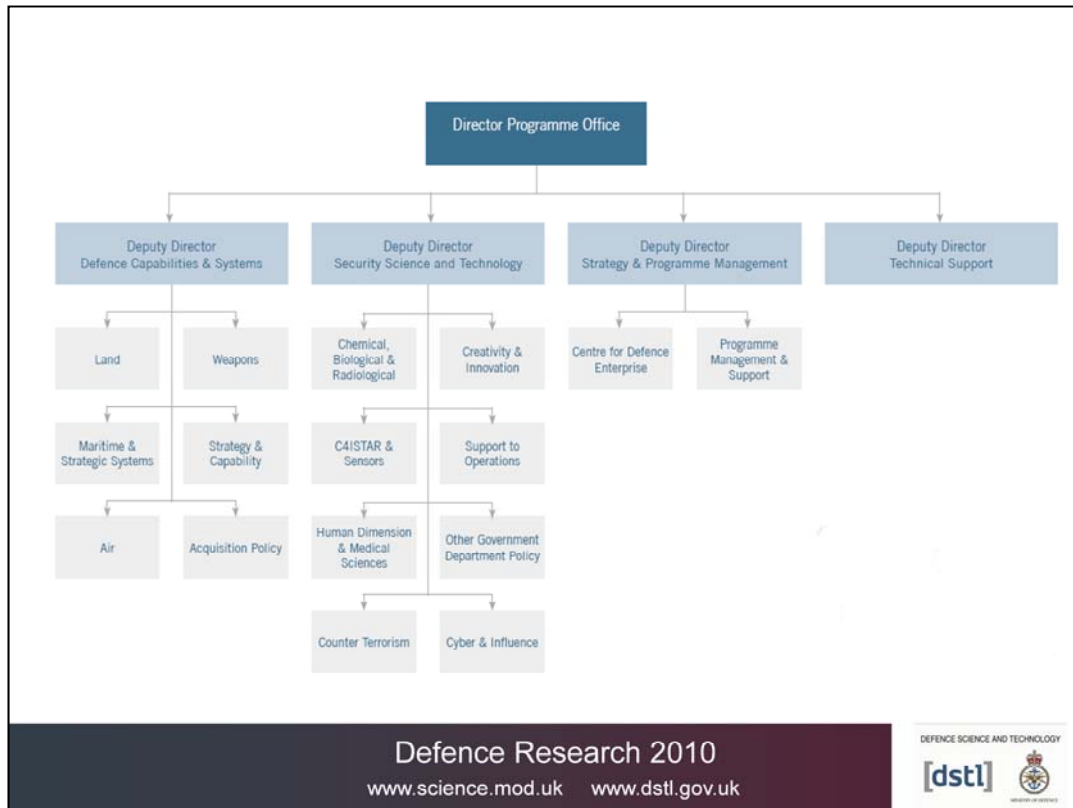
In turn this will help us to deliver the best solutions to MOD's S&T requirements – identifying real S&T advances and increasing the pull through into service.



Dstl

In addition to this, Dstl will continue to support our operations directly, with staff deployed to the frontline and 24/7 back up in the UK. It will also build on our existing connectivity with all the key users of S&T in MOD and beyond that into Other Government Departments.

(Talk through diagram)



Jonathan Lyle

It is with great pleasure that we welcome Jonathan Lyle as the new Director of the Programme Office in DSTL. Jonathan is a Chartered Engineer and a Fellow of the Institution of Engineering and Technology, and it is his engineering background that has helped steer his course through the MOD.

Jonathan is very experienced in procuring technology from industry and in working with Whitehall. His broad experience in Defence Acquisition makes Jonathan ideally placed to fully understand the interfaces between those of us who design and develop equipment, and those who buy it on behalf of the troops on the front line. I hope you will all join me in wishing him the very best in his new and important role.



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