



Future Land Warfare Report

2014

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The Directorate of Future Land Warfare leads the conceptual development that underpins Army's concept-led and capability-based approach to modernisation, defining the Army of the future. Comment on this publication is welcome and should be forwarded in writing to:

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Introduction

1. Since the end of the Cold War, the nature of military interventions and operations has become inherently unpredictable, making it difficult to define the character of future warfare. Interventions in East Timor, Solomon Islands, Bougainville, Iraq and Afghanistan have placed heavy demands on the Army — both anticipated and otherwise — and posed new questions concerning future employment, equipment and doctrine. The changing global environment continues to challenge our common assumptions, accelerating technologies in which information and precision dominate, and making it increasingly difficult for the Army to marry this technology with its core tasks in what is an increasingly cost-conscious Australian Defence Force.

2. Against this backdrop, this examination of future warfare and its implications for the Australian Army is both timely and relevant. Such an examination, however, necessarily avoids any attempt to predict the future. Given the almost infinite variability of human interaction, such prediction is unlikely to be helpful in designing forces for future conflict.¹ However, there are certain trends which can be discerned even in such a dynamic environment. Understanding these will provide the Army the insight to shape the evolution of the land force capability and ensure it can provide the greatest utility for government.

3. As this report explains, the emerging regional and global outlook and the changing character of war clearly suggest that land forces will continue to play the decisive role in the security of modern states against both regular and irregular adversaries. Notwithstanding the potential threats, a sound understanding of the likely future land warfare environment will produce a number of valuable opportunities. A clever and adaptable Australian Army can exploit these to enhance its strategic utility and tactical effectiveness.

4. This 2014 edition of the *Future Land Warfare Report* describes five trends in the future operating environment and suggests their possible influence — individually or in combination — on the Army's future land force.² These meta-trends will increasingly define the operating environment from now and into the future beyond 2035.³ These trends will be inter-linked, with activities in one influencing the others. The meta-trends that define these conditions are grouped in a series of five, termed: crowded, connected, lethal, collective and constrained.⁴ This grouping is useful for several reasons. First, and most obviously, understanding these trends allows the Army to design its modernisation initiatives, conduct experimentation, and fund those areas of personnel development, material enhancement and joint and inter-agency connectivity that provide the broadest range of options for government.

5. Second, the report provides a sound basis for the Army's contribution to the development of joint capability and to inter-agency cooperation. The Army's national security role demands the ability to operate within a joint force as well as alongside a range of potential partners within government and from external agencies.

6. Finally, the Future Land Warfare Report equips the Army to provide well-informed contributions to policy and strategy development within Australia's national security planning architecture. It is the Army's responsibility to explain why maintaining its current strength and modernisation plan is vital to the security of the nation. It is imperative that the Army provides a coherent rationale for sustaining the existing force structure and supplies the evidence to senior decision-makers that allows them to appreciate the impact of capability choices.

Conflict in the twenty-first century

7. **The enduring nature of war.** While the character of conflict constantly evolves, war's enduring nature is unchanging. War is and will remain a fundamentally human, societal activity, rather than a technical or engineering problem. It is and will remain a contest of wills in which rational actors seek to mitigate weakness and vulnerability while attempting to exploit either an opportunity or weakness. Human conflict will continue to be violent, dynamic, unpredictable, difficult to control and chaotic. Chaos will result from the complex interaction of friction, lethality, uncertainty and chance. Surprise and uncertainty will remain an enduring part of conflict.⁵

8. **The changing character of war.** Contemporary trends suggest future conflict will increasingly involve multiple diverse actors, all competing for the allegiances and/or acquiescence of targeted populations. Consequently, the outcome of conflict will be influenced by the perceptions of these populations rather than solely the results of battlefield action. Advances in technology will continue, and the pace of innovation will increase. This will provide opportunities for our own forces and for adversaries.⁶

9. While the United States will continue to be the world's strongest military power and the most influential strategic actor in our region, China's economic transformation is affecting the strategic balance, particularly in the Indo-Pacific. This will inevitably influence the strategic calculations and posture of regional countries. China's burgeoning influence will also affect decisions on Australia's broader national engagement and approach to military strategy.⁷

10. Australia's future prosperity will continue to be tied to the security and stability of our region. Changing patterns of underlying political and economic influence have given rise to new and dynamic strategic relationships. This reflects the long-term trend since the end of the Second World War and the Cold War. The rise and re-emergence of nation-states and the proliferation of non-state actors are redefining the character of international relations, a situation which directly affects Australia's sovereignty and its regional and global interests.

