Is military involvement with science undermining our security?

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Scientists for Global Responsibility
Scientists · Architects · Engineers · Technologists

SGR
Promoting ethical science, design and technology

http://www.sgr.org.uk/

Presentation at Leeds Headingly Cafe Scientifique, 14 May 2013
(Reference list updated: 3 June 2013)

We will talk about...

- SGR research on sci/tech and the military
- UK military research and development
- Key justifications for military R&D
- Four key problems of military R&D
- Reconsidering security

SGR research

- 'Soldiers in the Laboratory' (2005)
  - Detailed report on military sci/tech, especially in UK (and links to US), incl. funding, lobbying, ethical & political issues
- 'Scientists or Soldiers?' (2006)
  - Ethical issues and potential for alternative careers
- 'More Soldiers in the Laboratory' (2007)
  - Assessed new UK government/ industry military programmes
- 'Behind Closed Doors' (2008)
  - Examined growing military involvement in UK university sector
- 'Science and the Corporate Agenda' (2009)
  - In-depth report including chapter on military corporate sector
- New report on reform of UK security R&D to be published this summer

Other SGR activities include education work – including presentations to academics, peace campaigners, and students; articles in specialists media etc – and advocacy work with SGR members and other campaign groups on issues related to military involvement in R&D

Reports listed in references

UK military R&D – key aspects

UK is major military power

- UK military budget is world's 4th largest
- UK is one of 5 'official' nuclear weapons states
- UK forces active in recent major conflicts
  - e.g. Afghanistan, Iraq, Libya
- UK is home to world's 3rd largest arms company
  - BAE Systems
- UK is 6th largest arms exporter
  - Recent recipients include Algeria, Bahrain, Libya, Saudi Arabia, Tunisia, Yemen

• UK military budget was $60.8 bn in 2012 – world's 4th largest behind USA, China and Russia
• UK military spending per person: more than 2 times that of Russia; more than 10 times that of China
• UK spending per person/ per unit GDP is much larger than EU average
• UK is home to world's 3rd largest arms company – BAE Systems
• UK is 6th largest arms exporter behind USA, Russia, Germany, France and China

Main references: Stockholm International Peace Research Institute (2013); Committees on Arms Export Controls (2011).

Approach to national security

- Government military/ defence strategy based on:
  - High technology, especially 'networked' technologies
  - Prominent role for 'force projection'
- Major role of military corporations
  - Often monopoly suppliers
- Involvement of scientists/ engineers essential
  - Large budgets for Research and Development

Current strategy in USA, UK and elsewhere is based on concept known as Revolution in Military Affairs (RMA)

Ministry of Defence (MoD)

- £15 billion per year spent on military technology/ equipment
- £1.8 bn per year of this on R&D
  - Approx 1/6 of UK Gov R&D spending
  - One of the world's largest funders of military R&D
- Main research arm is Defence Science and Technology Laboratory (DSTL)

• Spending figures from DASA (2013) & BIS (2012) – R&D figures are 2008-11 average

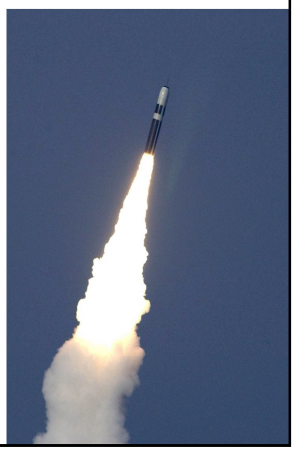
Main areas of MoD R&D

- Top 6 project areas in 2008-11
  1. Combat planes
     - Typhoon, Joint Combat Aircraft (F-35), Tornado
  2. Combat helicopters
     - Mainly Lynx
  3. Submarines
  4. Nuclear weapons
  5. Nuclear propulsion
     - For submarines
  6. Unmanned Aerial Vehicles ('drones')

• Top 6 categories (MoD, 2012a)
• Other areas of interest include missile systems, communications systems, warships, cyber-security, body armour, chemical/biological/radiological/nuclear defence, emerging technologies etc
• In public relations, the 'life-saving' contribution of military R&D projects is often emphasised, e.g de-mining, although in practice this is a small proportion.

