

# Scientists or soldiers? Career choice, ethics and the military

By Dr Chris Langley

*A Scientists for Global Responsibility Briefing*

## Summary

This briefing discusses military involvement with science and engineering, and how it can affect career choice in these fields. It outlines how the UK's position as a major military power influences research, teaching, and development and deployment of new technologies, and discusses the related ethical issues. The briefing also gives tips on avoiding military work and describes opportunities in a range of alternative fields such as peace-building, disarmament, and cleaner energy technologies.

## Introduction

There are various dilemmas and ethical questions that arise when choosing a career in fields in which the military provides support to research, teaching, technology development and engineering. Such support is not always obvious. The aim here is to provide some insights into how it came about and how to recognise it. Those contemplating working on military projects should also read on: there are many challenging points worth considering.

Also described here are the range of alternative choices in science, technology and engineering for those wishing either to avoid involvement with 'defence' (which tends to be narrowly defined, assuming a reliance on weapons and their support technologies), or those hoping to work in areas with an explicit aim of contributing to social justice, peace or environmental sustainability.

The choice can be a difficult one. Employers in the military sector such as the corporations (including BAE Systems and Rolls Royce), government ministries (especially the Ministry of Defence), or the partly privatised government research facilities (such as the Defence Science and Technology Laboratory and QinetiQ) often offer attractive, well paid job opportunities. However, working on military projects often requires using your skills to develop technologies whose specific aim is to kill others, or otherwise support a means of achieving results through the use of force. It is frequently impossible to distinguish between offensive and defensive applications.



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## About the author

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The UK currently deploys nearly 200 Trident nuclear weapons

Such work should be considered in the context of the UK's current position as a major military power in the world [1]. It is one of the few countries that actively deploys Weapons of Mass Destruction, in the form of approximately two hundred nuclear weapons. Of particular relevance to this briefing, the UK Atomic Weapons Establishment (AWE) – which maintains these weapons – has recently received taxpayers' funding to the tune of £2 billion for expansion and refurbishment [2]. The scientific press has carried advertisements for scientists, technologists and engineers to work on new and 'fascinating' projects at this weapons research laboratory. It is not hard to imagine what these might be.

The military also has involvement with the so-called emerging technologies like biotechnology and the nanotechnologies. These technologies already raise public concern because they are perceived as being both powerful and unpredictable in their impact, and such concerns are sharpened when the possibility of military applications is considered. However, new technologies often promise benefits in areas such as clean energy options and new therapeutic approaches to disease, so it can be difficult to assess the ethical merits of a particular line of work [3].

Whatever your field, it is worth remembering that military interests play a complex and changing role within many disciplines across science, engineering and technology especially in countries like the UK and the USA. It is a role that owes much to political decisions – about national security, for example, and the place of science and technology in a modern society. This influence exerted by the military, often subtle and difficult to unravel, is described in depth in the SGR report *Soldiers in the laboratory* (see *Further reading*).

## Science, technology and the military - a background

So, what's the story behind military involvement in science and technology? Investment in the military and security sectors in general has been affected by a number of global changes over the past twenty years. At the end of the 1980s, the break-up of the Soviet Union ended the Cold War and military expenditure fell. Following the September 11th attacks and the consequent 'War on Terror', this drop in spending was reversed [4]. The global military expenditure in 2004 was more than US\$1 trillion – and the UK is the world's second largest spender [5]. Along with other wealthy countries it is showing increasing emphasis on high technology weaponry, which contributes to a narrow approach to dealing with security issues. Multilateral and non-offensive ways of dealing with potential conflict are often marginalised (the UK Ministry of Defence (MoD) currently only spends around 6% of its budget on conflict prevention [6]).

Meanwhile, there is growing evidence that the international arms trade – in which the UK is also heavily involved – is contributing to conflict and worsening human rights problems and poverty. While the USA is home to the largest military corporations in the world, like Lockheed Martin and Boeing, the UK also has several major arms companies. BAE Systems, for example, sold military equipment worth £9.4 billion in 2003. In the same year, Rolls Royce recorded military sales worth around £1 billion – about 24% of its total sales [7].

This upturn in high-tech, offensive, high-expenditure military policies has been mirrored by an increasing military involvement with the UK and US science and technology communities – including in universities.

