Strategic Trends

Methodology, Key Findings and Shocks

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Conditions of Release

The findings contained in **Strategic Trends** do not represent the official policy of Her Majesty's Government nor the UK Ministry of Defence (MOD).

Strategic Trends does, however, represent the view of the Joint Doctrine and Concepts Centre, a Department within the UK MOD. **Strategic Trends** is the first publicly available product of the Strategic Analysis Programme, which is an iterative process. It is one of many pieces of work that will be drawn upon by the UK MOD to help inform the development of the UK Defence White Paper on Defence Strategic Guidance, which is due to be published in Summer 2003.

The information contained within **Strategic Trends** was updated until 24th January 2003. Developments taking place after this date have not been considered.

Every effort has been made to research the facts contained in **Strategic Trends** and remove any inconsistencies or inaccuracies. Whilst some of the judgements are contentious, we hope to generate debate and look forward to comment.

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Methodology, Key Findings and Shocks

Introduction

Strategic Trends is an ambitious attempt to develop a coherent view of how the world might develop over the next thirty years in ways that could alter the UK's security. It is the culmination of eighteen months of work by the Joint Doctrine and Concept Centre (JDCC), an integral part of the UK Ministry of Defence, and includes valuable input from over one hundred individuals from diverse organisations, to whom we are grateful.

Strategic Trends is the first publicly available product of the MOD Policy Area Strategic Analysis Programme. This work is already being used to inform thinking and assist planning within the MOD, notably the forthcoming Defence White Paper. Looking ahead, **Strategic Trends** will also inform an update of the MOD's Future Strategic Context, last published in February 2001. Clearly, much has happened since then, not least the tragic events of 11 September 2001, so the time is right to inform you of how our strategic thinking is developing and offer you the chance to make a contribution to that process.

If our Armed Forces are to maintain their deserved reputation as the most professional in the world, then we must continue to strive to develop a vision of the future challenges that they might be called upon to face. Some of the conclusions are uncomfortable: but we nonetheless think we shall face them. The MOD cannot claim to have all the answers; this document has been produced because we want to hear **your** views about what those future challenges might be. We are keen to test and build upon the findings to date in order to strengthen future iterations of the work, so this consultation exercise gives you a very real chance to influence MOD thinking.

Joint Doctrine and Concepts Centre (JDCC)

The Joint Doctrine and Concepts Centre (JDCC) is based at Shrivenham, United Kingdom. Its mission is to:

- Provide long-term conceptual underpinning for the development of future systems, doctrine and force development and contribute to the MOD defence planning process.
- Formulate, develop and review joint doctrine at the military-strategic, operational and joint-tactical level, co-ordinate single-Service tactical doctrine and provide the UK input to Allied and multinational doctrine.
- Lead the UK's contribution in promoting doctrine for peace support operations, in conjunction with International Organisations, other Government Departments, Non Governmental Organisations and the wider international community.

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We would also be delighted to receive your feedback on this work through the Strategic Trends Questionnaire included in this booklet

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Introduction

"To be of value to policy makers, futures studies must extrapolate trends and their interactions to produce coherent and defensible visions of the future against which policies, plans and strategy can be tested. The spread of outcomes should cover the major uncertainties, even if they are only subjectively assessed, which impact the policy issues."[1]

1. **Strategic Trends** is the first published material to emerge from the *UK Ministry of Defence Policy Area Strategic Analysis Programme.* This work, which is ongoing, was first commissioned in May 2001 to assist the Ministry of Defence to gain a strategic understanding of the future threats, risks, challenges and opportunities that might be faced by UK Armed Forces. Whilst 'horizon scanning' cannot provide all the answers, projects of this nature are increasingly being recognised by governments and other organisations as a valuable tool to reduce or manage risk, and/or to provide competitive advantage. However, such advantage can only be obtained if issues are correctly identified and robustly assessed.

2. **Strategic Trends** provides a broad assessment of the future strategic landscape out to 2030, but also takes stock of the environment in 2015. The analysis is broken down in to seven dimensions: Physical, Social, Science and Technology, Economic, Legal, Political and Military. The narrative provides a broad view of where the world might go (within these dimensional areas) if we follow current **trends** and based upon the current **drivers**. Given the all-encompassing nature of this project it has not proved possible – or even desirable – to 'drill down' into every area. Our purpose has been to identify the defence and security implications to the United Kingdom and to explore the potential synergistic effects of the various trends and drivers that we have identified. Cross-references between dimensions are made through the icons, which on the CD-ROM version are through bookmarks. Throughout the various dimension papers, key defence and security implications are made within the highlighted areas and these are summarised below in the Summary of Key Implications.
   We have also sought to take account of the unexpected and these we have called **shocks**.

A **trend** is a discernible pattern of change, which can be linear, accelerating or decelerating. An example of a trend is: the average age of the UK population is increasing.

A **driver** is a factor that directly influences or causes the change. Drivers can be direct or indirect. An example of a driver that influences the above trend is: better healthcare allowing greater life expectancy.

A **shock** is a high impact, low probability event. An example of a shock is: global collapse of financial system undermines confidence in capitalism.

[1] Strategic Futures Thinking - Dstl June 2001.

Methodology, Key Findings and Shocks

3. This introductory section will cover: a brief explanation of the methodology that was used to develop the work; a summary of the strategic trends that we have identified; the key implications from the seven dimension papers; and, lastly, a summary list of the possible shocks that we have postulated. All the work contained in **Strategic Trends** can found on our website at: **www.jdcc.mod.uk/trends.htm**

Methodology

4. The analysis for Strategic Trends was broken down into seven dimensions, the Physical, Social, Science and Technology, Legal, Political and Military. The work started, coincidentally, on 12 September 2001 with a series of workshops that analysed each of the dimensional areas (for workshop membership see acknowledgements at the front of this document). The workshops examined the trends and drivers for each dimension with a view to what the defence and security implications might be in the future.