UK nuclear weapons R&D

- Atomic Weapons Establishment (AWE), Aldermaston
- Major expansion, involving new research facilities
  - Supercomputers; Orion Laser etc
- Collaboration with USA and France
  - New joint research centre with France
- Concern that these undermine nuclear weapons treaties
- R&D spending £100m per year
  - from total budget of £1 bn+



New facilities installed in recent years – details:
• Supercomputers (Blue Oak, Larch etc) – simulation of nuclear explosion
• Orion Laser – small-scale simulation of nuclear detonation, e.g. fusion and boosting
• Materials testing laboratory – to study behaviour of nuclear weapons components
New joint research centres with France – as part of 2010 Teutates agreement
• Joint radiographic/ hydrodynamics facilities – Teutates EPURE at Valduc, France, and Teutates Technological Development Centre at AWE, UK
Claimed not to be connected to development of new nuclear warheads, but many doubts remain, especially regarding whether they undermine the Nuclear Non-proliferation Treaty and Comprehensive Test Ban Treaty.

Sources:
AWE annual reports and other related documents. http://www.awe.co.uk/
MoD (2012a); Nicholls (2011)
Photo: Trident nuclear missile

Robotic aircraft/ Drones R&D

- Rapidly developing technology globally
- UK situation:
  - Armed drones first deployed in 2007
  - Collaboration with Israel to develop and deploy
  - BAE Systems: Mantis, Taranis
  - FLAVIIR: R&D involving 10 UK universities
- Numerous concerns
  - e.g. proliferation, civilian casualties

UK situation

• Drones initially deployed for reconnaissance, but from 2007 the UK began deploying (US-made) armed 'Predator' drones in Afghanistan. By the end of 2011, the RAF had carried out over 200 drone strikes.

• UK collaboration with Israeli military and arms industry to deploy and develop drones

• BAE Systems developing two armed drones: Mantis and Taranis

• 10 UK universities involved in R&D on drones (FLAVIIR programme)

Ethical issues

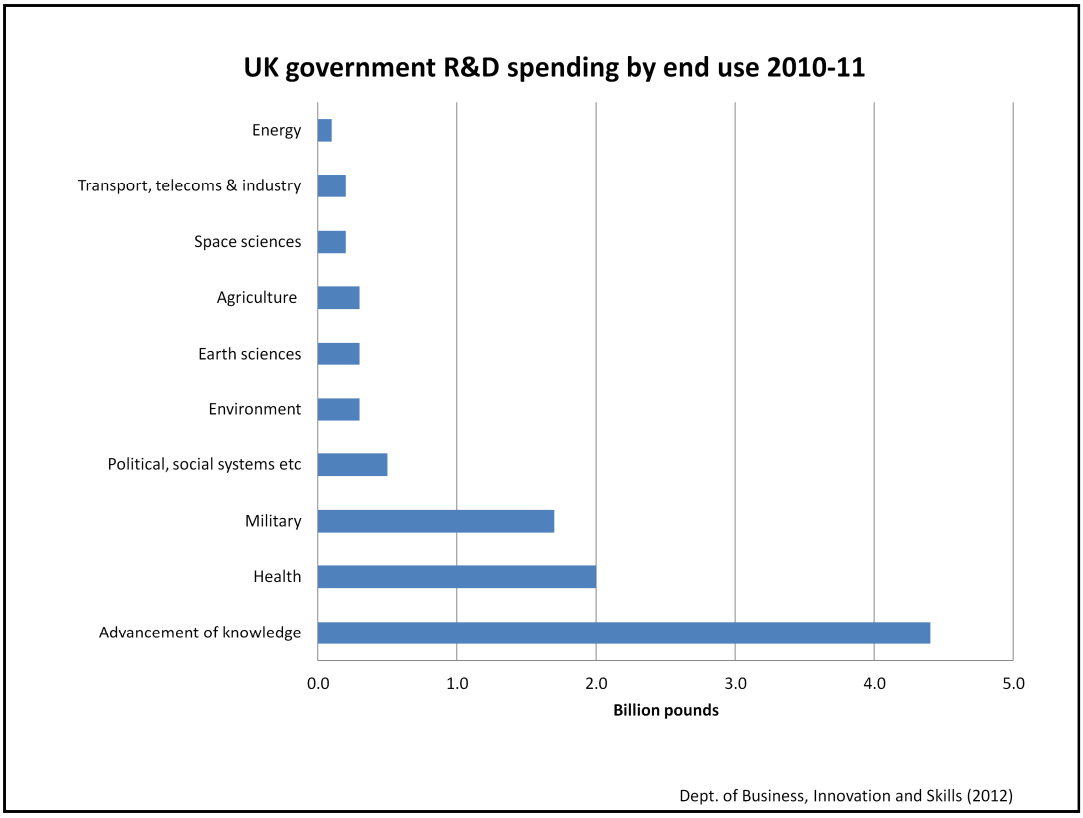
• Expansion of 'battlespace'
    - 'Illegal' CIA use in civilian areas (e.g. Pakistan)
    - Pilots not in combat zone so temptation to deploy more frequently
    - High risk of civilian casualties