It is true that science, engineering and technology have been involved with military objectives in the wealthier countries for hundreds of years. The economic and military dominance of countries of the 'North', such as the USA and the UK, owes much to the development of high technology weapons and their support infrastructure. The pace of the militarisation of science increased with the Manhattan project in the 1940s, which led to the nuclear bombs that destroyed Hiroshima and Nagasaki [8], and continued during the Cold War period (on both the US and the former Soviet Union sides). However it has received a huge impetus recently, especially in the USA, as part of the response to international terrorism.

These developments are reflected in a number of radical changes in academic establishments in many of the wealthiest countries over the last twenty years, especially the UK and USA. Universities have become increasingly commercialised and are expected to respond to economic targets and values. Research must therefore be driven by business opportunities – opening the way to various 'partnerships' with other organisations including military corporations and government defence ministries [9, 10]. It is apparent from the UK's ten year science and innovation investment strategy, published in 2004, that wealth creation is currently seen as the major driving force for the support of science, engineering and technology. For some, selling weapons and their means of delivery is an economic reality no different from other commercial activities.



Table – UK military-university consortia in 2004  
From Langley (2005) [11]

	UTC	DTC	DARPS	TOE
Bath				✓
Birmingham	✓	✓✓	✓	✓
Bristol		✓	✓✓✓	
Brunel		✓		
Cambridge	✓✓	✓	✓✓✓	
Cardiff		✓		
City			✓	
Cranfield	✓	✓✓	✓✓✓	✓✓✓
De Montfort		✓		
Edinburgh		✓		
Glasgow		✓	✓✓	
Glasgow Caledonian			✓	
Heriot Watt		✓		
Imperial College London	✓	✓	✓✓✓✓	✓✓✓
Leeds		✓		
Leicester			✓	
Loughborough	✓		✓✓	✓
Manchester	✓		✓✓✓	
Nottingham	✓✓			
Oxford	✓✓		✓✓	
Sheffield	✓✓✓	✓		✓
Southampton	✓✓	✓✓	✓✓✓	✓
St Andrews		✓		
Strathclyde	✓	✓		
Surrey	✓	✓	✓	✓
Sussex	✓		✓	
Swansea	✓		✓	
University College London		✓		✓✓
York	✓		✓	

Notes

UTC - University Technology Centres (part civilian, part military)  
 DTC - Defence Technology Centres  
 DARPS - Defence and Aerospace Research Partnerships  
 TOE - Towers of Excellence  
 From Langley (2005) [11]

A clear outcome of this shift can be seen in the form of the various consortia that have been set up in the last few years between military corporations (such as BAE Systems), government departments, the former government defence laboratories, and universities [11]. These consortia comprise the Defence Technology Centres, the Towers of Excellence and the Defence Aerospace Research Partnerships. Rolls Royce also funds a number of University Technology Centres, which include military R&D. In 2004, 29 British universities were involved in these four consortia (see Table). This figure is growing, not least due to a new collaborative programme run by QinetiQ, which was announced in late 2005.

What many do not realise is that the UK devotes approximately £2.5 billion each year of public money to military research and development – nearly one-third of all public R&D spending (see Figure overleaf). It is the second largest spender on military R&D after the USA [12].

Other relevant shifts have occurred in recent years. Conflict often now occurs more often within countries than between them, for example because of long-standing ethnic or resource problems, and is frequently supported by criminal gangs and money laundering. The international arms trade, in which the UK plays a significant role (we were the second largest exporter of arms, to the tune of £8.2 billion, in 2003 [14]), helps to fuel such conflict. Between 1989 and 2003 more than seven million people were killed in wars; there are no figures for the numbers still suffering physically or mentally [15]. These days around 75%, possibly more, of those killed in wars are civilians – many of them children. Keeping the military machine ready for use entails damage to the environment, because troops and their weapons are often trained in areas of ecological value, and because they consume scarce resources, including oil, on a large-scale.

In any case, the broad issue of security requires a far more in-depth and open approach from government than a simple reliance upon weapons systems and the projection of force. It needs an approach that addresses such issues as climate change mitigation, global poverty, access to clean water and energy sources, loss of biodiversity and the associated degradation of the environment. Given that the lives of those who are starving, poverty-stricken and lacking access to clean water

and adequate sanitation could be so dramatically improved by the application of scientific and technological expertise, it is clear that the current high levels of spending on military R&D should raise profound ethical concerns.