5. The findings from the workshops initiated detailed research in certain key areas, including a broad variety of commissioned academic work (again, see acknowledgements). The JDCC team then took all of the data available and conducted further analysis into the subjectivity and objectivity of the data. More research was initiated to make the overall analysis as objective as possible whilst at the same time discarding areas where there was no likely significant defence and security implications. The internal team had access to most relevant UK intelligence and has not included anything that is inconsistent with it. Where source protection did not allow material to be used, we have referred to open sources. Shock analysis was conducted through a separate research paper[2] and elements of this work have been incorporated, as appropriate, into the dimension papers.

The work presents a view of where we will get to if we stay on the road we are currently on. The implications drawn are neither 'right' nor 'wrong', but simply a starting point for debate and policy development.

6. The work was synthesised across the various dimensions and the papers subsequently written in the first half of 2002, to produce a pilot iteration in July 2002. The product was then shared with other government departments to test findings; their comments have been incorporated in the product that you now have before you.

[2] QinetiQ – Credible High Impact Low probability Events – Apr 2002.

An assessment of likelihood

7. Throughout the seven dimension papers we have tried to give a clear assessment of how robust we believe our findings to be – especially within the periodic summary of 'Defence and Security Implications'. For example: we are sure that computer processor speeds will increase by 2030; we suggest that Moore's Law will be exceeded; but we are 'unsure' what order of magnitude processor speeds will reach in 2030. Where the prose is emboldened within the shaded areas, there has been subjective analysis of the statement in order to be as objective as possible:

Prose (it/it is ...)	Confidence %	Confidence level
Will	100	Certainty
Probable	›90‹100	High confidence
Likely	66-90	Medium confidence
Possible	‹66	Low confidence

Key Findings

8. The following diagram outlines the key strategic drivers and strategic trends that will have a bearing on UK defence and security policy in the period up to 2030 and predicts some changes to the future strategic landscape:

Key Defence Strategic Drivers and Trends in the Period up to 2030

Strategic Trends

The greatest risk to UK security is that the strategic environment will change faster than the UK can acquire and/or apply resources to meet that threat.

9. Synthesising the Key Implications below provides the following significant Strategic Trends that will have a direct bearing on UK defence and security policy in the period up to 2030:

- Decline in state sovereignty and a shift of power from states to international or non-state networks
- Increased destructive power of the asymmetric threat from terrorists and/or hostile states to UK homeland and overseas interests
- Greater requirement for UK Armed Forces to operate in complex terrain, e.g. mountainous or urban areas
- Increasing turbulence world-wide, with persistent low intensity threats
- Proliferation of new technologies (e.g. biotechnology), which could be used by future adversaries
- Likely new nuclear and WME powers
- Failing states becoming a greater threat to global security than resurgent ones; poorly governed space poses a threat as a safe haven and training ground for terrorist groups
- Evolving politico-military alliances and coalition partnerships; various states will face strategic crossroads
- Evolving North Atlantic/European security architecture; the UK is likely to find it increasingly difficult to satisfy both US and EU political goals
- The US-declared 'global war on terrorism' and ongoing military transformation programme will significantly affect future US concepts, diplomacy and global military footprint
- Fundamentalist reaction to Western (particularly US) power and culture
- Increasing mutual antagonism between Islamic and Western cultures
- Inter-state migration becomes a greater issue
- Competition for scarcer natural resources
- Increasing calls for humanitarian intervention and assistance overseas (especially in sub-Saharan Africa)
- New environments for conflict: space and cyberspace

Summary of Key Implications

10. The following list highlights the key defence and security implications for the United Kingdom. The implications are drawn from the relevant section of the seven dimension papers:

Physical Dimension

Physical 1. The effect of global warming, principally rising sea level, changing climatic belts, and climatic instability, do not in themselves pose direct threats to global security. We judge that these will probably contribute to the risk of internal or interstate conflict where tensions are present for other reasons, but will not directly cause conflict. However, it is probable that global warming will increase the vulnerability of those fragile states that are not able to manage the consequences of the change. This is likely to increase the demands for UK military participation in humanitarian assistance and humanitarian disaster relief operations.

Physical 2. Ozone depletion and local air, sea and land pollution will not be significant security issues although they will have implications for health on deployed operations.

Physical 3. Water scarcity will increase globally, increasing environmental stresses on low-capacity states and may increase the demand for military assisted humanitarian relief to the poorest states. We assess that water scarcity will not be a cause of conflict but may exacerbate existing tensions and water supply may be used as a tool within interstate conflict that has begun for other reasons.

Physical 4. Food scarcity will reduce overall, although poor governance and poor distribution, together with regional climate change and/or water scarcity, will mean that starvation and malnutrition remain significant issues in the poorest states. This is likely also to lead to additional humanitarian commitments for the UK Armed Forces. The scope for food blockades to be used as a strategic weapon between states in conflict will not be significant.

Physical 5. North and Sub-Saharan Africa and the Middle East will be most at risk from food - or water-induced environmental stresses.