11. Analysis drawn from this report identifies five principal questions that the Army must consider if it is to adapt to the future battlefield:

a. **Constrained access to information domains.** Even with US support, Australia is unlikely to be able to dominate the electronic domain in the future. To what degree can the Army adapt to this and ensure that it is able to operate effectively in a digitally contested and constrained environment without information assurance? How can the Army convert this to a competitive advantage? Can the Army conduct a 'digital break-in' and win access to contested domains?

b. **Single points of failure.** To what degree do the meta-trends and their associated implications place the Army at risk of developing capabilities that have single points of failure in the deployed and domestic environments? How will the Army achieve resilience across the range of its capabilities?

- c. **Contiguous battlespace.** To what degree is the Army prepared for an interconnected battlespace in which deployed theatres are not quarantined from the homeland and force generation base? Is the force generation cycle the soft underbelly of the deployed force?
- d. **Capability balance.** Less sophisticated but highly lethal threats of the future may seek to undermine the kinetic dominance of Western forces. To what degree is the Army prepared to rebalance its force structure into non-traditional capabilities and units (such as boosting the capability of the intelligence battalion or adding an Army cyber capability) in order to build greater capacity for intelligence-led targeting? Can the Army manage risk and reduce some traditional capabilities while relying on its ability to rapidly regrow these as required?
- e. **How we fight.** Is the Army willing to fundamentally change its traditional command, control and communication structures and processes, in particular the Army's unit and formation headquarters, to maximise the advantages of access to joint effects and the enhanced networking of digital systems?

Meta-Trends of the Future Operating Environment

A crowded environment

12. The world's population is expected to reach eight billion by 2030, with the overwhelming majority of this increase (95%) concentrated in the developing world.⁸ Furthermore, for the first time in history the world has become more urban than rural.⁹ In 1800, only 3% of the world's population lived in cities. This figure rose to 47% by the end of the twentieth century. Today, more people live in cities than rural environments. By 2030, the current urban population of 3.6 billion will rise to five billion, and 60% of people will live in cities.¹⁰

