

No 10 April 2012

Nuclear weapons: historical perspective and modern dangers

Three papers by
Jim McCluskey, Peter Burt and Howard Gest

The tenth of a series of occasional papers on defence
and disarmament issues in memory of Frank Blackaby

Published by Abolition 2000 UK

Abolition 2000 regrets to inform you that our author Howard Gest died suddenly in Bloomington, Indiana, USA, shortly after having submitted his memoir for this Blackaby Paper. We have sent condolences to his family and friends. Obituaries will appear later.

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Cover designed by Sue Longbottom

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ISBN: 0-9540464-9-8

Nuclear weapons: historical perspective and modern dangers

Page 3:

Nuclear Weapons Are Immoral, by Jim McCluskey

Page 7:

**Insurance or hazard? The risks posed by the UK's
nuclear weapons programme, by Peter Burt**

Page 12:

**Science and Nuclear Weapons: The emergence of
the atomic era, A tribute to Charles D. Coryell (1912-
1971) and Leo Szilard (1898-1964), by Howard Gest**

Acknowledgments

We acknowledge financial support for printing and publication of Blackaby 10 from the Christian Peace Education Fund.

Cartoon by Stig; photograph provided by Howard Gest.

Preface

For Blackaby 10 we have decided to create a multi-author paper. Three contributions were invited on different aspects of nuclear weapon dangers, including both the early political problems and the present day ethical and safety problems.

Jim McCluskey says that his title may seem old-fashioned. As we live in a world where some democracies have used kidnap, torture and assassination and in a country whose three major political parties think we need a nuclear arsenal in case our 'vital interests are threatened' we may wonder what morality has to do with official nuclear weapons policies. The article attempts to answer this question.

Peter Burt then discusses safety problems associated with the UK's weapons programme. Although nuclear weapons are sometimes described as an insurance policy against an uncertain future the consequences for the UK of remaining a nuclear weapons state will be neither neutral nor benign if a serious accident involving a nuclear weapon takes place in the UK. His article reviews the UK's nuclear accident history and Ministry of Defence nuclear safety documents to examine this risk.

Howard Gest is one of the small band of living Manhattan Project scientists. In the concluding article he describes how, while such scientists were dedicated to the earliest possible production of nuclear weapons, at the same time many became concerned about their actual use against targets that included civilian populations. This was a major issue in the secret Szilard Petition, signed by many of them in July 1945 and addressed to President Truman. Howard Gest's project mentor was Charles Coryell, a vigorous supporter of the Petition. Although it never reached Truman subsequent political battles resulted in civilian control of both atomic weapons and nuclear energy in the United States. Abolition 2000 UK is honoured to be able to publish this unique historical memoir.

Editorial Committee: Peter Nicholls, George Farebrother, & Claire Poyner.

The Authors

Jim McCluskey (Twickenham, UK) practised as a civil engineer and landscape architect. He now writes and campaigns on problems of nuclear weapons, nuclear power, wars and the arms trade. He has a special interest in the legal and ethical questions posed by the existence of weapons of mass destruction.

Peter Burt (Reading, UK) is director of the Nuclear Information Service (<http://nuclearinfo.org>), a not-for-profit information service supported by the Joseph Rowntree Charitable Trust. NIS works to promote public awareness and debate on nuclear weapons and related safety and environmental issues. Burt graduated in biological sciences from the University of London and did research in applied biology at the University of Wales College in Cardiff. He previously worked for UK government environmental regulatory agencies and as a freelance consultant on environmental and nuclear policy issues.

Howard Gest (now Distinguished Professor Emeritus of Microbiology at Indiana University, Bloomington, USA) was one of the Manhattan Project scientists who worked at the University of Chicago and Oak Ridge under nuclear pioneer Charles D. Coryell. From 1946 to 1949, Gest was a graduate student of Martin D. Kamen, a noted radiochemist. In 1939, Kamen and Samuel Ruben discovered radioactive Carbon 14, which became an important tool as a tracer in research on photosynthesis and other life processes.

Nuclear Weapons Are Immoral

Jim McCluskey

The title of this article may strike some as quaint and old-fashioned. After all we live in a world in which the most dominant country, America, has used kidnap, torture and assassination in pursuit of government goals; a world in which our own UK government has been fighting two unjust and unjustified wars; a world in which our own government has said it needs a nuclear arsenal in case its 'vital interests are threatened'. What, we may wonder, has morality to do with government policies and nuclear weapons? But to abandon morality is to abandon the spiritual dimension to life. And we cannot survive the abandonment of spirit.

Many of the world's citizens realise that nuclear weapons are the end of the line for human beings. They are recognised as the obscene culmination of a reliance on aggression and violence. The Bomb represents the triumph of materialism. It is matter divorced from spirit and reduced to pure destruction.

The magnitude of the affront to mankind and nature contained in the existence of nuclear weapons numbs the soul. We do not want to think about it; something so horrible. It has become a taboo topic, sanitized by politicians, glossed over by the media and too often avoided by those who purport to be champions of a moral existence. One man who was prepared to confront the reality was Victor Gollancz who declared that:

'To drop a nuclear bomb, in any circumstances whatever' ...would be the final iniquity, final in the sense that no more abominable iniquity is possibly conceivable by the mind of man: sheer, unqualified evil. For what else would it be than the ultimate rejection of spirit, a total abandonment, by the men who did it, of any last vestige of sympathy with their fellow-creatures, and the conversion of their own beings as a matter of deliberate choice, into instruments for the unspeakable torture of millions upon millions?'