Physical 6. Global demand for energy resources will increase significantly due primarily to development and industrialisation in South and East Asia. There is little prospect of revolutionary breakthroughs in alternative supplies. Renewable and nuclear energy sources will remain of moderate importance but fossil fuels, and particularly oil and gas, will remain dominant. These will stay the key strategic resources as the main areas of supply and demand are separate. Their location and transport routes will therefore be security drivers for the developed and developing nations alike.

Physical 7. Oil will remain available throughout the period of the study but is likely to cost more and suffer larger price variations after 2015. Gas will become increasingly important, will remain plentiful and probably experience fewer price variations. OPEC will increase its share of world oil production to over 50% by 2015, enhancing its strategic leverage. The Caspian basin, West Asia, Russia, the Gulf of Guinea and North Africa will increase their importance as producing regions and may therefore become regions where stability and security becomes of greater concern. Transport routes will see a greater dependency on overland pipelines, transiting unstable regions and introducing new vulnerabilities.

Physical 8. The UK is likely to become more dependent on imported natural gas for electricity generation and will therefore have increased interest in the stability of gas producing regions. In the absence of a renewed programme of nuclear power station construction, this sector's contribution will decline significantly from 2015, increasing our dependency on energy imports.

Physical 9. There may be occasions where niche mineral resources rise to strategic importance due to heavy demand and isolated supply. It will remain challenging to predict which ones these will be, to determine whether strategic reserves are required, and to ensure the security of the producing areas. These could include new resource sources such as the seabed or Antarctica after 2015, potentially expanding the potential for dispute in new areas.

Physical 10. Potential adversaries will seek to exploit mountainous areas to lessen Western comparative advantage. Western armed forces are likely to continue to avoid large-scale combat in mountainous areas where possible. However, the number of occasions when our forces are compelled to operate in the mountains will probably increase, due mainly to the asymmetric strategies of our opponents.

Physical 11. Both chronic and infectious disease will remain a significant drag on human well-being despite the advances foreseen in biotechnology. Progress will be made but infectious disease will remain a real threat to the poor of both the developed and developing world. In much of the developing world diseases like malaria, and HIV will reduce the prospects for economic growth. In some states, particularly in sub-Saharan Africa, the sheer prevalence of disease may threaten social structures and contribute to instability. This could contribute to demands for additional stabilisation operations.

Physical 12. Deployed forces will continue to require protective measures when operating in areas prone to infectious disease and will demand increasing reassurance that these are effective. Both the providers and recipients of peace support forces will increasingly wish to ensure that they are not importing diseases through troop movements. Attempts by states to prevent the spread of virulent epidemics are likely to lead to localised tension at borders, ports and airports. Armed forces may be employed in support of the civilian authorities to contain epidemics.

Physical 13. The increasing ease of developing biological weapons and the difficulty of determining whether an outbreak is the result of a natural occurrence or deliberate attack may make biological warfare against humans, crops or animals relatively more attractive, particularly to those engaged in low-level, long-term conflict.

Social Dimension

Social 1. As identified in the Physical Dimension global food resources will keep pace with the population increase, although there will be increasing water stress.

Social 2. Developing world countries experiencing very rapid population increases, such as much of North Africa and the Middle East, may become less stable should their economies not expand sufficiently to employ the forthcoming 'working age bulge'.

Social 3. Russia is likely to suffer a population decline of 8-10% by 2015, including a 50% reduction in the military recruitment age cohort, challenging its ability to man its armed forces.

Social 4. Countries in the developed world will need to manage their ageing populations. This is likely to demand increased social welfare provision, revised recruitment strategies, and may require changed expectations of retirement age and pension provisions and/or a more positive view of the potential benefits of immigration.

Social 5. International migration from the developing to developed world will increase. Government action to reduce this is only likely to reduce rather than eliminate these flows due to the increasing ease of illegal migration. Large-scale immigration may challenge social cohesion in those countries where the issues are not debated or managed effectively. Push migration as a consequence of crises will continue to test the capacity of neighbouring states.

Social 6. Urbanisation in the developing world will also test local governance when it occurs rapidly. Urban-rural disparities may become an increasing source of tension.

Social 7. There will be more urban terrain and some potential adversaries will seek to exploit it to lessen Western comparative advantage. Western armed forces are likely to continue to avoid large-scale combat in urban areas where possible. However, the number of occasions when our forces are compelled to operate in urban areas will probably increase, but more due to the asymmetric strategies of our opponents, than as a consequence of urbanisation per se.

Social 8. The UK's ageing population will reduce the size of the Armed Forces' historic recruiting pool from 2015 despite small increases in the total working population. Within this smaller traditional recruiting pool the proportion of women and ethnic minorities will increase. The size of the Armed Forces' traditional recruiting pool will be further limited by delayed entry into the workforce as more young people undertake higher education. Given continuing economic growth, and despite productivity increases, these trends are likely to increase the competition for recruits.

Social 9. Cultural globalisation will increase the intensity and breadth of outside influence on all cultures. Increased interaction will develop understanding and tolerance in many societies, especially those with a tradition of openness. It will nevertheless challenge traditional frames of reference, exposing more instances where shared understanding and dialogue are hard to achieve. The breadth and intensity of interaction will potentially cause social tension and instability within conservative (including some European) societies.

Social 10. Western culture, and particularly America, will remain the dominant global influence although there will be increasing interchanges directly between other cultures. This will spread positive values but will also serve as a source of tension with disparities being more clearly visible, and the West being viewed as both a threat and a direct cause of national, regional and local frustrations. This is likely to increase the frequency and range of extremist attacks on Western interests, particularly from some members of strong, internally focused cultures.

