British American Security Information Council

Oceans of Work

Arms Conversion Revisited

Dr Steven Schofield

January 2007

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B@SIC 20 years of promoting transatlantic cooperation for global security

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Published by the British American Security Information Council

BASIC in the UK is a registered charity no. 1001081.
BASIC in the US is a non-profit organization constituted under Section 501(c)(3) of the US Internal Revenue Service Code
BASIC Research Report 2007.1 - January 2007

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Printed by Seacourt Ltd, Oxford on a waterless offset printing press using paper of at least 75% post-consumer recycled paper. Seacourt are EMAS certified and carbon neutral. www.seacourt.net

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Acknowledgements

Thanks to Derek Brook, Ian Davis, Paul Ingram, Terry McSorley, Maggie Mort and Barbara Panvel for advice and comments, and to the staff of Barrow Borough Council, Furness Enterprise and the North West Regional Development Agency for information on the Barrow-in-Furness economy.

Support

This publication was made possible through funding from the Joseph Rowntree Charitable Trust, The Ploughshares Fund and the Anita Roddick Foundation.

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Windfarm in Washington State USA Photo: Tara Jorgensen

Executive Summary

This report is published a month after the Government's White Paper outlining its decision to replace Vanguard ballistic missile submarines with an indigenously-manufactured submarine to continue deploying Britain's strategic nuclear weapons.[1] The House of Commons is due to vote on the White Paper in March. This report also comes two weeks after the House of Commons Defence Committee published its report on the industrial requirements surrounding this decision. The Committee concluded that British manufacture of nuclear-powered submarines required a regular orderbook without gaps.[2]

This report puts the case for arms conversion as integral to a 'national needs' programme of civil R&D and manufacture, including a major investment in offshore renewable energy, for both security of supply and to help tackle the growing international threat from climate change. It is based on a reevaluation of 'Oceans of Work', produced by the Barrow Alternative Employment Committee (BAEC) in 1987, as part of the campaign by local trade unionists for alternative, civil work to the construction of the Trident ballistic missile submarines at the VSEL shipyard in Barrow-in-Furness, West Cumbria. 'Oceans of Work' put forward an ambitious programme to utilise the shipbuilding and engineering skills of the workforce, with particular emphasis on offshore renewable energy, including wave and wind power systems.

The proposals were rejected by the VSEL management who stressed the continued importance of the company's military specialism in nuclear submarine manufacture. Employment declined, however, from 12,000 in 1987 to just over 3,000 in 2006. Such job losses reflected the broader pattern of consolidation and rationalisation in the arms industries, with overall defence employment down from over 500,000 to 260,00 and with BAE Systems (formerly British Aerospace) emerging as the effective UK monopoly supplier in fighter aircraft, surface vessels and nuclear submarines.

Arms conversion is still popularly associated with the end of the Second World War, and the successful re-integration of millions of people, both from the armed forces and from the arms industries, into civil manufacturing. But this was essentially a reconversion exercise back to civil production in which companies had considerable experience prior to the war. The emergence of highly specialised military firms has made this traditional approach of plant-based conversion problematic because of the very different demands of civil manufacture and the high transition costs.

Alternative models provide a more relevant and contemporary approach to maximising the economic opportunities of disarmament. For example, under macro-economic conversion, central government compensates for reduced military expenditure through other forms of spending on infrastructure, housing, etc, bringing enhanced employment prospects, including those for redundant arms-industry workers.

...a fundamental shift from military R&D and procurement to a programme of investment in civil technologies for major objectives like renewable energy and reduced carbon emissions in the face of a global environmental crisis.

More radically, as in this report, conversion is put forward as part of a 'national needs' agenda, highlighting a fundamental shift from military R&D and procurement to a programme of investment in civil technologies for major objectives like renewable energy and reduced carbon emissions in the face of a global environmental crisis. Comparison is made between Denmark, as the leading nation in the development and manufacture of wind turbines during the 1980s and 1990s, and the UK's industrial cul-de-sac of nuclear reprocessing, to emphasise the importance of central government leadership and broader institutional networks for successful (and unsuccessful) technological trajectories.

The potential exists for a massive expansion of wave and wind power to satisfy up to 50% of the UK's energy needs by 2030, while forming the basis for a major industry employing tens of thousands of workers to satisfy domestic demand and export markets.

Vesta's wind-turbine factory in Campbeltown, Scotland. September 2004
Photo: © Greenpeace / Kate Davison

A key element of this new arms conversion framework is a fundamental review of UK security policy. Since the end of the Second World War, the underlying doctrine pursued with remarkable consistency by successive governments, has been to ensure the UK can support the United States in global force projection. The MoD's Defence Industrial Strategy, published in 2005, which emphasised the need for long-range military platforms, including fighter aircraft, nuclear submarines and aircraft carriers, is intended to carry this doctrine on for the next twenty to thirty years.

A Non-Offensive Defence policy is one alternative that breaks with this subordinate relationship and allows the UK to make an effective contribution both to new international security challenges and to international disarmament. The focus is on territorial defence and a contribution to an EU peacekeeping and reconstruction force that can carry out UN-endorsed humanitarian interventions. Under this policy, major offensive platforms, including the follow-on Trident ballistic missile system, aircraft carriers and conventional nuclear submarines would be cancelled and the UK would be a leading proponent of a new international security architecture based on global disarmament. There would be the potential for major annual savings of between £3-4 billion on military expenditure by 2012, available for the 'national needs' programme of civil investment.

Although there will, inevitably, be disruption and higher unemployment in the short-term, the prospects exist for stronger and more diversified local economies in the medium to long term.

The industrial implications of cutbacks to military procurement are serious yet manageable and temporary, including the closure of surplus manufacturing capacity and the run-down of military research facilities. Overall, approximately 100,000 workers would lose their jobs but many of these are based in relatively prosperous regions of the UK, where alternative employment opportunities are high, especially for skilled industrial and technical staff. The shortage of highly-skilled workers is perhaps the most important bottleneck constraining economic development, more so than financial investment; an injection of highly-skilled workers with expertise appropriate for the growing and crucial sectors such as the development and production of renewable energy technologies will stimulate the civil economy.

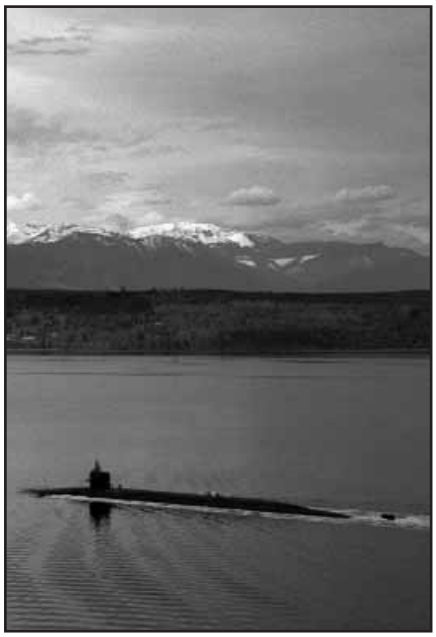
A small number of military-dependent localities in relatively deprived areas face major job losses, including Barrow which would lose all nuclear submarine work. Here, the emphasis will be on regeneration policy, involving national government through the Department of Trade and Industry, the Regional Development Agencies and local economic task forces to attract new industries and to support programmes like the relocation of civil service functions to these areas. Although there will, inevitably, be disruption and higher unemployment in the short-term, the prospects exist for stronger and more diversified local economies in the medium to long term.

The research establishments will be run down as their focus changes to the dismantling and decommissioning of nuclear weapons. This offers the opportunity to redirect government supported military R&D, running at over £2 billion a year, and heavily biased towards the South East. New civil, regional research facilities could be supported around the national needs agenda for innovations in areas like hydrogen storage of renewable energy and decentralized energy distribution systems.

Although a radical programme, this is an entirely feasible one and is intended to demonstrate how the UK can take a leading role in a new international security agenda based on disarmament and sustainable economic development.

Introduction

"when policy becomes doctrine, the acknowledgement let alone assessment of alternatives is repressed." [3]



A Trident nuclear-armed submarine heading out to sea from its base on the Clyde

It is now twenty years since research was carried out on the possibility of alternative, civil work to the Trident ballistic-missile submarine programme at the VSEL shipyard in Barrow-in-Furness, Cumbria. The construction of the four Trident submarines was one of the biggest shipbuilding and engineering programmes ever undertaken in the UK, employing at its peak, over 14,000 people locally.

'Oceans of Work', published by the Barrow Alternative Employment Committee (BAEC) in 1987 [4] provided an alternative approach that stressed the over-dependency of the company and the local economy on arms production. It argued that the potential existed for new, civil engineering opportunities in the marine sector, particularly offshore renewable energy systems like wind and wave power, with enhanced prospects for skilled manufacturing jobs over the medium to long term.

Although the report received considerable national and international attention and was supported by senior politicians and trade union leaders, its proposals were never seriously considered by the company's management. They continued to stress VSEL's expertise in military work and its specialism in nuclear submarine production throughout the 1990s and early 2000s, while employment levels at the yard spiralled ever downwards.

Why, if the report failed to achieve any of its objectives, is it useful to revisit these issues? Firstly, the Government has just published its White Paper outlining its decision to replace Trident with a new generation of ballistic missile submarines, with the promise of a debate and vote in the House of Commons in March of this year.

This further undermines the nuclear Non-Proliferation Treaty (NPT) and commits the UK to an estimated £20-£30 billion programme. It will sustain only low levels of employment (around 5,000-7,000 people nationwide), focused on a local economy in Barrow that is still heavily dependent on military work.

Secondly, the Barrow experience is a microcosm of broader trends in UK arms production, i.e., consolidation and specialisation around expensive military research and development (R&D) and procurement programmes. The result has been massive job losses but little effort to provide alternative, civil manufacturing work.

Thirdly, many of the arguments raised in the original report about the lack of support for civil alternatives like renewable energy, are even more relevant today, since the international energy crisis is deepening and the issues of climate change have become ever more pressing.

This report considers various questions, including:

- what lessons can be drawn from the Barrow and other arms conversion case studies on the opportunities for, and barriers to, conversion?
- what role can government play through R&D and procurement in promoting new technologies that offer opportunities for civil manufacturing? and
- can arms conversion be incorporated into a broader framework for disarmament and sustainable economic development relevant to contemporary conditions?

Chapter One gives a brief history of post-war arms conversion in the UK to contrast conditions in 1945, where manufacturing capacity was mainly reconverted back to civil work, and the emergence of a specialised military-industrial base in the 1960s and 1970s. Attention is focused on the example of the Lucas Aerospace Alternative Plan as a major inspiration for conversion in the UK during the 1970s and 1980s.

Chapter Two provides a short review of the structure and objectives of BAEC and the research for 'Oceans of Work', highlighting the potential for new, civil marine technologies, the negative response to its publication by the VSEL management, and other more favourable reaction.

Chapter Three considers some of the theoretical issues raised in the academic literature that provide a critique of the traditional, site-based conversion approach. It develops an overview of the various models including community-based conversion, macro-economic conversion and comprehensive conversion, drawing out the policy implications of each approach.

Chapter Four provides a contemporary analysis of the UK's military-industrial base in the context of consolidation and internationalization, and the emergence of BAE Systems as the dominant force in UK arms procurement. The government's Defence Industrial Strategy (DIS) is assessed for its long-term commitment to indigenous production on a new generation of offensive, conventional and nuclear platforms.

Windfarm near Fluvannah, Texas, USA Photo: Sarah Fields

An alternative framework based on a non-offensive defence strategy, a UK contribution to an EU peacekeeping/reconstruction corps and a major rationalisation of specialised military production is assessed for its impact on procurement and employment.

Chapter Five draws on the recommendations of 'Oceans of Work' to assess the choices taken in the UK's energy policies during the 1980s and 1990s, comparing the continued R&D support for nuclear power by the government against the rejection of renewable energy. Specific reference is made to the THORP nuclear programme and wave power as alternative 'technology trajectories', and how a comprehensive conversion programme could have led to a much larger share of energy supply through offshore renewable systems that also supported an indigenous manufacturing capacity.

Chapter Six considers the future of Barrow in the context of its dependency on nuclear submarine production, the failure to broaden the local economic base and continued high levels of social and economic deprivation. The impact of the closure of the yard is assessed in relation to conversion policy for local economies that are highly dependent on military work.

A concluding chapter provides a framework for arms conversion that links disarmament to a new 'national needs' programme for civil R&D and production.

Chapter one Historical background to Arms Conversion

Shipyard workers at Barrow-in-Furness in 1900

Arms conversion generally invokes the Old Testament expression, 'swords into plowshares'.[5] This powerful imagery still resonates today, providing hope and inspiration for millions of people around the world that peaceful alternatives can be found to the global arms race and to weapons of mass destruction like the UK's Trident ballistic missile system. The forging of handcrafted weapons in the agricultural societies of biblical times may bear little comparison to the industrialised and technologically sophisticated military production of today, but conversion has, of course, a much more recent and successful historical experience.

The end of the Second World War brought with it a formidable economic challenge and many commentators at the time feared a return to the sort of mass unemployment that blighted the 1930s, with over 3.5 million armed forces personnel to be demobilised and 3.25 million workers in arms manufacture needing to find alternative employment. Such pessimism proved groundless. Savings accumulated during the war were available to spend on civil goods, stimulating demand that more than compensated for the loss of military work and helping to achieve a relatively smooth transition to full employment by 1947.[6]

The forging of handcrafted weapons in the agricultural societies of biblical times may bear little comparison to the industrialised and technologically sophisticated military production of today, but conversion has, of course, a much more recent and successful historical experience.

Not surprisingly, this successful experience is used to support the argument that arms conversion should be a relatively straightforward exercise today, since the restructuring of military industries and employment would be on a much smaller scale. However, there is a crucial difference. For the vast majority of companies, this was a return to pre-war production as tools and equipment were, quite literally, dusted off from the factory stores and brought back into use. So, rather than conversion, it would be more accurate to describe this, generally, as 'reconversion', to forms of civil production in which companies already had considerable experience.[7]

The onset of the Cold War from the early 1950s onwards, brought with it sustained high levels of military spending, unprecedented in peacetime, and the emergence of specialised military industries in aerospace, shipbuilding, engineering and latterly, electronics, with little or no experience of civil work. The challenges of conversion were now much more formidable because of these specialisms, as well as the competition from established civil companies in all these sectors.

During the 1970s, one pioneering campaign inspired many people with its radical vision of conversion to socially-useful production. Lucas Aerospace was a major arms manufacturer, employing 13,000 workers at 17 sites. The workers were faced with clear indications from both the government and management that reduced orders for military equipment, during one of the periodic downturns in expenditure, would probably lead to substantial job losses.[8]

Rather than passively accept this fate, trade union representatives from the various sites came together to draw up an alternative plan that would help both to protect jobs and to satisfy unmet social needs. For the members of the Combine committee, a key factor in arms conversion was the role of the state. The government, through military spending, had prioritised certain types of production but it could equally set a new national economic and technological agenda that looked to combat the growing energy crisis and environmental pollution, as well as improve public transport and health services. Therefore, it was entirely feasible for the government to re-direct military expenditure into innovative civil manufacture at companies like Lucas.