From 'The Devil's Repertoire': by Victor Gollancz

The appalling and present danger

There presently exist more than 20,000 nuclear weapons. This is sufficient to kill every individual on the planet almost three times over. More than 2000 of these are held in a state of high alert ready for launch within minutes, by accident or design; Armageddon as close as the press of a red button under the finger of some demented leader of a nuclear armed state.

In the summer of 2010 the United Nations Committee on Disarmament had a vote on taking nuclear weapons off hair-trigger alert. 144 states voted to take them off. 3 states voted to keep them on hair-trigger alert. These states were Britain, America and France. The organisation 'People for Nuclear Disarmament'¹ commented '*That a tiny minority - perhaps no more than a dozen or so people in the Pentagon and the Kremlin - continue to hold the entire world at risk - is mind-boggling*'. Surely the people responsible for this monstrous vote should be held to account. If we are to return to expecting moral standards from our politicians surely those who hold the wellbeing of peoples in such contempt should answer to the people.

Each of our nuclear submarines is armed with 48 nuclear warheads, and each of these have around 7 times the destructive power of the bomb which destroyed Hiroshima. Extrapolating from the 140,000 Hiroshima deaths, one of our submarines can kill 47 million people. This is what our government calls 'Our Minimum Deterrent'. The 47 million dead would, of course, be predominant civilians. How can the threat of such slaughter be called moral?

In spite of their solemn commitment to get rid of their nuclear weapons all the nuclear states are now committed to the design and construction of a new generation of these genocidal machines. In the 2006 White Paper, 'The Future of the United Kingdom's Nuclear Deterrent', Prime Minister Blair wrote in the forward that an arsenal of nuclear weapons was 'Crucial' and is to be retained 'for the foreseeable future'. In spite of this breaking the terms of the Nuclear Non-proliferation Treaty (NPT)

which had been signed by the British government, Blair's illegal decision was supported by the British House of Commons and furthermore is supported by the present Coalition Government.

Details of the way in which all the other nuclear weapons states, including the other members of the United Nations Security Council which are bound by the terms of the NPT, are building new arsenals of nuclear weapons are presented in the report 'Beyond the United Kingdom: Trends in the Other Nuclear Armed States' by the Basic Trident Commission².

This report tells us that,

Long term nuclear force modernisation programmes or upgrade are underway in all nuclear armed states'.

Whatever the current rhetoric about global nuclear disarmament from the nuclear armed states and others,....the evidence points to a new era of global nuclear force modernisation and growth'.

And,

Nuclear weapons are present today in some of the most unstable and violence prone regions of the world, and in North East Asia, the Middle East and South Asia, there are serious conflict and proliferation concerns that suggest an increased potential for nuclear weapons use'.

The death of humane values

Traditionally certain human capacities were considered to have special value in our relationships with each other. These included love, compassion, kindness, respect, gentleness. None are qualities which are given prominence in discourse about our present society. The values which are touted in our materialist capitalist world are success, wealth, celebrity, competitiveness, winning, acquisitiveness. To become more rich does not mean to develop our humanity but to enlarge our bank balance.

In the UK and the US we embark on interminable wars. We, the citizens, appear to give little thought to the unimaginable suffering these wars inflict on other humans - other humans just like us. We meticulously count (as we should) the tragic number of deaths among our young men and women combatants but do not count the vastly greater number of civilians killed in the countries we have invaded. In Iraq

alone, by 2006, the highly respected Lancet medical journal wrote that the number of deaths approximated to six hundred thousand. The remoteness of the killing dulls our sensibilities. Paul Oestreicher, canon at Liverpool Cathedral, tells us that *'As murder is condemned in public opinion and in law, so must collective murder be. For the one we go to prison; for the other we get a medal'*³.

The Club of Rome⁴ is one of the world's most respected commentators on the present state of humanity. It recently published a report entitled 'The First Global Revolution'. In it we are told that

'Moral values ...are being eroded, since they are flagrantly ignored by the individuals and societies for whom they are presumed to be the inspirational message. ... selfishness and materialism appear to have made them irrelevant.'

The young witness the self-serving, behaviour of the adults in power who are often seen to act recklessly and as though the world was void of moral principle.

'...young people are being exposed rapidly to more and more facts that give them reason to believe that their elders lack responsibility and are unaware of enormous dangers such as a nuclear holocaust,...

And in spite of the huge burgeoning of NGOs there is a terrible passivity amongst the majority of citizens.

'There is... a weakening of the moral sense of individuals, who feel cheated not only because the ethical structure that used to serve as their reference and to which they willingly submitted has collapsed, but also because the threats posed by the contemporary world situation have frightened them into a chilly self-withdrawal.'

The Basics

The world's great belief systems have been the traditional champions of morality. They have held that moral human behaviour is behaviour based on love and respect for the integrity of others; 'Do unto others as you would have them do unto you'. The argument presented here for the immorality of nuclear weapons is grounded in this insight and teaching.