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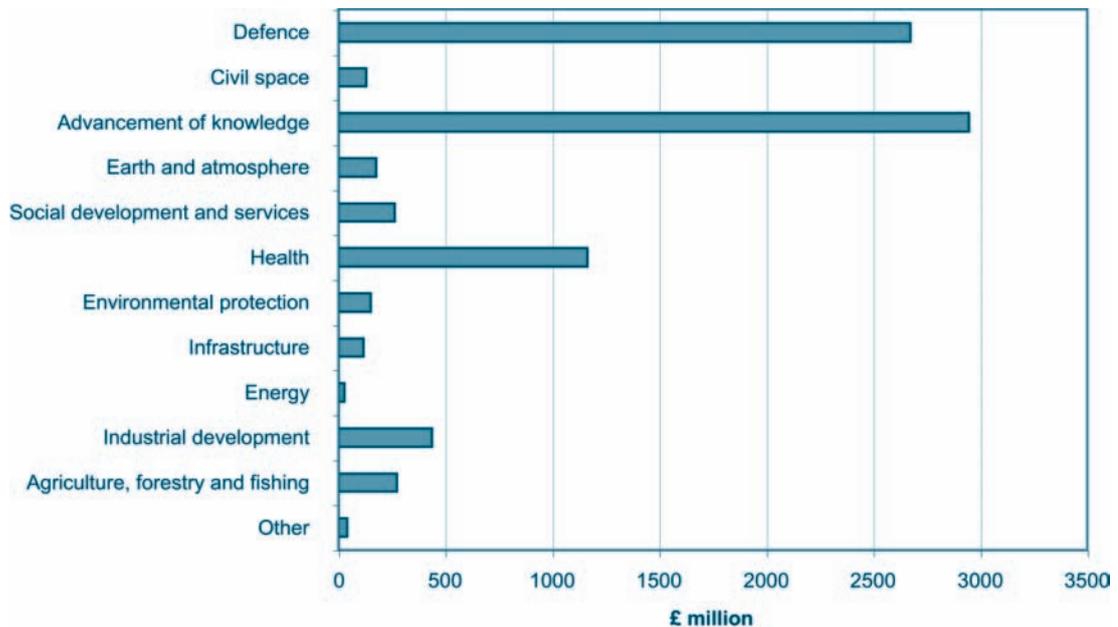


Figure – UK government R&D expenditure by application, 2003-04. *From Office of Science and Technology (2005) [13]*

## Ethical issues raised by military work

The 'War on Terror' has led to an increase in the harnessing of science and technology for use in controversial areas – especially biodefence, the new low yield nuclear weapons and the ill-conceived and much criticised 'Missile Defence' programme. The UK now has a Missile Defence Agency – comprising BAE Systems, QinetiQ and other military players – which is inviting UK universities and businesses to participate in the venture.

These are among the issues and applications that raise moral and ethical issues for those considering working in research, engineering or teaching in related fields. The key question is: under what circumstances might a military project or post be considered ethical – or unethical? The following points and questions should be considered when trying to find an answer:

- The chief justification for maintaining military forces and developing military technology is that they will provide national security. However, the UK already has the world's second largest military budget. Are we putting too much emphasis on the use of military force to deal with security problems? Does this encourage other countries to boost their arsenals in response? Does it undermine diplomatic attempts to reduce international tensions?
- There is an increasingly complicated and difficult-to-resolve relationship between research for defensive objectives and for those which are offensive or interventional. It is difficult or impossible for a scientist/engineer to know just how a weapon they might work on is going to be used – or to influence that use. So would it be better just to avoid weapons-related work?
- Almost all military corporations are implicated in some way with arms proliferation problems, often involving sales to governments that have poor human rights and environmental records [16]. Working for or taking funding from such corporations can contribute to these problems. Should we avoid them, or should we try to change things from within?
- It is often not immediately clear which universities, departments and research groups are supported by the military sector. Even the products of civilian research might be used in military contexts, often without the full support of either the public or members of the research community. It is important therefore, before accepting a job in a given field, to try to find out more about the most common applications of the R&D and where any military support is focussed. This issue is exemplified by the university consortia listed above.