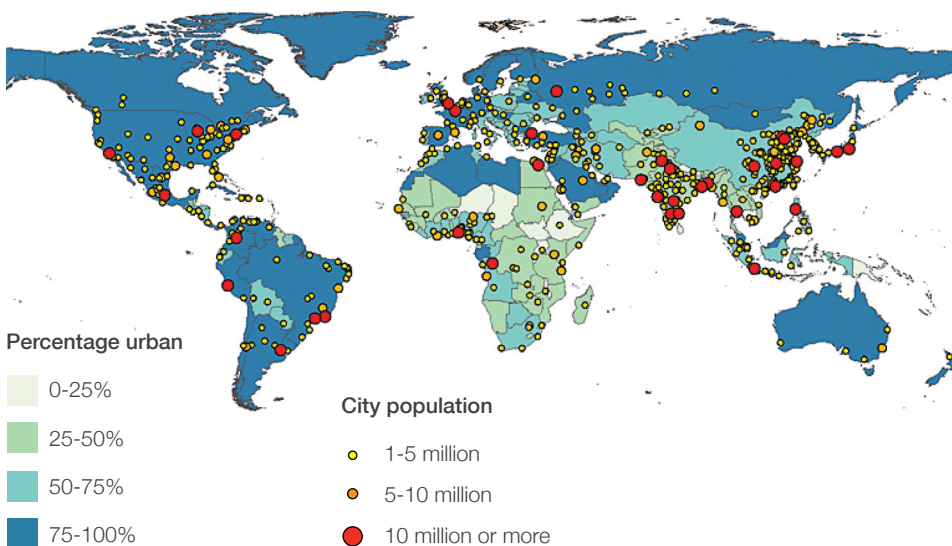


Figure 1: Percentage of urban population and concentrations by size, 2025¹¹

13. Figure 1 illustrates the projected increase in urban populations and the growth of 'megacities' by 2025. Over 20 megacities exist today, with six of these cities home to over 20 million inhabitants.¹² By 2025, Asia alone will have at least ten megacities, including Mumbai (33 million), Shanghai (27 million), Karachi (26.5 million), Lahore (12.5 million), Dhaka (26 million), Manila (14.8 million) and Jakarta (25 million).¹³

14. Massive migration to cities, both internal and transnational, will precipitate an increase in growth in urban populations and spatial concentrations previously unseen in history. At the same time, rapidly ageing populations among the wealthier countries will drive immigration patterns. Given their much younger demographics, the pull-and-push factors point toward migration of African and Middle Eastern Muslims to 'post-Christian' Europe. Similarly, South Asian populations may move north into China and East Asia, respectively, in search of greater opportunities. While these trends are significant, urbanisation does not necessarily represent a destabilising trend. The shifts in global urban demographics have lifted millions out of rural poverty, led to significant increases in wealth and standards of living and have deepened and strengthened the connections of global trade and investment. These are overwhelmingly positive developments. Notwithstanding, they may portend cultural clashes that could challenge existing paradigms.

15. Urbanisation may produce power shifts between existing authorities and incoming populations with different ethnicities, cultures and values. Where problems of access to food, water and services emerge, non-regulated networks of gangs and quasi-state actors may seek to apply their own rules and codes of conduct in competition with the existing rule of law. The emergence of unregulated cities, or zones of disadvantage where traditional rule of law models do not apply, within otherwise functional cities, provides a potential haven for organised crime, terrorists and insurgents, from which they can organise and launch operations.

16. The majority of this urbanisation will occur in regions that border the ocean. Among the 63 most populated urban areas (with five million or more inhabitants in 2011), 72% are located on or near the coast, with two-thirds in Asia.¹⁴ In the Pacific region, a majority of significant concentrations is located adjacent to the coast.

17. Expanding urbanisation will diminish population access to forested areas and wetlands. States containing rapidly growing cities may compete for supplies of fresh water, provoking disputes over up-river dam building. The international community is likely to cooperate on distribution and increase the supply of potable water through pollution control and desalination. However, this may shift the balance of resources towards states with access to both coastlines and desalination technology. Many countries may require international assistance to avert critical food and water shortages. Food security has been aggravated by abnormal weather conditions in the world's land masses over the past two decades.

Flows in the Nile, Tigris-Euphrates, Niger, Amazon and Mekong river basins have been diminished by a decade of drought. Based on current trajectories, the Organisation for Economic Cooperation and Development estimates that, by 2030, almost half the world's population will live in areas suffering severe water stress. Competition for increasingly scarce resources can lead to both intrastate and transnational conflict. There is also potential for interstate conflict, although wars fought solely over access to scarce resources are uncommon in the contemporary world.

18. Scientific observations also reveal that the Arctic ice shelf is shrinking faster than expected and could vanish sooner than originally predicted in 2030–2050. Even modest sea level rises, when coupled with intense storm surges and the subsidence of delta lands, could have a devastating effect on coastal regions and Pacific small island states. Population movement alone will present Australia and the international community as a collective with a number of economic and security challenges.¹⁵ These include the economic costs associated with the regulated and secure migration of entire populations to safe ground, the loss of sovereign territory and resources, and the potential for cultural isolation and subsequent unrest both pre and post-migration. Relations between influential powers in the region may deteriorate as states vie for (or resist) migration and mass population movement.