A misinterpretation of Darwinism's dictum 'The survival of the fittest' has contributed to a dog-eat-dog mentality in certain realms of social

interaction. This has worked against the more traditional and benign dictum 'Do no harm'. In fact the 'fittest' are gradually being seen to be those most willing to co-operate and work communally to improve the human lot while attesting to the rights of all.

Held to be self evident

There are certain matters relating to nuclear weapons that can be deemed self-evident.

1. The world would be a safer place if there were no nuclear weapons and it was policed to remain that way.
2. Nuclear weapons could be outlawed with a world-wide ban. This is clearly possible since there are already bans on chemical weapons, biological weapons, land mines and cluster bombs.
3. The only obstacle to such a ban is the lack of will on the part of the governments of the nuclear weapons states.

There is a further element which can reasonably be claimed as self evident. Our government has signed an international treaty (NPT) which obliges it to get rid of its nuclear weapons. In the words of the International Court of Justice⁵ which was asked to give an opinion regarding the obligation imposed on governments by the treaty,

'There exists an obligation to pursue, in good faith, and bring to a conclusion, negotiations leading to nuclear disarmament in all its aspects under strict an effective international control'

Yet in the 2006 White paper the justification for retaining our 'deterrent' was that 'It is not possible accurately to predict the global security environment over the next 20 to 50 years'. This takes us to 88 years after the treaty was signed. Self-evidently this is not acting 'in good faith'. It is thus self-evident that the British government is failing to honour its commitment under the Nuclear Non- Proliferation Treaty.

The posture and intentions of the UK government and the other nuclear states who have signed the NPT are immoral since they are not acting in good faith and bringing to a conclusion the end of nuclear weapons.

Supporters of rebuilding our Trident submarine fleet and building a new arsenal of nuclear weapons (both of which are now under way)

plead that they will create jobs. The madness of creating jobs by building Armageddon killing machines is also self evident. Instead of building death-delivering machines, many more jobs could be created by developing the desperately needed sustainable energy industry. Britain could be the world leader in this life-confirming pursuit. This is the moral course.

Contravention of just laws is immoral

As explained above, it is now over forty years since the nuclear states signed the Nuclear Non-Proliferation Treaty in which they undertook to get rid of their nuclear weapons. As we have seen they are not doing so. It is universally recognised that the contravention of just laws is immoral since a person who so acts harms his fellows thus violating a basic tenet of the moral life.

The International Court of Justice was asked to give an 'Advisory Opinion' on the legality of the use of nuclear weapons. They have not yet been asked to give an opinion on the legality of the existence of nuclear weapons. However, an outstanding report commissioned by the Government of Switzerland⁶ suggests that, in view of the urgency of the matter and the spread of these weapons, it is time to pursue a parallel path; namely that of ridding the world of the nuclear weapons threat on the basis that their existence is illegitimate.

One way of doing this is to question the legality of their existence. This could be done by pursuing the claim that they are illegal on the grounds that they contravene international law governing human rights. The existence of nuclear weapons is illegal, it is contended, because they contravene international law relating to human rights with respect to the right to life and the right to a secure and safe environment. They contravene these laws since their existence gratuitously puts the survival of human individuals and populations at risk.

Nuclear Weapons are also illegal because they contravene Humanitarian Law which regulates armed conflict. There is an additional body of international law relating to War Crimes, Crimes Against Humanity and Genocide which could be brought to bear.

However for the purpose of this article we restrict the emphasis to human rights.

The illegality, and hence the immorality of nuclear weapons can be simply stated.

1. Since the Universal Declaration of Human Rights⁷(UDHR) has existed unchallenged for over sixty years, Article 3 which states ‘ Everyone has the right to life, liberty and security of person’ is now part of customary law.
2. The existence of nuclear weapons poses a grave risk to the life and security of citizens of the world.
3. The existence of nuclear weapons is therefore illegal.

The existence of nuclear weapons keeps the human population in a state of anxiety or denial. As President Kennedy said, “The world was not meant to be a prison in which man awaits his execution”.

The Churches

There have been many statements by the Christian churches condemning nuclear weapons⁸. The World Council of Churches with its 347 denominations from 120 countries represents virtually all Christian traditions. In 1983 it stated the sane and moral position with utter clarity by declaring,

‘That the production and deployment as well as the use of nuclear weapons are a crime against humanity and that such activities must be condemned on ethical and theological grounds’

The Canadian Council of Churches is a community of 20 denominations. It declared in 1998,

“The willingness, indeed the intent, to launch a nuclear attack in certain circumstances bespeaks spiritual and moral bankruptcy. ... Nuclear weaponsdeliver only insecurity and peril through their promise to annihilate that which is most precious, life itself and the global ecosystem upon which all life depends. Nuclear weapons have no moral legitimacy.”

The Second Vatican Council stated that any act of war aimed indiscriminately at the destruction of entire cities “is a crime against God and [humanity].”

“it is not morally acceptable to intend to kill the innocent as part of a strategy of deterring nuclear war.”