- It is frequently difficult to direct science and engineering expertise toward a broader and more inclusive security agenda – one that addresses social justice and environmental sustainability for instance – in the face of powerful military influence.
- Military involvement in science and engineering projects – especially when linked to commercial objectives – can reduce openness and hence limit public and professional scrutiny of the direction of work. If you took a job with military connections, would you be free to discuss the ethics and implications of work with other researchers and the public? What limitations might there be on your freedom to publish the work? How will your intellectual property rights be affected – or those of the university?

In forming opinions about these issues, it can be useful to determine which of the following three positions best fits your personal view:

1. Non-military work should be given a much higher priority and therefore you will refuse to work on any military project unless it is clearly aimed at *disarmament*.
2. Military force should only be used in self-defence (e.g. New Zealand's defence policy [17]), so you will only work on military projects that are strictly *defensive* in nature.
3. Military force can be used to *defend our broad interests* (for instance, the current US and UK defence policy), so major overseas use of military force (for example, the Afghanistan and Iraq wars) is justified.

Those who feel that (1) or (2) are closest to their own ethical position are unlikely to find that most UK military projects will be consistent with their views. Some discussion of alternatives to the current UK defence policy can be found below, but for more detail see [18].

## Career choices for a safer world

There are many career options in science and technology that focus on reducing the incidence of conflict and/or avoid active participation in military work while also offering attractive careers. It is possible to contribute to fundamental human needs and a broader interpretation of global security without getting involved in weapons-based R&D. It is also possible to find a career that contributes to making the world not only safer but also more just and environmentally sustainable. This briefing has space only to touch on a few examples – see other SGR briefings in this series (listed in the *Further reading* section) for more information about such fields as climate change mitigation and cleaner energy.

Other positive choices include working in disarmament and areas that give a better understanding of what creates and supports conflict globally. A number of relevant web sites and references are provided later in this briefing.

### *Avoiding military work*

If you prefer to avoid connections with the military, it is necessary to identify whether there is military involvement in a prospective area of work or with a prospective employer. In some fields such involvement can be widespread – aerospace, mathematical modelling, computation and composite materials being obvious examples. However, these areas also include a variety of non-military applications and are not entirely no-go. Equally, in other areas where military involvement is much less common, it is still wise to check the situation.

There are a number of ways to establish whether and to what extent a prospective employer has military connections.

For a corporation, start with its website or annual report – look out for the terms 'defence' or 'security services/products' rather than 'military'. Check whether the company is in the *Defense News* 'Top 100' – which lists the world's top 100 military corporations according to global revenue [19]. If it is, you are likely to find it difficult to keep away from military work even if the post is in a civil area. Also useful is Corporate Critic website [20]. Bear in mind that corporations which rely heavily on military sales are also less likely to be sympathetic to the ethical concerns outlined above.

For university departments, despite their public nature, it can often be more difficult. Information about funding agencies (military or not) is rarely listed on websites and many departments do not produce an annual report. See the Table above, but often you will have to enquire directly. Background reading on your chosen field, e.g. in the magazines and journals of relevant professional institutions, will also help to reveal any significant military involvement.

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## *Helping to understand the causes of conflict*

There are numerous positive career choices for social scientists (including sociologists, psychologists, human geographers, political scientists, and economists) in providing expertise to improve the understanding of the causes of conflict as a means to help reduce its incidence.

For example, the New Security Challenges Programme of the UK Economic and Social Research Council (ESRC) under the direction of Professor Stuart Croft at the University of Birmingham is researching security in the widest sense. Professor Croft describes the group's objective as "to promote research into security which transcends the traditional pre-occupation with military conflict between states" [21]. This programme involves forty research projects throughout the UK, and looks at a range of factors that threaten security, focusing in detail on the environment, economic issues and human interactions [22].

Other universities with research centres and departments carrying out work within this broad area include Birmingham [23], Loughborough [24], Leeds Metropolitan [25], East Anglia [26], Oxford [27] and the London School of Economics [28].

## *Contributing to peace-building and disarmament*

There are several initiatives with a science and technology component that examine disarmament and alternatives to military force for settling areas of conflict or rebuilding post-war societies. These can offer interesting career opportunities.