Over 150 products were eventually proposed in a detailed, six-volume corporate plan that matched workforce skills and industrial facilities to a range of alternative products, including alternative energy systems – solar and hydrogen fuel cells; public transport – a hybrid road-rail bus; and medical equipment – a kidney dialysis machine.

Not surprisingly, the Combine Plan was rejected out of hand by the Lucas management who clearly saw it as a threat to their authority and to the company's status as one of the leading UK military aerospace companies. The Labour government also offered little support, preferring to treat this as a matter of internal industrial relations between the company and the workforce, rather than one of national policy and economic priorities.[9]

Dreadnought - the first UK nuclear powered submarine launched in 1960

However, the work behind the Combine Plan stimulated further efforts under the banner of socially-useful production, including a working prototype of the road/rail bus and the setting up of an academic centre, the Unit for the Development of Alternative Products (UDAP) in Coventry to follow through a range of design concepts.[10]

Other conversion studies were also undertaken during the 1980s, including one focused on the British Aerospace, Kingston site which faced redundancies and possible closure, as well as work assessing regional and local dependency on military contracting, in the Coventry area, and in Scotland around the Faslane and Coulport naval dockyards that were due to service the Trident submarines.[11] It was in this context that the Barrow research on the potential for civil work at the VSEL shipyard was undertaken.

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Chapter two

The Barrow Shipyard and *Oceans of Work*

The main objective was to draw up plans for diversification of the product base, ...but with the emphasis on civil alternatives to military work.

The Barrow arms conversion project emerged as a response to the Conservative government's decision in 1980 to replace Polaris with the Trident ballistic missile submarine programme. Construction of the four submarines was to be carried out at the VSEL shipyard, in a contract worth over £2 billion to the company that was expected to maintain employment for the 12,000-strong workforce well into the 1990s.[12]

A group of local trade unionists from the yard and active in the local Trades Council came together as the Barrow Alternative Employment Committee (BAEC) in 1984. They were concerned about the growing dependency of the company on military work and especially on one large contract that was vulnerable to cancellation if there was a change of government.[13]

The main objective was to draw up plans for diversification of the product base (accepting that the shipyard and engineering works would continue with other military contracting), but with the emphasis on civil alternatives to military work. BAEC received initial funding from the Campaign for Nuclear Disarmament (CND) to employ a researcher, and an academic base was provided by the Department of Peace Studies at Bradford University.[14]

VSEL (better known as the Vickers shipyard before privatisation of the company in 1986) had a long and proud tradition of commercial shipbuilding and engineering during the last century, including the construction of oil tankers and passenger liners.

It was only during the 1960s and 1970s that the company began to concentrate on both ballistic missile and conventional nuclear submarine manufacture, resulting in a decisive shift in the balance of production from civil to military work.

Therefore, the remit of the research was to identify promising ideas developed internally and new opportunities in marine technologies that could use the skills base and facilities of the company for large-scale, marine engineering projects. The management were approached for support but made it clear that they saw no value in the research, prevented site visits by the researcher, and refused to offer technical analysis of product ideas.

BAEC's 'Oceans of Work' was published in 1987. It identified a range of products, including civil engineering equipment and marine-based renewable energy, with the focus on wave power, offshore wind power and tidal barriers. Some of these ideas had emerged from the company's own design work such as the Constant Speed Generator Drive (CSGD) and the Oscillating Water Column (OWC) wave power machine, while others were based on international comparisons of emerging opportunities.[15]

The CSGD was designed by VSEL as a response to escalating fuel costs in order to provide a more efficient form of electrical power generation for ships at sea. Through an innovative gearing system, ships' generators could be driven directly from the main engines, even with a varying speed, because the CSGD provided the means to maintain a constant output speed.

However, the design was not pursued by the company in the face of international competition, in particular from the German company, Renk.

The OWC was a pioneering design put forward by the company in the mid 1970s. Waves strike a column of water trapped in an inner chamber, open at the sea base, and the moving column acts as a piston that, as it rises and falls, forces air back and forward through a low pressure turbine housed in the column, in turn providing power. Again, the design was not pursued by the company's management and a similar prototype was built by a Norwegian company, Kvaerner Brug AIS, that became operational in the mid 1980s.

A strong emphasis in the report was on international comparative analysis of marine technologies and the role of central government R&D funding to support innovations that had the potential to generate substantial new employment opportunities. Recognising this positive relationship between government and industry, the report's most ambitious proposal was to set up a government-funded marine technology R&D centre in Barrow to co-ordinate a national programme and develop the expertise necessary to build a cluster of new marine industries in offshore renewable energy and underwater exploration.

HM Submarine Vampire was built in Barrow and completed in 1943

The report did not dodge concerns about internal barriers to successful civil work at the shipyard. These centred on both the cost base for military production and a management culture that prioritised continued military contracting. Ministry of Defence (MoD) specifications, especially for nuclear systems, included many layers of quality control and the integration of complex sub-systems like sonar, steam generating plant and communications that all had to be inter-operational under extreme conditions of performance. Any civil, commercial work would have to be carried out within this framework of military-industrial specialisms and a highly bureaucratized military accounting and costing system.

The Oriana at night in 1960 in the Barrow docks

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MV Copenhagan was the last passenger ship built at Barrow-in-Furness in 1973

The company's senior management also had a strong cultural bias in favour of military work. For them, the development of a specialism in nuclear submarine production had given the company a unique strength as a prime contractor to the MoD. Civil work, although possibly welcome, simply could not offer the same combination of market strength and profitability, nor industrial and technological challenge. In proposing a marine technology centre in Barrow, 'Oceans of Work' attempted to respond to some of these concerns by indicating how marine industrial and technological resources could be re-configured, outside VSEL, and act as an incubator to a variety of larger and smaller companies that were responsive to these new civil opportunities.

When 'Oceans of Work' was published, the then Chief Executive of VSEL, Dr Rodney Leach, dismissed it out of hand. He called it 'mischievous' for suggesting that a company that prided itself on meeting a technological challenge equivalent to sending a man to the moon might consider such alternatives. For him, commercial shipbuilding in the UK was in terminal decline and new civil marine systems were riven with technological and market uncertainties. Any major expansion of marine-based renewables would require 'social engineering on a global scale'. VSEL's future was secured by the management's focus on Trident, other nuclear submarine and armaments work for the MoD, and a renewed drive on arms exports.[16]

The irony that VSEL had become an industrial extension of the MoD and was building a platform for cosmically destructive weapons, seemed to have escaped Dr. Leach in his peroration to market forces and against global social engineering. But other commentary was more reflective. Several reviews welcomed the general thrust of the report, that renewable energy and other marine-based systems offered significant opportunities, including potentially very large export markets, and that the UK might fall further behind other countries without government support for innovation during this early phase of development. But there was also skepticism that VSEL could play any positive role, mainly because of the inherent military conservatism of the company's management.

Here, again, we meet the fundamental dilemma facing arms conversion; that of a mismatch between the prospects for new civil employment in associated areas and the reality of military production at specialist arms manufacturers, hamstrung by industrial and cultural barriers that made even the more modest ambition of product diversification on site, with both military and civil work, look highly unlikely, if not impossible.

For all practical purposes the research was completed by the end of 1987 and, despite efforts by the members of BAEC to take the proposals forward, the company's course had been firmly set on armaments work and its specialist niche of nuclear submarines.

Arms Conversion Research and Policy Options

Chapter three

Introduction

There is now a substantial body of academic work on arms conversion, although interest tends to wax and wane with improved prospects for disarmament, as at the end of the Cold War, or the lack of them, as is tragically the case now. The main focus has been on the United States, with its enormous arms industry, but research has also been carried out elsewhere, mainly in the UK and Europe.[17] Major contributions of the literature have been to explore the characteristics of a specialised arms industry in the advanced Western economies, and to put forward various policy options for transferring resources from military to civil work.

Influential in setting the original agenda was Seymour Melman, an American academic, whose research through the 1960s onwards, explored the negative economic impact of military spending on the US economy.[18] He argued that the US Department of Defense's (DoD) insatiable demand for ever-more sophisticated armaments had created a peculiar sort of anti-economy, a black hole characterised by cost-plus contracting and the 'gold-plating' of military equipment.

American corporations that had built their post-war success through continued productivity improvements and reliability in the manufacture of civil goods were now being sucked into this alternative reality where they were encouraged to do exactly the opposite; to continuously add new capabilities beyond original specifications and irrespective of potential complications, yet safe in the knowledge that all cost increases would be passed onto the DoD.

Not only did this result in a series of procurement scandals over delays, inflated contract values, faulty equipment and outright corruption, it also established a form of peacetime, specialised military-industrial firm. This peculiar creature's expertise lay in satisfying the byzantine bureaucratic requirements of arms procurement, rather than in the normal concerns for cost control and productivity that were essential in civil markets. As a result, the very few attempts at converting military facilities to civil production were little short of disastrous, characterised by over-engineered and unreliable equipment that broke down and faced costly redesign and repair problems.[19]

The only way out of this crisis, according to Melman, was to put in place an ambitious national framework for arms conversion that required all the leading arms manufacturers to draw up detailed conversion plans at each site and in consultation with their workforces. His approach gained considerable support, including attempts at legislation through Congress. It was also influential in the UK, where a similar framework was proposed by the Labour Party in the mid 1980s.[20]

Clearly, this emphasis on site-based conversion planning drew heavily on the experience of reconversion at the end of the Second World War. So, having graphically demonstrated the serious barriers posed by military specialisms and the lack of success in the, admittedly limited, attempts at site-based conversion, Melman insisted on maintaining a traditional structure for arms conversion.

Seymour Melman, 1947 - 2004

...the US Department of Defense's (DoD) insatiable demand for ever-more sophisticated armaments had created a peculiar sort of anti-economy, a black hole characterised by cost-plus contracting and the 'gold-plating' of military equipment.

He believed that the process of planning would, itself, stimulate new ideas and new ways of working to liberate these facilities from the dead hand of military production.

But a growing consensus was emerging in the academic literature that, given the characteristics of these specialist military-industrial sites, it was highly unlikely that they could make the transition to civil work, even with substantial support from the state. Rather than waste resources in this way, the focus of research became one of assessing alternative approaches to arms conversion against the criteria of maximizing the economic potential of disarmament through new industrial and employment opportunities.[21]

Community Conversion

One alternative that claimed success was community conversion, an approach that focused on the capacity to attract new employment into areas facing a decline in military work. The Office of Economic Adjustment (OEA), part of the US Department of Defense, had the responsibility to assist communities facing military base closures during the 1960s and 1970s. Small amounts of funding were made available to support the re-use of administrative and accommodation buildings for various new activities including commercial business premises, educational campuses and civil aviation.

In some cases, there was an overall increase in employment on site but these tended to be ones located in or near large cities, where the commercial attractions were clear. More remote and smaller bases faced a bleak future. Similar small-scale programmes were developed in the UK and Europe at the end of the Cold War. The most significant was the EU's Konver programme during 1991-93 that allocated £15 million to a number of eligible projects, including retraining of redundant workers and re-use of former military sites.[22]

Essentially, what these minor programmes reflected was an overall reliance on market forces. If jobs were lost in the arms industry or at military bases, then it was assumed that normal mechanisms of supply and demand would operate. In other words, the economy was in a constant state of 'conversion' with some industries declining and others offering new opportunities. Previous experience of structural unemployment in staple industries like coal and steel may have demonstrated that the process could be an extremely painful one in particular localities, and that similar job losses and closures might well occur in the arms sector. But the government's role was restricted to small regional aid programmes in the attempt to attract new industries, allied to retraining packages for redundant workers, even though, in all likelihood, they would prove inadequate to deal with the scale of the cutbacks.

Macro-Economic Conversion

Other approaches called for a more ambitious agenda, especially when the prospects for disarmament looked favourable and the balance of government expenditure could be fundamentally changed. Macro-economic conversion emerged as a strong theme in the early 1990s, when it became clear that the Cold War was drawing to a rapid end and the opportunity existed to release a substantial peace dividend.

One study in the UK analysed how a reduction in military expenditure of 50% was achievable over the period 1992 to 2000, but would have very different outcomes dependent on whether the government provided compensatory expenditure or not. In the first case where military spending was simply cut, overall demand in the economy declined, Gross Domestic Product (GDP) fell by 3.5% and unemployment increased by half-a-million.

In the second, where the cuts were balanced by a proportionate increase in other forms of public expenditure there was an extra 1.8% growth in the economy and a reduction in unemployment by half-a-million. There would be problems of restructuring at the local level for a small number of military-dependent areas but these would be manageable within the context of a growing economy and new opportunities for employment.[23] Of course, such large reductions in military spending and compensatory investment did not occur, with an overall cut in UK military expenditure in real terms of only 14% between 1991 and 1998.[24] But Keynesian analysis of this type reinforced a strong message from the body of conversion research, that a sustained period of disarmament can also provide real economic benefits, including increased aggregate demand and employment, assuming that the government was willing to play a pro-active role at the level of the macro-economy.

Comprehensive Conversion

By far the most ambitious set of proposals, which could be described as comprehensive conversion, went further than this form of macro-economic compensation for reduced military expenditure. Fundamentally, it challenged Western governments to embark on a programme of sustained disarmament matched by a new national and international economic agenda for peaceful development.

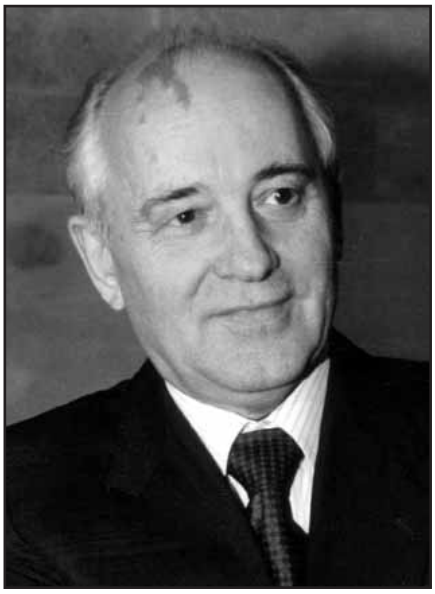
The most eloquent exponent of this approach was Michael Gorbachev during the astonishing period of disarmament initiated by the Soviet Union under his leadership. His speech to the United Nations Assembly in 1988 encapsulated the sheer scale of these ambitions, including the abolition of nuclear weapons and other weapons of mass destruction by the end of the century; the removal of all foreign bases, and massive reductions in conventional forces to a form of territorial defence only.