U.S. Catholic Bishops’ Pastoral Letter on War and Peace, 1983

Although the Catholic Church has not yet condemned the existence of nuclear weapons with the clarity of the World Council of Churches, Douglas Roche, who was elected Chair of the United Nations Disarmament Committee at the 43rd General Assembly in 1988, writes he believes that, ‘In the eyes of the Catholic Church, nuclear weapons are evil and immoral and must be eliminated as a precondition to obtaining peace.’⁹ Christians and Muslims constitute 55 percent of the world’s population. Both faiths are unambiguous on the sanctity of human life and on the protection of all forms of creation.

Finally

Perhaps pondering the answers to some simple questions can help us get a perspective on the issue.

How many civilians would you be willing to kill to save your own life?

Would you be willing to kill a million people to save your own life?

Would you be willing to kill a million people to save the lives of those you love, in the knowledge that the people you kill also love and are loved as you love and are loved?

Would you want to be placed in a position in which you had to make such choices?

Would you be willing to kill a million people because you are told that your (or someone’s) vital interests are being threatened?

Postscript

‘Never in the history of humanity has such urgency existed in relation to any issue and never were the consequences so devastating to the human future and to all that we hold dear’.

‘Any nation which does not take the steps to fulfil its obligations to rid the world of nuclear weapons cannot claim any longer to be concerned with human welfare and the human future’

Judge Weeramantry International Court of Justice 1991-2000. Vice-President from 1997-2000

1. <http://tinyurl.com/c3wpanh>

2. The 'Basic Trident Commission' is an independent cross-party commission set up to examine UK nuclear weapons policy'.
3. Paul Oestreicher, 'If soldiers truly look into the spiritual dimension we can abolish war', *Guardian*, 18.11.11.
4. <http://tinyurl.com/5clkxel>
5. <http://tinyurl.com/5onhxe>
6. 'Delegitimizing Nuclear Weapons: Examining the validity of nuclear deter-

rence', James Martin Center for Non-proliferation Studies, Monterey Institute of International Studies, 460 Pierce St., Monterey, CA 93940, U.S.A. Tel. +1 (831) 647?4154; fax +1 (831) 647?3519; email: cns@miis.edu

7. <http://tinyurl.com/8mc59>
8. <http://www.zero-nukes.org/religiousstatements3.html#wcc>
9. <http://tinyurl.com/bv2x347>

Insurance or hazard? The risks posed by the UK's nuclear weapons programme

Peter Burt

Nuclear weapons have been described by government ministers as “the United Kingdom’s ultimate insurance policy in this age of uncertainty”.¹ However, rather than providing insurance against risks the UK’s nuclear weapons may in fact add to future risks - both globally and to the UK and its citizens - rather than reduce them. Such factors usually receive limited consideration during the formulation of government policy on nuclear weapons. This article examines some of the risks posed by the UK’s nuclear weapons programme, examining nuclear weapon proliferation issues, political and economic risks, factors relating to Scotland and the Union of the United Kingdom, and safety hazards.

Nuclear weapon proliferation

Although the current programme to replace the UK’s Trident nuclear weapons aims to ensure that the UK remains a nuclear-weapon state for the next half-century, this might paradoxically make the future more risky if it acts as a driver for the global proliferation of nuclear weapons. For example, Iranian government outlets have argued that in their view, the UK is in breach of its disarmament obligations under Article VI of the Non-Proliferation Treaty (NPT) by modernising its nuclear weapons, and that as a result the UK is in no position to criticise Iran’s nuclear enrichment programme.² In the eyes of some, therefore, Trident replacement serves to undermine and de-legitimise the international non-proliferation regime. Proliferation risks have

been summarised by Ken Booth, Professor of International Politics at the University of Wales, Aberystwyth, who wrote: “If the present British government announces that it will retain nuclear weapons until about 2050, and if this contributes to the erosion of the norms so far sustaining the NPT (and history shows the fragility of international regimes when key states ignore their obligations) then what might British security look like, even if it possesses nuclear weapons, in a world of 20-plus nuclear powers? Change rather than continuity may sometimes be the rational response to the inevitability of future uncertainty.”³

Political risks

One reason sometimes cited as a need for the UK to remain nuclear weapons in the long term is protection against the possibility of a ‘resurgent Russia’, with an aggressive and extremist leadership, in the future. In the UK politics are showing a long-term drift to the right, and extremist political parties have experienced some recent electoral success. Over the fifty-year life of Trident’s replacement there is a possibility that the UK political landscape may change beyond recognition, and that the UK’s nuclear weapons may end up in the hands of an aggressive extremist government. Under such circumstances the decision made by the current generation of politicians to replace the UK’s nuclear weapons could end up posing significant risks to global stability, with reciprocal risks to the British public.

Looking into the longer-term future, there is a possibility that factors such as a severe economic crisis, or dramatic impacts resulting from a worst-case climate change scenario, might result in a future government in the 2050s being unable to maintain the level of institutional control needed to manage its nuclear weapons infrastructure safely and competently. Such risks increase looking into the far future, beyond the proposed lifetime of the Trident replacement system but within the lifespan in which radioactive wastes and the nuclear legacy from the programme will need to be managed. Under a more optimistic scenario, a cordial US - Russia relationship which resulted in the US delivering on its offer to share missile defence technology with Russia would undercut the deterrent effect of the UK's nuclear weapons against Russia.