Social 11. Within the West increasing relativism, pragmatism, multiple identities and reducing deference may make it more complicated to determine the right course of action through political debate, and to win and sustain national or coalition support in times of conflict. Individualism is likely to reduce the attraction of obligation-based roles, such as the Armed Forces, to some people.

Social 12. Evolving social patterns in the UK in areas like cohabitation, parenting and sexuality will make the current living arrangements and moral standards of the Armed Forces seem increasingly outmoded unless they continue to match the rate of external adaptation. More fluid working patterns with regular career changes, multiple jobs, and flexible hours are likely also to make the current longer-term commitment and conditioned working arrangements of the Armed Forces seem increasingly unorthodox. This may reduce the potential recruiting pool, although the nature of Service life will still appeal to many.

Social 13. More pervasive, international and differentiated media and more complex operations, often in coalition, will complicate attempts to explain the reason for military action and will also make operational security more challenging.

Social 14. The UK public will maintain support for the existence and active employment of the Armed Forces so long as they maintain a clear role in protecting UK interests, and are successful in doing so, whether directly or indirectly.

Science and Technology Dimension

Science and Technology 1. It is almost certain that the US will dominate technical innovation in all areas, and particularly defence, until at least 2015 with the EU and Japan remaining major players. The West will therefore retain its overall technical advantage in military technology. India and China may become significant competitors by 2030.

Science and Technology 2. Despite multilateral regulation it will be increasing hard to control key technologies. Diffusion, collaboration, and leakage will probably lead to a widening number of military and non-state actors accessing advanced military technologies. The UK may be exposed to unplanned vulnerabilities should potential adversaries exploit various treaties and other agreements limiting the development and employment of certain types of weapon.

Science and Technology 3. Commercial imperatives will increasingly direct the nature of research and development. Outside the US, the relatively low level of public spending on science and technology is likely to remain at its relatively low level, although there are signs that the importance and value of a strong national S&T base is being recognised. The UK will find it ever more difficult to retain a wide range of defence technologies on a purely national basis and effective public-private multi-nation collaboration will be key. UK defence innovation will increasingly depend on exploiting innovations developed for commercial purposes, but will also need to fund research for military-specific technology, as well as ensuring continued access to US military research. A technical lead in niche areas may help secure this access

Science and Technology 4. In many areas the rate of technological innovation will remain high. Technically derived advantages in military capability may be less enduring but is most likely to be achieved via the integration of several different innovations. Defence systems will probably need the following attributes to maintain their qualitative advantage: rapid capitalisation on innovation; insertion of new technology into legacy systems; fusion of separate advances; new techniques to get the most out of new technologies; provision of informed, trained scientists and engineers and other specialists; and effective management of the social, commercial and legal context in which the technologies are being applied. Failure to do so may result in longer lead times and/or obsolescent systems.

Science and Technology 5. The increases in the speed, connectivity, and pervasiveness of information, and communications technology will continue unabated, requiring continual adaptation by UK defence systems. The commercial lead in these areas may mean that the West's comparative advantage in individual C4ISR components will decline as equivalent or better capabilities become available 'off the shelf'. However, the command system as a whole will remain a key force multiplier and advantage for US-led coalitions. Opponents will seek to contest this advantage through electronic warfare, computer network attack, and asymmetric techniques.

Science and Technology 6. Knowledge management tools, self-monitoring and repair, and more intuitive human-machine interfaces, are likely to ease the demand for widespread technical skills in the UK Armed Forces.

Science and Technology 7. For advanced militaries, remotely controlled weapon systems will become prevalent in all environments and are likely to be widely weaponised by 2015. Artificial intelligence may technically allow fully independent tactical decision-making (humans out the loop) by 2030, but is likely to be contested by ethical and legal factors. Nevertheless, these developments could fundamentally change the nature of combat.

Science and Technology 8. The diffusion of commercially-available strong encryption is likely to mean that the privacy and surveillance arena becomes more contested, potentially reducing the US-UK advantage in strategic signals intelligence.

Science and Technology 9. Advances in prevention and treatment will gradually reduce the prevalence of infectious and chronic disease for the developed world. This will help reduce the risk to our service personnel at home and on deployed operations.

Science and Technology 10. Cognitive science is likely to allow improvements in human-machine interfaces, particularly after 2015, potentially speeding and simplifying battlefield decision making and execution.

Science and Technology 11. Beyond 2030, it is possible that new behaviour-controlling chemicals, bionics and germ line engineering could be used to enhance the fighting power of opposition forces in new ways that we would not contemplate ourselves.

Science and Technology 12. Biological weapons will proliferate further and may become more sophisticated after 2015 and tuneable with respect to duration, survivability, transmission, lethality, resistance to medical countermeasures, and target specificity. At the same time more effective countermeasures will become available in terms of detection, protection, and treatment but there is likely to be a lag before such countermeasures are derived. There will be an increasing risk of biological weapons being used by terrorist and non-state organisations.

Science and Technology 13. Nanotechnology is unlikely to mature until well beyond 2015. It may then have significant implications for military technology, particularly in the fields of faster information systems, new sensor devices, smaller mechanical systems, and improved material properties.

Science and Technology 14. After 2015, materials technology, including nanotechnology, may deliver novel materials with defence-specific applications such as high-strength/low-weight, low-signature, and actively deformable properties.

Science and Technology 15. Revolutionary advances in power sources are not likely before 2015, although fuel cells are likely to provide a realistic alternative to combustion engines through electric vehicle drives by or before 2015. Up to 2015, man-portable combat systems will probably remain limited by battery power and life span.

