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FUTURE OPERATING ENVIRONMENT 2035

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The document draws upon on qualitative data from contemporary national security, international relations and foreign policy documents, and a range of quantitative data to outline key demographic, economic, and biosystemic trends.

Foreword

In considering the environment in which Defence and its national security partners will operate over the next two decades, our analysis must encompass more than just the means of waging war. We must also appreciate the circumstances and settings in which decisions will be made, and the actions likely to be taken by friends and adversaries alike.

Implementing the First Principles Review and the Capability Life Cycle means that we must adopt a new approach to force design. As a key element of the initial strategy and concepts phase of the force design process, the *Future Operating Environment: 2035 (*FOE 2035*)* provides context for explorations of how the Australian Defence Force may need to operate in the future. In essence, securing the Strategic Defence Interests set out in the Defence White Paper in the context provided by FOE 2035 is the 'military problem' addressed by our Future Joint Operating Concept.

FOE 2035 thus serves a purpose broadly similar to the roles played by the United States' *Joint Operating Environment 2035*, and the United Kingdom's *Global Strategic Trends* and the associated British version of the *Future Operating Environment*. However, Australia's FOE 2035 is a more exploratory document than the US *Joint Operating Environment*, and is more tightly focused on force design than the UK's *Global Strategic Trends*. FOE 2035 provides analysis from a range of areas on the basis that developments in human, societal, environmental and technological fields will decisively shape the reasons for which wars are fought, the ways they will be fought, the actors involved, and the capabilities employed.

FOE 2035 does not seek to describe the future precisely. Rather, its aim is to accelerate and deepen thinking about force planning across Defence. It is a primary source of the military problem addressed by the Future Joint Operating Concept and translated into follow-on force development activities. FOE 2035 encourages us to examine a range of future scenarios, and sets the context for how we might best conceptualise the Future Force in defence of Australia and its interests.

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Vice Admiral
Vice Chief of the Defence Force

Contents

Foreword iii
Executive Summary 1
Broad Trends 1
Warfighting in the Future Operating Environment 2
Opportunities, Challenges, and the Context of Conflict in 2035 2
Introduction 4
Purpose 4
Review Cycle 4
Scope 4
Method 5
Part 1: Understanding the Broad Trends and Change Agents 7
People and Culture 7
Population 7
Urbanisation 7
Migration 8
Identity 8
Globalisation 8
Climate and Resources 9
Climate Change 9
Natural Disasters 9
Economics and Governance 10
Economics 10
Governance 10
Non-State Actors 11
Coercion 11
Geopolitical Trends 12
United States of America 12
China 13
Japan 13
Indonesia 14
India 15
Major power interests in the Pacific Ocean 15
Territorial disputes in the Pacific Ocean 15
Southeast Asia 16
The South Pacific 17
Technology 17
Information 18
Emerging Technologies 19
Space 19
Cyber 20
Part 2: Warfighting in the Future Operating Environment 21
Command and Control 21
Situational Understanding 23
Force Projection 24

Force Application 25
Force Protection 27
Force Generation and Sustainment 28
Part 3: Opportunities, Challenges and Context of Conflict 30
Opportunities 30
Challenges 31
Contexts of Future Conflict 32
Violent Ideological Competition 32
Threatened Australian Territory and Sovereignty 33
Antagonistic Geopolitical Balancing 34
Disrupted Global Commons 35
A Contest for the Information Environment 35
Environmental and Humanitarian Crisis 36
Future Areas of Analysis 36
Conclusion 38
Annex A: Conceptualising Alternative Futures 39
The Multilateral World 40
A Multilateral Future Narrative 40
Causal Drivers 41
Indicators 41
Threats 41
Opportunities 41
Contexts of Conflict – Multilateral future scenario 42
The Multipolar World 43
A Multipolar Future Narrative 43
Causal Drivers 43
Indicators 44
Threats 44
Opportunities 45
Contexts of Conflict – Multipolar future scenario 45
The Networked World 46
A Networked Future Narrative 46
Causal Drivers 47
Indicators 47
Threats 47
Opportunities 48
Contexts of Conflict – Networked future scenario 48
The Fragmented World 49
A Fragmented Future Narrative 49
Causal Drivers 50
Indicators 50
Threats 50
Opportunities 51
Contexts of Conflict – Fragmented future scenario 51
Endnotes 52

Executive Summary

1. The *Future Operating Environment: 2035* (FOE 2035) is an initial step in the force design process. It provides context for the *Future Joint Operating Concept* (FJOC), which provides in turn broad force design solutions to questions of how Australia's Strategic Defence Interests might be secured in a rapidly changing world. Describing how the future might look is the role of the FOE.

2. Part One of the FOE 2035 describes a number of trends likely to shape the world over the next two decades. These canvass the evolutions of societies, populations and cultures, climate and resource usage, economics and governance, geopolitical alignments, and technology. Part Two provides an analysis of the change agents and trends that will impact upon the nature and conduct of future warfare and military operations. These are examined through the six joint warfighting functions: command and control, situational understanding, force projection, application, protection, and force generation and sustainment. Part Three considers how the factors in Parts One and Two could interact to produce opportunities, challenges and contexts of conflicts for the Future Force. In order to maintain currency with these factors, the FOE (and FJOC) will be reviewed every two years.

Broad Trends

3. **People and Culture.** Over the next two decades, the populations of the world's least developed nations will increase substantially and, conceivably, will serve to increase those nations' productivity. Economic circumstances may improve as a result, though tensions associated with increasing inequality and the risk of internal instability may also increase. Several Pacific nations are likely to experience significant population increases coupled with modest economic growth. Large-scale population movements across national borders are likely to remain a feature of the international landscape, and population movements within countries will continue to fuel urban growth. Rapid population growth, unregulated urbanisation, economic inequality and endemic poverty can work to diminish state capacity and resilience. As a consequence, the Future Force may be required to perform a range of regional stabilisation operations.

4. **Climate and Resources.** Changes associated with the Earth's warming will introduce significant risk into the security environment in the period to 2035. It will reduce the availability of basic resources in many regions of the world, exacerbate existing environmental stresses, and increase the risk of extreme weather events. Climate change is likely to exacerbate existing scarcities of food, water, fibre and arable land and intensify international migration pressures. These factors may increase humanitarian assistance and disaster relief deployments as well as stabilisation operations. Climate change is likely to impact on the infrastructure required to support ADF operations and may complicate collective training exercises. It may also complicate the physical operating environment itself if weather conditions exceed platform operating constraints or deny domain access in unpredictable ways.

5. **Economics and Governance.** A combination of global population growth and increases in productivity is likely to see an average world GDP growth of about 3.5% in the years to 2035. Increasing prosperity within the region will translate into increased military modernisation. These trends are likely to erode the technological advantage currently enjoyed by the ADF. The importance of non-state actors is likely to increase, with greater participation

by individuals, cities, non-government organisations and non-state actors in global and regional governance regimes and global financial and commercial orders. The legitimacy of armed force may change in consequence, as may the actors empowered to use it: armed force is already being re-privatised in many parts of the world.

6. **Geopolitical Trends.** The US will seek to remain engaged in the Indo-Pacific and maintain the complex of rules, institutions and values that have supported prosperity in the Asia-Pacific since 1945. The East and South China Seas will remain potential flashpoints for confrontation between China and the US, and the future of the Korean Peninsula is both uncertain and potentially subject to rapid and dangerous change. The South Pacific is unlikely to benefit substantially from the Asia-Pacific's growing economic power and will continue to display levels of state fragility. Australia will be expected to contribute to missions designed to maintain the current rules-based global order.

7. **Technology.** The centrality of data and information in warfighting will be further consolidated. Emerging technologies—robotics and artificial intelligence, for example; or bio- and nano-technologies, quantum computing, and energy storage and distribution technologies—will both increase and challenge the capability of the Future Force. Space-based assets and capabilities will remain critical. Cyber capabilities will continue to increase in importance, placing greater emphasis of the consequences of network exploitation, degradation, disruption and / or destruction.

Warfighting in the Future Operating Environment

8. Though geopolitical rivalry, popular grievance, ethnic or religious difference or the pursuit of extra-legal advantage will continue to spark conflicts, the confluence of technological development and changes in the rules of war will be a singular factor in determining how the Future Force will fight. As a fundamental driver of social and cultural change, technological development will transform the weapons of war as well as the communities that wield them. At the same time, and as they have in the past, social, cultural, ethical values will shape the legitimacy of employing certain technologies in armed conflict. These values will not be universal.

Opportunities, Challenges, and the Context of Conflict in 2035

9. The future operating environment will present both opportunities and challenges to the Future Force. To take advantage of the opportunities and successfully confront the challenges, the ADF and the Australian Defence Organisation will need to evolve and adapt across each of the inputs to capability.

10. The Future Force will benefit from its history as a practiced, professional and ethical military force. It will find opportunities in a diverse Australian society that continues to value ingenuity, entrepreneurialism, creativity and a determination to succeed. Opportunity will flow from an ability to adopt technological innovations and adapt them to the tasks at hand. The development of deeper military-to-military relationships within the region will also generate opportunities to increase the effectiveness of the Future Force, as will the development of strong government-civilian partnerships.

11. However, the Future Force will be challenged by increases in adversaries' technological capacities and the proliferation of cheap and lethal systems and devices. It will be challenged if access to the global commons is disrupted by actors seeking to exert influence and wield strategic power, and through unchecked erosions of the legitimate use of military force. Given these opportunities and challenges it is anticipated that the Future Force will require a diverse set of capabilities—some of which are not currently available in the Joint Force.

12. **Context of Conflict.** Violent ideological or identity-based conflict will remain a challenge to all three of Australia's Strategic Defence Interests.[1] Australia's social resilience and internal security will be challenged if disaffected members of our population are radicalised and if acts of violent spectacle become routine. Heightened competition may see actors use coercive strategies to influence Australia's decision-making in an effort to secure natural resources. Challenges to the influence of the United States and disruption of the current global rules-based order have implications for all three Strategic Defence Interests.

Introduction

13. The purpose of war is to impose one's will on an adversary and to compel their compliance. War is therefore considered enduring, as is conflict and competition in society more broadly. How war is conducted is as much a social and cultural behaviour as it is a strategic and political behaviour, and as such has a variable character.[2] In this way, the continuum of war, conflict and competition are all influenced by society, as society itself changes and evolves.

14. The character of future warfare and the instances of conflict are governed by the same trends driving social and cultural change. Likewise, the pursuit of more effective ways of warfare can drive technological advancement, and the character of war can influence societal change. These trends change both the means available to conduct war, and the circumstances and conditions likely to be encountered by future military forces.

Purpose

15. The FOE's purpose is to explore the operating environment out to 2035 in order to inform ongoing force design against an unpredictable future. The document seeks to extend thinking beyond extant guidance and challenge current norms. With this in mind, the FOE is based on the following assumptions:

a. Australia remains a territorial nation-state based on Westphalian premises.

b. Australia's Strategic Defence Interests, as articulated in the *Defence White Paper 2016*, remain broadly extant.

c. There remains an accepted role for Defence in the preservation of those interests.

Review Cycle

16. To ensure currency and capitalise on emerging opportunities, the FOE will be reviewed every two years. It is intended that the FJOC is reviewed in the same timeframe. The FOE review process will include a series of 'deep dives' on topics of specific interest to Defence including global and regional power dynamics, violent extremism and climate change.

Scope

17. Though Australia's Strategic Defence Interests are global in scope, the geographic focus of this document is maritime Southeast Asia, Papua New Guinea and the South Pacific. This is not only because a majority of Australia's defence interests lie within this area, but also because this regional orientation will complement the geographic orientations of publications produced by the US, the United Kingdom, Canada and New Zealand, in which the security environment beyond the Indo-Pacific is more widely explored.

18. The FOE looks out to 2035 through a three-part approach. Part One examines the agents of change moving across social and environmental sectors and identifies trends likely to influence and shape the operating environment. Part Two adopts the perspective of the Future Force and contextualises the ways that the trends identified in Part One might

influence the six joint warfighting functions. Part Three considers how the factors in Parts One and Two might interact to produce opportunities and challenges for the Future Force.

Method

19. The FOE considers the features of the future environment and the implications of these factors for Defence. In consultation with stakeholders, Defence identified two driving forces within the international security order that held both the greatest importance for the nature of that order and were at the same time the source of greatest uncertainty within it. These forces comprised, on the one hand, the actors with power enough to act strategically within the international security order and, on the other hand, the nature of the interactions between them (i.e., whether they would act in support of a cooperative international order, or whether they would act in a manner that imports into that order a significant level of sustained, 'zero-sum' competition.

20. These two drivers were then used to construct a double-variable framework to guide the development of four alternative futures. This approach, which works to structure a future 'possibility-space', has become commonplace since its adoption by the Intergovernmental Panel on Climate Change in 2000.

21. The method creates representations of alternative worlds and offers an inclusive and systematic way of thinking about what the future might look like. It goes beyond a single best estimate, or a 'high' and 'low' projection either side of this, to encourage the exploration of a number of different, logically-consistent pathways. In this document, it is intended that the four alternative futures provide a series of lenses through which the implications of the dynamics set out in the FOE might be considered. The alternative futures are set out at Annex A (page 39); in brief they are:

a. The **Multilateral World.** A context in which states remain the most influential actors and interact with a view toward strategic cooperation. Globalisation continues, and multilateral institutions are adapted to the shift in the global balance of power.

b. **The Multipolar World.** A context in which states remain the most influential international actors, but interact in a highly competitive manner. International relations reflect the strategic rivalries of great powers.

c. **The Networked World.** A context in which states and non-state actors with comparable strategic weight cooperate to shape the global order. The prevailing world order is non-polar and unpredictable.

d. **The Fragmented World.** A context in which states and non-state actors with comparable strategic weight compete to shape the global order to their own advantage.

22. The following section of the FOE sets out a series of trends considered likely to influence the character of future conflict. It also considers the characteristics of actors in the future strategic environment. How these trends and actors might combine is impossible to say; however, the four alternative futures furnish a series of possible combinations, both optimistic and problematic. The FOE is not designed as a forecast: instead, it provides alternative futures to encourage thought about how key trends might interact and affect the

nature and character of warfare. From this perspective, the alternative futures have a key role to play in further analysis of the future operating environment.

23. The set of alternative futures will also be fundamental to the task of revising the FOE throughout 2017-18.They will form the backdrop to questions of how the ADF will need to operate, in a range of settings, to realise Australia's Strategic Defence Interests. In turn, this will assist with questions of where force planners might most prudently hedge against possible shocks and discontinuities.

Part 1: Understanding the Broad Trends and Change Agents

24. The Future Force must be capable of understanding and shaping the emerging strategic environment according to policy and responding to the nature of conflict even as it evolves. This section examines the agents and drivers of change that may affect the incidence and character of future war across five core sectors: People and Culture; Climate, Resources and Energy; Economics and Governance; Geopolitics; and Technology. Force design can then position the ADF to adapt to and take advantage of future environments as they emerge.

People and Culture

Population

25. Much of the population growth that will occur in the next two decades will take place in the world's least developed states. Populations of many developing nations are growing quickly, a circumstance which may enhance developing nations' economic prosperity and power. Realising this outcome, though, will require sustained domestic investment and trade policies embedded in sound, rules–based regimes of economic governance. The effectiveness of governance structures will play a central role in raising or lowering the threshold of conflict.

26. In some instances, such as in Papua New Guinea, Timor-Leste and the Solomon Islands, significant increases in population will combine with very low median ages and economic stagnation. States with large youth populations are often unstable, prone to violence and armed conflict particularly where economic prospects are low.[3] Existing patterns of social disadvantage within the region are expected to continue out to 2035, with governments unable to harness economic growth because of entrenched corruption, cronyism and ineffective governance. This could exacerbate social and cultural animosities, with ongoing internal tension across South Pacific states being likely.[4]

Urbanisation

27. By 2050, with 5.2 billion urban dwellers, the least developed regions of the world are projected to have 82 per cent of the world's urban population and 86 per cent of the total world population. As a consequence, by 2030 the number of people living in informal settlements or slums is expected to reach 1.7 billion. These settlements will be highly vulnerable to natural disasters and the impacts of a changing climate. Few will see effective governance; failed or 'feral' cities may result. Slum conditions create a range of economic, social, physical and legal vulnerabilities for their inhabitants. Consequently, megacity slums can generate instances of insecurity that can take the form of ethnic rivalry, cultural grievance, criminality and religious extremism where the state lacks both popular legitimacy and a monopoly over armed force.

28. Operationally, megacities and megacity slums present complex challenges. Natural disasters can devastate city systems at a scale beyond local authorities' capabilities and trigger high levels of violence and unrest, complicating reconstruction efforts.[5] Moreover, the nature of armed violence in a sprawling urban context is characterised by multiple lines of approach, dense assemblies of structures and signals, short lines of sight, and the likely presence of significant and heterogeneous non-combatant populations.[6] These environments will show dense networks of connectivity, noting that two to three billion more mobile internet users can

be anticipated within the next decade or so. In addition, very large networks of devices will come together in systems designed to improve service delivery. These will be vulnerable to subversion and attack, with unpredictable consequences for deployed joint force elements and for the adversaries they face.

Migration

29. The permanent migration of people across borders continues to accelerate, propelled by a quest for economic opportunity, the consequences of a changing climate and natural disasters, and seemingly endemic violence and conflicts.[7] Human mobility is higher now than at any other time in history, and a key question for international security is whether this trend proceeds in an orderly or a disorderly manner.