Parallel with international disarmament would be a programme of development to tackle the growing security challenges posed by poverty and environmental breakdown:

> *Initiating active steps to halt the arms race and reduce weapons is a necessary pre-requisite for coping with increasingly acute global problems – those of a deteriorating state of man's environment and the need to find new energy sources and combat economic backwardness, hunger and disease. The pattern imposed by militarism – arms in place of development – must be replaced by the reverse order – disarmament for development.*[25]

The dismantling of the Cold-War military economy, therefore, was a major opportunity to re-direct scientific and technological resources from military R&D, and to use government expenditures in ways that met pressing social and economic priorities including energy supply, health, the environment and the rebuilding of civil infrastructure.[26]

Under the first Clinton administration the United States did pursue some technological policies that seemed to address these issues. For example, the leading government nuclear research establishments at Los Alamos, Lawrence Livermore and Sandia, as well as the Defense Advanced Research Projects Agency (renamed ARPA and dropping Defense in recognition of the changing emphasis) were expected to develop partnerships with industry in order to make a productive contribution to the civil economy, using their core competencies in areas like computer sciences and advanced materials.[27]



Mikhail Gorbachev

Parallel with international disarmament would be a programme of development to tackle the growing security challenges posed by poverty and environmental breakdown...

Figure One: Typology of Arms Conversion

Type	Description	Implications
Factory-Based Conversion	Individual sites move completely from military to civil work	Rests heavily on the reconversion experience at the end of World War Two but faces serious barriers in the modern context of specialised military-industrial firms
Diversification	An increase in civil work without abandoning military production	Normally this refers to restructuring at a company level rather than site level. It can mean acquisition which may reduce the overall dependency on military work or it may mean companies divest military interests but in both cases the capacity for armaments production is maintained
Technology Transfer	Military research laboratories 'spin-out' technological innovations that might have applications in civil manufacturing	Small scale programmes within the context of large, government-funded military R&D programmes and continued close relationships between the research laboratories and major arms manufacturers
Community Conversion	Assistance to areas dependent on arms manufacture or military bases facing redundancies and closure	Stresses the role of regional and local assistance through attracting new industries and through retraining. In practice, relatively small assistance programmes, although there is potential to expand the scale through various central government, regional and local economic agencies
Macro-economic Conversion	Government compensates for major reductions in military expenditure through other forms of civil investment.	No direct support to arms firms and significant redundancies in military employment but more than compensated by overall increases in demand and job creation in other civil sectors of the economy. It still leaves a substantial, specialised military-industrial base and the potential for future increases in military expenditure and production.
Comprehensive Conversion	A national and international needs programme linking disarmament to an irreversible shift from military to civil work with the focus on sustainable development, e.g. renewable energy	Calls for a total re-focusing of international security through disarmament to priortise civil programmes of R&D and production. Would require the dismantling of most of the specialised military-industrial capacity. A fundamental challenge to the Western security paradigm established by the US and its main allies after the Cold War.

Much was made of the concept of dual-use technologies, where innovations could be adapted to both military and civil applications, particularly in the electronics sector. But the fundamental structure and military focus of the laboratories was left intact, and the bulk of their partnership work continued to be with the giant arms corporations. A similar approach has been taken in the UK with the Defence Diversification Agency (DDA), whose main role is to support limited forms of technology transfer from the military research establishments.[28]

Consolidation rather than Conversion

Such 'conversion' then was simply a form of disguised consolidation. The United States and its allies were compelled to acknowledge the radical nature of the Gorbachev agenda, and the growing public support for disarmament. At the same time, they wanted to ensure that the industrial and technological base for advanced weaponry and military supremacy was maintained, even though their main adversary had, quite literally, disappeared. Russia, the only potential military successor to the Soviet Union, was in a state of economic chaos where arms expenditure had collapsed.

Cuts in both nuclear and conventional forces were agreed through the major disarmament treaties of this period resulting in some demobilisation of armed forces and reduced expenditure. This served two purposes. First, it satisfied domestic public demand that progress was being made on disarmament. Second, it preserved key capabilities, including the option for nuclear weapons and advanced conventional weapons that gave the United States overwhelming superiority for global force projection.

Fundamental to this strategy was the consolidation of the military industrial base. Cuts in military R&D and procurement were carried out but this still left military expenditure at the average for the whole of the Cold War period. So, unlike the end of other major conflicts, the US and UK governments made it clear to the leading arms companies, that no deep, structural changes would be made. Rather, there would be a short period of adjustment and the removal of excess capacity but this would leave procurement and R&D budgets at what were still historically high levels by normal peacetime standards. And, just as importantly, there was every expectation that military expenditure would rise again in real terms, that all the major land, sea and air systems would be purchased and that government support for arms exports would be maintained, if not intensified.

During this period, therefore, there was a substantial loss of jobs and rationalisation of capacity, with an estimated million arms industry jobs lost in the United States and a further 500,000 in Europe.[29] But the structure of specialist manufacturers supported by the government's military research establishments remained remarkably intact, hardly distinguishable in terms of capabilities and real term expenditure from the height of the Cold War in the early 1960s when President Eisenhower could warn of the dangers of a military-industrial complex.

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Conclusion

Arms conversion research has been important in clarifying the main characteristics of a specialised arms industry and the range of policy options that could be applied to the transition from military to civil economy. The main debate has been on the relevance of a traditional 'swords into plowshares' model that was best served by the particular conditions of the Second World War but is generally considered to be an anachronism in this modern context. A variety of approaches have been identified, from the more modest, community conversion programmes to a radical comprehensive conversion programme that calls for the linkage of disarmament to an irreversible shift from military to civil production.

The end of the Cold War is, therefore, the saddest of historical paradoxes. How was it possible for one of the most remarkable transformations in history, resulting in international disarmament and a European political reconstruction scarcely imaginable only a few years earlier, to mutate into one of the most rapid resurgences of military power in history?

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What should have been a golden opportunity for comprehensive conversion became a cynical exercise in the management of expectations. Western leaders used the collapse of the Soviet Union as a means of consolidating military supremacy. Perhaps most cynical was the attempt to portray the disarmament programmes as a sea-change in international relations, when the long-term strategy was always to sustain, and if possible, enhance the capacity for global military reach against any potential adversary, as planned before this shocking and completely unprovoked outbreak of peace.

Military expenditure was allowed to decline by a limited amount that sustained the capacity for indigenous military production while conversion consisted of some very small regional aid and technology transfer packages. These were totally inadequate for the scale of the redundancies experienced, but as with the disarmament programme, gave the illusion of good intent. The main characteristics of this post Cold War consolidation were that military R&D continued to dominate government research, and specialised arms industries continued to benefit from multi-billion pound procurement programmes.

The first Gulf War and the interventions in the former Yugoslavia may have been used as legitimation for grossly inflated arms budgets, followed, more recently by the threat from rogue states and international terrorism. But what they really signify is the essence of Western militarism, refined through the Cold War and carried on into the new millennium - the power of the exaggerated threat and the manipulation of fear and anxiety. Given the popular expectation of a major peace dividend, this strategy has been remarkably successful, not just temporarily deflecting those hopes but permanently de-railing them by making them look totally unrealistic in a world of spectres and demons.

The UK Military Industrial Base and Arms Conversion

Chapter four

Introduction

In this chapter, the UK context for arms conversion is brought up to date by analysing the trends in military restructuring and employment since the end of the Cold War. Significant has been the consolidation around BAE Systems, the acknowledged 'national champion' of UK arms procurement, large-scale redundancies, and rationalisation of capacity. The future of the military industrial base is related to the MoD's recently published Defence Industrial Strategy (DIS) that provides a longer-term perspective on government's plans, as well as the recent decision to replace the Trident ballistic missile system. The DIS is contrasted with alternative security policies around non-offensive defence and peacekeeping and how this would relate to a contemporary agenda for conversion.

Options for Change

The UK's major strategic response to the end of the Cold War was the 'Options for Change' review, published in 1993.[30] Acknowledging that the collapse of the former Soviet Union and the Warsaw Pact had brought an end to the Cold War and to the military confrontation in central Europe, the review came to several main conclusions on the restructuring of armed forces, with overall manpower down by 18% and a similar reduction in military expenditure. Most significant was the sharp reduction in UK forces deployed in Germany, particularly tank regiments, that were no longer seen as necessary with the re-unification of Germany and the removal of Soviet forces.

But the government continued with virtually all the major programmes planned prior to the end of the Cold War, including the Eurofighter aircraft, conventional nuclear submarines and attack helicopters, albeit at reduced numbers. Also, the government maintained its network of military R&D institutions and worked closely with the major manufacturers on the development of the next generation of weapons for offensive operations.

Fundamentally, both the Conservative government (and subsequently the Labour government from 1997) wanted to retain influence with the United States as the sole remaining global military power. The significance of Options for Change, therefore, lies not in the minor reductions to force and equipment numbers but in the retention of equipment such as aircraft carriers, nuclear submarines and long-range fighter aircraft, seen as essential for the offensive capabilities necessary as a contribution to US power projection. This remains the overriding objective of UK military doctrine up to the present day and into the foreseeable future:

> *The programme for the Joint Strike Fighter and the future carriers together make up the principal components of the proposed carrier task force. That in turn is at the heart of the Armed Forces expeditionary ambitions, and the MoD's primary goal for large-scale operations, of maximizing its influence in US-led operations.*[31]

Vesta's wind-turbine factory in Campbeltown, Scotland. September 2004
© Greenpeace / Kate Davison

The response of the major arms companies was to accelerate the processes of consolidation and internationalization that were already well underway in the 1980s as they looked for new opportunities in global markets. As a result, there emerged some very large military corporations that could be defined both as 'national champions' having gained monopoly power over domestic military procurement, and as international conglomerates with extensive links, either by ownership or alliances, into other major markets.

In the UK, both British Aerospace and GEC carried through aggressive acquisition programmes during the 1990s. BAE Systems (as it became known) finally bought out GEC's military divisions in 1999 for £6 billion, to become the dominant force in UK procurement with effective monopoly power in fighter aircraft, submarines and warships.[32] Although a little smaller than the American giants Lockheed, Boeing and Northrup, BAE Systems has acquired several US military companies, including the most recent, United Defense, for $4 billion, elevating the company as the sixth largest US Department of Defense (DoD) contractor.[33] BAE also pursues an aggressive arms export policy, including the long-running and highly controversial Al Yamamha contract, with Saudi Arabia. The first sales occurred in September 1985 and the most recent contract for 72 Typhoon fighter aircraft was signed in August 2006.[34] It is now the world's fourth-largest military contractor.[35]

A similar process has occurred elsewhere in Europe with the emergence of the Franco-German aerospace company EADS, combining the French companies Aerospatiale and Matra with the German company DASA, and now also incorporating CASA of Spain and Finmeccania of Italy. Another French-based company, THALES (formerly Thomson CSF) took control of Plessey's military electronics business and is now a major contractor in the UK.

Many of these giant corporations have both civil and military capacities. However, even where production is in the same sector, the civil and military divisions operate as separate entities, and there is very little sharing of resources given the very different demands and specifications of military compared to civil work.

Below this level of giant corporations there is a large network of subcontractors who play an important role in the production chain, providing key subsystems, like aircraft engines, sonar systems, etc. Many are themselves subsidiaries of the larger companies but there are also major independent companies like Rolls Royce (aircraft engines and nuclear power plant). However, it becomes increasingly difficult to track the content and value of subcontractor work further down the supply chain, and many companies may well be unaware of the ultimate destination of components.

This industrial consolidation and rationalisation accelerated the decline in both direct and indirect military-industry employment. According to the MoD's figures, overall defence employment was 510,000 in 1991/2 and declined to 260,000 in 2003/4.[36] Of these 170,000 jobs were dependent on domestic military equipment expenditure and 90,000 dependent on arms exports. In the context of overall employment in the UK, then, arms employment is very small. It is concentrated in specialized sectors of the UK manufacturing base, particularly in aerospace, shipbuilding and electronics.[37]

Regional distribution of defence-related employment appears to favour the South East and the South West, though there are significant obstacles to accurate measurement.[38] Historically, key sites were also developed that were less vulnerable to air attack from mainland Europe with important concentrations in the South West around Yeovil, (helicopter production), Bristol (aerospace) and the North West (fighter aircraft and submarines).

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Research facilities are also geographically concentrated in the South East with two major organisations, the Defence Science and Technology Laboratory (DSTL) under government ownership and Qinetiq, the privatised element of what was previously the Defence Evaluation and Research Agency (DERA). DSTL employs about 3,000 personnel, while Qinetiq employs 9,000.[39] The other significant employer is the Atomic Weapons Research Establishment (AWRE) based at Aldersmaston and Burghfield (see below) and run by a private sector consortium employing 3,600 people. It is estimated that 40% of all government R&D personnel are employed by the MoD.[40]

Defence Industrial Strategy

What future then for the arms industry and employment in the UK? The MoD has recently published a substantial report, the Defence Industrial Strategy, that sets out its approach to procurement and its relationship with industry. The report's main purpose is to clarify what the MoD considers to be the essential industrial and technological capabilities that it wants to see retained in the UK, including nuclear submarine and major surface vessel construction, fighter aircraft and attack helicopters. It also trails an expectation of reduced demand for new platforms and greater emphasis on upgrades and through-life maintenance of equipment. Again, the overall commitment to supporting the US military strategy could not be clearer.[41]

In the light of these trends, further consolidation must be expected. BAE Systems has sold its stake in the Airbus consortium to fund further military acquisitions both in the UK and in the United States. But there is no guarantee that private sector companies, under pressure to maximise profits, will retain production work in the UK. There may well be moves to take this 'offshore' and in all likelihood, a continuation of the long-term downward trend in employment.

The Trident Network

The Government announced in December 2006, through the publication of a White Paper, its intention to order a new fleet of replacement submarines to the existing Vanguard-class at the earliest opportunity. It also announced a debate and vote in the House of Commons in March 2007, though it is still unclear what form this vote will take.

The main argument, even among those who support the UK's ballistic missile system, centres on whether there is a need to make an early decision, or whether the existing fleet's life can be extended and the decision delayed. Radical alternatives involve withdrawing the existing submarines from patrol while taking a pro-active role in nuclear disarmament and non-proliferation negotiations that make replacement unnecessary.[42]

There are close parallels to the previous decision to replace Britain's nuclear force, made by the Conservative government in 1980. While the government was at pains to deny that any final decision had been made, much preparatory work was underway to ensure that the UK had the industrial and technological capabilities for building and maintaining a new generation of ballistic missile submarines.

A Trident submarine is escorted out to sea from Barow
Photo: Bob Straughton

A crucial consideration at that time was the US' probable upgrade from the existing Trident C4 ballistic missile to the newer and larger Trident II D5. Because of the UK's total dependency on US missile technology, it was essential to plan for larger submarines even though no official statement had been made:

> *I think we have to say that as shipbuilders even though we have not been asked the question by the Ministry of Defence we simply must look to the possibility that we might be called upon to build a submarine to take on board the most advanced missile system which would be available at the time. That is why in our thinking we take a 12,000 ton boat and a Trident II system.*[43]

The fact that Dr Kinloch, from British Shipbuilders, felt compelled to deny that the MoD had specified the expected submarine size, even though the D5 programme was well advanced, speaks volumes for the way that the government handled the decision on Trident.

As a House of Commons Defence Committee report said at the time:

> *Parliament's role in the decision to procure a successor system to Polaris has been limited to endorsing a decision already taken. Decisions on defence, and on Britain's strategic nuclear deterrent have historically been taken by a small elite of very senior Cabinet Ministers, Civil Servants, and Service Chiefs, and this present decision was no exception…We urge, therefore the present Government, and future Governments to take Parliament, the public, industry and the defence policy institutions more into its confidence in the future.*[44]

In December 2006 the Government promised a formal debate in the House of Commons and a vote in March 2007, but the fundamental problems of secrecy and elite decision making remain familiar.