19. **Implications of a crowded environment.** For the Army, operating in high density urban terrain will no longer be a discretionary activity. High density population centres are likely to be urban areas in close proximity to the coast, and will require the Army to better understand the way cities are designed and how they work (the 'metabolism' of cities).¹⁶ One key implication for modernisation of land forces is that our developing amphibious capacity will become a more central element of land force manoeuvre. It will provide a launch pad and base to support land forces deployed into urban areas. Urban environments absorb larger numbers of land forces than operations in any other type of terrain. For this reason, operations must be focussed on discrete zones within urban and peri-urban areas, rather than seeking to achieve control over entire cities or regional towns. This presumes understanding of a given urban area's design and metabolism, and must be underpinned by highly effective intelligence, surveillance and reconnaissance.

20. Operational experience has clearly demonstrated that, as intelligence, surveillance and reconnaissance technologies continue to improve, adversaries will seek shelter in complex and congested physical, human and informational terrain.¹⁷ The co-mingling of ad hoc networks within essential infrastructure will challenge targeting approaches, complicate calculations of collateral damage and force changes in military focus away from traditional structures and competencies.

The land force needs to be capable of discriminating between adversary combatants and the multitude of other actors who are likely to be present within the battlespace. The balance of human versus technical collection capabilities, the types of detection systems (night, heat, emissions), and whether these capabilities are embedded or centralised, manned or unmanned are important issues for ongoing consideration.

21. Operating in large cities within civilian populations will also require armies to engage with a much broader range of organisations that deliver security and social services than has previously been the case. This may demand that armies deepen their capacity for interoperability and broaden their ability to engage in shared planning with civilian partners. The need and capacity for the land force to exploit situational awareness from other partners, military and civilian, as well as sources outside the battlespace must be reviewed. Moreover, new psychological and intellectual capabilities should be part of the development of the Army, including the ability to negotiate with others, utilise interpreters, operate in ambiguous environments, improvise, make decisions under pressure, and understand local cultures, history and politics so that its ability to engage with and influence humans on the ground is not lost.

22. Despite the promise of new detection technologies, acceptance of uncertainty and surprise in the urban environment must be an enduring assumption. In many circumstances, forces will be deployed in situations in which adversary weapon ranges are greater than our detection capabilities. Resilience and the ability to withstand surprise must be force design considerations in any analysis of the future urban environment, including individual psychological preparation for uncertain conditions and appropriate training to enhance the soldier's capacity to act in unpredictable situations.

23. Beyond 2025, new technologies and emerging operational approaches will offer innovative force design options. These should be developed and tested against defined defence outputs to ensure prudent procurement and investment in an age of austerity. Army force development will need to devise flexible structures and approaches that can generate mass and resilience in the land environment. Linkages to new and evolved defence capabilities that enhance land force situational awareness will be critical to operations beyond 2025. Improvements to airborne early warning aircraft (due from 2027)¹⁸, enhanced tactical unmanned aircraft (from 2025)¹⁹ and improved geospatial support (from 2023)²⁰ are some of the joint capabilities that will enhance the conduct of land operations — if the right linkages and concepts are in place.

A connected environment

24. The term 'connected' refers to the propensity of global economic, social and communications systems to become increasingly interlinked. Connectivity will continue to be facilitated by global telecommunications networks and ubiquitous communications technology enabling near-instantaneous communications. The land, sea and air domains will become further entwined with the cyber, electromagnetic and space domains. These domains will be the subject of constant competition, with land force operations increasingly enabled (or disabled) by access to digital networks.²¹

25. No country will have complete control over its communications infrastructure or control over the information that its citizens can access. Global telecommunications networks coupled with omnipresent communications technology will continue to empower non-state and semi-state actors. The effect will be disproportionate to their size and stature and allow the formation of supra-national organisations within the cyber domain. Large populations are also likely to be permanently connected to global networks, providing constant access to new 'real time' information. Access to social media, such as Facebook and Twitter, is widespread and accessible to both friend and foe, potentially allowing any individual to influence political outcomes, transform perceptions of events, and create positive or negative responses. This may dramatically affect the future use of military force.