30. Transnational migration can disrupt established patterns of culture, politics and economics, and create the conditions for a variety of social dislocations.[8] Uncontrolled, large-scale migration can also spark conflicts at a distance, as the spread of ICT devices in the less developed regions of the world will enable diaspora communities to maintain contact with their communities of origin. This circumstance could complicate the integration or accommodation of migrant communities, and generate self-contained 'virtual' communities across continents.[9] Large, heterogeneous populations will also be vulnerable to conflicts based on identity—ethnic, religious, historical, political or socio-economic.

Identity

31. The rise of social media has been linked to changes in the way people interact. The internet will continue to enable devolved political interaction, increasing individual power and influence, and supporting the promulgation of niche political views.[10] By 2035, individuals are likely to define themselves less by their nationality than they do today. Globally, the state may become of less relevance to the individual, due to the movement of people, information and ideas across national boundaries and the ongoing consolidation of strong virtual communities. As individuals feel less connected to the state they reside within, they are also likely to become less interested in supporting it.[11] Conversely, a rejection of globalisation and increased prioritisation of national security may contribute to increased nationalism. Religion is, however, likely to remain a significant component of many people's identity. Vastly increased access to information and communications technologies will enable religious groups to unite diaspora populations and appeal to a wider audience than previously possible.[12]

Globalisation

32. The future of globalisation is uncertain. The benefits of globalisation have not been evenly distributed either within or between developed and developing countries. It is likely the gap between countries and individuals that benefit economically, technologically and socially from globalisation, and those left behind, will continue to widen. This will fuel perceptions of comparative disadvantage and injustice and may continue to drive opposition to the Western Democracies that promote neo-liberal economic policies. Conversely, states that oppose democratisation may be characterised as non-liberal zone[s] of violence, injustice and chaos and become, in turn, the subject of a variety of interventionary actions. As a proponent of the liberal rules-based global order, Australia may find itself engaged in conflicts that emerge in the gap between the core Western liberal states and the others.

33. Continued globalisation will shape many dimensions of the ADF's future operating environment. A globalised operational environment already generates adversaries who neither function as a single discrete entity nor pursue a linear campaign plan. Instead, highly decentralised adversaries will continue to pursue operations in a discontinuous series of theatres. Planning that relies on single 'centres of gravity' will be challenged by globalised conflicts where adversaries can operate strategically in distributed networks without being linked to a centralised authority.

Climate and Resources

Climate Change

34. The World Economic Forum's Global Risks Report 2016 identifies "the failure of climate change mitigation and adaptation" as the most consequential risk for the years to come, as well as one of the most likely.[13]

35. Climate change is forecast to reduce the availability of basic resources in many regions of the world. Rising temperatures and changes to rainfall patterns will reduce crop yields, contributing to higher food prices and unsettling the balance between supply and demand.[14]

36. Climate change will exacerbate existing environmental stresses and patterns of competition over fresh water, food and energy.[15] Increase rates of glacial melt in the Himalayas, for example, have potentially profound implications for many Asian communities that depend on the river systems that originate in the mountains. Scarcities of water, food and arable land could see increasingly desperate populations fragment or turn to challenge their governments, enhancing the risk of violent conflict in either case.[16]

37. Climate change will bear on (inter)national security to the extent that it exacerbates economic or political competition within or between states. It will challenge the capacity of states to govern, generate risks in terms of access to basic resources (food and water), exacerbate existing inequalities and influence national and cultural identities.[17]

38. Some states in the Asia-Pacific may come to regard food, water and energy security as issues of national survival, and may turn to coercion to further their national interests. Demographic and environmental pressures, however, are considered unlikely to cause international conflict provided that global markets operate freely and regulatory regimes are considered as legitimate.[18]

Natural Disasters

39. As a result of climate change, Asian countries face greater exposure to tropical storms and typhoons, floods, forest die-back and increased fire risk. Sea-level rise will cause large-scale inundations along the Asian coastlines and threaten the livelihood of large, economically significant communities.

40. Weather events and natural disasters of greater frequency and severity will increase demands on the joint force and other government agencies to provide humanitarian and disaster relief assistance within Australia, our near region and globally. Large-scale population movements may see joint force elements deployed in stability operations overseas

or border protection duties closer to home. The depletion of fisheries and the southwards migration of many fish species may see ADF units performing a wider range of surveillance and constabulary operations in colder southern waters.

41. Climate change has the potential to reduce energy security in Australia. High levels of global warming will increase electricity demand during summer, placing stress on networks and conceivably resulting in failures and blackouts. These factors may impact on key ADF mounting bases and the resilience of critical infrastructures and services. Australia will also be increasingly vulnerable to flooding due to the intense rainfall events driven by a warmer, wetter atmosphere, with consequences for military bases and infrastructure, training areas and mobility. Climate change has implications for both the type and frequency of ADF roles and missions, potentially increasing concurrency pressures.

Economics and Governance

Economics

42. The world's economic centre of gravity is shifting from West to East, and North to South. Global economic growth to 2035 is projected to be about 3.5% per annum, leading to rapid income growth in Asia and, to a lesser extent, Africa and South America. If realised, this circumstance will see billions of people transition from poverty into the global middle class.[19] The rapid growth of the global middle class has important implications for resource and energy demand and consumption. If the new middle-class entrants find their new status at risk or begin to slide back towards impoverishment, they may mobilise political forces difficult to contain.

43. Asian economies are likely to continue to transfer greater resources to military modernisation, and regional dynamics may work to accelerate this trend as well as promote certain capabilities (submarines and anti-access and area denial systems, for example) over others. The effects of regional military modernisation programs are likely, though, to vary significantly given wide variations in national funding bases and existing capabilities.

Governance

44. The structures of global governance will continue to be of fundamental importance in shaping relations between states, and between states, cities, multinational corporations, super-empowered individuals, and a range of non-governmental organisations. The existing order may come under increasing pressure as newly-emergent market economies seek larger and more equitable roles in the western-dominated global organisations established after 1945: the World Bank, the International Monetary Fund, the World Trade Organisation and the Financial Accounting Standards Board. A redistribution of this sort can come only at the expense of the Western states, which are unlikely to relinquish voluntarily their inherited power and institutional dominance. Failure to integrate Asian economies into existing regimes of global economic governance may result in competing global systems and accelerate the growth of exclusionary regimes of regional governance. This circumstance has implications for the stability and coherence of the existing rules-based global order.

Non-State Actors

45. Global governance is expected to become more complex with the increasing participation of technologically-skilled individuals, non-governmental organisations, multinational firms and sub-national actors. This may decrease the legitimacy of international institutions if they are unable to keep pace with political, economic and demographic change. The increasing involvement of private or state-owned companies and non-governmental organisations in transnational governance regimes creates the potential for fluid forms of complex sovereignty, where boundaries between global and domestic politics and policy are unstable if not transitory. In these circumstances, political authority will be much more widely diffused and anchored less in territory than in organisations designed to address specific issues. Large private or semi-private companies and non-governmental organisations will continue to grow in number and power, and may become much more influential in national and international decision-making.

46. Armed non-state actors not only challenge the state's monopoly on violence: they also represent a challenge to traditional state-based governance structures.[20] In these circumstances, the ADF will likely confront a variety of conflict types. These may include violent criminality (traditionally treated through policing), terrorism and well-organised adversaries with strategic ambitions and global reach. In failing states, as state capacity to provide public goods declines, and as governments become less able to meet citizens' basic needs, citizens may look to other groups for security.

47. Australian operations in fragile, failing or failed states (however defined) may see ADF units deployed into environments where a wide variety of private military and security actors are operating. These actors may be involved in combat or logistical support, intelligence collection and processing, policing, training, as well as aid delivery, weapons disposals and infrastructure building.[21] They may have been engaged by allied or partner governments; adversary actors, private companies or interests, or even by non-combatant communities. The human complexity of such a battlespace is likely to complicate the deployed force's situational awareness command and control arrangements as well as unsettle applications of the laws of armed combat and rules of engagement.

Coercion

48. While not a new strategy, states and non-state actors may turn increasingly to economic coercion: international economics is now seen through the prisms of national security and foreign policy, and this can be expected to continue.[22] Global economic interdependence has given powerful actors the ability to exercise coercive power through financial means. Potentially, leveraging economic power over other countries may become the foremost element of foreign policy in a tightly interconnected world.[23] In the worst case, international management of the global economic system could falter as actors with divergent interests fail to cooperate in building a more inclusive global economy.[24] In the event that states use economic measures to assert their geopolitical power, global risks may emerge with the potential to affect trade and political cooperation. This would represent a significant reversal of the logic behind Western support of globalisation since the end of the Cold War: the belief that increasing economic integration would translate into more democracy and greater stability around the world.[25]

49. The confluence of population growth, climate change and rapid urbanisation will increase opportunities for the use of innovative coercive strategies by both state and non-state actors. The growth of large cities across the Asia-Pacific, if they develop without adequate infrastructure or effective governance, will create conditions of inequality and near-existential scarcity. In these circumstances, control of basic human needs such as water, food and energy, or security and health services, will give conflict actors a coercive machinery akin to that used by Daesh in Iraq and Syria. In these conflicts, Daesh's systematic and sustained use of water as a weapon is probably unprecedented in modern warfare, and it allowed a group with relatively small combat capabilities to exercise strategic control over disproportionately large areas.[26]

Geopolitical Trends

50. The international context of conflict is constantly changing. Both the absolute and relative strategic weights of key Indo-Pacific states are shifting, as are the places, patterns and subjects of their interactions. The United States seems likely to continue as the pre-eminent global strategic actor to 2035. Though perhaps increasingly constrained militarily, the US will seek to maintain a stable global strategic environment and Australia's defence and national security strategies will continue to be shaped both by shared historical experience, cultural values and strategic outlook as well as the formal terms of the ANZUS alliance.[27]

51. The relationships between the US, China and India will be the most important set of geo-strategic factors shaping the Indo-Pacific region out to 2035 and beyond.[28] Rapid growth in both China and India, and their large and growing demand for energy and a variety of resources as well as their substantial role in managing climate change, will test the resilience of the post-war international order.[29]

United States of America

52. The US will seek to remain engaged throughout the Indo-Pacific out to 2035, but the depth of engagement will vary in response to domestic political dynamics, or a multiplication or intensification of security challenges outside the region. Direct threats to the continental US would likely result in rapid reorientations of US security and defence policy.[30]

53. The US will also seek to maintain the foundational rules and values that have supported prosperity in the Asia-Pacific since 1945: balanced, steady economic growth; integrated yet dynamic systems of trade and investment; and a stable security order subject to an American security guarantee.[31] However, China's re-emergence as the region's "industrial heart and economic hinterland" has forced a division between the region's economic and security arrangements. A substantial number of Asian states, though tied to China economically, are seeking to strengthen security relationships with China's geostrategic rival, the US.[32]

54. Washington will likely continue to seek Australian support for the US' interests in a stable and peaceful order in the Indo-Pacific. Washington will also continue to expect Australia, together with other allies and partners in North and Southeast Asia to assist in promoting stability and preserving established norms. Washington is likely to seek the assistance of its partners and allies—including Australia—to support measures designed to dampen regional tensions, and is likely to engage regional partners and allies both to legitimise major operations and to reduce the US' burden.

China

55. China is currently witnessing a slowdown in economic growth and, as a "'fragile' fiscal superpower," it is unlikely that China will emerge in the next decade as a high-income modern economy.[33] Absent significant domestic dislocations (political, economic or social), China will, though, likely consolidate its position as Asia's strongest military power in the period to 2035. However, the People's Liberation Army (PLA) is unlikely to be able to defeat the US forces in a major conventional conflict, but by 2035 China will be able to constrain US freedom of action in the western Pacific through improved strike, anti-access and strategic deterrence capabilities China's terrestrial and space-based information systems, civilian and military, will become increasingly sophisticated, as will its capacity to destroy and disrupt satellites and related systems.[34]

56. China is modernising maritime-related military and law enforcement capabilities, including its naval surface fleet, submarines, aircraft, missiles, radar capabilities and coast guard.[35] These systems, supported by increasingly sophisticated C4ISR architectures, are intended to support Beijing's sovereignty claims in near waters and deter potential adversaries.[36] Recent land reclamation activities in the Spratly Islands may eventually support sustained maritime law enforcement and naval operations astride Australia's critical trade routes.[37]

57. Preparation for a potential Taiwan conflict remains the primary driver of Chinese investment, but China is also preparing for contingencies in the East and South China Sea. The PLA Navy is being prepared to support China's 'new historic missions' and operational tasks outside the first island chain with multi-mission, long-range, sustainable naval platforms equipped with robust self-defence capabilities.[38] China is also likely to be able to field an integrated carrier air capability within the timeframe of this analysis.[39] PLA Navy surface and submarine deployments in the mid-Pacific and Indian Oceans are likely to become routine over time.[40]

58. Chinese forces are likely to respond with increased assertiveness to US surveillance and other maritime operations around China's periphery. US forces in the western Pacific and forward operating bases are vulnerable to Chinese attack; China will also develop a greater ability to hold Australia's assets and infrastructure at risk.[41]

Japan

59. Japan will seek a role as a major power in the Indo-Pacific incoming years and, in line with the concept of 'dynamic defence' announced in the 2010 National Defence Program Guidelines, is enhancing its ability to respond to incidents short of actual conflict.[42]

60. Japan's underlying strategic imperatives are animated by China's regional ambitions, North Korea's nuclear and ballistic missile programs, a fear of abandonment by the US, and a need to obtain bipartisan political agreement to changes considered necessary for Japan to effectively manage its security concerns. These will probably ensure that the normalisation of Japan's defence policies will remain a long-term trend.

61. Japan will remain a major resource importer in the period to 2035, and is likely to experience varying levels of resource insecurity.[43] A gradual lessening of constitutional restrictions on the deployment of armed forces is likely over the next two decades, but this

may unsettle Japan's neighbours. In Japan's relations with China, for example, economic interdependence has increasingly been obscured not only by strategic tensions but also by deepening mutual distrust and the growing salience of populist politics in each country.[44]

62. Japan's alliance with the US is likely to remain central to national security. Japan may seek closer engagement with India and Southeast Asian states to counter Chinese influence and to deter or prevent other powers from developing or wielding decisive economic influence.[45]

Indonesia

63. The rise of Indonesia over the longer term, and the continued relative strengths of the US and Japan, suggest that the Indo-Pacific region will see the consolidation of a more complicated regional order over the next 20 years.[46]

64. A strong relationship with Indonesia in the period to 2035 and beyond will be a critical component of Australia's defence and national security calculus. Indonesia will be a regional power capable of working in partnership with Australia to address security issues in Southeast Asia and the Pacific, while seeking a greater role in global affairs.[47] Australian efforts to maintain and deepen engagement with Indonesia will face increased competition in coming years: the US and China may become attractive partners given their ability to offer security assistance, military equipment and economic incentives to Jakarta.

65. Successive Indonesian governments have pursued policies of strategic autonomy in international affairs. Indonesia is likely to maintain an active engagement in multilateral cooperative mechanisms at the regional and global levels in order to promote cooperative relations amongst states, peaceful conflict resolution and a cohesive international order. At the same time, Indonesia relies on a strongly realist approach in defence policy thinking, and will seek to enhance its military capabilities and indigenous defence-related industries.[48]

66. Russia and China have emerged as Indonesia's principal arms suppliers, though Jakarta also purchases military materiel from EU nations, the US and South Korea.[49] Indonesia has a variety of military linkages with the US through a series of bilateral and multilateral frameworks, and with regional partners including Singapore, Malaysia and Australia. Indonesian military units also exercise with Chinese special operations forces, and under the terms of the Comprehensive Strategic Partnership (revised in March 2015). Indonesia and China will cooperate on a range of infrastructure, energy and logistics projects; maritime, aeronautics and space initiatives; and defence, security and economic issues, the latter including the implementation of the ASEAN-China free trade agreement.[50]

67. Jakarta continues to face major internal challenges centred on governance, education, infrastructure and logistics, and the implications of climate change (particularly food and water security).[51] Without increased economic growth, Indonesia will struggle to provide employment to a population estimated to exceed 300 million by 2035 while showing a median age of only 33.[52] Indonesia will also remain vulnerable to natural disasters, which will have significant consequences for its population. It is likely that in the event of a natural disaster, Australia will render humanitarian aid and disaster relief, which will be complicated by Indonesia's increasingly dense urban populations. Internal security problems, such as separatist insurgencies or Islamic extremism, may reduce in size and intensity but are likely to persist.

India

68. India will be an important power by 2035, and throughout the intervening period New Delhi will seek to engage with the dynamic economies of East Asia. But India faces internal problems, not least of which is a need for high rates of growth to address widespread poverty. India-Pakistan tensions will remain a source of potential conflict.

69. India seeks to be a major player in the Indian Ocean, and build greater influence in Southeast Asia in order to protect its economic interests, increase its international standing and balance great power influence. India's aspirations to great power military status will bolster its development of a flexible maritime-based capability with reach throughout the region. By 2035, both India and China are likely to have an increased military presence in the Indian Ocean, as both seek to safeguard their access to energy and raw materials in the Middle East and Africa. As the gap between India and China's naval capabilities grow, India may seek to offset this by advancing its maritime domain awareness and becoming better integrated with the US and, by extension, Australia.[53] Beyond the maritime domain, scope exists for an increase in tensions along the land border between India and China in the Himalayas.

Major power interests in the Pacific Ocean

70. The East and South China Seas will likely remain flashpoints for confrontation between China and the US and perhaps allied countries, including Japan. The consequences of such a conflict will depend upon its scale, but could be very substantial. Operations in the Asia-Pacific may see Australian forces operating with forces from the United States, Japan, the Republic of Korea and Southeast Asian partners.[54] Interoperability with a wide range of partners throughout a period of rapid technological change will underpin the Australian contribution.