Ken Booth points out that "there can be no risk-free futures, for uncertainty is the existential condition of international politics. The challenge then is to find the optimum means of controlling the nuclear risks of whatever policy prescription one advances".⁴ It would be unwise to assume that the UK is guaranteed a stable and predictable future whilst the rest of the world faces uncertainty, and equally unwise to view the possession of nuclear weapons as a panacea which will guarantee future security. All policy options for the future, including maintaining the status quo, pose risks in varying degrees.

Economic risks

The long term economic situation for the UK is uncertain. In his Autumn Statement in November 2011 the Chancellor stated that public spending will need to be tightly controlled until 2017⁵ and recovery thereafter may be hampered if, for example, there is an unexpected steep rise in energy prices. The affordability of the UK's nuclear weapons programme has always been a critical issue,⁶ and if the UK experiences an unexpected shock to the economy, circumstances could arise which might make it impossible for the nation to complete the Trident replacement programme and deploy the four submarines which are said to be necessary to guarantee an invulnerable nuclear deterrent. Given that the UK has invested significant political currency in its status as a nuclear weapons state, such a situation would be a major blow to the UK's international status and, possibly, to national morale. Longer term economic decline

might make it impossible for the UK to continue to operate its nuclear weapons and infrastructure to adequate safety standards (see below). Such a situation was experienced - entirely unforeseeably - by Russia in the early 1990s following the break-up of the Soviet Union, giving rise to significant concerns about the security of fissile materials and proliferation-sensitive technology.

Scotland

The possibility of Scotland's independence also raises major issues for the future of the UK's nuclear weapons, which have been explored in detail by Malcolm Chalmers and William Wallace.⁷ If Scotland becomes independent, the location of the Trident submarine base on the Clyde will create enormous difficulties for England, Wales, and Northern Ireland in continuing to operate a nuclear weapons programme. Conversely, widespread hostility to the Trident programme in Scotland appears to be a significant factor driving support for independence. The significant lack of public support in Scotland (increasingly reflected in opinion polls across the remainder of the UK) for Trident is presented by sceptics as evidence of a 'legitimacy deficit' for a London government which does not reflect Scottish aspirations. Regardless of the future path which Scotland chooses to take, Scottish opposition to Trident replacement can be expected to pose risks for the UK's nuclear weapons programme.

Safety risks

The consequences for the UK of remaining a nuclear-weapon state will be neither neutral nor benign if a serious accident involving a nuclear weapons takes place in the UK. Accidents can and do happen: production of plutonium for the nuclear weapons programme resulted in the UK's worst nuclear accident, the Windscale fire in 1957,⁸ and there have been a number of documented accidents which have resulted in the dispersal of radioactive material or breakup of US nuclear weapons.⁹

Some of the more significant 'near miss' incidents which have been reported as occurring in the UK's military nuclear programme over recent years include:

- Grounding of the Trident submarine HMS Victorious on the Skelmorlie Bank in the

Clyde Estuary on 29 November 2000.¹⁰

- Serious flooding at the Atomic Weapons Establishment at Burghfield on 20 July 2007 which caused damage valued at £5 million and resulted in the plant being out of action for 9 months.¹¹
- A series of leakages of radioactive coolant from the Clyde submarine base at Faslane in 2004, 24 August 2007, and 20 February 2008, said to be sufficiently serious for the Scottish Environmental Protection Agency to warn that it would consider closing the base down if it had the legal powers to do so.¹²
- A collision between the Royal Navy's Trident submarine HMS Vanguard and French nuclear armed submarine MN Le Triomphant whilst submerged at sea on the night of 3-4 February 2009, which required each vessel to return to port for repairs.¹³
- Failure to restore steam generator emergency safety valves following refit of patrol submarines HMS Turbulent and HMS Tireless at Devonport Naval Dockyard.¹⁴
- A fire in an explosives processing area at the Atomic Weapons Establishment Aldermaston on 3 August 2010 which left one worker injured and required the precautionary evacuation of nearby homes.¹⁵

Resource shortages - both financial and personnel - pose the greatest current threat to safety standards within the Ministry of Defence's nuclear programme. The Defence Nuclear Environment and Safety Board has highlighted a lack of suitable nuclear experienced and qualified personnel as a key risk for the programme every year in its annual assurance report since 2006, with the risk rated as red for the last three years (2008 - 10). In its 2010 report the Board assessed that the situation was "getting progressively worse rather than being steady",¹⁶ stating: "What is less clear at the time of writing is the pressure that may result from the declaration of reductions in the MOD workforce by 17,000 military and 25,000 civilian personnel, but it would seem unlikely that the DNP [Defence Nuclear Programme] will be exempt from an expectation of "efficiencies". Initial indications are of an aspiration for 25% savings in operating costs; this is obviously pulling in an opposite direction to the current shortfall in resource; managers in the DNP will need to establish the

most robust baselines possible and defend them rigorously".¹⁷

Resource shortages are a challenging and long term issue for the Ministry of Defence's nuclear programme. The Royal Navy's Director of Submarines, Rear Admiral Simon Lister, has told the Defence Nuclear Environment and Safety Board: "We have been 20 years in a position of concern over adequacy of resource and people with the likelihood that it will take 10-15 years to recover ... The demographics are bad for both civilian and uniformed NSQEP [nuclear suitably qualified experienced personnel] and will deteriorate for the next five years".¹⁸ The problem is compounded by poor staff morale within the Ministry of Defence and a lack of confidence in senior management.¹⁹