• Serious arms proliferation risk – small drones, especially, are also a potential terrorist weapon

• Industry is developing the potential for them to act autonomously

Sources: Drone Wars UK (2012); Langley et al (2008)

Photo: BAE Mantis



• Military R&D is spending by Ministry of Defence.
• In the last year, health R&D spending has risen above military R&D for the first time on record.
• Private R&D spending (by arms companies) is smaller and less certain – around a few hundred million pounds (Langley, 2005)
• Further analysis is given later
BIS (2012). Tables 2.4 & 2.2.

International comparison of military R&D

Country	Proportion of total public R&D spending for military purposes	Public R&D spending for military purposes ($bn)
USA	57%	76.7
UK	17%	2.2
South Korea	16%	2.1
France	15%	2.4
Japan	5%	1.4
Germany	5%	1.3

OECD (2012)

Public funding of military R&D in 2010: comparison of six major nations in the OECD (OECD, 2012)
Base year of 2005, purchasing power parity

Military corporations

- Majority of military R&D (including gov-funded R&D) takes place within industry
  - Represents a subsidy of over £500m annually
- UK home to major military corporations
  - BAE Systems
  - Rolls Royce
  - QinetiQ
  - Many others incl. subsidiaries of foreign companies

• Often, government funds military R&D within industry and then purchases the resulting technology – effectively paying twice (Langley, 2005)
• Estimate of subsidy (Jackson, 2011)
• BAE Systems – world's largest arms company following takeover of several US contractors
• Rolls Royce – specialises in engines for ships, aircraft (2nd largest in UK)
• QinetiQ – privatised government military labs (5th in UK)
• Aggressive lobbying – sit on many influential advisory committees

Military & UK universities

- Numerous paths for military funding of R&D in universities
  - About £200 million a year, but figures very uncertain
- Government schemes
  - Through military labs, civilian Research Councils etc
- Corporate schemes
  - Large programmes run by Rolls Royce, QinetiQ
- Joint government-industry schemes in recent years
  - e.g. Defence Technology Centres (DTC)

• Government schemes run in conjunction with: Defence Science and Technology Labs (DSTL); Engineering and Physical Sciences Research Council (EPSRC)
• References: Langley (2005); Langley et al (2007, 2008)

Military-university consortia in the UK - who was involved in 2004

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

Langley (2005)

• UTC – University Technology Centre; DTC – Defence Technology Centre; DARP – Defence and Aerospace Research Partnership; ToE – Tower of Excellence
• Data from Langley (2005)
• Research by SGR and others has yet to identify a UK university which does not receive any military funding (Langley et al, 2008)
• Funding is focused on engineering, computer science and physics departments in top universities