71. Reunification of the Korean peninsula could unsettle relations between the US, China and Japan. It is likely North Korea will continue to use brinkmanship as a means to gain concessions from the international community as well as to gain recognition as a nuclear state. Conflict on the Korean peninsula cannot be ruled out, but regime collapse scenarios may be more likely as accumulating stresses introduce uncertainties into the regime's future. China may well seek, though, to support the North Korean regime to maintain a buffer against the US-aligned South.

72. Domestic political and / or social instability in North Korea, and to a lesser extent, China, Russia or Taiwan, could unsettle international relations in the Asia-Pacific. Multiple factors could give rise to instability, including economic volatility and / or failure; intensifications of elite competition; nationalistic pressures; and / or zero-sum disputes over sovereignty or territory.[55]

Territorial disputes in the Pacific Ocean

73. Numerous complex maritime disputes exist in the Pacific Ocean. Some disputes are fuelled by resource availability (hydrocarbons or dwindling fish stocks, for example) and competition for control of exploitation. Others enjoin claims over resource-related sovereign rights with claims to territorial sovereignty and show jurisdictional incompatibilities with extant international law.[56]

74. The Kuril Islands (and their territorial waters) claimed by both Russia and Japan, for example, have considerable strategic and economic value. Offshore hydrocarbon deposits combine with deposits of gold, silver, iron, titanium and the rare earth, rhenium, and an exceptionally rich source of fish and seafood production—estimated in 2012 to be worth USD 4 billion annually—to offer significant economic value.[57] Russian control of the Kuril Islands also underwrites Russian naval projection into the Pacific, as the deep channels between the southern Kurils allow Russian submarines to transit to the open ocean underwater. Following Russia's annexation of the Crimea in March 2014, and Tokyo's subsequent decision to join the US-led sanctions regime, the issue appears unlikely to be resolved in the near term.[58]

Southeast Asia

75. The archipelago to Australia's north sits at the intersection of the spheres of influence evolving in the Indian and Pacific Oceans. It encompasses the global trade routes of the Malacca and Lombok Straits, through which 20 per cent of global oil production passes, including 80 per cent of China's oil imports. Over 60 per cent of global shipping passing through the archipelagic sea-lanes is destined for Chinese ports. The strategic importance of these trade routes will continue to grow.

76. China is critically dependent on energy imports to fuel its economy. The most important of these come from Iran and the Gulf States through the Indian Ocean. The stability of Gulf energy exports is vital to China's national security interest, as it is to the US and to Europe. The shipping routes cross the Indian Ocean, transit the Malacca Straits, and traverse the south-eastern Pacific. China has examined pipeline and port routes through central Asia, Pakistan and Myanmar that could reduce this dependence, but such options are uncertain at best and so far increased energy exports from Russia have been the only major new source of energy that bypass the maritime chokepoints.[59]

77. Southeast Asia represents a key area of Chinese economic and strategic interests. It is an area where China and the US will continue to compete for influence; China will also continue to face a range of regional states that will seek to maintain their independence, their access to resources, and their economic influence. Indonesia, Singapore, Malaysia and Thailand all have security ties to the US. They also have important economic ties to China.[60]

78. Within the archipelago, Islamist influences will remain strong, particularly in Indonesia, Malaysia, Brunei, and the Philippines, while unrest in Thailand's south reflects ongoing ethno-nationalist aspirations. The United Nations Security Council, amongst others, has also warned of the serious threat posed to Southeast Asian states by the return of fighters associated with Daesh.[61] Some 900 foreign fighters of Southeast Asian origin were estimated to be in Syria and Iraq at the end of 2015, but this number is likely to be augmented by so-called third country nationals—foreign fighters leaving Iraq and Syria to take up residence in countries other than their states of origin.[62] Terrorism and irregular activity in support of identity-based ambitions remains likely.

79. Military operations against insurgents and separatists will continue in Southeast Asian states, especially Myanmar, Indonesia, Thailand and the Philippines, alongside actions aimed at a range of other non-state actors including violent criminal and armed ethnic groups. The maintenance of a secure and stable Southeast Asia will continue to be a key strategic focus for Australian policy-makers, who will seek to minimise the likelihood of regional

security threats as well as mitigate the use of the region as a conduit for the projection of military force by extra-regional strategic actors, state and non-state.[63]

The South Pacific

80. The South Pacific is unlikely to benefit substantially from the growing economic centrality of the Asia-Pacific and, in the period to 2035, is likely to continue to display high levels of enduring state fragility. Negative environmental and social trends could easily exacerbate state weakness. Requirements for external assistance in maintaining political stability and managing the effects of natural disasters may increase.[64]

81. Papua New Guinea will remain prone to outbreaks of violence to 2035. Most will remain localised but their impacts could be severe in major population centres. Weak governance, limited public sector capacity, a young population with few economic prospects, under-regulated urban drift and endemic corruption will combine to undermine national development and challenge domestic security forces.[65]

82. Operations in the South Pacific are likely in the decades to 2035. South Pacific states will remain burdened with weak governance, fast-growing populations, the potential for ethnic conflict as well as chronic unemployment and crime. Environmental degradation and vulnerability to natural disasters further complicate this picture. Australia will continue to be expected to take a leading role in activities designed to compensate for local incapacity and to prevent police and security forces from being overwhelmed. ADF and Australian Federal Police assistance will likely be called on for evacuations, humanitarian relief or other non-combat tasks. More demanding stabilisation operations are also possible.

83. The most demanding operations will involve large populations and large areas of operations. They involve the potential for conflict with military or paramilitary forces. Papua New Guinea, Fiji and Timor-Leste do not necessarily present challenges of reach, but, poor physical and communications infrastructure, extreme weather and difficult terrain ensure that they continue to present challenging areas of operation.

84. South Pacific states will continue to be vulnerable to influences adverse to Australia's interests, including major power competition or encroachment and transnational criminal activity. The emergence of major power competition or an increasing and prolonged major power presence in the South Pacific would have significant strategic implications for Australia's defence planning.[66]

Technology

85. The advancement and spread of technologies are heightening social aspirations throughout the world. The biological revolution will open new opportunities for combating diseases, improving agricultural productivity, and protecting essential ecological resources. Expanding geo-science capabilities will contribute to the ability of population centres to mitigate or withstand the shocks of tsunamis, earthquakes and floods. Increasingly affordable technology will permit system replacements to incorporate higher-order capabilities, and more capable military-off-the-shelf and dual-use commercial-off-the-shelf systems will become available.

86. Some nations will obtain capabilities that present a disproportionate threat to joint force operations, including highly sophisticated weapon systems that provide a specific operational advantage, such as supersonic anti-ship missiles, advanced fighter-strike aircraft and enhanced anti-armour weapons. At the same time, comparatively low-technology threats such as improvised explosive devices (IEDs), perhaps in combination with commercially available drones and sensors, will also become more sophisticated, and aimed at securing an asymmetric advantage. The greatest threat will be actors who combine strategies of subversion and destabilisation with ambiguous approaches to warfare and combinations of highly sophisticated and low-cost weapons. These actors will have advantages in terms of gaining access to and manipulating the battlespace and exploiting opportunities for gain on a 'prepared' informational landscape.[67]

87. The lethality of adversaries and the corresponding chemical, biological, radiological and nuclear (CBRN) threat from state and non-state actors is expected to increase, including the proliferation of devices incorporating the improvised use of CBRN materials. This in turn leads to a decreasing advantage traditionally enjoyed by Western forces as advanced weaponry proliferates to state and non-state actors.

88. For the Future Force, the most significant areas of technology development are likely to be in areas of Command, Control, Communications, Computing, Intelligence, Surveillance and Reconnaissance (C4ISR); behavioural and cognitive sciences; bio- and nanotechnologies and technologies that increase or facilitate the production, distribution and storage of energy. Vastly increased capacity is already visible in directed energy applications, hypersonics robotics and artificial intelligence. These developments will continue to be of interest to Australian Defence.

Information

89. The place of information in modern warfighting will be further consolidated. Advances in information technology will create new synergies amongst combinations of advanced precision weaponry, improved C4ISR systems and an expanded use of artificial intelligence and robotics. As an enabler of modern warfighting, information and data transmission structures (civil and military) will be an important target in future conflicts, as will the social, cultural and political effects of information itself. Adversaries are likely to deploy weapons designed to deceive, degrade, disable or destroy information, networks, sensors, and communication systems.

90. The full potential of the mobile internet is yet to be realised. Mobile internet has the potential to bring two to three billion more people into the connected world over the coming decade, mostly from developing countries. The prospect of such a vast number of consumers joining in the digital economy could represent an unprecedented growth opportunity; but it could also fuel significant transformation and disruption.[68] Further, the growing Internet of Things—a global infrastructure enabling services by interconnecting (physical and virtual) things based on interoperable information and communications technologies—is unifying the ICT landscape into a vast yet coherent network of technologies capable of communicating and interacting with each other in both anticipated and unanticipated ways.[69]

Emerging Technologies

91. Advanced biotechnologies have the potential to deliver substantially better outcomes for military personnel. Tissue science and tissue engineering may see artificial organs, body parts and / or blood produced from a patient's own stem cells. Implanted devices could monitor vital signs, hydration and blood sugar levels; prompt the subject with warnings or send distress signals; or perhaps even administer drugs.[70] How this type of advance is realised will depend heavily on cultural and social acceptance, as much in Australia as elsewhere.

92. Research and development of bio-inspired, bioengineered materials, and micro- and nano-structure materials are expected to result in a range of new materials and novel material properties over the next 30 years. These will support the construction of superior military systems and platforms and could allow for enhanced protection, health, stealth, energy efficiency and situational awareness.[71]

93. Additive manufacturing will enable adaptation to processes, structures and technologies in response to changing customer needs. Developments in software and computer systems, computer controlled additive manufacturing, and new materials are generating improved ways of making products and providing the means to make superior products. Industry will use agile manufacturing to improve productivity by lowering costs and improve competitiveness.

94. Improvements in battery technology will extend the endurance of portable electronic devices, unmanned systems, vehicles and other battery powered systems by a factor of two to three by 2035. Alternatively, smaller, lighter batteries could deliver equivalent power and run-time as present day batteries. Battery advances will support improved intelligence, surveillance and reconnaissance persistence, network connectivity and situational awareness in the Future Force. The imminent arrival of lithium-water batteries offers low-power, long-endurance subsurface applications in the near-term. With the option of carrying larger power budgets, future soldiers will be able to operate independently for longer, or reduce battery loads while maintaining existing power budgets.

Space

95. Space is becoming increasingly congested and contested. Space assets that enable communications, intelligence, surveillance and navigation capabilities will play an increasingly important role in military operations. Counter-space technologies will pose an increasing risk to space-based systems. Space-based intelligence collection has led to the development of range of capabilities to deny, disrupt or destroy space-based capabilities. This trend is likely to continue.

96. By 2025, the performance limitations of space sensors, platforms and processing technology that currently restrict air and maritime platform detection may be resolved, at least by the top tier of space-faring actors. Beyond 2025, advances in spacecraft attitude control and increased data processing and distribution may permit the development of moving target indicators from advanced space-based optical and radar sensors, which will contribute to global, near-real-time situational awareness pictures.

97. Space-based and ballistic threats emanating from outside the region will present a threat to both joint force operations and critical military and civilian infrastructure in Australia. The drive to maintain freedom of action during a conflict with a space-enabled adversary will probably spur the development of counter-space operations: denial and deception techniques, and kinetic and directed energy weapons.

Cyber

98. The coming decades will see further changes in digital environments and technologies. Cyberspace will continue to extend its physical reach through the growth of 'cyber-physical systems'. Military systems will be increasingly software-defined and reconfigurable using globally-accessible commercial dual-use soft- and hardware, posing both risks and opportunities. (Preparing for activities in space, for example, is becoming more complicated as the lines between commercial, civil and military space programs blur, and technologies with both civilian and military applications become commonplace.[72]) The virtual world is expected to expand as access to information (internet) increases and the flow of digital products and services across borders accelerates in response to a burgeoning consumer market. Increasing interest in internet governance and regulation may lead to fragmented global internet marketplaces depending on the outcome of debates over net neutrality.

99. Cyber capabilities will continue to increase in importance to military operations, increasing in turn the consequences of network exploitation, disruption and / or destruction. Actors will pursue capabilities designed for both attack and defence. Computer network attacks will remain attractive to 'amateurs', including hackers and issue-motivated groups, but the complexity of sophisticated special operations involving applications like Stuxnet are expected to remain out of reach for actors without substantial time and institutional infrastructure.[73] The number of deniable computer network attack operations conducted by states will continue to increase, though attacks designed to cause network destruction will likely remain the course of last resort for state-based actors. They may, however, be the preferred option of non-state actors. Systems targeted by network attack operations are likely to be specific high-value systems, requiring the attacker to have physical or human access to the system.

Part 2: Warfighting in the Future Operating Environment

100. Out to 2035, climate change and identity-based competition may grow as drivers of the contexts and onset of conflict. To the degree that they are 'culturally palatable', though, technological developments will very likely be a primary driver of changes in *how* actors use violence, or the threat of violence, to achieve their desired objectives. As a dominant driver of social and cultural change, technological development and proliferation will transform both the weapons of war and the general conditions of the society involved in conflict. At the same time, changes in social, cultural and political beliefs will shape the manner in which an actor might use technologies for conflict or warfare. Understanding the way that trends and actors might interact in the conduct of future warfare is the focus of this section.

101. The ADF Warfighting Functions are a set of six high-level organisational outputs that work to break down the generality of joint force capability into manageable pieces. The warfighting functions have been designed to be mutually exclusive as far as possible and to provide a simple conceptual scheme that categorises capability systems according to a logic of complementarity and substitutability. Some overlap is unavoidable, however. Conceptualising the impact of trends and actors and trends through these will help focus the preceding information on particular aspects of joint force capability.

Command and Control

102. Command and Control is a cross-cutting warfighting function that enables all others and is based on the ability, at all levels of command, to lead, decide and adapt. The burgeoning partnering of humans with machines has the potential to re-define the scope of command and control in future conflict. Importantly, advances in human cognition and organisational sciences have the potential to aid decision making and adaptation, as does the potential of 'big data' analytics. However, increased capability of networked command and control systems will be balanced by the commensurate growth in capacity to disrupt or degrade those networks.

103. **Deep-learning systems.** Deep-learning systems and human-machine collaboration have potential to assist humans manage large data streams and make better, faster decisions. These systems could be used for indications and warnings in cyber defence, electronic warfare attacks and large density missile raids when human reactions are not fast enough. Human-machine collaboration combines human insight with the tactical acuity of computers by merging humans' creative abilities with the speed offered by artificial intelligence.[74] Such systems may contribute to an improved capability to manage and make use of the masses of data that will be available in the 2035 environment.

104. **Decentralised command and control.** Developments in networked technologies will fully enable the realisation of concepts such as decentralised command and control. Connectivity between systems will remain a key facilitator of command and control out to 2035. The integration of high bandwidth digitised communications equipment may enhance the ability of battlespace actors to cope with the demands of a connected environment and improve coordination within and between established and non-traditional partner force elements.[75] These networks could also enable groups or individuals to mount rapid and unexpected attacks in the physical and virtual domains, in order to achieve symbolic effects through media impact.[76] This would support the operational conditions of decentralised command and control.

105. **Contested narrative.** Digital media, social networking and instantaneous 'reporting' will be ubiquitous by 2035. Skilful media management will allow conflict actors to shape a rival's command and control posture. State and non-state actors will likely have become adept at achieving this shaping effect by 2035. Command structures will therefore need to adapt to use or counter the processes through which narratives are produced, distributed and consumed.

106. **Information and knowledge management.** As more and more devices are added to networks, the volume, velocity, variety and (possibly) veracity of data will grow. Consequently, actors at all levels will seek the automated analytical power required to produce actionable information from otherwise overwhelming information flows. Advances in areas such as artificial intelligence, 'big data' analytics and cognitive and human behaviour sciences are likely to provide a means of exploiting this data.[77] Analytical tools that visualise and fuse multi-source data will also deliver new insights.[78] Such advances will influence the interpretation of the 'mission space' and the development of response options. These technologies may also provide actors with an improved ability to build situational understanding and to reconcile operational pictures, devise plans, and direct operations.[79]

107. **Information assurance.** While great utility may rest in networked capabilities, they could also put significant pressure on network security, reliability and bandwidth.[80] Without effective cyber security, networked devices will increase the potential for operational security breaches. Resilient and robust systems architectures will become increasingly important. Military forces should anticipate operating in a congested and in the "worst case" contested operational environments.[81] Improvements in cryptography, including the application of emergent quantum technologies, may contribute to greater system security and the integrity of information transmission. While quantum encryption systems are very likely to detect intrusion and corrupt the message if intercepted, there may still be vulnerabilities in the hardware ('rowhammering' vulnerabilities, for example).[82] In such cases, quantum computing breakthroughs may then make breaking the encryption possible without further detection. This will create the conditions of pro-active and responsive information assurance activities being required.

108. **Adaptive and meshed networks.** ICT advances at the confluence of wireless communications, internet networks and encryption will enhance communications between actors. These networks could expand automatically and efficiently as the number of devices on the network increases. As they are not controlled from a central point, these networks could be resilient to attack and able to autonomously heal and re-route in order to re-establish connectivity with minimal operator action. Meshed networks are likely to be supported by software-defined radios and cognitive systems that assess the frequency spectrum and available protocols. Metamaterials technologies can employ a narrower bandwidth that allows for a more efficient usage of the electromagnetic spectrum while reducing the possibility of interception or jamming. This will produce ubiquitous yet fluid architectures of connectivity, as networks form and are structured.