Similar preparatory work has been underway to ensure facilities are available for a new submarine-based system. These include a £1 billion additional investment programme at the AWRE, including laser equipment and a hydrodynamics facility to simulate nuclear warhead explosions, as well as new facilities at the Devonport Dockyard for the servicing of ballistic missile submarines at a cost of £933 million.[45]

The Government argues that these are simply general modernisation programmes required to manage the existing stockpile of nuclear warheads or to support the fleet of nuclear submarines. The pattern fits that for the original Trident programme: to argue that no final decision has been made but to have everything in place for the formal announcement.

This demonstrates the utter determination on the part of those elite groups who have always held the power over decisions on nuclear weapons to ensure that the UK will be in a position to construct a new generation of nuclear submarines, compatible with the US' choice of submarine-launched ballistic missiles, and to do so at the earliest opportunity consistent with the inconvenience of a parliamentary debate.

Trident Employment

An enduring ritual of military procurement is the ministerial announcement of a new order, highlighting the thousands of jobs that will be generated. Local MPs then queue up to welcome the order for bringing much-needed work to their constituencies, despite the fact that military employment has already been decimated, that the trend continues downwards and that even multi-billion pound contracts only serve to secure existing employment rather than create new jobs. Trident, it would seem, will be no exception.

Prior to the contracts for the first generation Trident programme, initial estimates for employment put the figures as high as 20,000 direct and 25,000 indirect jobs. But MoD reports during the 1980s on the progress of Trident construction consistently reduced those figures until, by the mid 1980s, they had declined to only 7,000 direct and 9,000 indirect jobs.[46] Contracts included the construction of the submarines at Barrow, and the PWR 2 nuclear propulsion plant built by Rolls Royce at Derby.

Although it is beyond the scope of this report and would require a fuller analysis of the Trident network and employment at each facility, a reasonable assumption would be that the major capital investment of recent years has resulted in reduced demand for labour and that employment generated now will be at much lower levels, possibly between 5,000 and 8,000 people nationwide for the period of construction.

If Trident's replacement is delayed there would be strong pressure to maintain this military-industrial network, mainly through the construction of extra, conventional nuclear submarines. A significantly wide constituency sees this as the ideal solution to the dilemma of employment impacts.

Non-Offensive Defence Policy

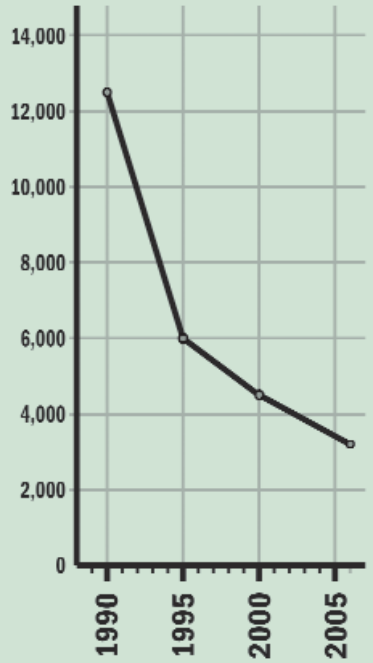
Here, we come to the crux of the problem facing the UK over the future of its military-industrial base. As long as government doctrine locks UK defence and industrial policy into serving Britain's position as a significant but dependent military ally of the United States, then the country will continue with a specialised arms industry constructing hugely expensive military platforms. Even if Trident were not replaced, the expectation of the UK's military-industrial network would be for a larger programme of conventional nuclear submarines as compensation, which could then be legitimized as a contribution to the protection of aircraft carrier groups.

The issue of Britain's nuclear posture is of secondary importance to its overall approach to security and its relationship to the United States. A Non-Offensive Defence (NoD) policy is one option that calls for a total re-alignment of UK military forces in order to carry out two main tasks - territorial protection of the UK mainland and international peacekeeping. The country would rely much more on coastal defences built on patrol vessels, early warning aircraft and surface-to-air missiles. Any international role would be through a United Nations peacekeeping mandate and as part of a broader peacekeeping force, ideally through an EU peacekeeping corps with expertise in both military stabilisation and civil reconstruction.[47]

Clearly, the implications for the restructuring of the armed forces and military industries would be serious in that much out-of-area equipment including aircraft carriers and nuclear submarines would no longer be required. Other long-range forces would be needed for peacekeeping activities but at much-reduced levels. The opportunity would then exist to rationalise the European arms industries with consequent savings of significant proportion, retaining some specialist capacity that could satisfy a non-offensive security policy and utilising the broader European civil technology and manufacturing base for less specialist equipment.

For example, a case could be made for a small fleet of conventional diesel-electric, coastal patrol, submarines for territorial defence. The German company, HDW has experience of this work and could be expected to carry out the programme, while other excess naval submarine capacity in the EU, especially the UK and French nuclear submarine facilities, is closed down.[48]

Decline of shipyard employment in Barrow, 1990 - 2006



The cumulative UK savings on equipment expenditure for a small number of offensive military platforms would be in the region of £3-4 billion a year by 2015 (representing around half the defence equipment procurement budget), accepting cancellation costs on some orders presently in the early stages of production. These resources could be allocated to peacekeeping and reconstruction, government spending elsewhere, or reduced overall government spend. They could represent significant investment potential for alternative civilian projects applying the appropriate skills freed up.

Military industries would be faced with further cuts in capacity and employment could decline by approximately 100,000 jobs over the next five years, including 4,000 to 5,000 staff at the military research laboratories. Given the timescale, and the relatively small number of job losses, the adjustment would be manageable, especially for those in relatively prosperous regions where alternative work is more likely to be available. The transfer of investment and skills elsewhere in the economy could lead to greater numbers of jobs.[49] Only in a few local economies that rely heavily on military work will there be serious disruption and even here, assuming effective regeneration and retraining programmes, the prospects in the medium to long term are positive.

Conclusion

The British state has been nothing if not consistent in maintaining the industrial capacity for long-range, offensive weapons, even though such capabilities are irrelevant to the defence of Britain and its armed forces have been relegated to the role of a minor appendage to the US military.

Given the extraordinary costs of entry and exit into military procurement, the industrial and technological consequences have also been fairly predictable, with the emergence of BAE Systems, through rationalisation and consolidation, as the UK monopoly producer for many of these offensive platforms.

Under a NoD policy there would be a fundamental change of direction signalling the UK's intention to fulfill its international responsibilities through a EU peacekeeping and civil reconstruction corps while at the same time leading a renewed effort at disarmament and arms conversion. Trident's replacement and most of the major offensive systems like the new JSF fighter aircraft, aircraft carriers and conventional nuclear submarines would also be cancelled, along with major reductions in military R&D.

The loss of 100,000 jobs in the arms industries over a five-year period would be a relatively minor adjustment in the context of the national economy and where many jobs are based in relatively prosperous regions and demand, particularly for skilled workers, is high. There would be real short-term difficulties in those few 'hot spots' of local dependency on military procurement in less prosperous regional economies, like Yeovil in Somerset, and Barrow in Cumbria but support is available for regeneration programmes in these areas.

Approximately £3-4 billion a year of savings on military expenditure would be available for investment in a comprehensive conversion programme by 2015, depending on the level of other peacekeeping and reconstruction commitments, to invest in new areas of civil technology and manufacturing, including marine-based renewable energy that offer the prospects of significant new employment.

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Alternative Technological Trajectories and Arms Conversion

Chapter five

Introduction

Arms conversion research presented a radical case for linking disarmament to national economic renewal, utilising scarce government funding and R&D support for new priorities such as renewable energy and environmental technologies. Marine-based renewables, as advocated in the original 'Oceans of Work', could have made a substantial contribution to the UK's overall energy supply by the end of the 1990s but, despite considerable interest in early forms of wave and wind power, the government's limited support was effectively ended in the early 1980s in favour of nuclear research.

This goes to the heart of the dilemma facing arms conversion, because it demonstrates how choices over technological options, and what effectively become national technological and industrial trajectories, are deeply contested terrain. Key institutions and networks can have a decisive influence in setting the terms by which one set of technological choices is prioritised and others are marginalised or closed off.

The legacy of those decisions is with us today, not only in the lost opportunity for a much larger indigenous renewable energy sector, with employment and export benefits, but also through the continued support for disastrous nuclear projects like the THORP programme, the construction of another generation of nuclear power stations and research on nuclear fusion. The issue, therefore, is not just one of the redirection of funding but the creation of a new set of institutional relationships for long-term, civil R&D and investment.

Early Years of Funding for Renewable Energy in the UK

Serious interest in renewables can be traced back to the energy crisis of 1974, when the Organisation of Petroleum Exporting Countries (OPEC) cartel raised oil prices and the government sought alternative energy sources. In 1976, the Department of Energy published a review that identified wave power as the most attractive of the renewable options, possibly meeting half of all the UK's energy needs through a major construction programme. Availability was high and would correspond with patterns of demand:

> *[Wave power] is worth pursuing because it offers the prize of a substantial contribution to our energy supplies from a renewable, non-polluting, indigenous resource.*[50]

Funding and evaluation were carried out through a relatively small government research body, the Energy Technology Support Unit (ETSU). From the mid 1970s to the early 1980s wave power received a total of £17 million of funding, the lion's share of overall renewables funding but still very small in comparison to nuclear power; in 1980 alone the government spent £340 million on nuclear research.[51]

Early working prototypes were evaluated but very demanding criteria were set for continued support, based on constructing a large-scale, offshore wave energy station capable of generating two Gigawatts of power, similar in scale to a conventional power station, and achieving cost competitiveness with existing energy sources in the region of 4.5 – 5.5 pence per kwh.

Off-shore turbines
Photo: Greenpeace / Kate Davison

Off-shore turbines
Photo: Greenpeace / Kate Davison

Initial assessments by ETSU suggested that the wave power prototypes generated electricity at 20p per kwh, and it concluded that the economic prospects for large-scale offshore wave energy were poor compared with other renewables. Government support was abruptly cut back in 1982.[52]

Although land-based wind power was rated as having some potential and tidal power had longer-term prospects, the general perception left from this early period of research was that renewables were not cost effective and would never contribute a large proportion of the UK's energy needs. This hung like a shroud over UK-based renewable energy for the following ten to fifteen years.

The role of ETSU came under growing criticism, especially from the advocates of wave power. It was based at Harwell, the home of the Atomic Energy Authority (AEA) and the heart of research on nuclear power.[53] While ostensibly independent, concerns were raised that ETSU had a strong institutional bias towards nuclear power. The use of crude cost estimates for wave power, using data from first-generation prototypes that took no account of the potential for innovation and efficiency improvements in subsequent development work, only heightened suspicions. Certainly, there were no similar, stringent cost criteria for the major nuclear research programmes on fast breeder reactors and nuclear fusion at such early stages in their development.[54]

There was some supportive analysis from ETSU scientists and encouragement to prototype designers right up to the time that funding was cut, suggesting that there was a real debate within the organisation and some measure of internal conflict. However, key people, with decision-making powers over both nuclear and renewable funding seemed to view the two, not as complementary, but as competitive technologies.

At a time of growing concerns about the safety and viability of nuclear power, the over-riding priority would seem to have been to secure government support for a range of controversial nuclear programmes. If renewables gained, not just a foothold, but a platform from which to launch a credible case for large-scale investment, the future of nuclear energy funding might be jeopardized and this was simply unacceptable.[55]

The evaluation criteria by which wave power and other renewables were rejected appears to confirm an institutional strategy for securing nuclear power against a potential threat. Certainly, during the 1990s there was a growing critique of the framework for decision-making on energy research and the House of Commons Science and Technology Committee called for a re-assessment of support for renewables. A consensus of opinion emerged that wave power had been unfairly treated, that it could satisfy a large proportion of domestic demand and that a major industry could be developed with export markets worth up to £500 billion:

> *Given the UK's abundant natural wave and tidal resources, it is extremely regrettable and surprising that the development of wave and tidal energy technologies has received so little support from the Government.*[56]

Denmark and Wind Power

Other countries viewed the potential for renewables very differently. Denmark had already decided, through a national referendum, that nuclear power would play no part in its future energy supply. Instead, the country would maximise the potential for renewables, especially wind power, in which it had an abundance of potential onshore and offshore sites. Ambitious targets were set to have in place sufficient capacity to supply a quarter of the country's energy needs over a twenty-year timescale.[57]

Relatively small prototypes were tested to see which designs achieved the best results for reliability, and incentives were made for further development including guaranteed connection to the national grid. An important feature of this early phase was community ownership, with local groups taking shares in new wind farm development. An enthusiastic group of practitioners worked closely with designers to provide a constant feedback loop on performance, technical problems and suggestions for improvements.[58]

As a result of this pioneering work, refinements were made to the best designs that allowed for larger onshore and offshore wind power generators, easily satisfying the original target for national energy supply. The Danish wind power industry is now the world's largest and 90% of the wind turbines manufactured in Denmark are for overseas customers. In 2003, the Danish manufacturers had a total world market share of approximately 38%, generating a combined turnover of almost 3 billion Euros and providing employment to over 20,000 people, from wind turbine factories to maintenance and research.[59]

Of course, there was no guarantee that support would lead to successful development. The US Department of Energy programme for wind power was very generous but focused on a design by Boeing Aerospace for a massive turbine capable of generating 2.5 MW of power. The prototype was plagued by technical difficulties centred on the stresses on its giant blades and was finally abandoned in 1985. These sorts of problems, in transposing complex systems engineering from large aerospace and military platforms to civil engineering projects with very different specifications, were identified in much of the arms conversion literature.[60]

In comparison, Denmark utilised a classic model of civil technological development. Relatively small scale, first-generation prototypes were built and lessons learnt, new entrants added further innovations that improved on performance, bringing costs down and paving the way for major investment in the present generation of much larger turbines for onshore and, increasingly, offshore wind farms. Once a critical mass of production has been reached, it stimulates a whole series of what could be described as third generation innovations with ripple effects beyond the original technology.

For example, now that wind power has grown to become a mature and essential element of energy supply, a focus of technological development is on the variability of weather conditions and how to ensure a consistent source of power. One possible solution centres on storage, whereby a proportion of renewable energy would, through the electrolyzing of water, produce hydrogen that can be transported by pipeline to power stations in liquid (or gas) form to be utilised as a secondary supply, or even, potentially, be used for transport applications. Such innovations could be applied to other forms of renewables, like wave power, and even open up the prospect of a radical restructuring towards a system of local power distribution. This could provide dramatic savings on much of the power lost in long-distance transmission through the national grid.[61]

The UK and THORP

Nuclear power continued to distort development priorities in the UK in this period, itself built on the state's military requirement for plutonium. The grand vision of the nuclear establishment was a 'plutonium economy', fuelling a new generation of fast breeder reactors that would supply the lion's share of the UK's energy needs, followed ultimately by the holy-grail itself, nuclear fusion with the tantalising prospect of limitless and pollution-free power.[62]

The Danish wind power industry is now the world's largest and 90% of the wind turbines manufactured in Denmark are for overseas customers. In 2003, the Danish manufacturers had a total world market share of approximately 38%...