Justifications for military R&D

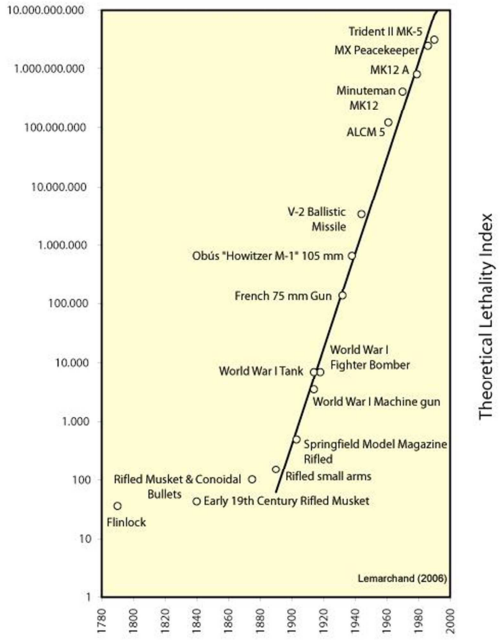
- Technological/ operational military advantage
  - To ‘win wars’
- To protect our soldiers/ reduce casualties
- To deal with emerging/ unknown future threats
- Income from arms sales
- But...

20 year time horizon often considered for ‘desired’ new technologies

Six key problems of military R&D

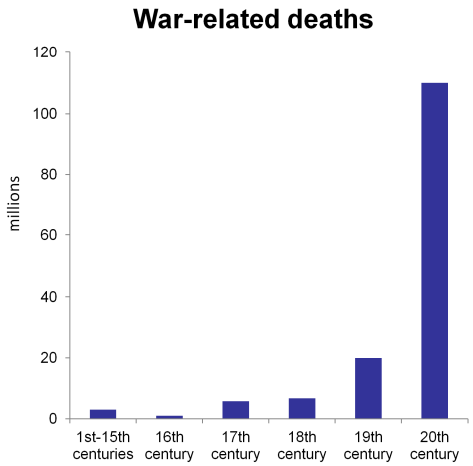
1. Increase in destructive power of weapons systems

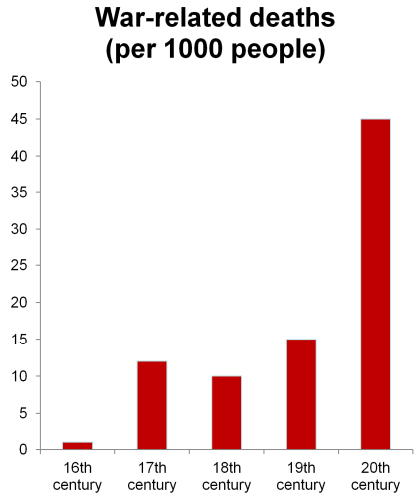
- Theoretical Lethality Index
  - maximum number of casualties per hour that a weapon can generate
- Military R&D has been a key factor in exponential growth in lethality of weapons during 20th Century



• Theoretical 'Lethality Index' first proposed in 1979 by Colonel Dupuy
• It includes consideration of: rate of fire, number of targets, relative effectiveness, range effects, muzzle effects, accuracy, reliability, etc.
Graph from Lemarchand (2007).

Increase in destructive power = Increase in casualties in war





Webb (2005)

2. Contributing to high civilian casualties

Conflict	Percentage civilian
World War I (1914-18)	45%
World War II (1939-45)	70%
Iraq War (2003-11)	At least 79%

Key factors leading to high civilian casualties:
- destructiveness of modern weapons
- targeting of civilians and infrastructure
- low tech responses, e.g. hiding among civilians

Use of modern technology in war has **not** reduced proportion of civilian casualties

A range of different factors have
Total number of deaths:
- World War I – about 15 million (including indirect deaths)
- World War II – about 66 million (including indirect deaths)
- Iraq War – 162,000 (violent death only)

Sources: White (2010); IBC (2012).