Safety issues within the Ministry of Defence were examined in depth during the Haddon-Cave investigation into the broader issues surrounding the loss of an RAF Nimrod aircraft over Afghanistan in 2006. The Haddon-Cave review found that reports warning of conflict between ever-reducing resources and the demands of keeping old aircraft flying had not been heeded. Haddon-Cave concluded that following the 1998 Strategic Defence Review "deep organisational trauma", financial pressures and cuts at the Ministry of Defence "drove a cascade of multifarious organisational changes, which led to a dilution of the airworthiness regime and culture within the MOD, and distraction from safety and airworthiness issues as the top priority".²⁰ The risks that the same mistakes will be made across the Ministry of Defence following cuts resulting from the 2010 Strategic Defence and Security Review are significant.

The military nuclear programme is generally subject to different regulatory arrangements to civil nuclear sites, with the Defence Nuclear Safety Regulator (DNSR), the Ministry of Defence's own internal regulatory team, playing a significant role while civil regulators such as the Office for Nuclear Regulation, Environment Agency, and Scottish Environmental Protection Agency play a lesser role and may have limited enforcement powers in areas where the Ministry of Defence is exempt from statutory control. Regulatory standards in the military sector - particularly at the Devonport and Clyde naval bases, where DNSR plays the main regulatory

role - lack the same degree of independence, transparency, and rigour as those in the civil sector, increasing the risk of accidents. In February 2012 the Sunday Herald newspaper reported that the Clyde naval bases at Faslane and Coulport that host Britain's nuclear bombs and submarines were plagued by widespread safety flaws according to an internal Ministry of Defence report released under Freedom of Information legislation. The annual safety review for 2010 for the bases indicated that safety standards for 11 out of 13 activities were declared unsatisfactory following assessments by site managers and regulators.²¹

As well as concerns about safety at naval bases, there are also specific issues about nuclear reactors used to power the Royal Navy's submarines. The head of the Defence Nuclear Safety Regulator has acknowledged that the second generation pressurised water nuclear reactors [PWR2] which power the Royal Navy's current fleet of submarines "falls significantly short of benchmarked relevant good practice"²² in nuclear submarine design and operation in two important respects. The low power of the emergency propulsion system, in the event of a reactor fault in deep water, is not able to provide sufficient dynamic lift to allow the submarine to surface under certain circumstances, and the PWR2 plant is twice as likely to experience structural failure causing a loss of coolant accident as equivalent civil and submarine reactor plants. Unlike civil reactors and those used in the US Navy's submarines, the PWR2 emergency core cooling system does not inject coolant to the reactor pressure vessel head. Although a new generation PWR3 reactor is under design for the Trident 'Successor' submarines, the current Vanguard class submarines are powered by PWR2 reactors and Astute class vessels which are planned for construction will also employ PWR2 technology.

Risks are compounded by pressure on the submarine fleet caused by delays in construction of new Astute class submarines, which mean that the Royal Navy will have to use older boats beyond their out-of-service dates and work the smaller fleet of Astute submarines harder, or reduce scheduled activity for submarines over part of the next decade.²³

The Defence Nuclear Safety Regulator has also expressed concerns about arrangements for

design of the next generation PWR3 nuclear propulsion plant for the 'Successor' submarine. A Safety Improvement Notice was served on the Ministry of Defence's Nuclear Propulsion Project Team in May 2010 by the regulator requiring the team to take action to address failures in meeting good safety management practice.²⁴ A persistent failure to address regulatory concerns was considered to be "no longer tolerable" at a time when key design decisions for the Successor submarine are being made, presenting increased risk to reactor design and safety management arrangements. Inadequate resourcing was identified as a root cause of the problems. More than one year late the regulator was still not fully satisfied with arrangements: on 24 June 2011 two formal Safety Directions were issued to the Nuclear Propulsion Project Team on control of organisational change and on construction and installation of new plant, with a requirement for implementation by the end of 2011.²⁵ Safety management arrangements of the reactor designer (Rolls Royce) have also been identified as an emerging issue.²⁶

A serious incident involving the military nuclear programme, apart from the obvious safety and environmental consequences, could be expected to have a major impact on public



trust in the armed forces and public opinion on the need for the UK to have nuclear weapons. The clean-up costs in the aftermath of such an incident might also be considerable. Malcolm Chalmers and William Walker point out that Scotland's tolerance of the Trident operating facilities at Faslane and Coulport is contingent upon the highest standards of safety, and that a serious accident in Scotland could not only jeopardise the future of the UK's nuclear weapons programme, but open deep rifts between Edinburgh and London which might threaten the Union itself.²⁷

In the current economic climate the Ministry of Defence will face significant challenges in managing its nuclear programmes with due regard for the protection of the workforce, the public, and the environment. Over the years ahead the Ministry is likely to face increasing difficulty in ensuring that the nuclear weapons programme is resourced and regulated so as to meet the highest safety standards.