Science and Technology 16. Developments in propulsion technology are more likely to be evolutionary and incremental rather than revolutionary at least as far as 2015. Improved propulsion technology could result in enhanced performance in absolute speed, reduced deployment time and increased time on station by 2015.

Science and Technology 17. The space environment will be more widely utilised militarily and commercially. This may reduce the near-absolute advantage of the USA and its allies in this environment before 2015, in terms of communications, positioning and imaging. Space exploitation is likely to be more crowded and contested militarily, using both space and terrestrial systems by 2030.

Science and Technology 18. Advances in military technology are likely to lead to wider development and employment of electromagnetic and blast effect weapons by 2015.

Economic Dimension

Economic 1. More pervasive and intensive globalisation will increase interdependency between states. This may further discourage interstate conflict, especially between those countries with large open economies.

Economic 2. Overall, the developing world will not significantly close the gap with the developed world. The extent of the disparity will become ever clearer through the global media, potentially exacerbating internal tensions, and encouraging dissatisfaction, resentment, migration and even terrorism.

Economic 3. Poverty will worsen in sub-Saharan Africa, increasing demands for humanitarian assistance.

Economic 4. The USA will remain the key economic power, underpinning continued military pre-eminence.

Economic 5. China and India are likely to emerge as significant economic powers (although great internal inequalities will remain), increasing their military potential should they choose to develop it.

Economic 6. Russia's low base and limited growth will limit any conventional military expansion or significant spending on military reform in the period to 2015.

Economic 7. Globalisation will increasingly limit national economic policy, penalise poor governance, and spread the impact of economic and political shocks, such as those resulting from armed conflict. This may increase the chances of economic difficulties leading to political collapse.

Economic 8. Transnational companies will further increase in size but are unlikely to seek to exercise this power geopolitically. However, co-operation between companies and state governments on intelligence and information, may increase in response to mutual threats such as terrorism and organised crime.

Economic 9. The UK economy is likely to grow close to the trend rate of G7 competitors and will remain one of the world's largest economies up to at least 2015. This could continue to underpin significant defence spending in international terms.

Economic 10. The level of actual UK defence spending will continue to be broadly related to the level of the perceived threat and the role the UK wishes to take in the wider world. Defence will gain additional resources from higher taxation or other government priorities if the strategic context warrants it. The main risk may be that the strategic context changes more rapidly than MOD can gain and deploy resources.

Economic 11. Globalisation will probably mean that the UK economy becomes even more open and dependent on broad stability, particularly with key trading partners in the EU, USA, and increasingly with East and South Asia after 2015.

Economic 12. Further rationalisation is likely in the West's defence industry. Russia will continue to depend on exports of legacy equipment but will gain diminishing sales after 2015. Emerging industries in Israel, Turkey, India, and China will provide increasing competition, mainly in the medium technology areas.

Economic 13. The USA will increase its dominance of global defence industry, based on its large domestic market and research spending. A degree of protectionism will remain a feature of the West's defence market in both the US and EU. It is unlikely that a balanced two-way flow of sales will emerge and the US will continue to be the net beneficiary.

Economic 14. The UK's defence industrial base is likely to become narrower and less clearly British, with increasingly international ownership and a corresponding need for stronger security of supply and technology control arrangements.

Economic 15. MOD and wider government defence industry policy is likely to become harder to keep coherent, with MOD seeking US technology and interoperability and some other government policies aiming to sustain UK on-shore industry and/or EU political influence. The defence export market may increase in the medium term but export policy is likely to become more contested domestically.

Legal Dimension

Legal 1. There will be little progress in the development of independent supranational enforcement mechanisms to force states to obey international law. International law will remain subject to interpretation, with the most powerful Western states providing the will and means to enforce international law on behalf of the 'international community'. Other states, in particular the least developed and non-state actors, may refuse to comply with its strictures and may increasingly contest claims that the West equates to the 'international community'. International law will become increasingly permissive about when outside force can be used to intervene in a nation's domestic affairs, if there are strong humanitarian grounds for that intervention.

Legal 2. The US action following 11 September 2001 and its emerging grand strategic doctrine have strengthened the claim to a right to pre-emptive self-defence. Anticipatory action against other states will remain more contentious than against non-state actors. Other states may use US precedents to justify their own actions.

Legal 3. The concept of what constitutes 'threats to international peace and security' is likely to widen further to encompass extreme humanitarian crises and terrorism. This, in turn, is likely to provide greater opportunity for the legitimate use of force than hitherto.

Legal 4. State sovereignty is likely to become more conditional on adherence to customary international norms. It is probable that the West will gain mandates to intervene when states gravely breach these norms.

Legal 5. UN mandates will remain desirable to underpin Western action. Constructive abstention in the Security Council, and resort to the General Assembly may be advocated as mechanisms to gain mandates more readily. The UNSC will remain the key multinational clearinghouse for providing international sanction and moral acceptability to acts of war or intervention operations until at least 2015.

Legal 6. There will be increasing pressure to expand the scope of weapons law in such areas as imprecise weapons, lethal weapons when non-lethal alternatives are available, directed energy, and blast weapons. The focus on post-conflict effects will continue and may extend to encompass environmental impacts.

Legal 7. Throughout the period up to 2030 there will be an increasing trend to seek to hold individuals more systematically to account for war crimes. In the period up to 2015, this will be limited by the current US position on the ICC. UK personnel are unlikely to be unduly affected unless they commit war crimes, in which case they would be dealt with by the UK, and not by the ICC.

Legal 8. The categorisation of terrorists as combatants or criminals may be determined by US precedent in the short term, but may be subject to more systematic international agreement after 2015.