3. Failure of ‘precision’ weapons

- Recent drive to create more accurate ‘precision’ weapons to reduce casualties
  - Especially missile systems
- Academic study of 14,000+ violent incidents during Iraq War
  - Suicide bombs: 16 civilian deaths per incident
  - Airstrikes: 17 civilian deaths per incident
- Rise of armed drones
  - Use outside the battlefield – illegal?
- Terrorist response

• Kings College London study: Analysis of 14,196 incidents involving 60,481 civilian deaths in Iraq 2003-08 (Hicks et al, 2009)
• Rapidly increasing use of armed drones by USA; UK and Israel also leading in deployment and R&D
• CIA deployment in Pakistan, outside the battlefield – ‘targeted assassinations’

4. Driving export/ proliferation of weapons

- To help spread R&D costs, military tech is exported to other nations
- Example: UK exports to Libya
  - Licenses granted for €119m from 2005-09
  - Exports included armoured vehicles, tear gas etc used against uprising
  - Other NATO countries exported combat aircraft, missile systems etc
- Exports of drones technology will fuel international military threat

Figures from the Official Journal of the European Union summarised in The Guardian (2011)

5. Overconfidence in use of military force

- Flawed belief that military technology allows wars to be won quickly and cleanly
- Side effects of war
  - Destruction of infrastructure
  - Unsecured weapons
  - 'Blowback'
- Military R&D fuels arms races
  - Even with allies

• Blowback is the unintended consequences of a military/ covert operation that are suffered by the civil population of the aggressor government or its allies.

6. Opportunity costs

- Financial and technical resources could be used elsewhere
- Science and technology needed to help solve other urgent problems
  - International poverty/ injustice
    - Malnutrition, clean water etc
  - Global environmental problems
    - Climate change; biodiversity loss etc

Reconsidering security

Different approaches

- New security policies
  - Less aggressive military roles
  - Tackling root causes of insecurity
- Changed roles for security-related R&D

Non-Offensive Defence

- Focus military forces on narrowly-defined defence
- Cut the 'offensive' arsenal, especially:
  - Nuclear weapons
  - Long-range 'strike' aircraft, missiles etc
  - Long-range military ships and submarines
- Minimise arms exports
- Shrink the military industry
- Peace-keeping activities would be retained

• Under a Non-defensive defence policy, the armed forces retain the capability to defend national territory (and contribute to peacekeeping), but not to invade or mount a major attack

• The case for Non-offensive defence (although known under a variety of titles) has been made for decades.

Reference: Webber (1990)

Sustainable Security

- More substantial shift
- Focus on tackling the roots causes of major security threats:
  - Competition over resources
  - Global militarisation
  - Marginalisation of the majority world
  - Climate change

Reference: Abbott et al (2006)

UK National Security Strategy

- Published in October 2010
- Government approach is starting to change
- Assessed wider range of security concerns than just military threats
  - Including environmental and resource problems, international development problems
- However, 'force projection' remains prominent

Source: HM Government (2010)

Resistance...

- New UK defence sci/tech strategy
  - Includes ‘defence’ and ‘security’ sectors
  - Government support:
    - To retain major ‘defence industrial base’
    - To expand and promote arms exports
    - New minimum level of research spending
    - Justified by desire to retain ‘technology advantage’ in key military fields
  - But more ‘off-the-shelf’ procurement

• Entitled ‘National security through technology’
• Research spending to be set at 1.2% of total MoD budget
Source: MoD (2012b)

Changing R&D priorities

- New priorities should be:
  - Arms control/ disarmament
  - Tackling environmental problems
  - Economic reform
  - Energy security
  - Food/ water security etc
- UK public R&D spending 2008-11
  - Substantially more spent on military than on 'sustainable security'

➢ **A major spending shift towards sustainable security is urgently needed**

Details will be published in SGR's new report

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