Situational Understanding

109. Situational Understanding is the accurate interpretation of a situation and the likely actions of groups and individuals within it. Analysis, knowledge and judgement facilitate understanding, and underpin a commander's ability to make accurate and timely decisions. Technological advances will improve the ability to collect, analyse and disseminate information. A Commander's understanding and ability to anticipate will, however, be challenged by the limits of human cognition and increasingly connected, congested and complex operating environments.

110. The internet, artificial intelligence, machine learning and human machine interfacing could optimise information sharing processes and resource consumption, and improve analytic processes. Sophisticated analysis tools could be used to augment the work of human analysts.[83] Potentially, given the commercial and ubiquitous nature of many of these technologies, it is likely that no single actor will be able to ensure information dominance. Sensor suites are developing in a way that may allow data fusion at the point of collection and the rapid generation of 'rich pictures' with reduced information processing requirements. Data-mining technologies will continue to develop, allowing rapid real-time processing in information-dense environments.

111. **High-fidelity sensing.** Advances in sensing technologies are likely to increase the detection, characterisation and engagement of platforms, systems and individuals in complex natural and urban environments, as well as facilitate rapid assessments of adversary performance and vulnerabilities.[84] Autonomous systems, including the small, self-assembling and swarming robots (currently in prototype form) will present new options for intelligence collection, reconnaissance and surveillance tasks in complex terrain. The same may be true of miniaturised platforms with advanced nano-sensors able to increase situational understanding and unmask manoeuvre.[85] Quantum sensing has application, across all domains, to the detection of objects and platforms that are currently undetectable, or not easily detected. This has impacts on capabilities—such as submarines—that currently derive advantage from ambiguity and stealth.

112. **Impact of climate change on situational understanding.** Sensors will be critical in analysing the impact of weather on operations. The increasing potential for severe weather events underscores this requirement, particularly in situations where force elements are deployed to extended humanitarian disasters. Conversely, adverse environmental conditions are likely to contribute to the increased physical vulnerability of technology. Extreme temperatures and sudden large-scale weather events have the potential to disable and destroy technologies that conflict actors rely on to conduct operations.

113. **Individual targeting.** Biometric technologies will increase in accuracy and employment. Advances in forensic sciences are likely to provide biometrically-enabled and forensically-enabled intelligence.[86] Other biological and genetic technologies could support sophisticated ISR and offensive action through intelligence gathering based on genetic profiles.[87] 'Find-and-fix' missions may use bio-marker recognition to acquire high value targets. The ability to target an individual through their digital fingerprint is also likely to improve.[88] Both force application and force protection are also impacted by this suite of technologies.

114. **Access to space.** Access to space will become less costly as technical developments continue to reduce satellite mass. Satellites of less than 500kg (and as small as 10g) will provide many more users—non-space faring states, non-governmental organisations, educational institutions and even individuals—with low-cost access to space and thus to high-quality intelligence gathering capabilities and earth imagery.[89] Reductions in satellite mass also will also drive significant reductions in the size and cost of launch vehicles, leading to the possibility of 'launch-on-demand' systems that will allow a variety of actors to deploy satellites at operational tempos.[90] Further, developments in launch technologies are enabling the simultaneous launch of multiple small satellites which together comprise a single satellite constellation capable of simultaneous and distributed measurement and greater inbuilt redundancy.[91]

115. Increased access to space combined with readily available commercial means, such as Google Earth, will continue to allow conflict actors the ability to replicate command and control and situational understanding capabilities traditionally only available to state militaries. This will create the conditions of widespread use of space by a variety of actors as well as raising the prospect of space being a congested and actively contested domain.

Force Projection

116. Force Projection is the ability to project military capability in order to shape the views and actions of other actors, and to position forces for manoeuvre. Advances in energy production and storage, autonomous vehicles and human performance all provide the potential to increase the reach and endurance of deployed forces. Advances in long range precision weaponry, combined with advanced sensor networks, will provide the defender the potential to create theatre-sized 'no-man's lands' where attacking forces are exposed to precision weapons and can only operate with a high risk of casualties.[92] The widespread use of unmanned and autonomous systems changes the conditions in which force projection occurs: the threshold for projecting force diminishes if the task of securing human actors is removed. This may result in a wider range of force projection options being available.

117. **Autonomous systems.** Fully-and semi-autonomous maritime, air and ground vehicles will become more affordable and more readily available. This would lead to an exponential increase in the diffusion and dispersion of force projection capability as the task of supporting human habitation in military craft diminishes. Autonomous vehicles and machine intelligence could significantly alter mass transport and logistics. Autonomous cargo ships, package delivery by drone, and globally automated supply chains could all enhance production and distribution.[93] Unmanned combat ground vehicles are likely to be used given rising personnel costs, the sophistication of adversaries' anti-access and area denial (A2AD) capabilities, and the lethality of future battle spaces.[94]

118. **Improved positional precision.** Satellite and portable navigation devices are likely to improve guidance and control. These technologies will rely on the use of hybrid satellite navigation (GPS) and inertial navigation systems (INS), in-flight guidance optimisation, and automatic target recognition. Jam-proof, stable, high-precision and portable INS may provide navigation alternatives in environments where global satellite navigation is denied, thereby enhancing the resilience of a range of navigation, cryptographic, communications and radar capabilities. Better estimates of position and accurate local time would also reduce the time needed to re-acquire GPS signals when they are available. Small-satellites, or UAV systems, could also be used to offset losses to GPS networks. This will reduce reliance on space-based

assets for position information and the increasing accuracy afforded by precision location information is expected to enable a more discriminating application of force.

119. **Sub-surface force projection.** Modern sub-surface capabilities are expected to proliferate within Australia's near region and the wider Asia-Pacific in the period out to 2035. Current anti-submarine warfare (ASW) capabilities are also expected to improve, not least as a function of higher processing power and the employment of robotic systems. Advances in sensor technologies could allow regional countries to detect and potentially counter operations by vessels with very low acoustic signatures. Improved Western- and Chinese-origin submarine-launched torpedoes with increased ranges, enhanced resistance to countermeasures and lower acoustic signatures are expected to become available. The sub-surface environment is likely to become increasingly contested as more actors projecting sub-surface assets and ASW operations benefit from a range of technological advances.

Force Application

120. Force Application is the synchronised use of all forms of tactical action in time, space and purpose to achieve strategic objectives, in whole or in part. Advances in and proliferation of weapons of war mean that warfare will continue to be contested across multiple domains simultaneously. An enduring challenge for future joint commanders will be how to understand and synchronise actions across multiple domains and levels of commands. This situation will be further complicated by the requirement to integrate and account for the actions of other government agencies, like minded allies and non-traditional partners.

121. **Novel weapons: directed energy.** Over the next 20 years, the development of novel weapons will continue, particularly in the field of directed energy weapons.[95] As currently conceived, directed energy weapons could augment or replace traditional munitions. For example, high-energy lasers could provide stealthy, highly accurate weapons that have no flight time, can engage more targets and possess magazines only limited by the weapon platform's energy supply.[96] In addition, high-energy lasers could significantly enhance force and infrastructure protection. The potential of directed energy weapons may be limited by environmental factors (such as bad weather) and the development of adequate energy sources and storage.[97] Improvements in energy gathering, concentration and focused release will support the deployment of increasingly effective directed energy weapons.

122. **Novel weapons: hypersonic weapons.** Hypersonic weapons are oxygen-breathing weapons capable of manoeuvre at speeds higher than Mach 5. They will likely be fielded operationally by 2035.[98] Speed, precision and greater survivability are the primary military advantages of such weapons. Hypersonic cruise missiles and surveillance drones will be equally likely, noting that jet technologies are already highly developed.[99] By 2035, hypersonic missile technology will almost certainly be employed in anti-shipping cruise missiles, surface-to-air missiles and probably air-to-air missiles, increasing the difficultly of intercepting or defeating these weapons as a consequence of their speed and non-ballistic flight path. Besides the US and China, Russia, India, Japan, South Korea are known to be researching hypersonic technologies.[100]

123. **Novel weapons: space.** Weaponisation of the increasingly cluttered space environment is also likely to increase by 2035. Technologies to counter low-earth orbit systems are currently available, and are likely to be further developed. Advances in novel weapon technologies and the spread of conventional technologies could result in greater

capability to deny, disrupt and destroy satellites in low-earth orbit. Space-based systems may face greater risk from kinetic and non-kinetic counter-space systems proliferation. Ground components and radio frequency communications with satellites will be essential and could also be subject to disruption, denial, or destruction.[101]

124. **Improved munitions.** The development of artillery munitions—explosively formed projectiles, for example, and individual targeting units—will improve weapon lethality and reduce the numbers of rounds required to achieve an effect. Enhanced blast munitions are expected to be widely proliferated. Rocket artillery systems will have baseline ranges of 50-200km, increasing to 400km for higher-tier systems by 2035. Advanced mid- and terminal-guidance capabilities will increase the accuracy of close-range ballistic missiles. Advances in missile performance and warheads will continue to increase the range and lethality of anti-armour weapons.

125. **Improved land-based stand-off fires.** Advances in land-based anti-ship missiles, long-range rocket systems, armed unmanned aircraft, and surface-to-air missiles allow land forces to strike deep into air and sea domains, to potentially dominate the sea and air from the land. Gun artillery ranges exceeding 40km will become standard in the region and extended-range munitions may reach out to 60km. Higher-tier self-propelled artillery classes are likely to incorporate improved course correction and munitions technologies, including laser-guided projectiles. Improvements in automation and ammunition technologies will reduce engagement times and increase accuracy. Land attack cruise missiles will become increasingly sophisticated, and by 2035 may feature hypersonic technology, more advanced target discrimination capabilities and reduced vulnerability to countermeasures.

126. **Unmanned and autonomous systems.** Roles for unmanned and autonomous systems are expected to multiply. The operating environments of 2035 will undoubtedly see an increased use of autonomous and semi-autonomous systems, with the breadth and depth of employment constrained by actors' social and ethical norms. Increasing use of unmanned systems will increase the likelihood of engagements between them (for example, an unmanned aircraft could be used to attack an autonomous oil installation). Reliance on fully automated machine-driven decision-making could have a wide range of societal, legal, ethical, and policy implications.[102] Ethical considerations could also constrain some actors from investing in and exploiting the opportunities offered by human performance and augmentation technologies. Moreover, the remote operation of autonomous systems is likely to impact on attribution.

127. **Human-machine combat integration.** Human-machine combat teaming is the process of using unmanned systems to perform operations in conjunction with crewed capabilities. These will enable humans to operate at higher performance thresholds including strength, endurance and reaction. Human-machine combat teaming, assisted human operations and network-enabled, cyber-hardened weapons all hold the potential to provide a competitive advantage in the application of force. Wearable computers could also provide context-sensitive information to enhance memory and physical performance.

Force Protection

128. Force Protection encompasses the measures and means, excepting offensive operations to defeat an adversary, taken to protect the capability of a force. Force protection measures are likely to be much enhanced by 2035, significantly increasing deployed forces' endurance and resilience to occupational and environmental threats. The increased range of ballistic and cruise missile threats will have a significant impact of the requirement for integrated air and missile defence across deployed forces, lines of communication and key sustainment nodes. Likewise, proliferation of low-signature, high-lethality conventional and improvised weapons will likely require increased force protection measures, for both the Future Force and its multi-agency partners, particularly in non-permissive HA / DR environments.

129. **Bio-technologies.** Bio- and nano-technology developments offer a means to detect and monitor the human body. New biomarkers, surgical implants and regenerative medicine through stem cell and tissue engineering applications will continue to develop. Advances in bio-defence technologies offer improved direction and coordination of vaccine development against biological warfare agents and endemic diseases. [103] Advances in bio-technology and additive manufacturing are likely to allow customised replacement of organs, bones, and tissue tailored to the individual's genetic makeup, within limits of ethical constraints. Advances in tissue engineering and regeneration, the development of synthetic blood and improved drug targeting will have application to the protection and treatment of personnel.

130. **Nano-technologies.** Nano-technologies will likely find application in force protection measures across diagnostics, treatments and monitoring. Improvements in nano-technologies could allow the development of multifunctional devices able to detect very small amounts of chemical or biological agents.[104] Advances in 'lab-on-a-chip' devices could also allow very cheap, fast diagnoses of diseases, medical conditions and other events from small samples of blood, urine or saliva.[105] These devices offer to move many diagnostic and analytical activities from fixed and centralised facilities to the field, and to provide real-time information.[106]

131. **New materials.** 'Smart' nano-materials could lead to the development of textiles that detect toxins in the environment and protect the wearer against infection.[107] Smart and interactive textiles could sense electrical, thermal, chemical, magnetic or other stimuli in the environment and adapt or respond to them.[108] Clothing could be developed that will adapt to the environment and self-regulate for temperature and other conditions. Radar-absorbing materials are expected to become lighter and more durable while being adaptable to differing wavelengths.[109] Platform durability and longevity will benefit from advances in materials technologies and manufacturing processes that create stronger, lighter and longer-lasting components and frames.

132. **Autonomous systems.** By 2035, remotely-operated or robotic systems could enable faster casualty recovery and extraction and the delivery of more expert care both on the battlefield. Robotic detection and identification of CBRN material and post-event consequence management could also be particularly important in respect of the proliferation of weapons with the ability to render large areas uninhabitable by humans.[110] The increasing use of autonomous systems provides potential to reduce human exposure to direct combat, thereby contributing to reduced force protection requirements, as well as potentially

simplifying force protection overall.

133. **Improvised threats.** Improvised threats, including IEDs and devices employing the improvised use of CBRN materials, will remain an attractive and effective tool available to state and non-state actors to exploit force element vulnerabilities and secure asymmetric advantage over Future Force elements. Additive manufacturing developments have potential to enhance the effectiveness, affordability and adaptability of these threats, as will dual-use commercial alternatives with legitimate civil applications. Technological developments will permit unanticipated forms of improvised devices, which will pose an ongoing challenge to Future Force protection capabilities.

134. **CBRN threats.** The proliferation of weapons of mass destruction (WMD) will remain of concern, particularly if such weapons fall into the hands of extremist groups. Defensive CBRN technologies are expected to improve over the period to 2035. Conflict actors will continue to face CBRN threats over coming decades from state and non-state actors in areas of possible deployment, particularly the Middle East and South Asia. As WMD programs mature, these threats will be likely to evolve to include enhanced and non-traditional chemical and biological agents, and innovative nuclear delivery systems. State and non-state combatants are likely to seek to improvise CBRN weapons using chemicals and materials within a given battlespace.

135. **Maritime mine warfare.** The strategic importance of uninterrupted maritime trade throughout the Indo-Pacific means that the widespread availability of affordable, easily deployable and autonomously-delivered mines will continue to shape the battlespace. Improved sensor discrimination will enable naval mines to be employed widely, with less risk of collateral damage. Easily-procurable mine warfare capabilities are likely to proliferate, including to states with limited resources and to non-state actors.[111] The proliferation of sea-mining capabilities is of particular concern in respect of maintaining free access to the global commons in accordance with maritime law.

136. **Integrated air & missile defence.** Air defence missile technologies are likely to show incremental performance improvements in the period to 2035. Air defence missiles will predominantly use fire-and-forget guidance technologies to achieve faster reaction times, increased multiple-target engagement capabilities and reduced vulnerability to attack or countermeasures. Long-range (300km and greater) anti-aircraft and surface-to-air missile are likely to be fielded by advanced military powers. The integration of long-range anti-air missiles, phased-array air-search radars, advanced tactical data links and electronic attack systems into destroyer- and frigate-sized vessels will improve regional maritime anti-air warfare capability. These capabilities are expected to pose challenges to military forces operating in maritime Southeast Asia and beyond.

Force Generation and Sustainment

137. Force generation and sustainment is the process of providing suitably trained and equipped forces and their means of deployment, recovery and sustainment and including their preparedness and mobilisation. Technological advances hold the potential to greatly increase the rate and flexibility of force generation and the reach, resilience and endurance of deployed forces.

138. **Human sciences.** Developments in cognitive, behavioural and social sciences will enable more effective selection, recruitment and training. These developments will likely help increase psychological and physiological resilience, through optimisation of performance in terms of effectiveness and health, and innovations in the design of 'smarter' organisations.

139. **Fragmented societies.** More complex identities will change and nature and complexion of social groups as political actors, which will in turn impact upon the make-up of nation-state military forces, including the ADF. Heterogeneous, networked and spatially discontinuous social and political group may increase recruiting difficulties as well as the maintenance of public support for the force. High degrees of population mobility combined with large, tightly connected diaspora communities also have potential to heighten insider threats.

140. **Increased self-sufficiency: manufacture.** Additive manufacturing technologies are likely to change sustainment functions by enabling the building of parts and supplies in theatre. Additive manufacturing could also affect the conduct of disaster relief and reconstruction missions by enabling local communities to print customised parts and maintain their own equipment.[112] Before 2035, it is likely that additive manufacturing will be able to print objects from multiple materials incorporating electronics, batteries and other components (organic tissue, potentially).[113] Very rapid prototyping may also be possible. This will facilitate the production of complex, custom devices quickly and easily, and permit the manufacture of any item for which a design exists and materials are at hand. In turn, this could reduce costs and contribute to increased resilience of nodes and infrastructure.

141. **Increased self-sufficiency: energy.** Developing technologies are offering bioengineered fuel sources and improvements in energy storage. Technologies geared to energy scavenging (from vibrations or footsteps, for example) and *in-situ* generation offer to augment traditional methods of energy collection, storage and distribution. This will have implications for the freedom of manoeuvre and employment of platforms, systems and individuals. It will also offer to reduce a force element's logistics 'tail'. Solar power will be much more prevalent in the coming decades. New materials are expected to make it possible to manufacture cheap, highly efficient solar cells, drastically reducing cost across production, building, transportation and maintenance and significantly lowering solar energy costs.