Since becoming operational THORP has experienced a series of technical problems, the most serious being in May 2005 when a substantial leakage of radioactive spent fuel led to closure for over a year.

Originally, nuclear power stations had been constructed simply to provide plutonium for the UK's nuclear weapons. Intermittently, they were connected into the national grid. As the civil nuclear power industry developed during the 1960s and 1970s, the UK looked to take advantage of this experience through the reprocessing of plutonium, considered to have major export potential.

Several other countries with civil nuclear programmes were building up stocks of material from which plutonium could be extracted, and this reprocessed plutonium was to be used in a future generation of fast breeder reactors that were expected to dominate nuclear power generation by the end of the century. Contracts to reprocess 1500 tonnes of oxide fuel had been negotiated with Japan and Germany, amongst others, and the Thermal Oxide Reprocessing Plant (THORP) was to be built at Windscale, in Cumbria, by British Nuclear Fuels Limited (BNFL) to carry out this programme at an estimated cost of £1.2 billion. This would be an enormous industrial undertaking, expected to employ 7,000 people during construction and over 3,000 when operational in the early 1990s.[63]

Even at this early stage the THORP plant was proving controversial, with concerns that alternatives such as dry storage of plutonium were not being given proper consideration, that the demand for plutonium was exaggerated and that its transportation involved serious dangers, particularly of theft or diversion into military uses.

The Windscale Inquiry was undertaken in the mid 1970s to consider these issues and to advise the government on future options. Essentially, it accepted the economic rationale put forward by BNFL that new supplies of plutonium would be required for a UK fast breeder reactor programme and that alternatives like dry storage were technically untested and unattractive.[64]

Construction went ahead during the 1980s but the economic justification proved illusory. No fast breeder reactors were built in the UK because of severe technical difficulties and concerns over safety, and the fast breeder reactor programme was officially cancelled in 1993 on technical and cost grounds.[65] Similar problems were being experienced abroad and THORP's foreign customers were desperately trying to extricate themselves from their original contracts for plutonium reprocessing.

As William Walker concluded in his widely aclaimed study of THORP:

> *One of Britain's largest facilities was being turned on to provide plutonium that was no longer needed or wanted, and whose stockpiling was considered by many to endanger international security.*[66]

Yet, despite these circumstances and a final parliamentary debate to reconsider this decision in 1994 in the light of these changing circumstances, a final decision was made to make the plant operational. By now the rationale had moved from reprocessing for fast breeders to adding plutonium into fuel for conventional reactors. BNFL constructed a Mixed Oxide Fuel (MOX) facility adjacent to THORP at a cost of £300 million, which was completed in 1996.[67] Since becoming operational THORP has experienced a series of technical problems, the most serious being in May 2005 when a substantial leakage of radioactive spent fuel led to the plant's closure for two years. The plant is now well behind its schedule for reprocessing.[68]

Sunset at Sellafield, home of Thorpe
Photo: © Greenpeace / Rezac

Contemporary Policy

So where does this leave us in terms of energy policy? The Labour Government has recently shown greater interest in supporting renewable energy as part of its overall commitment to reducing carbon emissions and securing alternative sources of energy to oil and gas imports. The renewables obligation on energy suppliers has set a target of 10% of total supply by 2010, although the contribution has only grown to 5% at present and there is concern the target will not be met. Also, land-based wind farms, the primary focus for development, have proved contentious for their local impact. Larger, offshore wind farms are now coming on stream. The Government has just given the go-ahead for the world's largest off-shore wind farm to be sited within the outer Thames Estuary, known as the London Array.[69]

Wave power is undeveloped, with small pilots on remoter island communities, including an Oscillating Water Column (OWC) on the Scottish island of Islay.

The most important demonstrator programme is the 750 kW Pelamis installation that the Edinburgh-based company, Ocean Power Delivery, is testing. The variable motion of the wave is used to pump high-pressure fluid to hydraulic motors, driving electrical generators that produce power, which, in turn is fed by cable to the shore and into the grid. The company recently announced an order with the Portuguese Government for three machines in what is intended to become a 2.25 MW wave energy farm off the north coast of Portugal, and it is also testing a 'wave hub' scheme off St Ives Bay in Cornwall.[70]

The UK Government has also increased R&D support to wave power as part of its overall support for renewables. But the majority of energy funding still remains with nuclear fusion at £52 million in 2003/04 compared to renewables as £23 million.[71]

Overall energy R&D support had, in fact, declined because the cuts in other nuclear research were not matched by increases for renewables but the government has recently announced a new initiative to support a broad range of energy research with increased funding through a public/private partnership.[72]

The nuclear option is now firmly back on the agenda, with the government arguing that there is a gap in energy supply because of increased demand and the phasing out of older coal and nuclear power stations. According to this view, nuclear is essential in helping to fill this gap, while also providing enhanced security of supply, and contributing to the UK's carbon reduction targets. The projections are for up to ten nuclear power stations providing up to 25% of total supplies by 2030.[73]

This is a remarkable turnaround, as it was only in 2003 that a previous energy review had rejected the nuclear option as commercially unattractive because of serious uncertainties about total costs, decommissioning and insurance liabilities.[74] Nor should a nuclear build programme be seen as a stopgap measure to help tackle global warming while other renewable technologies come on stream. The vision of a nuclear future is still very much alive through a combination of future generations of conventional fission plants and ultimately fusion power. By contrast, wave power is still seen as marginal.

A wave-power plant on the Island of Pico in the Azures. The power rating for this plant is about 600 kW.

A War on Global Warming

The scientific evidence is now very clear that the threat from global warming is greater and more pressing than first considered and that the original targets for reductions in emissions of greenhouse gasses set out in international agreements are totally inadequate.

For example, Sir Martin Rees, President of the Royal Society, expressed dismay at the G8 leaders' "worrisome lack of determination" to accelerate development of new energy sources, given the expected 50% rise in the world's energy needs - and carbon dioxide emissions - in the next 25 years and called for a co-coordinated programme of research on alternative energy sources. He likened the scientific challenge to that posed by the scale of the Apollo or Manhattan projects and warned that if action was not taken in the next five to ten years it may not be possible to stabilize and reduce carbon emissions, and that the planet faced catastrophic climate change.[75]

In this context, the UK has the capacity to substantially increase its use of renewables as part of a coordinated national programme including energy conservation and alternative fuels for transport, which aims to reduce carbon emissions by 60% by 2030 and eliminate them in a post-carbon economy by 2050. Investment in offshore renewables and into new forms of hydrogen storage and transmission networks would be integral to that new framework.

The impacts of climate change are being felt across the world, particularly in the poorest countries

Conclusion

The UK effectively abandoned research in the early 1980s on an indigenous offshore renewable energy industry that had the potential to satisfy much of our overall energy needs by the beginning of this decade, as well as create thousands of engineering and construction jobs and a vibrant export market. Instead, it continued with the THORP reprocessing plant, one of the biggest industrial white elephants ever seen, and continues research on nuclear fusion dependent upon an illusion of unlimited power at some indeterminate time in the distant future.

Is it over-simplistic to compare the two sets of choices: one for relatively small amounts of developmental funding in infant but diverse and highly promising technologies; the other for large projects in a mature sector where the UK was seen as a leading player? At the level of scale, the answer is, of course, yes. But in terms of the processes of engagement and disengagement, these radically different experiences tell us a great deal about the role of the state and key institutional networks in framing technological options.

THORP was the apotheosis of the UK's energy policy. Large investments had been made by the government in various forms of nuclear power and much political capital and credibility rested on the maintenance of the nuclear option. The value of this comparison is in highlighting how technological decision-making is bounded by institutional influences including senior politicians, representatives of the nuclear industry, key civil servants such as those in the Department of Energy and the Ministry of Defence, and supportive networks of trade unions and local MPs with vested interests in THORP's continuation.

The Devonshire Dock Hall on Barrow Island is the main UK submarine factory today

The rigged terms of reference allowed it to survive a public inquiry, a growing body of opposition during the 1980s as the fast-breeder dream dissolved, and the increasingly desperate attempts of its main customers to extricate themselves from their contracts. No such institutional support existed for wave power. A core group of decision makers saw renewable energy not as complementary to nuclear but as a potentially direct competitor for limited sources of R&D funding and, therefore, set the evaluation criteria in such a way as to guarantee failure.

Denmark's alternative technological route demonstrates the vital importance of political leadership in setting clear priorities. By rejecting nuclear power and emphasising the role of wind power, the country was set on a train of development that resulted in a vibrant new industry, satisfying the domestic market and becoming the leading international exporter. The use of relatively simple prototypes and a feedback loop of testing, evaluation and innovation led to constant improvements, and larger turbines for offshore power. All this within 10-15 years of the original government support. Now Denmark generates 20% of its electricity from wind turbines and plans to increase this to 40% by 2030.

Germany, also, is intending to supply 10 GW through offshore wind by 2030 - 25% of its overall supply.[76]

There is no reason, given the scale of potential capacity that the UK enjoys, why the Government could not aim for at least 50% of energy supply from offshore wave and wind power by 2030. This would involve a multi-billion technological and industrial investment but it is an entirely feasible one in the context of an arms conversion programme, where funds were made directly available from the savings in military expenditure over the next twenty years. The industrial and employment benefits would also be significant both from the domestic programme and potential exports and would more than compensate for the loss of employment in the arms industries.

In the context of support for other renewables such as roof-based solar photovoltaics and energy efficiency programmes for housing, the need for nuclear power and fusion research would be eliminated, while the UK could work towards the new target of eliminating carbon emissions by 2050. This would be a significant contribution that the UK could make to international efforts at climate control.

There is no reason, given the scale of potential capacity that the UK enjoys, why the Government could not aim for 50% of energy supply from offshore wave and wind power by 2030.

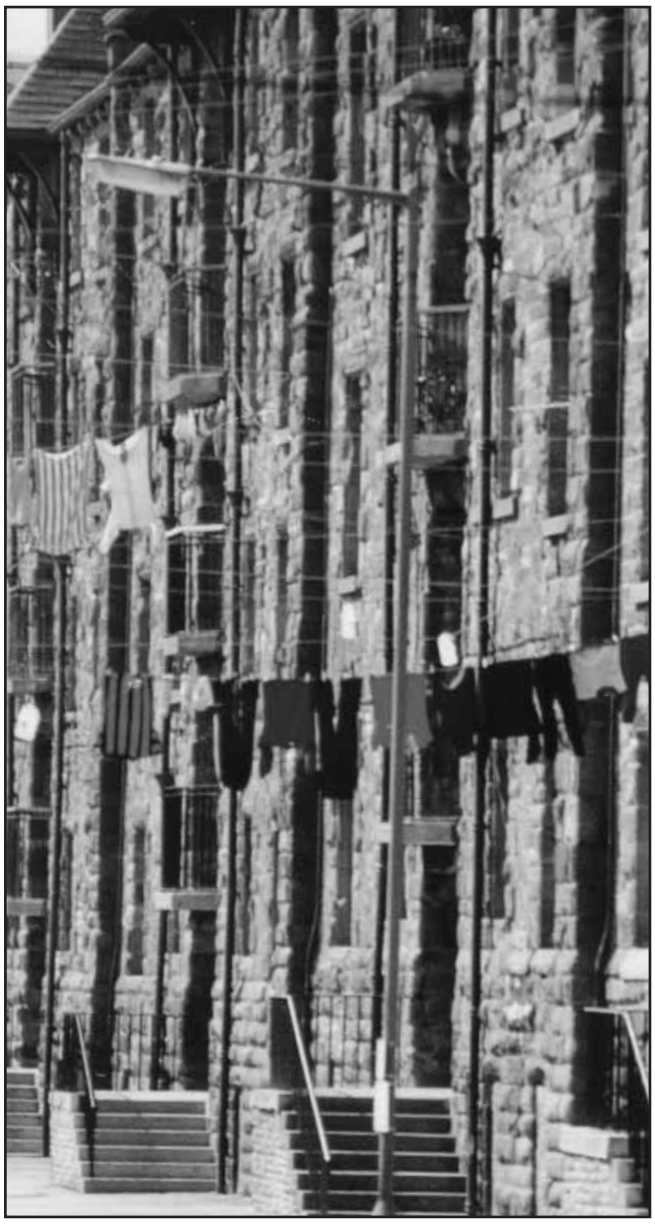
Chapter six

Barrow-in-Furness and the Closure of the Shipyard

Introduction

Barrow-in-Furness, despite large-scale redundancies at the shipyard, still represents one of the most military-dependent local economies in the UK. Attempts at attracting new industries into the area have met with limited success, levels of social and economic deprivation remain high and a local consensus exists that the prosperity of the town and the district rests on securing future nuclear submarine orders – its 'specialist niche'.

Tenements on Barrow island
Photo: Bob Straughton



From a wider perspective, the cancellation of all nuclear submarine production would be a welcome signal that the UK was fundamentally reforming its security policy, while saving billions of pounds on useless weapons. Inevitably, this would lead to the closure of the yard with the loss of several thousand jobs and a significant local economic impact. The question then is a simple one, does this act as a catalyst for change to a normal, peacetime local economy, accepting that there will be a period of painful adjustment, or will the area try to cling onto the vestiges of former glory?

Employment Decline — 1990-2006

When Trident was in its peak of production in the late 1980s and early 1990s, the total workforce numbered over 14,000. These exceptionally high levels could not be maintained, but the combination of capital investment in the new construction hall, reduced orders for nuclear submarines after the 'Options for Change' review, and the failure of the company to win any significant export orders for naval vessels led to a steep decline, with employment down to 6,000 by the mid 1990s.[77]

During this time VSEL saw two changes of ownership, from the local management consortium that had controlled the company since privatisation in 1986, to GEC which took over the company in 1995 and finally to British Aerospace, now BAE Systems in 2000. These changes reflect the broader consolidation of the UK military industrial base and BAE's effective monopoly power.

The initial GEC bid in 1994 was referred to the Monopolies and Mergers Commission (MMC) because of concerns that the company's ownership of the Yarrow shipyard in Glasgow, combined with the Barrow shipyard, would create a monopoly in naval shipbuilding and undermine the MoD's competition policy. GEC was actually bidding against VSEL for a nuclear submarine contract, but argued that it could maintain competition after acquisition by outsourcing much of the work. The MoD was satisfied with this arrangement, even if competition might have led to the closure of the Barrow yard.[78]

British Aerospace also opposed the takeover of VSEL by GEC on competition grounds. Those reservations of course disappeared by the time it took over GEC in 2000 and secured its own monopoly position in UK military procurement across many sectors. The company made it clear that the yard would be the main focus for its nuclear submarine design and build programmes, coupled to larger surface vessel construction should MoD orders provide sufficient workload.

But the process of job losses continued. The end of the Trident build programme, compounded by severe technical problems and delays on the new generation of Astute class nuclear submarines led to a further hemorrhaging of jobs over the last four years with employment now at 3,200, of which 600 are design staff. The original contract for the first three submarines has increased from £2.5 billion to £3.5 billion and the Government has delayed any decision on the next batch of up to five while negotiations continue with BAE on controlling costs.[79]

There are serious concerns that without firm contracts for at least another three Astute Class submarines and, longer term, the follow-on Trident ballistic missile submarines, there may be further cutbacks in employment. But even assuming a large order book for nuclear submarines, and some work on aircraft carrier sections and other naval support ships, there is no expectation that there will be major additions to employment at the yard.