For example, the Department of Peace Studies at the University of Bradford has played a major role in providing a better understanding of the ways in which peace, conflict resolution and security can be achieved. The department has researchers with a variety of backgrounds, in the social sciences, humanities and the physical sciences. At present it has three major research groups covering social change, conflict resolution, mediation and peacekeeping set within the context of international relations [29].

In the summer of 2005 a new initiative was launched by the ESRC and the government's Department for International Development to undertake research into international poverty reduction. Obviously reducing and eventually eliminating poverty is one way to reduce tensions and inequalities and build a safer world [30].

There are many initiatives across the world addressing non-violent means of intervening in conflict. The Oxford Research Group examined 280 non-violent interventions in conflict across the globe and published details of fifty of the most effective of those initiatives with costings [31]. The overwhelming finding was how cheap and effective non-violent intervention can be at building peace. The UK Global Conflict Prevention Pool, a project of the Ministry of Defence, the Foreign Office, and the Department for International Development, working jointly with the Africa Conflict Prevention Pool represents a small but very valuable development in conflict prevention [32]. The Pools offer a variety of career paths.

The proliferation of weapons and the consequences of their use remain long after conflict has ended. Landmines are particularly devastating to post-conflict communities. The United Nations estimates that landmines kill around 20,000 civilians each year [33]. Here is an area where scientists and technologists can play a desperately important role. Research into a more effective, non-military landmine clearance method (and training in its use) is much needed, because the existing clearance methods are primarily for military objectives, and so expensive and not appropriate for rural areas. Two potential employers in this field include Landmine Action [34], which undertakes research on the impact of mines and other remnants of war and how best to redress the situation, and the engineering company, Redbus LMDS [35], which seeks effective means of landmine clearance.

No section on disarmament would be complete without mention of VERTIC: an independent non-governmental organisation which seeks to promote both effective and efficient verification of the implementation of national and international agreements, especially in the fields of arms control and environmental protection. VERTIC undertakes research, carries out training and disseminates information to governments and technical, scientific and non-governmental communities. It also maintains a large database of organisations working in these fields [36].

## *Contributing to a sustainable world – cleaner energy technologies*

Energy plays a vital part in everyone's life regardless of where they live. The source, production and use of energy are all beset with huge problems. The use of fossil fuels (coal, oil and gas) to support our modern technology-based lives in itself creates security and environmental problems (not least its sourcing from unstable political regions like the Middle East) and can be seen to influence the policies of many governments. Human emissions of the greenhouse gases – from fossil fuel consumption and deforestation – are the main culprit in climate change.



Investment in research, development and deployment of technologies that will help to tackle climate change – for example, in the renewable energy and energy efficiency sectors – is increasing rapidly. These sectors offer many opportunities for those with a science and engineering background, and can be seen as a direct alternative to working for military industry. Such careers are discussed in other SGR briefings (see *Further reading*). One new initiative is the Renewable Energy Flexible Training Programme [37].

### Concluding thoughts

Military interests are widespread within the science and technology sectors in modern society. However, as this briefing shows, there are many ways in which the qualified scientist, engineer or technologist can not only avoid contributing to militarisation but make a real difference to increasing peace and security in the world. From peace-building and disarmament work to research on cleaner energy technologies, the opportunities are far more numerous than is often realised. It may take some effort to find an area which personally suits you, but the result is generally much more fulfilling!

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## Further reading

- Scientists for Global Responsibility (SGR) report ([www.sgr.org.uk/ArmsControl/MilitaryInfluence.html](http://www.sgr.org.uk/ArmsControl/MilitaryInfluence.html)):  
Langley, C (2005). Soldiers in the laboratory: military involvement in science and technology – and some alternatives.  
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This briefing is one in a series, produced as part of the *Ethical careers in science, design and technology* programme. The programme is intended to give information and advice to students and professionals in science, design and technology about the wider ethical dimensions of careers in these fields. Each briefing focuses on a field in which these professions can play a major role, either good or bad, and examines the social and environmental controversies in that area. It then gives guidance on how to make an informed, 'ethical' career choice. For further details about the programme – including a full list of the current briefings and a list of 'ethical employers' – see [www.sgr.org.uk/ethics.html](http://www.sgr.org.uk/ethics.html) or contact us (details below). The series of briefings is edited by Dr Stuart Parkinson and Vanessa Spedding, Scientists for Global Responsibility (SGR).

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