142. **Virtual and augmented reality.** The expansion and development of virtual reality systems ('virtual worlds') has implications for individual and collective training. Teamed with dense sensor networks for capture and feedback, virtual worlds offer near-real time opportunities for the development of situation-specific tactics, techniques and procedures. Interconnected virtual worlds are expected to already be available by 2025, allowing competencies to be achieved at a level commensurate to live exercises. The networked and sensor-rich environments also offer scope to increase the amount of additional information that can be overlaid the physical environment, in order to provide richer understanding in an augmented reality construct. This will allow for improved training and capability enhancement.

Part 3: Opportunities, Challenges and Context of Conflict

143. This section outlines the way that the trends and actors discussed in parts one and two might interact to produce opportunities, challenges and contexts of conflicts for the Future Force. Each of the six contexts presents drivers of conflict, actors' objectives, consequences of conflict in terms of preserving Australia's SDIs, and the character of conflict overall.

Opportunities

144. **Technological innovation.** Australia will need a culture of innovation to ensure ongoing economic growth and to take advantage of the shift in economic power to Asia.[114] The development of an economy in which science, technology, engineering and mathematics feature prominently, and which rewards innovation, will present opportunities for the Defence enterprise.

145. Defence can actively contribute to the development of a national culture of innovation. In the future, Australia and Defence will transition to sustainable energy solutions: the only question is when. The size of the Defence organisation, its diversity, and its role in society can potentially be leveraged to lead this transformation. Defence can encourage innovation through increased engagement with industry, directly nurturing science and technology research and, through acquisition and sustainment decisions, investment in emerging areas of promising Australian technological development. The benefits to Defence include stronger alliances through research and development programs; access to emerging technologies; and an innovative and technologically-competent recruitment base and workforce.

146. A culture of innovation can more readily transition to a culture of adaptation in times of heightened competition and conflict. A national support base capable of competitive adaptation combined with an effective mobilisation strategy can become a source of enduring military advantage. As Future Force capabilities increase in technological and manufacturing complexity, it is likely that much Defence industry will increase in specialisation or the provision of 'niche' military capabilities. It is also likely that, due to reasons of interoperability and technological advantage, Future Force capabilities will rely on access to allied industry and technology.

147. **Professional and ethical military.** Australian society will continue to require the ADF to prepare for and use lethal force legally, ethically, and in accordance with national and international laws. Its established reputation for professionalism and ethical conduct provides the ADF with a means to maintain the trust of the Australian population, to be seen as a security partner of choice for regional partner states, government and non-government agencies, and to establish new and non-traditional military partnerships. A professional and ethical Future Force provides Government with a wide array of strategic options that balance hard and soft power—a necessity in a connected world where battlefield actions have both a local and global audience.

148. **Military-to-military relationships.** Shared security challenges, regional military modernisation, and partnered responses to humanitarian and environmental crisis provide opportunities to establish and deepen regional and global military-to-military relationships. These relationships will provide an advantage in 2035, across the alternative futures outlined

in Annex A, regardless of the nature of competition or the sources of geopolitical power. When state interests align, they enhancer interoperability and enable coalitions to be formed quickly. During periods of conflict and war, they can provide alternate avenues of strategic communication, and potentially defuse hostile confrontations, as well as prevent misunderstandings and undesired escalation.

149. **Government-civilian partnerships.** The capacity of the state to provide services to the population will be based increasingly on the establishment of government-civilian partnerships. This allows for the provision of services in a more competitive and innovative manner, whilst also encouraging and stimulating industry. An enduring reality of conflict and war is that strategic objectives are never achieved solely through the use of military means. The Future Force can leverage deepening of civil-military-police partnerships in peacetime to develop the relationships, structures, interoperability and processes necessary to effectively operate in a multi-agency environment during periods of conflict and crisis. ADF response options also form part of a broader 'tool bag' of national options including shaping, diplomacy, aid, and rule of law. As civilian actors become more active and capable in security environments the ability to form *ad hoc* coalitions involving civil-military-police actors will both enhance Future Force ability to adapt to the unfolding nature of conflict, as well as placing additional demands for enabling support on the Future Force.

150. **Social Diversity.** The increasing diversity of Australian society will present opportunities, and potentially challenges, to the Future Force. Well managed, social diversity is a source of strength for the military. The ongoing empowerment of women and minority groups within Australian society over coming decades will provide a more diverse population from which to draw a wide range of skills and insights—a development that will better prepare the ADF for operations amongst heterogeneous and highly networked populations.

151. However, diversity within society can be a source of potential fragmentation. Discrimination and social dislocation can increase the disaffection of vulnerable individuals, potentially making them more likely to become influenced by extremist words and actions. Although Australian society is peaceful and rules-based, it is not immune to this phenomenon, and will likely have to continue to meet the challenge that extremism over the coming decades.

Challenges

152. **Technological parity.** Historically, the United States has been able to offset adversaries' military advantages through doctrine, training, and technological superiority; advantages shared by the US' closest allies. In the future, technological superiority may be defined more by ethics than by investment in innovation. Pursuit of military advantage by actors with alternate ethical frameworks through human enhancement, human-machine integration and fully autonomous systems may create a level of capability that may be difficult to match.

153. **Trade Disruption**. Disruption to the flow of trade with allies and in global logistics chains has the potential to compromise Future Force capability. In addition, complex technologies are increasingly reliant on exotic materials such as rare earth minerals. The disruption of global trade in critical or strategic resources, as well as state monopolies on the global provision of key resources, has the potential to also compromise Defence industry and therefore the capability of the Future Force. It is likely that state actors will continue to

threaten to restrict critical trade flows or access to key resources to increase their influence and, in adverse situations, seek to compromise enemy capabilities by disrupting critical flows.

154. **Legitimate military force.** Australian society will continue to scrutinise the use of military force to achieve political and national security outcomes. Globally connected and socially complex populations may question the Government's use of military force and some alliances, particular when Australian security interests are not immediately clear. This may complicate the use of military force and reduce the means by which Government might seek to secure Australia's interests.

Contexts of Future Conflict

Violent Ideological Competition

155. The contest of ideas and expression of personal beliefs remain cornerstones of Australian society and a salient feature of the rules-based global order. However, several groups express extreme beliefs that advocate violent acts against the state and against civilian populations. Perceptions of socio-economic inequality, religious and ethnic rivalry, and failures to integrate immigrant communities create spaces for outbreaks of organised political violence. A robust contest of ideas is a fundamental feature of liberal democracies, but the translation of that contest into violence is unacceptable and challenges the order that guarantees a modern democratic society.

156. Politically-motivated violence is a threat to all three of Australia's SDIs. It will challenge the internal security and resilience of Australia if disaffected members of the community are radicalised. It threatens to destabilise the near region, perhaps fostering 'ungoverned spaces' where radicalised actors are able to prosecute extremist causes.

157. The extent and complexities of the urbanised regions of the Indo-Pacific may strain the capacities of state whilst presenting a challenging operating environment for the Future Force. The failure of legitimate governments to provide security, governance, sanitation and access to food, water and energy may serve to fuel violent protest and conflict. Actors who are a threat to Australian interests may seek a level of legitimacy by providing populations with security, services and resources to undermine legitimate government structures. The primary threat will be from actors who adopt irregular methods to avoid directly confronting our military strength. Different threat categories—military and criminal, conventional and asymmetric, local and global—will continue to merge

158. Domestically, the Future Force will continue to provide support to state and local government services in countering political violence. This may come in the form of direct physical and informational support in the event of a domestic crisis or event. It is likely to include the provision of expertise to other government organisations in areas such as counter-terrorism, information activities, intelligence sharing, and other capacity building activities. Information sharing activities, particularly with the public, will remain essential in order to assure the legitimacy and integrity of any Future Force activities.

159. Regionally, the Future Force is also likely to be involved in assistance activities aimed at building partner capacity. These may include multilateral peace and stabilisation missions, where the ADF is called upon to lead on behalf of the international community. As state and armed non-state groups continue to act through the information environment and

dispersed networks, it is likely that the Future Force will be called upon to increase its ability to cooperation with other regional government and non-government organisations. Increasing the depth and capacity of intelligence networks to identify and monitor extremist groups is likely to remain a priority, particularly as their technological sophistication and counter-espionage capabilities increase.

160. Globally, the likelihood of Australian participation in international actions to counter violent extremism remains high given the number of failed or failing states in the Middle East and Africa in which extremist groups can organise. This raises the importance of ensuring Future Force interoperability with traditional allies and the flexibility to accommodate new partners from both governmental and non-governmental organisations. An adept and effective information operations capability, particularly among foreign influencers, remains essential. The cultural flexibility of the Future Force, as well as language training and regional area specialist skills, are likely to be in high demand.

Threatened Australian Territory and Sovereignty

161. The core role of the ADF is to deter, deny and defeat attacks on or threats to Australia and its national interests. In 2035, Australia will confront an increasing number of actors with the capability and perhaps the will to threaten national interests at home and abroad. Heightened competition will potentially lead actors to use coercive strategies to secure natural resources and influence Australia's strategic decision making. The ability and opportunity for state and non-state actors to employ coercive strategies has implications across all three of Australia's Strategic Defence Interests.

162. In this context, thresholds for conflict and war may well reduce as adversaries become increasingly capable and willing to encroach upon or disregard Australian sovereignty and the freedom of its citizens. Today, direct threats against Australian territory and sovereignty are constrained by international institutions and norms, and deterred by Australian military capability and the the ANZUS alliance. A perception that Australia's military edge has declined significantly, and / or United States engagement and influence within our region has diminished may encourage adversaries to attempt to coerce Australia through the credible threat of violence. This may take the form of threats from conventional military capabilities or irregular threats that blur the line between criminal activity, (dis)information operations and armed force.

163. Australia has a vast Exclusive Economic Zone (EEZ) and enforcing Australia's sovereignty over this maritime domain will become increasingly difficult out to 2035. Incursions by actors seeking to exploit the natural resources within our EEZ—fish stocks in particular—are likely to become more frequent and will require greater and more sophisticated capabilities to detect, identify, track and respond. Disputes over maritime borders and access to resources also create opportunities for third party actors to undermine Australia's influence in the near region.

164. The consequences of natural disasters or a changing climate may accelerate migration rates within the near region, either by itself or in combination with political instability, outbreaks of violence, or political or economic disenfranchisement. People will continue to seek both legal and illegal ways to cross Australia's borders. To maintain Australia's maritime borders, the Future Force will continue to support and conduct multi-agency maritime border protection operations within our EEZ.

165. Where Australian citizens and interests are threatened abroad, the ability to understand the environment and respond decisively will continue to be important. Understanding and shaping requires a combination of trust, presence and a capability to project force. In responding, the Future Force will be required to support multi-agency responses regionally and globally. Evacuation and recovery operations will continue to be core missions for the ADF, and will be reliant upon strong relationships with other nations and their militaries.

Antagonistic Geopolitical Balancing

166. States and non-state actors determined to increase their strategic power will feature in the future operating environment. Australia's security and prosperity relies on a stable, rules-based global order that supports the peaceful resolution of disputes, facilitates free and open trade, and enables access to the global commons.[115] This order is underpinned by the political influence and military power of the United States. Challenges to the influence of the United States or disruptions of the current global rules-based order have implications for each of Australia's Strategic Defence Interests. Australia will continue to risk instruments of national power to maintain the current global order.

167. Conflict and war could occur in this context as powerful and ambitious actors work to maximise their power and influence while moving to limit the freedom of action enjoyed by established global powers and institutions. Conflict is likely to feature actors who are unwilling to risk major escalation through military adventurism but will seek to dislocate sources of deterrence through proxy conflicts or through disruptions of the global commons. Heightened great and regional power competition may lead to open warfare through strategic miscommunication and miscalculation.[116]

168. States and non-state actors seeking an aggressive geopolitical rebalancing are likely to engage in "grey zone" operations. These pursue political objectives through cohesive, integrated campaigns; employ mostly non-military or non-kinetic tools; strive to remain under key escalatory or red line thresholds to avoid conventional conflict; and move steadily toward their objectives in preference to seeking conclusive results within defined timeframes.[117] The central strategic concept of grey zone strategies is to confront the targets with a conundrum. Any one act in the campaign will likely have only limited outcomes, but a military response has the potential to drive escalations and create a crisis.[118] Grey zone operations are not new, but the ability of actors to employ recent and emergent technologies in new ways will challenge to Australia and others who seek to maintain the current global order.

169. Actors will pursue alliances and field offsetting technologies to dislocate the extended deterrence provided by the United States' conventional military and nuclear power. Australia's reliance on extended deterrence may require the development and deployment of forces to deter or counter revisionist actors. Australia's alliance with the United States may lead to situations where cooperation with states and non-state actors in fields such as trade or climate change mitigation may clash with government preferences over the outcomes of third party conflicts. Such conflicts will require the Future Force to conduct targeted operations that support Australia's strategic objective but which do not draw Australia into situations at cross-purposes to the national interest.

Disrupted Global Commons

170. By 2035, the global commons will be more congested and contested than they are now. The commons includes maritime areas beyond any state's territorial waters, and space (typically) beyond the Kármán line (100km above sea level). Additionally, the electromagnetic spectrum should be considered part of the commons, particularly with respect to communications, position, navigation, and timing signals.[119] Violent ideological competition, antagonistic geopolitical rebalancing, criminal networks will all contribute to contest for access to, and control of, the global commons.

171. In this context, conflict and war will likely revolve around the denial of coercion within spaces and places available to all, but owned by none. Australia relies on unrestricted access to the global commons for its security and for economic reasons. As the norms that support the idea of free and open global commons are principally underwritten by the political influence and military power of the United States, Australia should expect to commit military forces to support the United States and other like-minded partners in maintaining open and accessible global commons.

172. Competition between established and rising powers increases the likelihood of great power conflict and open warfare. As a precursor to open warfare, a future arms race may result in adversaries developing fully autonomous systems and assured second strike capabilities. This could lead to unintentional escalations of conflict.

A Contest for the Information Environment

173. Australia's military and security capabilities rely on unfettered access to the information environment. This trend is unlikely to be reversed in the coming two decades. In 2035, like many other developed military forces, the ADF's reliance on a pervasive network of interconnected devices will be significant. Such dependencies will increase the significance of cyberspace to all actors. Access to cyberspace will give actors a significant advantage and source of leverage. The ability to use, gain and assure information within cyberspace will be essential to the ADF's ability to operate and contribute to the securing of Australia's interests.

174. In this context, conflict and war may result from actors' moves to exploit the information environment and influence their adversaries or deny information. Actors in this space will seek to exploit ambiguities in attribution to probe states' network defences, exacerbating issues associated with information assurance and sovereign boundaries.

175. The years to 2035 will likely see a contest between and amongst state and non-state actors to shape the nature of the information landscape. The norms of conduct within cyberspace are still being developed as states and non-state actors seek to define the boundaries between reasonable use and malign exploitation and define and establish rights and responsibilities. The process of defining boundaries within cyberspace and establishing the norms required to understand and govern them presents actors with opportunities to exert influence and intervene in an established rules-based order that may not reflect their interests.

176. Governments and established organisations will seek to assure their access to and protection of information, even as this becomes increasingly difficult. Information infrastructure is vulnerable at the physical level, and as such protection and recovery will be an important undertaking for Defence. Providing a secure and networked information

landscape for operations will remain both an opportunity and potential challenge for the Future Force.

Environmental and Humanitarian Crisis

177. Australia will continue to be one of a number of global actors with the will and capacity to respond to environmental and humanitarian crises. Australia will continue to commit forces to contain or prevent humanitarian crises from generating regional or global instability.

178. Conflict and war may occur in this context when governance structures are unable to cope with political or environmental stressors, or external interference. Conflict is likely to occur in complex and contested environments in which a range of actors' interests compete. Whether the Future Force is deployed to lead or support activities will depend on the nature of the domestic, regional or global mission. Involvements may vary from simple information sharing and logistic support to leading a multilateral force in the provision of essential stability.[120]

179. Trend data suggest that the frequency and severity of crises related to environmental change and disease will increase. Australia will continue to face environmental emergencies that will require a rapid response and recovery on a national scale. Domestically, the Future Force will be called upon to support state and local authorities in the provision of essential and emergency services in instances where civil authorities require and request assistance.

180. Climate change is likely to impact upon Pacific Island nations and other states within Australia's near region. In combination with the trends identified in this FOE, nation-states in the region will remain fragile and susceptible to state failure, and in this context the Future Force will likely continue to be called upon to provide and support humanitarian assistance operations. Regionally, large urban agglomerations (particularly megacities such as Guangzhou, Manila and Jakarta) will pose a significant challenge for the provision of humanitarian assistance. It is likely that provision of aid will simultaneously require security and stability operations.

181. Overall, Australia is likely to continue to be called upon to assist in global relief missions and operations that support the global rules-based order. Humanitarian assistance may consist of both preventative and response operations, either independently or as part of a coalition.