A view of Piel Castle and Roa Island at the entrance to the Walney Channel, Barrow Photo: Bob Straughton

The Local Economic Context

What significance does the yard retain for the local economy, given that employment has declined by over 70% since the 1980s? At that time a massive 40% of male employment in the district was dependent on the yard but it is now less than 20% with a proportionately smaller multiplier effect in terms of secondary employment generated by local expenditure.[80] However, though the dependency of the local economy on the shipyard has reduced, it still represents by far the most important employer in the Barrow district, with relatively high wages in a generally low-wage local economy, and contributes an estimated £70 million to local demand.

This dependency has long been recognised as a weakness, with considerable efforts made by the local authority and Furness Enterprise, the district's economic development agency, to attract new industries and employment. Barrow has assisted-area status that provides grant funding for business start-ups and the development of existing businesses, and there has also been major investment to reclaim land for new industrial estates and business incubators. However, the record is patchy, especially in attracting larger employers, and new jobs have tended to be on the low end of the pay scale in service sector work such as call centres.[81]

What is most striking, despite the presence of the shipyard, is how the district has consistently suffered from levels of deprivation that are some of the highest in the country. National comparison based on the government's Deprivation Indices that incorporate statistical information including unemployment, income, housing and education ranked Barrow as the 29th most deprived local authority out of 354 in England. Of the 13 wards in Barrow borough, six, located mainly around the shipyard, are amongst the most deprived 10% in the country.[82]

The decline in employment at the yard, therefore, serves to highlight fundamental and long-standing weaknesses in the local economy. Not only has unemployment remained higher than the national average, there is general acknowledgment that many people, particularly older men who previously worked at the yard, have registered for incapacity benefit but would otherwise have been registered unemployed. Taken together, the overall total indicates a very high level of unemployment and inactivity at up to 14% of the 39,000 workforce in the district.[83]

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Most commentators ascribe these underlying problems to Barrow's relative isolation and difficult transport/communication links – 'the longest cul-de-sac in Britain' – which is said to discourage potential investors. The North West Regional Development Agency is responsible for coordinating much of the regeneration funding but provides rather confusing messages about the potential of the district. On the one hand, it has played a central role in generating financial and institutional support that have led to some large programmes, including the reclamation of dockside land and other brownfield sites for, potentially, large-scale commercial and housing development. On the other, it bases much of the broader regional strategy on 'city-regions', where the larger conurbations like Manchester are seen to provide the critical mass of service and manufacturing industries that stimulate demand for employment in adjoining areas. This is hardly reassuring for districts like Barrow that lack the geographical proximity to Liverpool and Manchester.[84]

Keep Our Future Afloat (KOFAC) or Getting the Shipyard off Our Backs (GOSUB)

In this context, it is not surprising that local leaders in Barrow, across the political spectrum, see the continuation of nuclear submarine design and construction as essential to the future of the district. A lobby group called 'Keep Our Future Afloat Campaign' KOFAC has been set up, mainly through the trade unions but supported by the local authority and Furness Enterprise, among others. Its remit is to press the government for assurances over future nuclear submarine programmes, and to make the case for the yard to take a major role in the construction of the two new aircraft carriers and other naval support vessels.[85]

Various arguments are raised about keeping naval manufacturing skills and design expertise in the UK, while providing a range of apprenticeships for young workers. But the most potent argument remains the capacity of the yard to satisfy MoD requirements for nuclear submarines. In support of this, the Rand Corporation, a high-profile American think-tank on international security issues, produced a very detailed analysis of future nuclear submarine requirements.[86]

By any standards, this is a most remarkable document, because in arguing the case that the MoD is best served by providing a steady ordering pattern that sustains production and design capacity in Barrow, the report maps out an 'ideal' procurement schedule that will guarantee the yard design and production work over a thirty year timescale on no less than three generations of nuclear submarines: Astute, Trident and the Maritime Underwater Future Capability (MUFC).[87]

Not content with a form of planning that would be the envy of the Soviet Union's Politburo, this bastion of American free-enterprise also recommends that the existing Trident fleet be run for a period of 30-35 years (five to ten years longer than originally envisaged) and its replacement be delayed. In that way, a further five Astute-class nuclear submarines will take up the base programme from 2010-2015, allowing a smooth transition to Trident and avoiding a bottleneck of work on both Astute and Trident in the latter half of the next decade. Trident would then be the base programme into the 2020s with MUFC set to follow in the late 2020s and early 2030s.

The local economic development agencies are also active in providing direct funding to BAE to support the yard's future naval work. A Regional Selective Assistance (RSA) grant of £250,000 was made to BAE to support a £2.5 million investment in submarine assembly equipment in 2004, along with a training grant of £435,000 to upgrade design and manufacturing skills. Funding has also been made available by the North West Regional Development Agency to maintain the Buccleuch Dock, which is presently not in use, but has the facilities for large-scale surface vessel construction, in anticipation of future work on sections of aircraft carriers that a BAE consortium is due to construct. The MoD, itself, has also recently announced a £40 million funding programme to maintain essential nuclear design and production skills, as part of its overall Defence Industrial Strategy for indigenous capabilities. A proportion of this will be allocated to BAE for workers in Barrow.[88]

As things stand, therefore, the main thrust of local economic policy, and state funding through the DTI, the RDA and the MoD, is to focus on the future of the yard.

The view of Barrow, from the village of Leece (about 2 miles away) shows only the submarine-building hall and the Victorian Town Hall Clock Tower
Photo: Bob Straughton

Although this form of state assistance to private sector companies is not unusual, the fact remains that BAE with £8 billion sales and an operating profit of £653 million in 2006 is benefiting from scarce forms of regeneration funding that might be used for other more productive purposes, since its only objective at present can be to secure existing jobs rather than create new ones. This speaks volumes for the perceived dependency of Barrow on the yard and the leverage that BAE can bring to bear through the possibility of diverting work elsewhere or through the threat of further redundancies.

The simple fact is that the limited success at attracting new industries under the present pattern of regeneration funding, coupled to the dependency on BAE, is leaving fundamental weaknesses of the local economy unresolved, as evidenced by the high levels of deprivation. The key issue then is not how to secure future nuclear submarine work, but on the contrary, to construct an alternative economic approach in which the yard has been closed down, and, after a period of adjustment, the district can enjoy a new form of successful and balanced economic development.

The key issue then is not how to secure future nuclear submarine work, but on the contrary, to construct an alternative economic approach in which the yard has been closed down, and, after a period of adjustment, the district can enjoy a new form of successful and balanced economic development.

An interesting approach is provided in a study sponsored by Furness Enterprise that looked at levels of deprivation in the district and related this to the national policy of relocating civil service posts away from London and the South East. The authors argued that Barrow, as an area of serious deprivation, should be considered a high-priority for relocation to provide new employment opportunities. Unfortunately, the present dispersal carried out by central government departments shows very little correlation to aiding deprived areas, with many functions being relocated to parts of the North that are relatively affluent.[89]

The level of employment from civil service relocation would not, in itself, compensate for the loss of jobs in the yard, either numerically or in terms of a skills match for manufacturing workers. But the research illustrates how an alternative strategy that builds new networks between central government, the local authority, the private sector and the local regeneration agencies can be independent of the shipyard. In this case, the focus would be on the large number of unemployed and under-employed people in the district who are presently marginalised but who could benefit from new forms of service sector work, particularly if regeneration funds were made available for long-term training programmes.

This would call for a new set of priorities. Without the shipyard's presence there could be much greater sense of urgency to translate these ideas for new employment from theory into practice. Certainly, if central government saw relocation as a viable option to an area normally considered to be one of economic isolation, then other forms of investment, particularly with government grants available, are more likely to gain support.

Conclusion

Earlier this year an offshore wind farm, consisting of 30 turbines generating 90 MW of electricity and located close to Barrow's Walney Island, began providing power to the national grid. This was a partnership between Centrica Energy and Dong, the Danish state electricity company that was responsible for the construction of the turbines. As far as the Barrow economy was concerned, because the prime contractor was Danish the only benefit was a handful of jobs in the contract for ongoing maintenance. If anything could symbolise the yawning chasm between alternative futures for the district it is the wind farm as a signpost to the new civil economy and the submarine construction hall representing a dying military culture.

The closure of the Barrow shipyard may be considered unthinkable by many people in the local area but that should not distract us from larger policy issues. Cancelling nuclear submarine production and closing down specialist manufacturing capacity that has no other utility would save the UK £50 billion pounds in procurement costs alone over the next 30 years (estimating the total costs on three classes of submarine) and release resources for a national conversion programme. Employment for a relatively small number of people in Barrow has to be weighed against those benefits.

The MoD itself has been prepared to countenance the possibility of closure, as long as nuclear submarine design and production capacity remained somewhere in the UK. This was further illustrated by its decision to withdraw the contract for servicing nuclear submarines from the Rosyth Dockyard in Scotland and award it to the Devonport Dockyard in Plymouth, in the expectation of significant savings, and despite intense opposition from Scottish MPs and trade unions over the loss of several thousand jobs in the Fife region.

If anything could symbolise the yawning chasm between alternative futures for the district it is the wind farm as a signpost of the new civil economy and the submarine construction hall representing a dying military culture.

There will, inevitably, be a massive lobbying exercise in Barrow to preserve military contracting and employment and it would be easy to buckle under the pressure. Nothing could be more counter-productive and the government should show as equal determination to follow through a new security policy as the MoD has done in pursuing its priorities in the past.

Clarity and determination over policy might also help overcome the local psychological barrier of dealing with the closure of the yard and help to refocus attention on the underlying problems of the area, namely its relative economic isolation, its consistent pattern of deprivation and low wages, and its low priority in the context of regional economic policy.
The fact that a large proportion of the state funding available for regeneration has gone to preserve employment, training and facilities at the yard is symptomatic of these limited horizons, since the yard has seen consistent decline in its workforce that is now at an historically low level.

A task force similar to those brought together for other major redundancy exercises is needed, incorporating all the local interest groups, economic agencies, and the RDA, along with central government departments, led by the DTI and responsible for maximizing the benefits from various sources of regeneration funding. Instead of KOFAC, it could be called GOSUB (Getting the Shipyard off our Backs) to signal that, far from being a lament for a dead industry, closure could be a catalyst for a new, and stronger economy. This would include new service sector and manufacturing employment, tourism, the relocation of central government functions, and commercial and housing development on reclaimed dockyard land. The release of skilled manufacturing workers and designers from the yard might also stimulate new offshore energy work given this supportive environment.

An aerial view of Barrow-in-Furness island showing the large docks (the dark areas)

Although the immediate period following on from closure would, inevitably, result in a serious economic downturn, the task force could ensure a rapid re-orientation of economic policy to these new priorities and have sufficient resources from local, regional and central government to carry through a comprehensive programme. After a five year period of adjustment, it would be reasonable to expect a growing level of overall employment and new opportunities, particularly for a range of people in the district who, historically, have been overlooked in the concentration on nuclear submarine production.

Conclusion

If conversion is defined as public policy to irreversibly redirect economic effort currently focused upon military production as a result of previous government military investment, then the last successful example in the UK was at the end of the Second World War. Since 1990 we have witnessed the consolidation of the arms industries, the rationalisation of capacity, the loss of hundreds of thousands of defence jobs and the closure of factories. We have also seen the re-use of military bases, the retraining of redundant workers, the transfer of technologies from military research establishments. All this occurred in spite of, rather than because of, government policy.

Throughout the post-war period, the British state has done everything within its power to maintain a military-industrial base for the research, development and production of high technology weapons, spending hundreds of billions of pounds in the process. Nothing has been allowed to deflect from that policy, not even the end of the Cold War - the best opportunity in fifty years to set a new framework for peace and international development.

The Gorbachev disarmament agenda provided a key role for arms conversion in ending the scourge of modern war, by linking disarmament in the present, to the dismantling of the capacity to construct weapons in the future; this was based upon the recognition that the build up of armaments itself contributes to international tension. Billions of pounds released in the form of a peace dividend could have been available for a comprehensive conversion programme that put, at its highest priority, civil R&D and production for sustainable development in which renewable energy played a key role.

Here, the visionary example of the Lucas Plan, around the concept of socially-useful production, should be acknowledged, because it anticipated the immense scale of the challenges facing the international community in areas like energy and transport policy, and identified the capacity of the state to redirect resources from military to civil programmes given the political will to do so.

Climate change is widely recognised as an emergency far greater than any other we have faced. This is the real war and it is one we are losing. Support is growing for an emergency programme of energy research on a scale not seen since the Manhattan project to rapidly construct a post-carbon economy, with the objective of zero emissions through renewable energy, energy efficiency programmes and the recycling of materials. But it is difficult, if not impossible, to see how sufficient resources will be made available unless the major industrial powers co-ordinate a programme of arms conversion and socially-useful production on an international scale.

Under a new drive for general and comprehensive disarmament there needs to be a phased programme, beginning with the elimination of nuclear weapons and all other weapons of mass destruction, followed by the closure of foreign military bases and the removal of all long-range offensive weapons. Countries would be expected to abide by a strict UN Charter that allowed only limited, non-offensive forces for territorial defence and a contribution to international peacekeeping. In the UK's case this would best be achieved through a EU peacekeeping corps that had the capacity both for military stabilisation and post-conflict reconstruction.

A growing body of scientific opinion refers to global warming as an emergency far greater than any other we have faced. This is the real war and it is the one we are losing.

A large proportion of arms manufacturing capacity would be closed down because it is characterised by what can be described as 'redundant complexity' – none more so than the Barrow shipyard. It has no other purpose than to construct specialised military equipment and its facilities cannot be converted to civil use – the traditional model of 'swords into plowshares' is no longer applicable. Similarly, the military research establishments should be contracted during the phased programme of disarmament and staff relocated to existing or newly established civil R&D facilities as demand for skilled technical and scientific staff would be high. The UK could set up a regional research structure, as is the case with the German Fraunhofer research centres, using the opportunity to end the heavy bias of military research funding to the South East and stimulate a more balanced approach through the Regional Development Agencies.

Over a ten year period the overall resources available for a comprehensive conversion programme would grow by £3-4 billion a year for the UK alone, providing funds for new civil R&D and manufacturing programmes. These would generate far more employment opportunities than those lost by the rationalisation of the military-industrial base.

A small number of military-dependent local economies like Barrow-in-Furness face particular difficulties when arms production is ended. Unemployment can be expected to rise in the short term, in areas already experiencing high levels of deprivation and where efforts to attract new industries have met with limited success. But this sort of dependency is rare and should serve to remind people in the district of a lesson painfully learnt by others, that a specialist niche can become an economic noose when circumstances change.

Walney Barrow off-shore windfarm
Photo: Bob Straughton

Even in Barrow, the level of military employment has already declined substantially from 14,000 to 3,000 in the past 20 years. The real challenge is to overcome the psychological barrier and refocus regeneration funding so that it ceases to be a prop for a dying industry but is used to support the diversification of the local economy. Lessons could be learnt from task forces set up elsewhere to deal with industrial closures and large-scale job losses, in many cases, much larger than those to be carried out in Barrow.