Conclusion

Nuclear weapons are sometimes described as insurance against uncertain future risks for the United Kingdom, but as with any insurance policy, a price must be paid as a premium for the cover provided. In the case of the UK's nuclear weapons, this price includes not only the considerable cash cost of developing and operating a nuclear weapons programme, but also the seldom considered risks which the programme poses to the security and safety of the UK and its citizens. Less risky alternatives to nuclear weapons exist which would be equally effective, if not more so, for maintaining the defence and security of the UK, and instead of replacing Trident, the UK should move down the 'nuclear ladder' over the next decade with the aim of abandoning nuclear weapons in favour of a more sustainable approach to security.

This article is based on evidence submitted by Nuclear Information Service to the BASIC Trident Commission in January 2012.

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Science and Nuclear Weapons: The emergence of the atomic era

A tribute to Charles D. Coryell (1912-1971) and Leo Szilard (1898-1964)

Howard Gest

I first met Charles Coryell when I was a biology undergraduate at the University of California, Los Angeles (1940-1942). Unexpectedly, he became a decisive mentor of my academic career. As Chief of the Manhattan Project Fission Product Chemistry Research Section, he invited me to become a member of his group at the University of Chicago in early 1943. Later in the year, our group moved to the "secret city" of Oak Ridge (Tennessee) where our research facility was code-named Clinton Laboratories. Our major activities included characterization of more than 250 radioactive isotopes produced in uranium fission, development of a process for chemical isolation of plutonium, and preparation of gigantic quantities of radioactive barium 140 that were required by physicists at Los Alamos. Late in the night of September 18, 1944, from a considerable distance away, our group witnessed a crane lift into the sky 280 curies of the isotope--a brilliantly glowing radioac-

tive globe-- from a "hot laboratory" and transfer them to a lead vault in an unmarked army truck. The truck was part of a convoy that left immediately for Los Alamos. Subsequently, we made shipments of as much as 1000 curies! About 10 days after our first shipment, Germany began destructive attacks on England with more than 1500 V-2 rockets.

In January 1945, it became apparent that the first bombs would probably be ready within the next six months. At the Clinton Laboratories, meetings were held to discuss issues relating to possible uses of the bomb and the peaceful applications of atomic energy. We had formed an organization called The Association of Oak Ridge Scientists at Clinton Laboratories for studying and analyzing atomic energy issues. A "legislative committee" considered possible actions by the U.S. Congress, and an "editorial committee" discussed publications of various kinds - all in complete secrecy.

When telephone calls from the Chicago site and Oak Ridge were suddenly prohibited, Leo Szilard realized that an atom bomb would soon be tested by Los Alamos personnel. Theoretical physicist Szilard was a major figure in the establishment of the secret Manhattan Project. His reminiscences noted:

“I knew by this time that it would not be possible to dissuade the government from using the bomb against the cities of Japan....I thought the time had come for the scientists to go on record against the use of the bomb against the cities of Japan on moral grounds. Therefore, I drafted a petition [to the President] which was circulated in the project.”

During the early days of July 1945, Szilard's petition was discussed in Oak Ridge and various criticisms led to revised versions. The final text, dated July 17, stated, in part: “The development of atomic power will provide the nations with new means of destruction. The atomic bombs at our disposal represent only the first step in this direction, and there is almost no limit to the destructive power which will become available in the course of their future development. Thus a nation which sets the precedent of using these newly liberated forces of nature for purposes of destruction may have to bear the responsibility of opening the door to an era of devastation on an unimaginable scale.”

Fate of the Szilard Petition

The petition was classified “Secret,” and was not declassified until September 1958 (thirteen years after the end of World War II). In July 1945, Szilard's attempts to have it declassified were rebuffed by General Leslie Groves, the nominal military head of the Manhattan Project. In Oak Ridge, Coryell and all members of our group signed the petition and there were signatories from other units of the Clinton Laboratories. In 1989/1990, the Szilard Petition was displayed publicly for the first time at the U.S. National Archives. An explanatory note stated that 70 scientists had signed. I knew this was erroneous and decided to investigate the archival. In 1945 [i.e., before easy photocopying] the circulated Szilard petitions were all typewritten “originals,” and there were three versions with slight modifications. My study of File 76 in the National

Archives disclosed there were about 152 signers (in Oak Ridge and Chicago). There were no signers in Los Alamos because Robert Oppenheimer effectively prevented its circulation.

Szilard was pressured by colleagues to transmit the petition to the President through official channels. He reluctantly agreed and gave it to Dr. Arthur Compton (scientific head of the project) for delivery to Washington. General Groves, however, devised a circuitous route for progress of the petition. It finally arrived in the office of Secretary of War Stimson on August 1, while Stimson and Truman were in Europe at the Potsdam conference. Stimson's assistant simply put it into a secret file cabinet, and it was never seen by Truman. I found the original in the Archives - in a brown 9 x 12 inch envelope addressed by hand to the President. It was torn open roughly and had no official receipt markings on it. Inside the envelope, in a celluloid folder, was the one-page July 17 petition, signed by 12 individuals, including Szilard, Eugene Wigner and Ralph E. Lapp. A cover memo, signed by Captain R. Gordon Arneson, ended with “... it was decided that no useful purpose would be served by transmitting the petition or any of the other attached documents to the White House, particularly since the President was not then in the country.”