Future Areas of Analysis

182. The FOE identifies trends, warfighting considerations, opportunities, challenges, and contexts of future conflict. Revising the document will involve deeper examination of key areas of the future operating environment. An initial set are detailed below. These topics have been chosen in consultation with the UK Ministry of Defence and to support the development of the Asia-Pacific sections of *Global Strategic Trends—Out to 2050*, as they involve topics of interest to both organisations.

a. **Strategic rivalry in the Asia Pacific to 2050.** Current trends indicate that while the US is likely to maintain global pre-eminence as the world's sole superpower, it will have to negotiate the increased influence of other major powers such as China,

Russia, and India. The nature of the future world order will depend on how these powers cooperate and compete in relation to global issues. A study will therefore be prepared to describe the potential trajectories of particular complexes of strategic rivalry, including (but not necessarily limited to):[121]

i. Russia, China, the United States and Japan.

ii. China, India, Pakistan.

iii. China, Russia and Central Asia, having regard to the potential futures of the Central Asian republics in the context of China's investments in infrastructure and economic development.

b. **Indonesia to 2050.** Not only is Indonesia the world's fourth-largest country, and one of the more successful Islamic democracies, it is likely to become a major regional power with significant economic, geopolitical and geostrategic influence. This study will consider the athways that Indonesia might trace in coming decades against the backdrop of the country's place in a changing Southeast Asia.

c. **Territorial Disputes in the Asia-Pacific to 2050.** This study will consider potential developments with respect to existing terrestrial and maritime border disputes. Examples include the South and East China Seas; the Kuril Islands dispute (Russia / Japan); Jammu and Kashmir; (Pakistan / India); North Borneo (Malaysia / Philippines).

d. **Armed non-State Actors in the Asia-Pacific to 2050.** This study will be comprised of smaller accounts of active insurgencies with a potential to endure. Insurgencies are currently active in Pakistan; Afghanistan; China (Xinjiang, Tibet); North-eastern India; Bangladesh; Myanmar; Thailand / Malaysia; Indonesia; Philippines; Mexico; Colombia. Besides these relatively limited insurgencies, transnational armed non-state actors (Al Qaeda, Da'ish) will be covered.

e. **Climate change in the Asia-Pacific to 2050.** Changes in the human and environmental geographies of the Asia-Pacific will intensify as the processes associated with a warming planet gather momentum. This analysis will examine the implications of a changing climate within the Asia-Pacific, such as they are relevant to food and water security (agriculture), changes in sea levels (urban inundation, degradation of economic centres), the risk of natural disasters, and the potential for conflict onset.

183. In addition to these more detailed studies, elements of this document will be made the subject of desk-top analyses and experimentation. The alternative futures at Annex A will provide the basis for further considerations of the effects that the Future Force may need to generate in order to secure Australia's Strategic Defence Interests. These considerations will indicate areas where future detail may be required to confirm the information already presented, and identify additional exploratory work to be conducted. A more robust and serviceable assessment of the ADF's future operating environment will following from this work.

Conclusion

184. The nature of war is enduring, but its character constantly evolves. Each future conflict will have its own character and present the Future Force with its own military problems. FOE 2035 provides an analysis of the evolving character of conflict. Is a primary source for development of the FJOC, and in turn the design of the Future Force.

185. The future operating environment will be shaped by the interaction of trends centred on people and culture; climate change and the availability of key resources and energy; by the evolution of systems of economics and governance; by geopolitical developments; and by evolutions in a wide range of technologies. These trends will combine to generate scenarios with different degrees of cooperation, competition and conflict. It is surmised that both competitor and non-state actors will continue to challenge the norms, institutions and hierarchy (perceived or otherwise) of the current world system.

186. Exploration of the drivers of change generates six contexts of conflict that describe the possible reasons, consequences and characters of future conflict. Maintaining a secure, resilient Australia, a stable Indo-Pacific region and the rules-based global order will be challenged by violent ideological or identity-based competition and by attempts to breach Australian sovereignty. Maintaining Australia's Strategic Defence Interests will also be challenged by the consequences of antagonistic geopolitical rebalancing, disruptions of the global commons and contests in the information environment. Environmental and humanitarian crises also have the potential to unsettle regional and global orders in ways inimical to Australia's interests. To ensure success within these contexts the Future Force will require a diverse set of capabilities and operational approaches—some of which are not currently available in the Joint Force.

187. The Future Force will be required to operate within and across multiple domains simultaneously. Likewise, conflict is likely to see actions escalated, transitioned, and de-escalated across multiple coercive modalities by a range of state and non-state actors. As a dominant driver of change, technological development will transform the weapons of war and lead to greater military parity amongst a range of actors within our region.

188. The future operating environment will present both opportunities and challenges. FOE 2035 provides an agreed context for the deliberate preparation of the Future Force such that it can take advantage of these opportunities and meet challenges. FOE 2035 will be reviewed biennially and provides a start point for further analysis of topics of interest both to Defence and a range of counterpart organisations. The FOE seeks to accelerate the development of critical future thinking within Defence. Ultimately, the *FJOC* will address this thinking and describe what the Future Force will be required to be and do to protect Australia and its national interests.

Annex A: Conceptualising Alternative Futures

189. The FOE 2035 main document outlines a range of trends across a number of domains. To be useful, these trends need to be synthesised to identify the high-impact drivers within our region. This means developing 'alternative futures' through which potential risks and areas of uncertainty for Defence can be explored. In a complex and interconnected global environment, surprise is not merely probable, it is certain.[122] Trends can and will combine in ways that make the future impossible to foresee. The alternative futures approach, however, provides insight into a range of possible outcomes that can be used to explore the spectrum of future conflict in more detail.

190. **Selection of Axes.** Using a double-variable approach, four alternative futures were developed as conceptual exploratory environments. While technological developments sector will drive changes to key elements of the military capability likely to be employed in future conflicts, the drivers that create the greatest risk lie in the social and governance domains. These will have the greatest influence on the incidence, contexts and ways that conflict will manifest and impact on Australia's Strategic Defence Interests. The synthesis produced two macro-level drivers of change as axes:

a. The evolution of the current Westphalia-based governance model, and

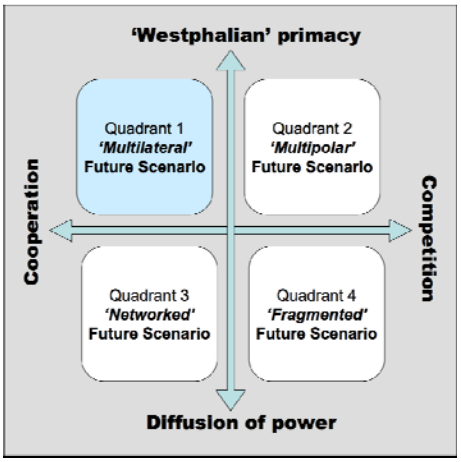
b. The degree of cooperation or competition among actors with strategic power.

191. **'Westphalian' Power Primacy Axis.** The governance model generally accepted in the international context is based on the concept embodied by the Treaty of Westphalia: it assumed a territorially-delineated state with exclusory authority within that territory, and a commensurate monopoly on the legitimate use of violence as an instrument of policy. However, this model is confronted by non-state actors wielding strategic power—once but no longer the monopoly of states—and transnational, 'deterritorialised' social groups united by increasingly ubiquitous information and communications technologies. It is therefore possible that the Westphalia paradigm may change. This allows us to extrapolate the variations of the Westphalia concept; specifically, the diffusion of political authority and the social legitimacy of its forms. One end of the scale, '*Westphalia Primacy*', assumes that political authority will continue to rest primarily with territorial nation-states. At the other end of the scale, '*Diffusion of Power*', political authority is shared among nation states and powerful non-state actors. The complete devaluation of the nation-state model is not assumed, and the state as a political remains an important factor in all alternative future.

192. **Cooperation-Competition Axis.** Social groups both compete and cooperate. Looking at whether relationships are primarily cooperative or primarily competitive allows explorations of a number of different futures. Amongst strategic actors, competition is generally driven by the need for independence and resource security. The potential impact of climate change, increasing populations (number, densities, diversity), increasing urbanisation and reduced availability of water, food and energy, may mean competition increases over time. At the same time, transnational and transregional issues force actors to cooperate despite their self-interests. So the second axis presents engagements between political entities as predominately cooperative at one end, predominately competitive at the other.

193. These two variables, considered in their binary forms, allows the development develop of four alternative futures, illustrated as follows.

The Multilateral World



194. In this scenario, states remain the most influential international actors in a highly cooperative fashion. Globalisation continues, and multilateral institutions are adapted to the shift in the global balance of power. The West still maintains a strong position alongside emerging powers and economies like China, Brazil and India.

A Multilateral Future Narrative

195. The primacy of the state in international affairs is reconfirmed by increased global economic cooperation and the opening of international monetary institutions to emerging market economies and developing states. Preserving the multilateral framework has seen some Western states relinquish or reduce their power to determine the global order. The multilateral framework, however, has delivered diplomatic machinery that has successfully spread the benefits of economic development and growth, slowed the impact of climate change, reduced the likelihood of conflict over access to resources and energy, and preserved the global commons.

196. Concern over the rate of technological change, together with an awareness of social and political vulnerabilities to cyber capabilities, has also brought states together in an effort to minimise the threats to state interests that the cyber environment might otherwise bring about. Not only has this arrangement supported private interests in market-based trade, it has also delivered to the vastly increased middle classes the rises in living standards to which they aspired. In doing so, states have found a means to avert the likelihood of tensions emerging in what have become strongly multicultural populations with divergent identities as a result of substantial regional population movements and the emergence of politically powerful diaspora groups. Some states have experienced population declines; but this has spurred the development of robotics technologies and the introduction of systems that operate largely autonomously.

197. Under this scenario, states have prioritised peaceful economic development and have pursued largely accommodating, though not always amicable, foreign relations with neighbouring powers. Increasing economic integration and the challenges posed by a variety of 'non-traditional' security threats (climate change, for example; as well as pandemics and the proliferation of increasingly destructive weapons technologies) have moved states toward cooperative relations, despite misgivings about the potential consequences of a Sino-centric economic paradigm. However, the United States and its allies share China's interests in handling the increasingly belligerent North Korean regime, and recognise the dangers of a regional polarisation that might have resulted from uncoordinated responses to maritime and other 'global commons' disputes such as those currently playing out in the South and East China Seas.

Causal Drivers

198. Climate change and its environmental consequences are widely recognised as significant transnational threats, as are the consequences of failing states (governance regimes), economic disparity, violent ideology and terrorism and rogue states. Rising vulnerability to networked capabilities leads to an awareness of mutually assured 'cyber-destruction' and orientates powers toward heightened cooperation and rules of the road. Finally, an actual or narrowly-avoided large-scale shared crisis, which is immediately apparent to the bulk of the global population, pushes major powers and influencers toward collective action.

Indicators

199. This future scenario will likely have resulted from a combination of slow-burning problems coupled with some short, sharp and unexpected shocks that have transnational impacts. These events are likely to see social cohesion around state institutions based on geographical necessity. Major crises in food or water security gives credence to threats embedded in climate change. Major states increasingly recognise the benefits of economic cooperation but are still likely to form blocs of like-minded nations. Cooperation is the order of the day and, motivated by self-interest, states cooperate to protect multilateral markets by acting against market defectors (e.g., tax havens) or risks (e.g., piracy). The development and effectiveness of multilateral institutions will be a key characteristic of this future scenario; such blocs are the likely mechanisms for states to act cooperatively. The ability of corporations or non-state actors to influence these institutions or countries directly will provide an insight as to the primacy of the state.

Threats

200. The primary threat to Australia is likely to be external, but will be diffuse, hard to attribute and most likely originate from non-state actors. Defence funding would be uncertain and perhaps seen as discretionary due to a lack of a direct threat. Complacency may arise, which means strategic shocks would be more acute, and capacity for response diminished. An ongoing requirement for regional security structures and interoperability may drive uncertainty in military interoperability requirements, including for Australia – particularly in balancing relationships with great powers such as China and US. The region may, however, benefit from a reconciliation of national interests and a focus on global trade security. Contributions to this order are collective and strong social pressures ensure rules are observed. This future also presents uncertainty in determining which actors set the rules.

Opportunities

201. The peaceful rise of several powers presents an opportunity to build new relationships and networks. The increasing capability and appetite for application of national power by countries such as India and Brazil can allow for defraying of risk and sharing security burden. The rise of India as a continental and maritime power presents an opportunity for an energetic and capable partner in the Indian Ocean, with a likely influence within South East Asia. The growing shared interests between Australia and India presents an opportunity to leverage the rise of a country with significant potential influence in the region. The emergence of Brazil has the potential to consolidate and normalise a South American bloc, with the capacity to positively influence the South Pacific.

202. A cooperative future scenario, with less likelihood of state-based conflict and greater burden sharing, may result in a reducing appetite or requirement for Defence investment as a proportion of national GDP. Heightened cooperation is likely to generate an increase in global defence engagement, resulting in an increasingly supporting role for Defence itself. A decreased role and requirement for Defence may result in an increase to the capability and capacity of other Government agencies, such as the Australian Intelligence Community, Foreign Affairs, Border Protection and AFP, which could enable Defence to focus more on core military roles, as opposed to broader national security tasks.

Contexts of Conflict – Multilateral future scenario

203. In a Multilateral World state cooperation will reduce the instances of major state on state conflict. While urbanisation has been managed effectively in most parts of the region, unequal distribution of the benefits of globalisation will continue to create the space for violent ideological competition. Within this future scenario, conflict and war are likely to occur at the sub-national level as identity networks interact, communicate and resort to promoting irreconcilable ideas through violence.123 Conflict will be characterised by fractured, disaggregated battlespaces with multiple actors competing to manipulate the mental behaviours of target audiences to reconfigure power relations within society to meet their disparate objectives.124 Cooperation between states will result in the formation of ad hoc coalitions to conduct military interventions to restore stability, contain transnational criminal and insurgent networks and promote the primacy of legitimate state governance structures.

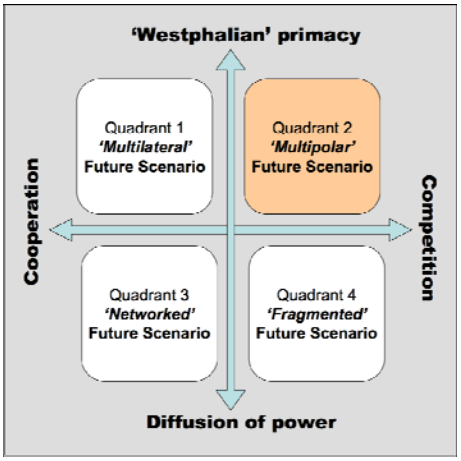
204. Particular contexts of conflict considered likely in this future scenario are:

a. Threatened Australian territory and sovereignty.

b. Violent ideological competition.

c. A contest for the information environment

The Multipolar World



205. In this scenario, states remain the most influential international actors in a highly competitive interrelationship. International relations reflect the rivalries of great powers. Different power blocs form, and the resulting situation is characterised by economic regionalisation, protectionism and competition for scarce resources. Cooperation proceeds with difficulty and largely depends on relations between the great powers.

A Multipolar Future Narrative

206. The state remains the dominant actor in global affairs, but the global order itself is characterised by a steadily increasing level of zero-sum strategic rivalry. Trade negotiations have burgeoned globally. Some are pan-regional, some are regional, and some are bilateral. All or most bypass the World Trade Organisation. The effect has been to consolidate the increasing polarisation of the world, and set the scene for competition between blocs to extend far beyond trade.

207. Political, economic and military competition abounds, driven largely by the failure, or perceived failure, of Western powers to accommodate the political and economic interests of emerging market states and developing countries. Particularly acute is the rivalry between the United States and China, which propels both governments towards efforts to elicit greater support from existing or prospective allies and non-allied powers. This situation results in a process of polarisation affecting virtually every sphere of political, economic, diplomatic, resource and security policy. Governments adopt (or tend toward) more authoritarian settings, partly in response to rising nationalist sentiments, partly in response to increasingly domestic and international instability flowing from sharpening competition over energy and resources, and partly in response to large-scale population movement induced by climate change and economic disparities.

208. In this future scenario, defence and security policy is shaped by expanding and intensifying state competition. Defence spending rises, and powers move to accumulate military stocks. An arms race between the larger powers intensifies, as they vie for control of the Pacific and Indian Oceans, and particularly the sea lines used to ship energy and disputed resources. The arms race extends, moreover, to the space domain as an increasing number of states develop space capabilities and continue to hone their cyber capabilities. As a result of expanding national defence and military capabilities, long-term economic trends and increased nationalism, the potential for a spiralling cycle of interstate distrust and misperception is great. Greater potential for crises over maritime territory and resource disputes is likely, driven in part by increasingly assertive nationalist sentiments. States may continue to use multilateral institutions to manage these risks, but emphasise networks and alliances.

Causal Drivers

209. The United States' pivot to Asia is delayed by Russian assertiveness, particularly in Europe, while China pursues an expansionist course and invests heavily in other countries. Expressions of regional tension and insecurity steadily increase in parallel with growing

Chinese political, economic and military assertiveness and a decline in the United States' relative influence. Technological solutions to climate change are attempted, but it becomes clear that they come at a price – with unwanted side-effects. Meanwhile, climate-induced migration proceeds apace. Strong competition exists for basic resources, such as water, food and energy. Nationalism becomes more prevalent and more strident in response, and states implement protectionist economic policies. In wealthy countries, healthcare improves but the populations continue to age. The current technological advantage enjoyed by the United States and its allies is seriously challenged by China and other nations through intellectual property theft and disruptive developments. It is likely that the internet becomes fragmented as nation blocs seek to control both virtual commerce and information.

Indicators

210. Multilateral institutions struggle to accommodate the shift of the global centre of economic gravity from west to east. A series of political and economic institutions are gradually consolidated: these are developed largely by the BRICS (Brazil, Russia, India and China) and operate to the exclusion of (most) western powers (the United States and European Union in particular). Trade tariffs reappear and states implement stronger controls over information, communications and intellectual property. Nationalism grows, and strong states invest in greater military capability. Smaller states align with major powers. The strong-man leader is likely to be more prevalent, with a resulting decrease in democratic, liberal states. Attempts to mitigate the effects of global warming fail, with disastrous consequences for food and water security for millions. State failure increases. The inability to achieve a global consensus on climate mitigation strategies causes some states to increase research and development of unilateral geo-engineering solutions. This further increases international mistrust and tension. Increased competition will become apparent through the use of proxy forces and ambiguous warfare. The threshold for military intervention is reduced dramatically. States are more likely to resort to coercive action when faced with an external threat. Border security will become increasingly problematic as the flow of refugees increase.