Some may argue that this is a betrayal of the original campaign to provide alternative work at VSEL. But the real lesson to emerge from the 'Oceans of Work' study is that the focus of conversion should not be on military-industrial sites but on the institutional relationships that encourage the successful development of new civil technologies and industries. In the case of wave power, identified as a major option for marine engineering, it was precisely the lack of institutional support at central government level and the opposition of a powerful nuclear establishment that led to its demise, and with it the opportunity for new manufacturing work and employment.

The set of proposals outlined here, be they disarmament or economic adjustment programmes, offers no insurmountable difficulties and can be placed within the mainstream of United Nations proposals for disarmament and models for sustainable economic development.

A church in the shadow of a crane on Barrow Island
Photo: Bob Straughton

Comprehensive conversion, then, looks to match resources to civil priorities for programmes that contribute to a new security agenda around escalating resources for the research and production of renewable energy. There is no reason why the UK, like Denmark, could not utilise its huge reservoir of renewable energies to satisfy the bulk of its energy needs, while terminating plans for nuclear power and ending research on the illusion of nuclear fusion.

A multi-billion pound construction programme for offshore wind and wave power, to provide 50% of total UK energy needs by 2030, would require a major investment in design and manufacturing capacity on a par with that generated for the North Sea oil industry in the 1970s. A research priority would also be on secondary storage capacity and new distribution networks that maintain constant energy supplies.

Of course, the level of investment required from government does not appear likely at present. But a distinction needs to be drawn between the improbable and the unfeasible. The set of proposals outlined here, be they disarmament or economic adjustment programmes, offers no insurmountable difficulties and can be placed within the mainstream of United Nations proposals for disarmament and models for sustainable economic development.

Instead, policy is driven by doctrine, and the narrowness of the debate is reflected in the options being put forward for the Trident replacement programme. Cancellation, as a contribution to international disarmament, is simply not on the agenda as far as the government is concerned. The most 'realistic' proposal on offer is to extend the life of the existing ballistic fleet in the hope of delaying a final decision.

And rather than look to utilising the £25 billion cost of Trident for an arms conversion programme, the main alternative put forward for any loss of ballistic missile submarine work is to build even more conventional nuclear submarines. In other words, they are in a hole, and still digging.

Without a new and invigorated agenda for disarmament there is no doubt that the trends of increased military spending and the proliferation of both nuclear and conventional weapons will continue. And like the grim period of militarism prior to the First World War, a cycle of action and reaction could lead to increasing international tension. The United States, with its vast military infrastructure and ideology, offers only an Orwellian dystopia of permanent war preparation. Other states, including regional powers like China, are realistic enough to know that the full range of superpower capability may be beyond them, but through a combination of indigenous production, arms imports and licensed production they can amass formidable armouries through which to gain some sort of leverage, even against the United States.

But the inevitable outcome will be regional arms races and the break down of international security. The United Nations was created essentially to prevent precisely this, through a combination of disarmament and ever-stronger international institutions with sufficient authority to resolve disputes. It is doubtful that the UN can survive if existing agreements like the Non-Proliferation Treaty continue to be undermined.

The UK can make a difference through disarmament and through an arms conversion programme that addresses a broader security framework on peacekeeping, climate change and sustainable development. Or it can continue on its present course as a minor appendage to the US military. A small town in Cumbria may well symbolise those future paths to peace or to war.

Endnotes

1 The Future of the United Kingdom's Nuclear Deterrent: Defence White Paper 2006 (Cm 6994), published 4 December 2006. Available online at: http://www.mod.uk/NR/rdonlyres/AC00DD79-76D6-4FE3-91A1-6A56B03C092F/0/DefenceWhitePaper2006_Cm6994.pdf

2 *The Future of the UK's Strategic Nuclear Deterrent: the Manufacturing and Skills Base,* House of Commons Defence Committee Fourth Report, 19 December 2006. Available online at http://www.publications.parliament.uk/pa/cm200607/cmselect/cmdfence/59/5902.htm

3 William Walker, *Nuclear Entrapment - Thorp and the Politics of Commitment,* p. 132 (Institute for Public Policy Research, IPPR, 2000).

4 I was employed by BAEC as the researcher for the project from 1985-1987 - see Chapter Two.

5 *Isiah 2:4,* "…and they shall beat their swords into plowshares and their spears into pruning hooks: nation shall not lift up sword against nation, neither shall they learn war any more."

6 Economist Intelligence Unit, *The Economic Effects of Disarmament* (EIU, 1963). Workers involved in arms production and members of the armed forces who had accounted for 42% of the working population, accounted for 10% at the end of 1947. Other factors need to be considered, including the large number of women who left the workforce, approximately 1 million, but the general picture is one of rapid recovery in output and employment after a short adjustment period. A similar picture emerges from the USA where over nine million military personnel were demobilized and unemployment remained under 4%. See Judith Reppy, 'The United States' in *The Structure of the Defense Industry: An International Survey*, edited by Nicole Ball and Milton Leitenberg (Croom Helm, 1983) pp. 21-2.

7 Peter Southwood, *Disarming Military Industries - Turning an Outbreak of Peace Into an Enduring Legacy*, pp. 9-15 (Macmillan, 1991).

8 Hilary Wainwright and Dave Elliott, *The Lucas Plan : A New Trade Unionism in the Making?* (Allison and Busby, 1982).

9 The Lucas Plan can be seen, at one level, as an anti-redundancy campaign but it also evolved into a radical vision of both the possibilities for peaceful technologies and also for workers' control over the production process. Mike Cooley, one of the founders of the Combine, emphasised how Computer Aided Design and Manufacture could either be used to de-skill work or to enhance skills and worker satisfaction. His book was highly influential in stressing the importance of human-centred design capabilities. See *Architect or Bee* (Langley Technological Services, 1980).

10 Wainwright and Elliott, *op.cit.,* pp. 226-230.

11 For a review of UK conversion projects in this period see Paul Quigley and Steve Schofield, *Alternative Uses, Better Futures : A Compendium of Work by the Bradford Arms Conversion Group* (Dept of Peace Studies, 1994)

12 See House of Commons Defence Committee, *Strategic Nuclear Weapons Policy* (HC 36, 1980/81) for a review of the decision to replace Polaris.

13 The main opposition Labour Party had an official policy to cancel Trident at that time.

14 See Steven Schofield, *Employment and Security - Alternatives to Trident, An Interim Report* (Peace Research Reports No. 10, Bradford University School of Peace Studies, 1986) for background information on BAEC and on early research into civil alternatives.

15 Barrow Alternative Employment Committee, *Oceans of Work - The Case for Non-Military Research, Development and Production at the VSEL Shipyard, Barrow* (BAEC, 1987).

16 Steven Schofield, *VSEL Barrow and Arms Conversion,* (PhD Thesis, Bradford University, 1990) and Maggie Mort, *Building the Trident Network: A Study of the Enrollment of People, Knowledge and Machines* (MIT Press, 2002) for further information on BAEC and on the responses to the publication of Oceans of Work.

17 Arms conversion research can be placed in the broader context of the literature on the Cold War arms race, the economics of military spending and the United Nations proposals for disarmament and development For an overview see Peter Southwood, op.cit.

18 Seymour Melman, *The Peace Race* (Victor Gollanz, 1962), *Pentagon Capitalism, The Political Economy of War* (McGraw-Hill, 1970), Profits without Production (Alfred Knopf, 1983). The concept of cost-maximization has been challenged but the high cost-base of complex systems integration and bureaucratic accountability is recognised as a serious barrier to conversion. See also Mary Kaldor, *The Baroque Arsenal* (Abacus Books, 1983).

19 Melman, *Profits with Production,* pp. 220-221.

20 The bill put forward by Representative Ted Weiss, H.R. 425, Defense Economic Adjustment Acct, 1977 is the most comprehensive example, see William Hartung, *The Economic Consequences of a Nuclear Freeze* (Council for Economic Priorities, 1984), pp. 91-95. See also Bill Niven, 'An Approach to Defence Industry Conversion' *END Papers, Five* (END, Spring 1983).

21 Michael Renner, *Economic Adjustments after the Cold War - Strategies for Conversion* (Dartmouth Publishing Company, 1992) provides a good international comparative study.

22 See Soutwood, op.cit, pp. 192-193 for the OEA and N. Cox and N. Hooper, 'The European Union KONVER Programme', *Defence and Peace Economics,* (Vol. 7, 1996, pp. 75-94).

23 Terry Barker, Paul Dunne & Ron Smith, 'Measuring the Peace Dividend in the UK', *Journal of Peace Research,* Vol 12, No. 4, November 1991, pp. 359-375.

24 *World Armaments and Disarmament Sipri Yearbook 1999,* p. 295 (Stockholm International Peace Research Institute, 1999).

25 Project on Demilitarisation, *The Triumph of Unilateralism - The Failure of Western Militarism* (Prodem, 1993), p. 4. See http://www.cnn.com/SPECIALS/cold.war/episodes/23/documents/gorbachev/ for a copy of the speech.

26 Ann Markusen and Joel Yudken, *Dismantling the Cold War Economy* (Basic Books, 1992) which called for a national economic development strategy at the end of the Cold War, based on popular planning for R&D in environment, health, and community regeneration.

27 Office of Technology Assessment, *Defense Technology - Redirecting Defense R&D* (OTA-ITE-552, 1993).

28 http://www.dda.gov.uk/.

29 Project on Demilitarisation, *Western Hypocrisy on Arms Conversion,* pp.12-13 (Prodem, 1993)

30 Ministry of Defence, *Defending Our Future: Statement on the Defence Estimates,* (Cmnd 2270, House of Commons, 1993).

31 House of Commons Defence Committee, *Future Capabilities,* p. 44 (HC 45, Session 2004/05). There have been other defence reviews since Options for Change with greater emphasis on the issue of terrorism and homeland security but the fundamentals of UK policy in its subservient relationship to the US remain consistent.

32 See Steven Schofield, *The UK and Non-Offensive Defence* (Security Studies Group, 2002).

33 Paul Dunne and Eamon Surry, 'Arms Production' *SIPRI Yearbook 2006* (OUP, 2006)

34 Stephanie G. Neuman, 'Defense Industries and Global Dependency', Orbis, Vol 50, No. 3, 2006, pp. 429-452, See also, Ian Davis and Emma Mayhew, *What Happens When a White Elephant Meets a Paper Tiger? The Prospective Sale of Eurofighter Typhoon Aircraft to Saudi Arabia and the EU Code of Conduct on Arms Exports,* (BASIC Papers No. 49, 2005) and, http://business.timesonline.co.uk/article/09067-2320097,00.html

35 SIPRI Yearbook 2006, Stockholm International Peace Research Institute, table 9A.1, page 421.

36 http://www.dasa.mod.uk/

37 For a technical analysis of employment statistics see A.J.W. Turner, M.G. Chalmers and K. Hartley, *Estimated UK Employment Dependent on MoD Expenditure and Defence Exports,* Defence Industrial Bulletin, No. 5 (Defence Analytical Service Agency, 2003) also, Robert Bowles et al, *Identifying the Flow of Domestic and European Expenditures into the English Regions* (Nuffield College, Oxford University, 2003) and Bryn Morgan, *Defence Employment 1996-97* (House of Commons Research Paper 99/27, House of Commons, 1999).

38 Identifying the flow of domestic and European expenditure into the English regions, Final Report for the Office of the Deputy Prime Minister, Sept 2003, DTLR Contract No. LGR 65/12/75. Section 4.7, page 102 Available online at: http://www.nuffield.ox.ac.uk/projects/odpm/Identifyingtheflow.pdf

39 www.ost.gov.uk/setstats.

40 Chris Langley, *Scientists in the Laboratory - Military Involvement in Science and Technology and Some Alternatives,* p. 8 (Scientists for Global Responsibility, 2005).

41 See Steven Schofield, *The Defence Industrial Strategy and Alternative Approaches* (BASIC Papers No. 50).

42 Paul Ingram, *Decisions over the future of British Nuclear Weapons,* (BASIC Green Paper, December 2006). Available online at http://www.basicint.org/nuclear/beyondtrident/greenpaper.pdf.

43 House of Commons Defence Committee, *Strategic Nuclear Weapons Policy,* p.18 (HC 36, Session 1980-81) evidence by Dr Kinloch, Managing Director, Corporate Planning, British Shipbuilders.

44 *Ibid,* p. xxxviii

45 *Aldermaston Update,* September 2003, Public Accounts Committee, *Devenport Dockyard - The Construction of Nuclear Facilities at Devenport* (HC 90, Session 2002/03).

46 Comptroller and Auditor General, *Ministry of Defence and Property Services Agency: Control and Management of the Trident Programme* (HC 27, Session 1987/88).

47 Steven Schofield, *The UK and Non-offensive Defence - An Introductory Study on the Implications of the UK adopting a Non-offensive Defence Stance* (Security Studies Network, 2002). Also Alternative Defence Commission, *Defence Without the Bomb* (Taylor and Francis, 1983). For EU options see Jocelyn Mawdsley & Gerard Quille, *Equipping the Rapid Reaction Force - Options and Constraints on a European Defence Equipment Strategy,* BICC Paper No 33 (Bonn International Conversion Centre, 1983).

48 Keith Hartley, *Naval Shipbuilding in the UK and Europe : A Case for Consolidation?* (Centre for Defence Economics, York University, 2003).

49 A report co-authored by senior MOD economists suggests that reductions in defence employment will lead to the creation of greater numbers of jobs in the civilian sector. See Malcolm Chalmers, Neil Davies, Keith Hartley and Chris Wilkinson, *The Economic Costs and Benefits of UK Defence Exports* (York University Centre for Defence Studies, November 2001). Paragraph 86, page 33.

50 Department of Energy, *Energy Research and Development in the UK,* Energy Paper No. 11 (Dept of Energy, 1976).

51 International Energy Agency, *IEA Energy Technology R&D Statistics 1974-1995* (OECD, 1997) p.177.

52 David Ross, *Power from the Waves* (OUP, 1995) is the most comprehensive book available on the background to UK policy on wave power R&D.

53 ETSU had responsibility for both nuclear and renewables because nuclear was classified as an 'alternative' energy source to non-renewable fossil fuels.

54 A fast breeder reactor is one where fuel is irradiated with high-energy neutrons and which produce more fissile material (usually plutonium) than it consumes. Nuclear fusion is the process whereby hydrogen atoms fuse together at very high temperatures (tens of millions of degrees centigrade) to form helium. Long-term research has focused on holding the resultant super-heated plasma through the use of magnetic forces as a source of heat for power. The Dept of Energy Review in 1986 commented: "On purely economic terms it would be hard to envisage cost effectiveness for fusion R&D on the timescales and levels necessary to achieve eventual power reactor deployment. Its justification is likely to be strategic and political rather than economic." *Background papers relevant to the 1986 appraisal of UK Energy R&D and Demonstration,* B87 (ETSU, Dept of Energy, 1986).