Legal 9. Divergent national positions on legal doctrine will increasingly complicate interoperability in coalitions unless harmonisation is sought more systematically.

Legal 10. International law, and particularly European law, will have an increasing impact on UK domestic law and hence on the operational and non-operational conduct of the Armed Forces.

Legal 11. The European rights-based legal tradition is likely to challenge further the obligations-based ethos of the UK Armed Forces in areas such as disability, maternity, marital status, freedom of speech, and employment of young adults.

Legal 12. The increasingly litigious nature of UK society will probably see a further increase in compensation claims by Service personnel, and of civilian processes running in parallel with military judicial mechanisms.

Political Dimension

Political 1. State sovereignty will continue to be eroded or ceded, and states will be more constrained in their internal and external policies. States will nevertheless remain the most significant geopolitical actors and most will retain national armed forces.

Political 2. Governments will be more stiffly tested by internal demands and external pressures and may fail more frequently. The consequences of ineffective governance and ungoverned space will be increasingly significant for other states and they will probably intervene more frequently to prevent or stabilise these situations.

Political 3. The frequency of significant interstate conflict is likely to diminish further due to the prevalence of democratic norms and increased economic interdependency. When it does occur the impact will become ever more significant locally and globally. The West may be obliged to intervene to pre-empt or react to interstate threats and failures, but will risk more in doing so due to proliferation and asymmetry.

Political 4. The increasing range of transnational threats will demand more international responses. The United Nations is unlikely to be reformed sufficiently to lead a comprehensive response and ad hoc treaty arrangements will be the most probable way forward.

Political 5. NATO will remain the most enduring political/military alliance, but in broadening its membership and co-operating with Russia it will inevitably become more political and less military in its orientation.

Political 6. NATO's principal stated role will remain collective defence. Although it is likely to widen its ambit to encompass out of area operations, stabilisation operations, missile defence, and counter-terrorism, it will rarely exercise these functions as a whole. It will remain a key clearinghouse for variable geometry coalitions, probably with greater role specialisation by contributors.

Political 7. The European Union will remain the most closely integrated supranational institution until 2030. It will broaden its membership significantly and integrate further. It is unlikely to form a super-state but will also have variable geometry according to the different levels of integration of different members. These will retain differing levels of sovereignty according to their own assessment of whether their power is best exercised nationally or collectively.

Political 8. European Security and Defence Policy will evolve to provide strengthened civil and military elements of conflict prevention and crisis management. This will remain dependent on NATO capabilities for the near future, but may develop greater autonomy from 2015. There may be calls to extend the roles of ESDP.

Political 9. It is unlikely that other supranational organisations will emerge to match the UN, NATO or the EU.

Political 10. Increased regional autonomy by 2030 will complicate security and defence mechanics, but is unlikely that even an independent Scotland would seek wholly separate defence arrangements. Terrorism in Northern Ireland may continue on a sporadic basis until at least 2015, requiring the UK Armed Forces to continue to provide assistance to the civil power.

Political 11. The provision of security to UK Overseas Territories may increase in significance with enhanced citizenship rights for residents. More UK citizens will reside abroad but their security will typically be the responsibility of their host governments. In most circumstances they will remain too dispersed to be a strategic target, but Non-combatant Evacuation Operations planning may need to be developed on a more widespread basis.

Political 12. New security threats may demand new organisational arrangements within Whitehall or internationally. The UK Armed Forces will almost certainly remain under the control of an independent department of state regardless of other organisational changes but may have wider roles, for example in providing assistance to the civil power.

Political 13. The US will largely dictate the nature of international relations. Even under pressure, the US will not be isolationist but it will have the power to go it alone. It will be tempted to use its predominance to act unilaterally, especially if its power attracts further attacks. The US may foster a more multilateral approach depending on the persuasiveness and usefulness of its allies. Europe will remain important to US security and prosperity, although Asia will increase in relative significance.

Political 14. The European Union will increase its economic and political weight. It is likely to argue more frequently with the US but will remain broadly aligned with it so long as America retains its multilateral inclinations. Those members with national geostrategic agendas will increasingly be confronted with hard choices about whether to pursue them independently or collectively.

Political 15. Russia is likely to remain inwardly focused until at least 2015 and collapse will be a more significant security risk to the West than resurgence. It will need ongoing Western economic assistance to maintain economic growth and internal stability. Its strategic weapons will be relied upon more than conventional capabilities to guarantee against external threats.

Political 16. China will increase its political and military power in line with its blossoming economy but is unlikely to exercise this globally before 2015, remaining focused on domestic security and regional threats.

Political 17. Japan may become increasingly autonomous from the US in terms of its security policy, and more regionally assertive.

Political 18. India is likely to seek a more influential role as a regional power on the back of economic growth, the political influence of the second largest population, and its increasing military capability.

Political 19. The Middle East and Gulf will remain a principal region of concern with continued tension between Israel and its Arab neighbours; increased Western dependency on Gulf oil; and further pressure on autocratic regimes.

Political 20. Sub-Saharan Africa will face severe challenges through poverty, disease, hunger, poor governance and potentially radicalism. It is likely to remain a secondary security concern but ethical pressure to assist, including through military stabilisation operations, will increase.

Political 21. Current tensions between India and Pakistan are likely to persist until at least 2015.

Political 22. New security concerns may emerge; in the Caucasus and Central Asia due to fossil fuel exploitation and weak governance; In South East Asia because of Islamic separatism and from the growing military power of East Asian states and the absence of well-developed regional security structures.