Threats

211. In this future scenario, Australia's strategic interests would depend heavily on the United States alliance and a renewed ANZUS emphasis. Challenges to Australian sovereignty, national interest and border security would increase, with a concomitant rise in nationalistic force posture. Defence's role in international policy and action would likely increase. Pressure to increase Defence spending may also occur to keep pace with a regional arms race. Greater importance is likely to be placed on self-reliance and resilience in managing the rivalry between and within Australia's region. Rivalry is also likely to be increased by a fragmentation and ineffectiveness of regional groupings and the rise of strongmen states.

212. Proxy conflicts characterise aggression between the United States, China and other great powers, within which a clear schism develops between Australia and with other powers including China, as a result of its United States alignment. Continual competition will result in states viewing international relations through a 'balance of threat' lens; potentially, reducing respect for international ethical norms and resulting in unrestrained pursuit of military advantage through human enhancement, biological weapons and fully autonomous military industrial systems.

Opportunities

213. While Australia's dependence on United States support may increase, so to may the United States look to Australia, as a one of a diminishingly small number of trusted partners. An increasing role and importance for Australia in United States considerations may be of advantage to Australia. Similarly, an increasing actuality or perception of threat may stimulate an increase domestically in recruiting and a willingness to fund national defence expenditure.

214. In a competitive environment, smaller nations in Australia's region may be more likely to seek partnerships and alliances to reaffirm their position and national security. As a net security contributor, Australia may benefit from more cooperative local bilateral ententes. More globally, if the threshold for military intervention is reduced in such a competitive future scenario, there may be more prospect and potential for the use and application of military influence. In a competitive future scenario, with a more explicit threat, there may be a greater willingness and freedom of action afforded to the military.

Contexts of Conflict – Multipolar future scenario

215. The nature of great and rising competition increases the likelihood for great power conflict and high intensity warfare. Reversion to a state based realist international relations paradigm; however will increase the importance of sovereignty and just war norms tempering greater capability with greater caution in resorting to violence to pursue national interests. This will likely occur along existing or traditional ally structures, with distinct boundaries between and outside these alliance groupings. There is an increasing likelihood for conflict by proxy to be carried out in areas which are not specifically within an alliance grouping, which in Australia's region could be carried out in South Pacific countries.

216. Particular contexts of conflict considered likely in this future scenario are:

a. Threatened Australian territory and sovereignty.

b. Antagonistic Geopolotical Balancing.

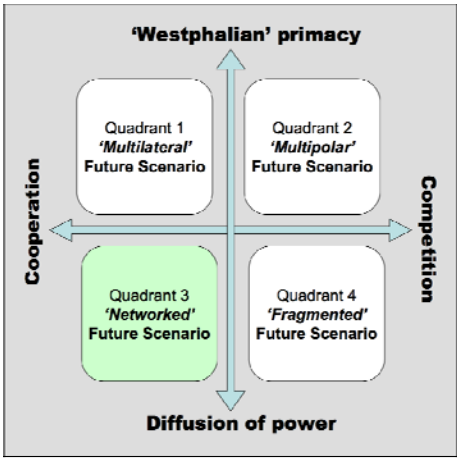
c. Violent ideological competition.

d. Disrupted Global Commons.

e. A contest for the Information environment.

f. Environmental and Humanitarian Crisis.

The Networked World



217. In this scenario, states and non-state actors cooperate to shape the global order. The prevailing world order is non-polar and unpredictable; a diverse range of non-state actors influence global affairs both economically and politically. These actors play an important role in transnational networks. States lose some autonomy as a result of globalisation.

A Networked Future Narrative

218. Under this scenario, non-state actors—multinational corporations, non-governmental organisations, academic institutions, wealthy individuals and megacities—flourish, and have taken the lead in confronting global challenges. The nation-state has not disappeared, but states have come increasingly to rely on orchestrating and coordinating coalitions of state and non-state actors to deal with specific problems. International political and economic regimes, such as those once supported by institutions like the United Nations, have declined in their influence; corporate actors have instead become the key players in maintaining a broad détente between major global and regional powers.

219. A growing consensus between political elites and many of the middle class on the need to address major global challenges (climate change, environmental degradation, pandemic) has delivered this arrangement. In turn, the need for solutions has brought to the fore the capacities of a growing number of countries (e.g., China, India, Brazil) and multinational firms to undertake sophisticated science and technology research in fields such as energy development, pharmaceuticals and advanced manufacturing.

220. Discoveries in nanotechnology, synthetic biology, and earth sciences have delivered new ways to improve human health, provide food and clean water, and warn of impending natural disasters. Advances in robotics, fuel cells, and plasticisers have revolutionised manufacturing, transportation and construction. The speed and direction of technological change has been set largely by private firms and entrepreneurs acting independently of governments. Non-state actors have, accordingly, found a means to enter the security arena and wield a level of influence traditionally associated with states. Coordination is achieved through intergovernmental agencies such as (evolved) World Health Organisation, and the Food and Agriculture Organisation.

221. Nonetheless, this scenario anticipates an uneven societal and political landscape. Global problems are solved where networks are able to coalesce and cooperation occurs across state and non-state divides. In other cases, non-state actors might try to deal with a challenge, but they are stymied because of opposition from major powers. Non-state actors such as international crime syndicates have an opportunity to exert negative influence.

222. Security competition does not, however, feature strongly in the relations between states in this scenario. Instead, most nations concentrate their resources on domestic and social issues and seek to avoid zero-sum solutions to common transnational threats and other issues of concern. In contrast, organised crime has become increasingly militarised and dispersed transnational conflicts based in identity (rather than national vs. territorial ties)

remain of concern. Access to lethal and disruptive technologies continues to enable individuals and small groups to perpetuate violence and disruption on a large scale.

Causal Drivers

223. There are two clear drivers for this future scenario. Firstly, the vastly increased capacity of non-traditional actors to provide traditional state services. While corporations immediately come to mind, the initial breaks are likely to come from megacities that are able to produce state-like powers and global effects. The increased capability of non-state actors allow a greater chance for a 'seat at the table' when global agreements are discussed.

224. The second driver is the increasing social realisation cooperative action is required to deliver global solutions. For example, escalating climate change may lead to the shutdown of North Atlantic Ocean currents, leading to extensive changes in seasonal weather in the Western hemisphere. There is an increased corporate recognition of the need to address climate change if businesses are to be preserved. Global state and non-state cooperation coalesces around the need for energy system transformations and geo-engineering for climate change mitigation. Increasing globalisation leads to elites with global mindsets and a strong interest in cooperation and reduced national identification. A new generation of politicians takes power, with concomitant changes in values (and conceptions of security). Aging populations weaken states relative to non-state actors as a consequence of increased age-related expenditure and shrinkage in national tax bases. Massive people flows triggered by climate change and resource security create incentives for elites to cooperate over otherwise destabilising migration problems.

Indicators

225. Increasing number of challenges to the global order is likely to herald in this future scenario. Accompanying these challenges, a number of alternate global orders are likely to be advance by non-state actors before potentially a neo-UN becomes the successor. Defence organisations are less likely to be the preferred partner with the dominance of private firms within security arrangements. The delineation between state and non-state force is likely to blur, leading to an increased accommodation with non-traditional partners by militaries.

Threats

226. This future scenario would see an increase in overlap between politics and the military; domestic threat responses may increasingly incorporate Defence and its logistic capacity. Heavy investment in information security would require military forces to carefully focus their activities. Australia is likely to be challenged to respond more frequently, to new non-state actors and issue-motivated violence in an environment characterised by high political uncertainty and diffused influences.

227. Determining the identity and source of threats in this future scenario would be considerably more complicated. A significant increase in border crossings and refugee movements would lead to an increase in networked criminal activity, but also the establishment of security frameworks based on trusted partnerships. These partnerships are further based on economic cohesion. Uncertainty would surround the new world order as non-state actors increase their capacity and relative power.

Opportunities

228. The rise of non-state actors with both the ability and societal approval to apply military force can provide an opportunity for government and the military. In a networked future scenario, the preservation of discrete nation-state security interests would also be shared by non-nation-state actors that would profit from secure arenas for commerce or other activity. Australia would be among these nation-states, and could anticipate multiple interested actors to be inclined to contribute towards the sustainment of Australia's national security. In a global context, there would be increasing potential for nations including Australia to prosecute their national security interests through non-state actors. The moral and ethical dilemmas that this presents would need to be carefully weighed.

Contexts of Conflict – Networked future scenario

229. This future scenario would likely see conflict conducted in broad coalitions, comprising state and non-state actors. Conflict is less likely to be peer on peer, with forces coalescing around a central problem as the reason for forming a coalition. State and non-state actors may contribute to a conflict through the provision of force elements or through other support (such as funding).

230. Non-state actors are likely more fluid in their choice of security partners, deciding to provide support or apply force on a case by case basis as suits their interests. As states lose the monopoly on the legitimate use of violence as a tool of policy, their recourse to strategies that apply state military force will be perceived as less legitimate. Conversely, diffusion and proliferation of military like capabilities will increase the instances of both state and non-state actors pursuing strategies that employ coercion and force while remaining in the grey area below the threshold of conventional conflict and attribution.

231. Particular contexts of conflict considered likely in this future scenario are:

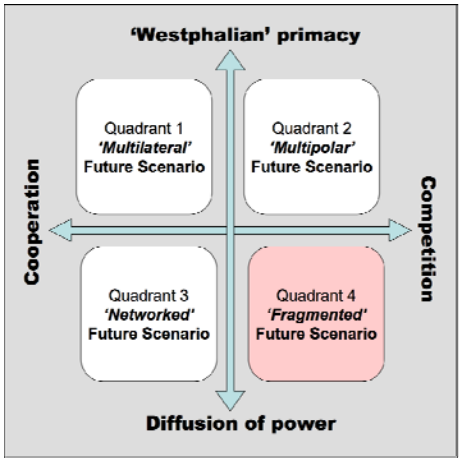
a. Threatened Australian territory and sovereignty.

b. Violent ideological competition.

c. Disrupted Global Commons.

d. A contest for the Information environment.

The Fragmented World



232. In this scenario, states and non-state actors compete to shape the global order to their own advantage. Anarchy dominates. International leadership is largely absent and a lack of functioning global institutions engenders rivalry and conflict between states. Self-interest, nationalism and preservation of identity drive the international system. There is little or no cooperation. It is an unsafe composition of fragile, isolationist states and powerful non-state actors that is dominated by conflict.

A Fragmented Future Narrative

233. Under this scenario, the international system has fragmented and global regulatory systems are increasingly nationalised. Many key global players no longer view multilateralism as advantageous. Sharp competition exists for resources and influence, and potential exists for great power conflict. Rates of economic growth are low. Growth has moderated sharply in China and India as both countries have matured. The United States and Europe turn inward and no longer pursue global leadership. The euro zone has unravelled and Europe is mired in recession. The United States energy revolution has faltered and prospects for an economic recovery are poor. Many states find it difficult to amass the resources needed to meet the challenges confronting them. The world may have been hit by a second global financial crisis.

234. Transnational ideological issues seriously challenge key assumptions of the Westphalian order in the West. Elites are preoccupied with managing the consequences of major, pressing and long-term transnational and non-traditional threats to the safety, health and security of populations. Domestic political and social unrest is episodic but widespread, driven by unprecedented increases in income disparity, urban unemployment, corruption and pollution, which stifle the aspirations of lower and middle-class citizens. The lack of societal cohesion evident domestically is mirrored at the international level. Major Powers are at odds; the potential for interstate conflicts exists but few powers can ignore domestic instability. More countries fail, fuelled in part by the lack of international cooperation on assistance and development.

235. Sub-national actors have an increasingly formal role in government decision making and in some cases deliver critical services to citizens. In the absence of a direct threat to the state, national consensus is difficult to achieve given widespread use of new media to organise powerful communities of interest without regard to national borders. People are intimately connected with distant 'homelands' of families and relatives; diaspora communities exert a considerable influence on national and international policy. 'E-citizenship' provides the possibility of political affiliation with other nations, further loosening associations with the national-territorial state. Organised crime flourishes and there is near unregulated people movement. The world is on course for average global temperatures to rise by 3-4°C by 2100. The Indo-Pacific region routinely suffers storm surges, natural disasters, and extreme weather events, which affects economic activity and societal wellbeing negatively. The international political order reflects the impact of second and third order consequences as climate change works to multiply threats. Climate adaptation measures in place are predominately controlled by non-national actors: (sub-national) state and local

governments, associations of corporations and civil society.

236. Technological advances have given non-state actors, including criminals, the capacity to compete with state actors and deliver effects with little or no warning. Both seek to exploit technological development for asymmetric advantage. Lethal automation (including drones) features in states' conventional military capabilities, as do cyber capabilities targeted at economic and social infrastructure. Genetically-tailored biological weapons and tactical non-nuclear electro-magnetic pulse weapons are also available. Agile manufacturing has empowered non-state actors, and allows them to challenges the state's monopoly on force. These capabilities are diffused amongst state and non-state actors, and private military organisations are common.

Causal Drivers

237. Internet provides rapid, unlimited and unfiltered access to 'raw' information (suggests that the project of pursuing national sovereignty in the cyber domain has failed). 'Unified' authority cannot be supported in the cyber domain and malicious activity cannot be countered. Technological advances cannot support ongoing growth. National states struggle—and sometimes fail—to deliver security from armed conflict as well as natural hazards. Popular confidence in national governments diminishes. Geography is no longer the primary axis of identity. Instead, identity fragments across a variety of interests. Violence motivated by religious differences continues. Inequality increases and is described by some as "islands of privilege in a sea of chaos".

238. Increased capacity within non-state actors have led to questioning of traditional social agreements. A history of failing to deliver and poor stewardship of national resources ultimately lead to competitive leadership models within the corporate sectors and even the creation of mega-cities. Climate change leads to greater scarcity of critical resources; this, in combination with increasing impacts of severe weather events, contributes in turn to population movement. Population movements also result, in part, from a desire for economic gain. However, states seek to resist transnational and, on occasion, internal population movements.

Indicators

239. Increased scarcity of basic resources occurs without appropriate cooperation to share or the promised technological dividends. Multilateral trade institutions stagnate and fail to deliver resources effectively; cartels emerge to control critical resources. Controls against corruption by traditional security forces weaken leading to an increase in lawlessness. Erosion of state power leads, increasingly, to breakdowns in law and order. The incidence of rioting and flash conflicts increases, and states seek to adopt more authoritarian measures. States fail to deliver critical services; privileged non-state actors (commercial or community-based) emerge to service the popular need. Organised violence perpetrated by non-state actors continues and non-state groups prove resilient in the face of sovereign and multinational action.

Threats

240. In this most disruptive future scenario, Australia's primary strategic interest would result in increased domestic threats and increased likelihood of concurrent conflict. High levels of uncertainty may require the mobilisation of the entire Defence architecture and the

economy into conflicts where legitimacy is also uncertain. Such operations will likely occur in information vacuums. The rules of war are not always observed and WMD proliferation is likely. World order may break down and threats will be dispersed. Defence will also suffer a decrease in spending, but with greater expectations placed on its capabilities, particularly in the task of identifying threat and opportunity. United States isolation is likely to have occurred and Australia will have to support its own strategic interests. Increased competition between state, sub-state and non-state actors may affect the ability of the ADF to receive clear government direction. Threats will be significantly increased in the cyber and space domains. Threats in this future scenario will be highly dispersed.

Opportunities

241. With increasingly little constraint to the application of military force, there is an increased freedom of action to pursue interests using military means. While this trend poses a heightening and diversifying threat to Australia, it also proposes a potential opportunity; however, this would only be realised in circumstances wherein Australian society was prepared to countenance an increased inclination for use of force – possibly unilaterally, and without international concurrence or support.

Contexts of Conflict – Fragmented future scenario

242. Conflict will likely be wide ranging in scope and intensity, with those actors capable of high intensity warfighting having little need to constrain its fullest application. Coalition and partnering is likely to be smaller scale and only to occur with immediate neighbours.

243. Particular contexts of conflict considered likely in this future scenario are:

a. Threatened Australian territory and sovereignty.

b. Antagonistic Geopolotical Balancing.

c. Violent ideological competition.

d. Disrupted Global Commons.

e. A contest for the Information environment.

f. Environmental and Humanitarian Crisis.