55 See Ross, *op.cit*

56 House of Commons Science and Technology Committee, *Wave and Tidal Energy,* p. 197 and xxi (HC 291, Session 2000-01).

57 David Elliott, *Energy, Society and Environment - Technology for a Sustainable Future* p. 164 (Routledge, 2003).

58 Bora Douthwaite, *Enabling Innovation - A Practical Guide to Understanding and Fostering Change* (Zed Books, 2002) Douthwaite uses Denmark's wind power industry as a successful example of innovation in which the tradition of co-operatives and community ownership helped stimulated rapid learning and dissemination of knowledge as well as overcome some of the opposition that has occurred in other countries.
See also Adrian Smith and Andy Stirling, *Inside or Out? Open or Closed? - Positioning the Governance of Sustainable Development,* Science Policy Research Unit (SPRU, Brighton University, 2006) for an analysis of socio-technological frameworks for innovation.

59 www.scandinavica.com/culture/nature/wind.htm.

60 Elliott, *op.cit,* p. 199.

61 Lester Brown, *Plan B - Rescuing a Planet Under Stress and a Civilization in Trouble,* pp. 159-160 (WWW. Norton, 2003).

62 Walt Patterson, *Nuclear Power* (Penguin, 1976) provides a good introduction to the development of nuclear power. The search for commercial development of nuclear fusion could have come directly out of Swift's satire, *Gulliver's Travels.* There is a very funny encounter between Gulliver and a scientist who is carrying out experiments to extract sunlight from cucumbers, so that the king's garden can have a guaranteed supply of warmth during inclement summer-time weather. The scientist is confident of future success, in this case after six or seven years of research, if only he can be guaranteed funding. But the satire does not simply lie in the absurdity of the research, nor the optimistic timescale for it to reach fruition, but in the context of poverty and hunger that Swift saw around him everyday, where immediate concerns are ignored to pursue a chimera. For the official assessment of the prospects for fusion, see www.fusion.org that describes the UK's own project and the joint European programme, TORUS, both based at Culham. An estimated £20 billion world wide has been spent on fusion research to date.

63 William Walker, *Nuclear Entrapment : THORP and the Politics of Commitment* (Institute for Public Policy Research, 1999)

64 *Ibid,* pp.17-21.

65 See the House of Commons Energy Committee, *The Fast Breeder Reactor* (HC 119, Session 1989/90)

66 Walker, *op.cit,* p. 137.

67 *Ibid,* p.117.

68 Thorp may have to stay closed until 2007 because of the serious nature of the radioactive discharges. See www.belosa.org/article/thorp_2007.

69 See news reports: 'World's Biggest Off-shore Wind Farm Approved for Thames Estuary Site', *Guardian* 19th December 2006, available online at: http://politics.guardian.co.uk/green/story/0,,1975066,00.html.

70 www.oceanpd.com/pelamis.

71 Hansard, w/ans, *col 878w, 21/10/2004.*

72 A proposed Energy Technologies Institute would be set up with £500 million of government funding to be matched by the private sector, although the actual focus of research is not yet clear, other than it should contribute to security of supply. http://www.gnn.gov.uk/environment/detail.asp?ReleaseID=227095&NewsAreaID=2&NavigatedFromDepartment=False

73 http://www.greenpeace.org.uk/contentlookup.cfm?SitekeyParam=D-E.

74 Energy White Paper, *Our Energy Future, Creating a Low Carbon Economy,* p. 12 (Cmnd 5761, 2003). The emphasis has been on the UK carbon-reduction target of 60% by 2050 in line with proposals to keep the atmospheric carbon dioxide concentration below 450 ppm, consistent with a temperature rise to 2o C above pre-industrial levels, but this does not take account of cumulative emissions between 2000 and 2050.Much deeper cuts will be needed to achieve this target.

75 http://environment.guardian.co.uk/energy/story/0,,1845526,00.html.

76 http://news.bbc.co.uk/1/hi/world/europe/1765054.stm.

77 For a detailed analysis of VSEL during this period see the Monopolies and Mergers Commission, *The General Electric Company and VSEL - A Report on the Proposed Merger* (Cmnd Paper 2852, 1995)

78 Ibid. p. 14.

79 Public Accounts Committee, *MoD Major Projects Report 2004* (HC 410, Session 2004-05).

80 The MMC calculated on a local multiplier of 1.7 jobs for each shipyard worker.

81 Furness Enterprise, *Assisting Companies to Create New Jobs, 1992-2005* (Furness Enterprise, 2005) and *Furness Enterprises Annual Report and Accounts 2004-05* (Furness Enterprise, 2005) for a listing of companies supported and employment either generated or sustained.

82 See Barrow Borough Council, www.barrowbc.gov.uk/default.aspx?page=1572.

83 According to official figures only 1,298 people were out of work and claiming unemployment benefit but the figure is misleading because there are a huge number of people who have been diverted to incapacity benefit, with estimates that between 2,500-2,700 men and 1,900 women of these are hidden unemployed who would work if opportunities existed. See, Stephen Fothergill, Tony Gore and Ryan Powell, *Relocating Public Sector Jobs - The Case for Deprived Non-Traditional Locations,* pp. 28-29 (Centre for Regional Economic and Social Research, Sheffield Hallam University, 2005)

84 North West Regional Development Agency, *North West Regional Economic Strategy, 2006,* (NWDA, 2006) website: nwda-cms.amaze.co.uk, also, www.nwda.co.uk/SimpleContent.aspx?news=1&area= 72&subarea=73&item=20044021804927169&yr=2004.

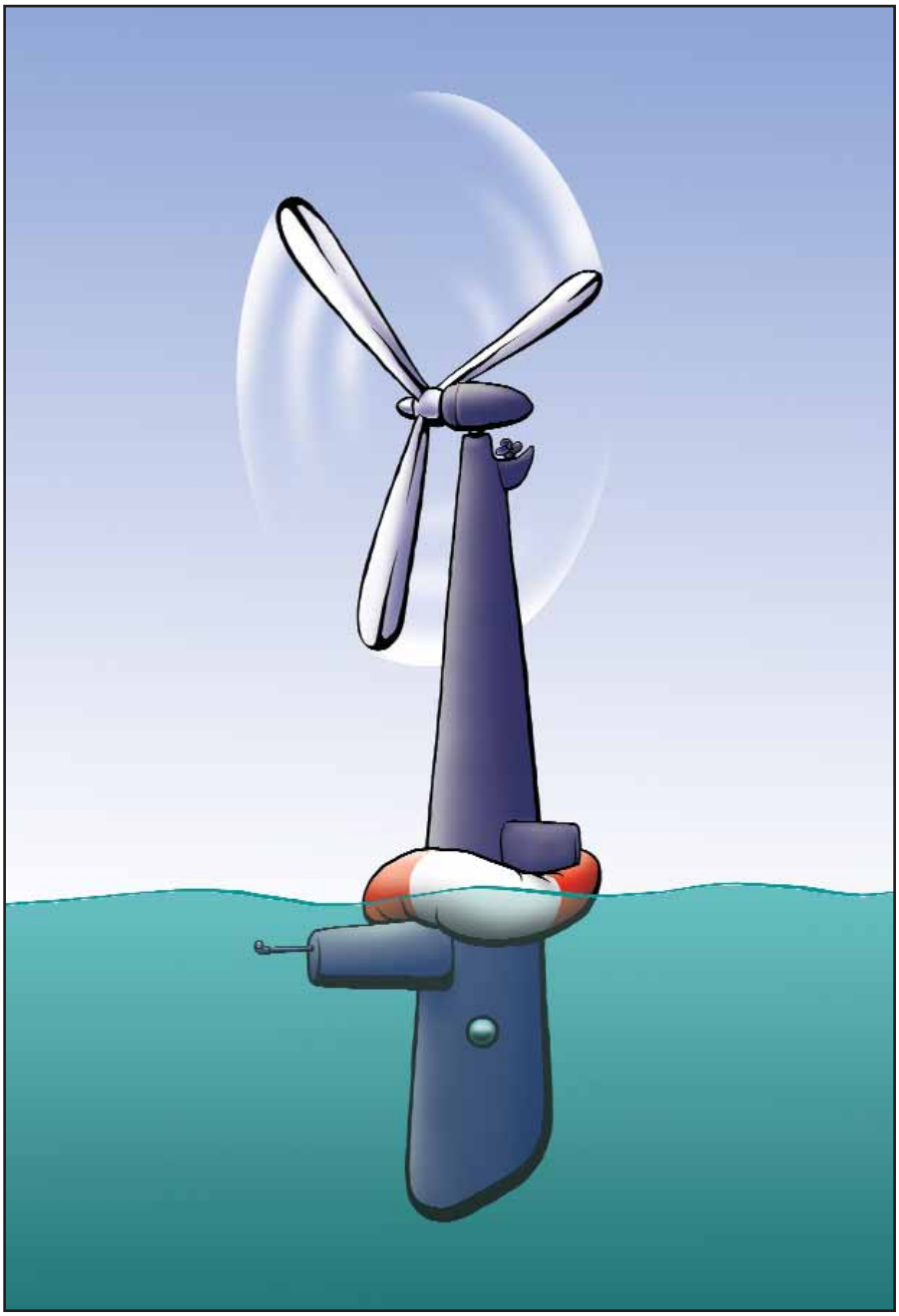
85 See Keep Our Future Afloat Campaign (KOFAC) evidence, House of Commons Defence Committee, *Future Carrier and Joint Combat Aircraft Programmes,* pp. 96-101 (HC 554, 2005-06). Also, KOFAC, *A Key Role for Barrow Shipyard In Building the Future Royal Navy* (KOFAC, 2006). The yard has recently completed the construction of two landing platform dock (LPD) support ships for the MoD and KOFAC is arguing that this is a solid basis for the construction of large sections of the aircraft carriers that can then be transported to the final assembly yard elsewhere.

86 John F. Schank, Jessie Riposo, John Birkles and James Chiesa, *The UK Nuclear Submarine Industrial Base - Sustaining Design and Production Resources,* (Rand Corporation, 2005), See also Keith Hartley, *The UK Submarine Industrial Base - An Economic Perspective* (York University, 2002) (http://www.york.ac.uk/depts/econ/research/documents/uksib.pdf#search=%22Keith%20Hartley%2C%20UK%20Submarine%22.

87 The multi-role MUFC concept includes vertical-launch missile tubes to allow the submarines to fire both nuclear, long-range missiles (possibly including Trident D5, or a lower cost but less capable ballistic missile) and conventionally-armed Tomahawk cruise missiles. See, http://navy-matters.beedall.com/mufc.htm.

88 See North West Evening Mail, 28/07/2006 *Shipyard to Get Cut of £40 million submarine cash.*

89 Fothergill et al, *op.cit.*



'Launch the sub-vertables' Cartoon: Stig

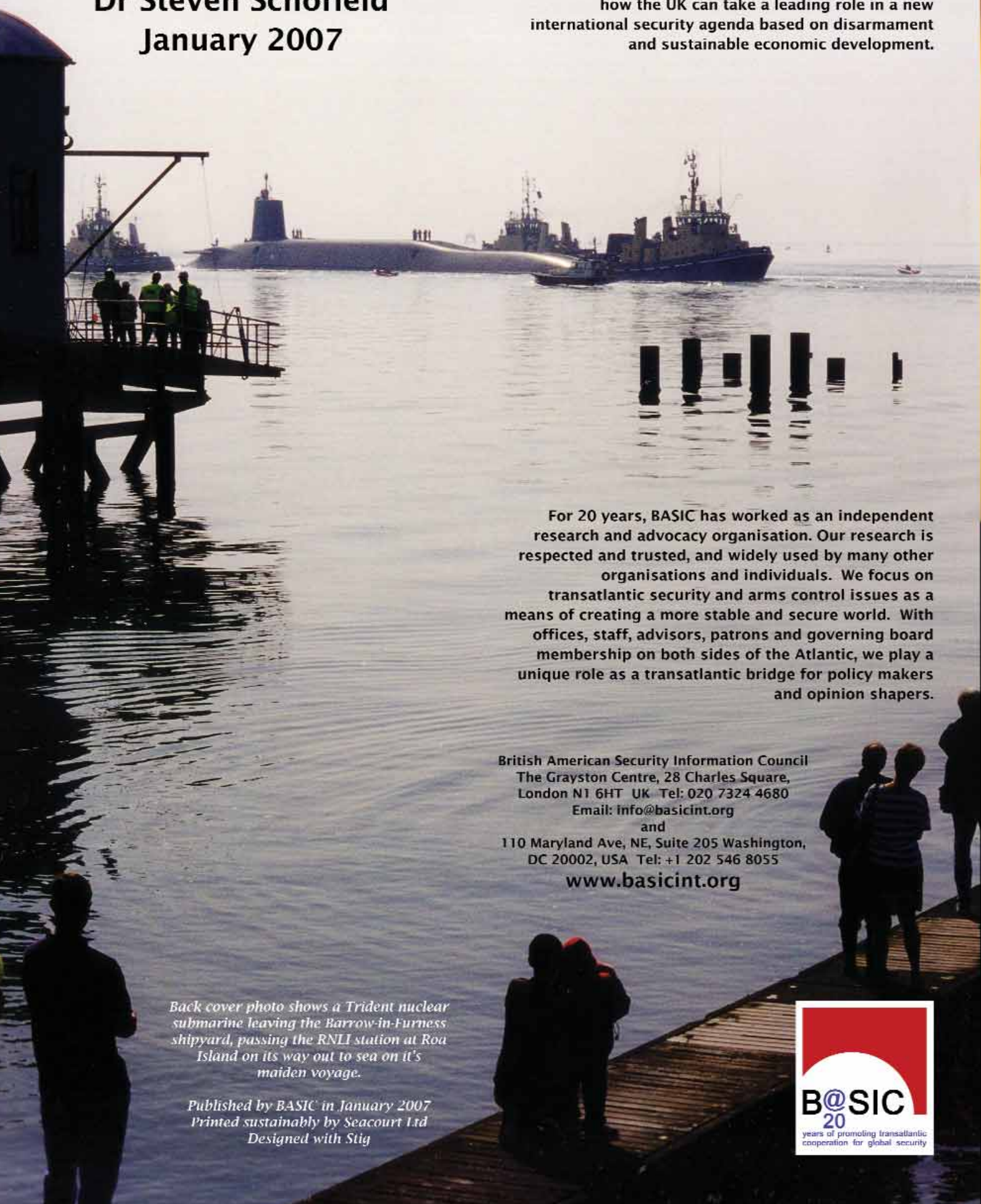
Oceans of Work

Arms Conversion Revisited

Dr Steven Schofield

January 2007

This report puts the case for arms conversion as integral to a 'national needs' programme of civil R&D and manufacture, including a major investment in offshore renewable energy, for both security of supply and to help tackle the growing international threat from climate change. Although a radical programme, this is an entirely feasible one and is intended to demonstrate how the UK can take a leading role in a new international security agenda based on disarmament and sustainable economic development.



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Back cover photo shows a Trident nuclear submarine leaving the Barrow-in-Furness shipyard, passing the RNLI station at Roa Island on its way out to sea on it's maiden voyage.

Published by BASIC in January 2007
Printed sustainably by Seacourt Ltd
Designed with Stig

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