Political 23. Power will shift from states to non-governmental actors, including inter-governmental and non-governmental organisations, transnational corporations, and terrorists.

Political 24. The number and influence of inter-governmental and non-governmental organisations will increase significantly such that they may surpass the role of Western governments in setting the international political agenda (although not in terms of delivering concrete change), perhaps through an emerging global civil society.

Political 25. Organised crime is likely to widen in scope and increase in scale, exploiting the slowness and disjointed nature of national and international responses. Only rarely will organised criminals threaten overall state security although they may exploit and sustain poor governance, instability and corruption. Its perpetrators are likely to access increasingly sophisticated weaponry to contest state attempts to close down their operations. Governments may call on military capabilities more frequently to support attempts to counter these.

Political 26. Terrorism is likely to become more widespread, extreme, international and autonomous. It will remain a key challenge to state power, particularly through its ability to use asymmetric attacks to by-pass military security and attack states 'at home'.

Military Dimension

Military 1. The ability to engage in armed conflict will remain the ultimate instrument of state power throughout the period of this study. Interstate conflict is likely to become more risky and so less frequent, but will be more dangerous when it does occur. Intrastate conflict will probably become more frequent and will have increased consequences for international security. There will be more conflict between state militaries and a range of non-state actors, but particularly terrorists.

Military 2. The US's defence spending is likely to exceed the sum of the next five biggest spenders until at least 2030. China and India will probably see the most significant relative increases in defence spending. China may be the second largest spender by 2030, by which time India may have overtaken the UK.

Military 3. A range of countries will extend their power projection capabilities but those of the US will remain pre-eminent. China and Russia may develop multi-regional capabilities (analogous to that of the UK or France now) by 2015. China and the EU could achieve global capabilities by 2030.

Military 4. Weapons of mass effect, and their means of delivery, will proliferate significantly by 2015. It is judged that North Korea, Iran and Iraq will develop nuclear weapons before 2015 in the absence of external intervention. Open sources indicate that India, Pakistan, Israel, Libya and Syria could potentially have biological weapons by 2015. Ballistic delivery systems will proliferate and extend in range; non-ballistic systems including cruise missiles, sleeper devices, and asymmetric delivery mechanisms will become more prevalent, especially if US ballistic missile defence becomes a reality.

Military 5. Non-state actors are likely to acquire weapons of mass effect before 2015 and will be much harder to deter than state proliferators, making this a key security threat.

Military 6. Delayed-lethality and non-lethal weapons such as electromagnetic pulse weapons, radiological and carcinogenic chemical weapons are likely to offer new mass effect threats by 2015.

Military 7. US posture will determine global military strategy until at least 2030. Its current movements towards enhanced homeland defence combined with assertive and pre-emptive military action abroad against terrorists and proliferating states are likely to continue until at least 2015.

Military 8. European allies will continue to depend on NATO and US commitment to guard against any strategic threat to Europe. A major conventional threat is unlikely, and would probably only arise if Russia recovers economically and regains capability and intent towards 2030.

Military 9. Alliance nuclear deterrence will be key in preventing coercion by states armed with weapons of mass effect. Consequently, the UK and France are likely to retain small numbers of capable nuclear systems. Meanwhile, China will continue to increase the effectiveness and number of its systems

and of the other P5 nuclear weapon states, the US and Russia are likely to retain a significant numerical advantage over other states.

Military 10. Until 2015, most European allies will limit military deployments abroad to stabilisation operations, although these may be over a wider range of potential regions. The UK and France will seek to retain the ability to project power and to contribute to US-led intervention operations. The EU may develop collective defence and intervention capabilities by 2030.

Military 11. Russia, China (and perhaps India) will seek to maintain their freedom of action from US influence by maintaining the surety of their weapons of mass effect. Notwithstanding their increasing power projection capabilities, China and India are unlikely to seek to exercise global military influence before 2030.

Military 12. States and non-state actors will be forced to adopt asymmetric strategies such as denying force entry, disabling force multipliers, disrupting enablers and avoiding combat or outright defeat in order to circumvent and deny the conventional military advantages of the US and its allies. Both states and non-state actors are likely to consider targeting civilians and homelands.

Military 13. The nature of strike operations to 2015 will be largely determined by US transformation. Full spectrum dominance will be built on precision engagement, information superiority, full dimension protection and focused logistics. This is likely to lead to US-led combat operations that are increasingly non-linear and dynamic, employing dispersed and precise forces at high tempo.

Military 14. Most Allies will be unwilling or unable to match the financial and organisational challenges of transforming their own forces to match those of the US. Role specialisation may therefore occur between coalition members such that the US concentrates on strike operations and many of its allies provide stabilisation and support capabilities.

Military 15. Those allies who wish to maintain a significant influence on US strategy and operations will need to offer front-line capabilities that supplement, complement or exceed US capability and can interoperate technically and organisationally.

Military 16. Opponents will be forced to adopt asymmetric tactics such as denying force entry, disabling force multipliers, disrupting enablers and avoiding combat or outright defeat.

Military 17. Stabilisation operations to 2015 will evolve to encompass a more frequent counter-insurgency element, more systematic burden sharing between contributors, and between the military and other agencies.

Military 18. Combat after 2015 may increasingly be shaped by the implications of remote and autonomous systems. It is likely to take place over a wider number of environments more frequently including space, cyberspace and the electromagnetic spectrum.