Endnotes

[1] Australia's Strategic Defence Interests are (1) a secure, resilient Australia with secure northern approaches and proximate sea line of communications; (2) a secure nearer region, encompassing maritime South East Asia and South Pacific; (3) and a stable Indo-Pacific region and a rules-based global order. Department of Defence, Defence White Paper 2016 (Canberra: Commonwealth of Australia, 2016) pg 33. Hereafter 'DWP 2016'.
[2] ADDP-D Foundations of Australian Military Doctrine (2012) para 2.16-2.17; C Gray, Another Bloody Century: Future Warfare (London: Orion, 2005) p.385.
[3] United States Marine Corps, 2015 Marine Corps Security Environment Forecast: Futures 2030 – 2045 (Qantico VA: USMC Futures Assessment Division, 2015) p.17.
[4] "Strategic Risk Drivers in the Indo-Pacific Region to 2035—Implications for Defence" (26 March 2014) p.21.
[5] M Harris *et al*., Megacities and the US Army: Preparing for an Uncertain Future (Arlington VA: United States Army Strategic Studies Group, 2014) p.12.
[6] D Miller Defense 2045: Assessing the Future Security Environment and Implications for Defense Policymakers (Washington DC: Centre for Strategic and International Studies 2015) p.9; Harris *et al*. (2014) p.8, p.1.
[7] A Missiroli *et al*., "A Changing Global Environment." Challiot Papers No. 133 (Paris: European Institute for Security Studies, 2014) p.13.
[8] F Schreier, Trends and Challenges in International Security (Geneva: Geneva Centre for the Democratic Control of Armed Forces, 2010) p.13.
[9] Development Concepts and Doctrine Centre, Global Strategic Trends—Out to 2045 (London: Ministry of Defence, 2014) pp.97-8. Hereafter 'GST 2045'.
[10] GST 2045 p.32
[11] GST 2045 p.86.
[12] GST 2045 p.87.
[13] World Economic Forum, Global Risks Report 2016 (Geneva: World Economic Forum, 2016) p.6. Hereafter 'WEF 2016'.
[14] WEF 2016 p.50.
[15] United States National Intelligence Council, Global Trends 2030: Alternative Worlds (Washington DC National Intelligence Council, 2012) p.iv; hereafter 'NIC 2030'. See also GST 2045 pp.24-5.
[16] D Bowles, C Butler and N Morisetti, "Climate Change, Conflict and Health." Journal of the Royal Society of Medicine Vol.108 No.10 (2015) p.1.
[17] C Barrie, W Steffen, A Pearce and M Thomas, Be Prepared: Climate Change, Security and Australia's Defence Force (NP: Climate Council of Australia, 2015) p.1; N Watts *et al*. "Health and Climate Change: Policy Responses to Protect Public Health." The Lancet Vol.386 p.1865.
[18] Food and Agriculture Organization (FAO) The State of Food Insecurity in the World 2015 (Rome: Food and Agriculture Organisation, 2015) p.38; H Urdal, "Demographic Aspects of Climate Change, Environmental Degradation and Armed Conflict." Contributing Paper, United Nations Expert Meeting on Population Distribution, Urbanisation, Internal Migration and Development: New York, 2008, p.348. At http://www.un.org/en/development/desa/population/events/pdf/expert/13/P18_Urdal.pdf, accessed 14 Nov 16.
[19] Hajkowicz *et al*. Our Future World: Global Megatrends that will Change the Way we Live (Canberra Commonwealth Scientific and Industrial Research Organisation, 2012) p.3.
[20] WEF 2016 p.25.
[21] Z Branović, "The Privatisation of Security in Failing States: A Quantitative Perspective." Occasional Paper No. 24 (Geneva: Geneva Centre for the Democratic Control of Armed Forces, 2011) p.26.
[22] M Thirlwell, The Return of Geo-economics: Globalisation and National Security (Sydney: Lowy Institute for International Policy, 2010) p.1.
[23] J Cini Geo-economic Competition: Global Disruptions from the New Frontline (Geneva: Geneva Centre for Security Policy, 2015) p.3. See also M Leonard (Ed.) Connectivity Wars: Why Migration, Finance and Trade are the Geo-Economic Battlegrounds of the Future (London: European Council on Foreign Relations, 2016) and K Freeman, "Russian Economic Warfare," in F Fleitz (Ed.) Putin's Reset: The Bear is Back and How America Must Respond (Washington DC: Centre for Security Policy, 2016).
[24] NIC 2030 p.40.
[25] Cini (2015) p.3.
[26] M King, "The Weaponisation of Water in Syria and Iraq." The Washington Quarterly Vol.38 No.5 (2016) p.155.
[27] A Acharya, "Power Shift or Paradigm Shift? China's Rise and Asia's Emerging Security Order." International Studies Quarterly Vol.58 No.1 (2014) p.167.
[28] Department of Defence, Defence White Paper 2013 (Canberra: Commonwealth of Australia, 2013) para.2.19-2.20; 'hereafter DWP 2013'. Department of Defence, Defending Australia in the Asia-Pacific Century: Force 2030 (Canberra: Commonwealth of Australia, 2009) para 4.24; hereafter 'DWP 2009'. See also R Medcalf, "Pivoting the Map: Australia's Indo-Pacific System." Centre of Gravity Series Paper No.1 (Canberra: Australian National University 2012) p.2.
[29] M Wesley, "Trade Agreements and Strategic Rivalry in Asia." Australian Journal of International Affairs Vol.69 No.5 (2015) p.484
[30] M Green, P Dean, B Taylor and Z Cooper, "The ANZUS Alliance in an Ascending Asia." Centre of Gravity Series Paper No.23 (Canberra: Australian National University Strategic and Defence Studies Centre, 2015) p.11.
[31] Wesley (2015) p.488.
[32] Wesley (2015) p.482. The traditional external growth engines for key southeast Asian economies (Indonesia, Malaysia,

Singapore, Thailand and The Philippines) were the US, the European Union and Japan. Whilst the economic rise of India and China over the past decades has changed the dynamics of growth in southeast Asia, the effect should not be overstated. India has had only a minimal impact as a growth engine on the leading ASEAN economies. China has surpassed Japan as an economic driver, and has now almost as strong an impact as the EU. However, and despite a decline over the last decade, the US remains the dominant engine of economic growth amongst the ASEAN-5 states with an impact about 1.5 times than of China. Moreover, the combined effect of the US and Japan in driving economic growth amongst the ASEAN-5 states is nearly double that of China. The policy question facing the leading ASEAN economies turns on managing the US presence (directly or indirectly) in regional economic groupings as a hedge against overdependence on China. See K Tan and T Abeysinghe, "Shifting Driver of Growth: Policy Implications for the ASEAN-5." Asian Economic Papers Vol.14 No.1 (2015) pp.157-8, pp.171-2.

[33] M Magnier, "China's Economic Growth in 2015 is Slowest in 25 Years." Wall Street Journal (January 2016), at http://www.wsj.com/articles/china-economic-growth-slows-to-6-9-on-year-in-2015-1453169398, accessed 14 Nov 16; P Chalk, ASEAN Ascending: Achieving Centrality in the Emerging Asian Order (Canberra: Australian Strategic Policy Institute, 2015) p.17. For an account of the risks involved in China's trajectory towards a modern high-income economy, see World Bank / Development Research Centre of the State Council (People's Republic of China), China 2030: Building a Modern, Harmonious, and Creative Society (Washington DC: The World Bank, 2013) pp.77-89; R Garnaut, L Song, C Fang and L Johnston, "Domestic Transformation in the Global Context." In L Song, R Garnaut, C Fang and L Johnston (Ed.) China's Domestic Transformation in the Global Context (Canberra: Australian National University Press, 2015) p.1, and T Sainsbury, US Global Leadership: Responding to a Rising China (Sydney: Lowy Institute for International Policy, 2015) p.2: "China continues to face a complex set of macroeconomic challenges that make it highly unlikely that China will wrest global economic leadership from the United States."

[34] Office of Naval Intelligence (ONI), The PLA Navy: New Capabilities and Missions for the 21st Century (Washington DC: Office of Naval Intelligence, 2015) pp.24-5. China is also developing and fielding unmanned aerial assets to support the ISR effort.

[35] A Cordesman and S Colley, Chinese Strategy and Military Modernization: A Comparative Analysis (Washington DC: Center for Strategic and International Studies, 2015) p.237, p. 247.

[36] ONI (2015) p.5, p.7 pp.24-5.

[37] ONI (2015) p.5, p.10.

[38] Department of Defense, Asia-Pacific Maritime Security Strategy (NP: Department of Defense, 2015) p.10; hereafter DoD (2015a). See also ONI (2015) p.8: "China has already conducted initial far seas missions, which have included intelligence collection, humanitarian assistance and disaster relief, non-combatant evacuation operations and protection of Sea Lines of Communications in the form of counter-piracy escort missions in the Gulf of Aden." However, the ONI report considers that only in the longer term (that is, from about 2025) will China be able to sustain naval operations in the far seas—principally in the Western Pacific and the Indian Ocean, but also in the Arctic. On Taiwan as a driver of PLA(N) transformation, see ONI (2015) p.9, p.11.

[39] ONI (2015) p.13.

[40] ONI (2015) p.8.

[41] DWP 2009 para.4.26.

[42] DWP 2013 para.2.35.

[43] Development Concepts and Doctrine Centre, Global Strategic Trends—Out to 2040 (London: Ministry of Defence, 2010) p.50. Hereafter 'GST 2040'.

[44] X Wickett, J Nilsson-Wright and T Summers, The Asia-Pacific Power Balance: Beyond the US China Narrative (London: The Royal Institute of International Affairs, 2015) p.8.

[45] GST 2040 p.50.

[46] Medcalf (2012) p.4.

[47] DWP 2009 para. 4.32.

[48] I Gindarash, "Politics, Security and Defence in Indonesia: Interactions and Interdependencies." National Security College Issue Brief No.4 (Canberra: Australian National University, 2014) pp.27-8.

[49] Gindarash (2014) pp.29-30;

[50] Gindarash (2014) pp.29-30;

[51] M Piesse, "Indonesia's National Characteristics: Challenges and Opportunities." Strategic Analysis Paper (Perth AUS: Future Directions International, 2015) p.10.

[52] United Nations, Department of Economic and Social Affairs, Population Division, World Population Prospects: The 2015 Revision. File: POP/DB/WPP/Rev.2015/POP/F05.

[53] WP 09, paras 2.6, 5.16.

[54] DWP 2009, para.11.13-14, para.11.17.

[55] M Swain *et al*., Conflict and Cooperation in the Asia-Pacific Region: A Net Assessment (Washington DC: Carnegie Endowment for International Peace, 2015) p.161.

[56] DoD (2015a) pp.6-7.

[57] D Gorenburg, "The Southern Kurils Island Dispute." PONARS Eurasia Policy Memo No.226 (Washington DC: Institute for European, Russian and Eurasian Studies, 2012) p.4.

[58] J Brown, "Southern Kuril Islands: New Developments in the Territorial Dispute Between Russia and Japan." The Asia-Pacific Journal Vol.38 No.3 (2015) n.p.

[59] Cordesman and Colley(2015) p.452.

[60] Cordesman and Colley (2015) p.452.

[61] Statement by the President of the Security Council, S/PRST/2015/11, 29 May 2015, at

http://www.un.org/ga/search/view_doc.asp?symbol=S/PRST/2015/11, accessed 7 November 2016. See also T Samuel, Radicalisation in Southeast Asia: A Selected Case Study in Indonesia, Malaysia and The Philippines (Malaysia: Ministry of Foreign Affairs (Southeast Asia Regional Centre for Counter-Terrorism), 2016) pp.23-26.
[62] L Khali and R Shanahan, Foreign Fighters in Syria and Iraq: The Day After (Sydney: Lowy Institute for International Policy, 2016) p.5, pp.10-11, p.12.
[63] DWP 2009 para.4.28.
[64] DWP 2016 paras.2.67 – 2.69.
[65] J Hayward-Jones, Papua New Guinea in 2015: At a Crossroads and Beyond (Sydney: Lowy Institute for International Policy, 2015); H White and E Wainwright, Strengthening Our Neighbour: Australia and the Future of Papua New Guinea (Canberra: Australian Strategic Policy Institute, 2004).
[66] DWP 2016 para.2.67.
[67] K Giles, Russia's 'New' Tools for Confronting the West: Continuity and Innovation in Moscow's Exercise of Power (London: Royal Institute of International Affairs, 2016) p.3.
[68]J Manyika *et al*., Disruptive Technologies: Advances that will Transform Life, Business and the Global Economy (San Francisco / Seoul: McKinsey Global Institute, 2013) p.29.
[69] International Telecommunications Union, Measuring the Information Society 2015 (Geneva: International Telecommunications Union, 2015) p.147.
[70] P Gowlett, Science and Technology Concept Card Set (Canberra: Defence Science and Technology Group, 2015) slides 28, 70 & 72.
[71] Gowlett (2015) slides 12, 18, 60, 86; H Barkley *et al*. (Eds), Strategic Science and Technology Estimate 2014 (DSTO-TN-1276) (Canberra: Defence Science and Technology Group, 2014) pp.49-50.
[72] M Bey, "Why China and the US Need Each Other in Space." Strafor (1 Nov 16). At https://www.stratfor.com/weekly/why-china-and-us-need-each-other-space, accessed 11 Nov 16.
[73] J Lindsay, "Stuxnet and the Limits of Cyber Warfare." Security Studies Vol.22 No.3 (2013) pp.385-389.
[74] K Lange, "3rd Offset Strategy 101: What it is, What the Tech Focuses Are." DoDLive (30 March 2016). At http://www.dodlive.mil/index.php/2016/03/3rd-offset-strategy-101-what-it-is-what-the-tech-focuses-are/, accessed 14 Nov 16.
[75] Australian Army, Future Land Warfare Report (Canberra: Headquarters Australian Army, 2014) p11.
[76] Canadian National Defence Headquarters, The Future Security Environment 2013 – 2040 (Ontario: 17 Wing Winnipeg Publishing Office, 2014) p.70.
[77] *Ibid.* p71.
[78] North Atlantic Treaty Organisation (NATO), Technology Trends Survey – Future Emerging Technology Trends Version 3 (Norfolk VA: HQ Supreme Allied Commander Transformation, Defence Planning Policy and Analysis Branch, 2014) p14.
[79] Canadian National Defence Headquarters (2014) p71.
[80] Department of Defense, Emerging Science and Technology Trends: 2015 – 2045 (London: Office of the Deputy Assistant Secretary of the Army, 2015) p4. Hereafter DoD (2015b).
[81] DoD (2015b) p77.
[82] A Greenberg, "Forget Software—How Hackers are Exploiting Physics." Wired (31 August 2016), at https://www.wired.com/2016/08/new-form-hacking-breaks-ideas-computers-work/, accessed 14 Nov 16.
[83] Manyika *et al*. (2013) p.6.
[84] Manyika *et al*. (2013) p.12.
[85] Manyika *et al*. (2013) p.74.
[86] Manyika *et al*. (2013) p.74.
[87] S Brimley, B FitzGerald and K Sayler, Game Changers – Disruptive Technology and US Defense Strategy (Washington DC: Center for a New American Security, 2013) p.18.
[88] GST 2045 p94.
[89] A Lele and T Shrivastav, Rocket Launchers for Small Satellites (New Delhi: Institute for Defence Studies and Analysis, 2015) p.2.
[90] Lele and Shrivastav (2015) p.10.
[91] N Crisp, K Smith and P Hollingsworth, "Launch and Deployment of Distributed Small Satellite Systems." Acta Astronautica Vol.114 (April 2015) p.66. At http://ac.els-cdn.com/S009457651500171X/1-s2.0-S009457651500171X-main.pdf?_tid=86cf00a8-aa05-11e6-8eda-00000aacb362&acdnat=1479085319_852a56ae140d994cfc8311591c0e50d1, accessed 14 Nov 16.
[92] A Palazzo and C Smith, "Coming to Terms with the Modern Way of War: Precision Missiles and the Land Component of Australia's Joint Force." Australian Land Warfare Concept Series Vol. 1 (August 2016) pg 8.
[93] DoD (2015b) p6.
[94] Brimley *et al*. (2013) p15.
[95] Canadian National Defence Headquarters (2014) p.78.
[96] Brimley *et a*l (2013) p.16.
[97] Defense Science Board, Report of the Defense Science Board Task Force on Directed Energy Weapons (Washington DC: Department of Defense, 2007).
[98] O Lamrani, "What the Next Arms Race Will Look Like." Stratfor (21 March 2016), at https://www.stratfor.com/sample/analysis/what-next-arms-race-will-look, accessed 07 November 2016; M Gubrud, "Just Say No." Bulletin of the Atomic Scientists (24 June 2015), at http://thebulletin.org/test-ban-hypersonic-missiles8422, accessed 07 November 2016.
[99] Defense Science Board (2007) p.49.

[100] N Al-Rodhan, "Hypersonic Missils and Global Security." The Diplomat (15 November 2015), at http://thediplomat.com/2015/11/hypersonic-missiles-and-global-security/, accessed 07 November 2016. See also Gubrud (2015).
[101] Defense Science Board (2007) p.78.
[102] Canadian National Defence Headquarters (2014) p.76.
[103] NATO (2014) p.25.
[104] NATO (2011) Technology Trend Survey – Future Emerging Technology Trends (Virginia: NATO HQ Supreme Allied Commander Transformation, 2011) p.15.
[105] NATO (2014) p.25.
[106] Foresight and the Government Office for Science Technology and Innovation Futures: UK Growth Opportunities for the 2020s (2012 Refresh) (London: Government Office for Science, 2012).
[107] Canadian National Defence Headquarters (2014) p.69.
[108] NATO (2014) p.37.
[109] NATO (2014) p.37.
[110] NATO (2014) p.34.
[111] L Willet Value Added: The Strategic Significance of European Naval MCM Capability. (Np: Jane's International Navy, 2013).
[112] Brimley *et al.* (2013) p14.
[113] DoD (2015b) p17.
[114] Commonwealth Science and Industrial Research Organisation, Australia 2030: Navigating Our Uncertain Future (Canberra: Commonwealth Science and Industrial Research Organisation, 2016) p.63.
[115] DWP 2016 p.44.
[116] Department of Defense, Joint Operating Environment (JOE) 2035: The Joint Force in a Contested and Disordered World (2016) p.27. Hereafter 'JOE 2035'.
[117] Mazarr (2016) p.58.
[118] Mazarr (2016) p.61.
[119] JOE 2035 p.31
[120] JOE 2035 p.37
[121] See, for example the approach taken in Hans Ninnendijk, Friends, Foes and Future Directions: US Partnerships in a Turbulent World (Santa Monica, CA: RAND, 2016), especially pp.5-7, which summarises global trends affecting US alliances including those in Asia and the Pacific.
[122] Gray (2005).
[123] JOE 2035
[124] E Simpson, War from the Ground Up: Twenty-First Century Combat as Politics (London: Hurst and Company, 2013).