August 1945

Use of the atomic bombs that destroyed Hiroshima and Nagasaki during the first two weeks of August 1945 was soon followed by the surrender of Japan, and the “Atomic Age” began. Szilard decided to stop his further research in physics, and became Professor of Biophysics at the University of Chicago. After a short learning period, he made notable contributions to our knowledge of the dynamics of bacterial growth and mutation rates in populations of bacteria. At the same time, he continued his political activities and was one of the leaders in establishing civilian control over the peaceful development of nuclear energy in the United States and international control of nuclear weapons. In 1959, he received the Atoms for Peace Award.

Control of atomic weapons and energy

The intensive efforts of Szilard, Coryell and a

number of other scientists during 1945 and 1946 proved to be crucial in determining how atomic energy would be controlled in the future. The May-Johnson bill proposed in the Congress advocated continued military control and led to bitter debates. Senator Brien McMahon of Connecticut developed an alternative bill specifying civilian control, which was opposed by General Groves. Eventually, President Truman signed the McMahon Act (Atomic Energy Act of 1946) which transferred authority from the U.S. Army to the U.S. Atomic Energy Commission (AEC), a five-member civilian board. As matters became more complex, the AEC was later abolished (1974), with functions assigned to two new agencies: the Energy Research and Development Administration and the Nuclear Regulatory Commission,

For a fascinating historical perspective, readers may consult Coryell's Oral History which recounts an extraordinary meeting at Oak Ridge in which Coryell was "master of ceremonies." It was attended by scientists, General Groves, about 15 Army Colonels, and several U.S. senators. Coryell called on Dr. Alvin Weinberg to give a talk on "atomic power in peace." Then, he continued:

"Dr. Weinberg has told you about atom power in peace, but I would like to tell you about the atomic bomb in war, because that's the thing you're going to realize. It isn't going to be the empty spaces of the world, it's going to be the crowded cities of New York, Washington, St. Louis, Los Angeles. It isn't going to be liquid metal carrying the heat away, it's going to be vaporized metals like the tower of Alamogordo...."

Coryell later said that "Groves had the blackest face I've ever seen on a man in my life. Before the dinner meeting all of the Army had been warm to me; after the meeting no Army officer came within 50 feet of me. Every Senator came by and thanked me, on behalf of the scientists for a most illuminating evening. I walked out a dishrag....this was the tightest fix I'd ever been in in my life."

Ending paragraphs of the full Szilard Petition

'If after this war a situation is allowed to develop in the world which permits rival powers to

be in uncontrolled possession of these new means of destruction, the cities of the United States as well as the cities of other nations will be in continuous danger of sudden annihilation. All the resources of the United States, moral and material, may have to be mobilized to prevent the advent of such a world situation. Its prevention is at present the solemn responsibility of the United States - singled out by virtue of her lead in the field of atomic power.

The added material strength which this lead gives to the United States brings with it the obligation of restraint and if we were to violate this obligation or moral position would be weakened in the eyes of the world and in our own eyes. It would then be more difficult for us to live up to our responsibility of bringing the unloosened forces of destruction under control....In view of the foregoing, we, the undersigned, respectfully petition: first, that you exercise your power as Commander-in-Chief, to rule that the United States shall not resort to the use of atomic bombs in this war unless the terms which will be imposed upon Japan have been made public in detail and Japan knowing these terms has refused to surrender; second, that in such an event the question whether or not to use atomic bombs be decided by you in the light of the considerations presented in this petition as well as all the other moral responsibilities which are involved.'

July 17, 1995: The 50th Anniversary of the Szilard Petition

In 1992, William Lanouette published a comprehensive biography of Szilard, and in 1995 he arranged a well attended public event about the petition at the National Archives in Washington D.C. After his introduction, three signers of the petition gave talks about their recollections. See photograph on next page.

The full text of the Szilard Petition and further details of its history, the decision to use atomic bombs in 1945, and relevant commentaries by historians, U.S. military, government officials and others can be found in my article, "The July 1945 Szilard Petition on the Atomic Bomb/ Memoir by a signer in Oak Ridge." (February 2001) at <http://www.bio.indiana.edu/Gest/>.

The once secret File 76 of the Harrison-

Bundy Files in the National Archives contains original documents relating to the July 17 Szilard Petition. These include a miscellany of declassified letters, memoranda, summaries of committee meetings, letters to Szilard from intelligence officers, and other items connected with the meanderings of the ill-fated secret petition.

A final personal note:

By example, Coryell taught the members of his group the highest standards of scientific research. After World War II ended, he arranged for me to become the first graduate student of his personal friend, Martin D. Kamen, the pioneering radiochemist and co-discoverer of carbon 14. I am forever in Coryell's debt.

Figure legend

From left to right: William Lanouette (meeting organizer), Ralph E. Lapp (1917-2004), Howard Gest (1921-), & John Simpson, Jr. (1916-2000).

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In the foreground, the Szilard petition with signatures.

Photo taken at the 1995 public meeting about the petition held at the National Archives in Washington D.C.