Shocks

"The benefit of strategic futures work is not that it predicts the future, which is unpredictable, or enables organisations to control it. It is about rehearsing possibilities so one is better able to respond if they happen"[3]

11. An analysis of trends and drivers can only go so far in describing the broad-brush strokes of the future strategic landscape. As an important element of any future planning we also need to expect the unexpected - shocks will occur. So, if our methodology is to be robust we need to plan to be shocked. For this reason we have sought to balance our analysis by including a number of shocks throughout the work.

12. By definition shocks are rare or have never happened, which makes them difficult to predict with any meaningful accuracy. We have chosen to characterise a shock as a high impact, low probability event. The tragic events of 11 September 2001 are an obvious recent example, but there are other shocks in recent history that have had a significant impact on UK defence policy, such as the Argentine invasion of the Falkland Islands in 1982, or the Iraqi invasion of Kuwait in 1990. Often shocks will be the worst case scenarios, however, a shock doesn't necessarily have to be a bad thing. It might also have very positive implications, such as the fall of the Berlin Wall in 1989 and the subsequent dissolving of the Warsaw Pact.

13. Whilst a shock may be an isolated event, the nature of the world means that any shock will have a primary impact, usually followed by consequential impacts. Thus the atrocity of 11 September had a primary impact of severe loss of life and property, followed by secondary impacts worldwide, such as the decision by the USA, UK, and other coalition partners to overthrow the Taleban regime in Afghanistan. Indeed, some shocks, particularly political shocks, have the potential to trigger a chain reaction of shocks, possibly escalating in intensity. An example of this would be the 1914 assassination of Archduke Ferdinand in Sarajevo, triggering World War I, the deaths of millions, the collapse of the Austro-Hungarian empire, defeat of Germany, rise of Nazism and, ultimately, World War 2.

14. A list of the possible shocks that we have identified is contained below (listed in the order that they appear in the paper). By highlighting these shocks as *possible*, we are not suggesting that we think that they are *probable*. Whilst we have endeavoured to identify shocks that are realistic, the main criteria for selecting them is simply that they are credible. Hindsight may show many of the shocks that we have listed to be wide of the mark. The value of including shocks in our analysis is that it prevents us arriving at easy conclusions, or putting more faith in trends than we ought.

We need to expect the unexpected. *We need to plan to be shocked.*

[3] Benchmarking UK Strategic Futures Work – Government Performance and Innovation Unit.

Methodology, Key Findings and Shocks

Possible Physical Shocks:

- The Gulf Stream could be switched off dramatically cooling the UK
- Declining human fertility through chemical pollution
- Deliberate contamination of UK food or water supply by terrorists or agents of a hostile state
- A breakthrough in energy technology such as fusion power would transform the world economy
- Outbreak of a new virulent infectious disease quickly kills millions

Possible Social Shocks:

- Christian revival in the West prompts a reverse of secularisation
- A significant UK military defeat or mass casualty attack on the UK could dramatically alter public support of the Armed Forces

Possible Science and Technology Shocks:

- Hostile state or terrorist group conducts major 'Information Systems attack' (cyber terrorism) causing collapse of vital UK infrastructure e.g. National Air Traffic Control System
- Computers have a widespread autonomous decision making capability
- A biomedical breakthrough slows human ageing, leading to almost unmanageable social consequences
- Solar activity disrupting or destroying US/NATO space systems during key operations

Possible Economic Shocks:

- Global collapse of financial system undermines confidence in capitalism
- A prolonged economic downturn reverses globalisation through a new wave of protectionism
- Deflation replaces inflation as the primary economic demon
- New OPEC oil shocks reverse globalisation
- Significant elements of the developing world co-operate to contest G7 dominance of the terms of trade.

- New taxes on currency and stock speculation used systematically to transfer resource to developing countries
- A sustained economic downturn could cause transnational companies to withdraw their interests to their home base, hurting open economies dependent on foreign direct investment
- Significant and prolonged disruption to the City of London would have a catastrophic impact on the UK economy
- Action by the EU to protect national defence industries could provoke retaliation by USA, threatening UK access to US technology and equipment

Possible Legal Shocks:

- International convention declares nuclear weapons to be unlawful
- Senior officer in UK Armed Forces is prosecuted for war crimes
- UK reasserts national supremacy over European Courts

Possible Political Shocks:

- Multi-national corporation asserts territorial control over a resource-rich region
- Crisis of democratic legitimacy in West
- Extremist politics becomes prevalent in the West
- Clash of civilisation between the West and Islam prompts widespread armed conflict
- UK and France lose seats as Permanent Members of the UN Security Council
- Future US administration withdraws co-operation from international bodies such as the UN and NATO
- Collapse of the Euro
- A coherent and assertive pan-Arab or wider pan-Islamic alliance as a counter to the West
- A widespread movement in the developing world to act to rebalance global power
- A Russia-China-India alliance to counter what they perceive to be a hegemonic USA

- An independent Scotland and/or Wales breaks defence links with England
- Tension over any oil discoveries in Antarctica or the Falklands
- A long term strongly unilateralist US posture would significantly alter the international order, potentially splitting the EU from America, and causing others to form new coalitions to oppose US power
- China becomes a democracy
- Arab states unite to invade Israel and 'liberate' Palestine
- Israel uses WME

Possible Military Shocks:

- The employment of WME by a state would have fundamental implications for the current security framework, causing some states to suspend their proliferation efforts and others to speed them.
- US-European de-coupling and low European defence spending could enable or encourage conventional military threats to Europe to re-emerge, perhaps from a resurgent Russia or the Middle East by 2030
- Hostile state develops new WME technology
- Nuclear exchange between two non-UK, non-ally countries
- Widespread chemical or biological warfare attack against a UK city

Back to Menu

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