26. **Implications of a connected environment.** Land force digitisation will enhance the force's ability to cope with the demands of a connected environment and will improve coordination between land, joint and coalition forces. The Army must reform its spectrum management practices and conduct more detailed research to understand the bandwidth requirements of future digital systems. A fully digitised force will depend on access to space-based capability for battlefield management, communications and precision navigation and timing (GPS, for example). As our networks will continue to be subject to disruption, the nature of this dependence and ways to mitigate risk warrant further exploration. Networks will require sufficient protection and adaptability to allow rapid reconfiguration. Current cyber defence capabilities have not kept pace with technological change and the Army must develop an ability to defend critical networks against cyber attack, while also being prepared to operate in a degraded network environment.

27. Given the increasingly important role of cyber capability in conflict, land forces must constantly evaluate their professional military training to ensure that soldiers understand how to use digital systems and other emerging technologies. Military cyber operations can be as effective as precision-guided munitions against either a nation-state or a non-state actor. Legal and ethical employment of cyber capabilities requires an appreciation that friendly, adversary and civilian forces may rely on the same digital infrastructure. Understanding the second and third order consequences of preventing access to digital domains, particularly for civilians, is critical.²²

28. The trend towards inter-agency and joint operations will make the land force more integrated at lower levels. Thus the force will become increasingly enmeshed with external enabling capabilities and require much greater use of civilian infrastructure in the conduct of operations. If access to digital systems offers Australian forces a 'competitive advantage', interdependence will see the land force become increasingly vulnerable to disabling attacks on partner capabilities (in addition to direct attacks on military systems).

29. In addition to protecting its access to digital domains, the land force will also need to identify back-ups to digital technologies. To achieve this, land forces must retain skills and equipment that will provide redundancy when digital networks fail. Troops will require the ability to fight effectively without access to digital networks for limited periods of time. The Army will need to imbue its soldiers with the mindset to 'fight for communications'.

30. The vastly enhanced ability of land forces to communicate and share information in the connected environment will significantly alter the way in which these forces will fight. Current mainstream understanding of digitisation generally assumes that the Army will fight the same way as in the pre-digital era, but do so with better communications and greater access to intelligence and surveillance data. It is likely that changes in the Army's operating practices will be more fundamental and the Army has only just begun to conceptualise the way it will respond.

31. Digitisation and advances in technology will present significant opportunities for changing the way land forces are supported over the next decade. The use of increased levels of automation and robotics within logistics may save manpower and enhance accuracy and speed of delivery. Similarly, the potential use of additive construction (3D printing) and the increased employment of deployable rapid prototyping and development facilities offer the potential to quickly manufacture or modify equipment in theatre. This would dramatically shorten response times and logistic chains and are areas worthy of further investigation.

32. By 2025 we may face adversaries with scientifically enhanced cognitive capacity. The land force will need to develop a better understanding of enhancing human capabilities with, for example, improved human-machine interfaces or better fusing of technology with biology. Targeted research in these areas will be necessary to explore opportunities and threats associated with enhancing human decision-making and performance in the future operating environment.

A lethal environment

33. By nature warfare remains violent, chaotic and uncertain, although technology continues to affect its central character. As has occurred constantly throughout history, technology will produce continuous competition to develop more effective weapons. Consequently, the weapons required to win future conflicts will differ markedly from those used to defeat adversaries today.

34. While Australian land forces engaged in recent conflicts have enjoyed a technological advantage over their opponents, technology alone does not deliver success. Terrorist groups and non-state actors with worldwide links and extensive financial resources have the ability to acquire weapons of increased lethality through rapidly exploiting new and/or 'dual use' technologies such as weapons of mass effect.²³ Non-state actors, unbounded by formal regulations and international norms of behaviour, have few limits on the use of such technologies.²⁴ Consequently, land forces will need to consider how they work with other government and non-government agencies to restrict or deny access to lethal technology. Options could include legislative measures to identify and control emerging dual-use technologies, import/export controls on technology that may threaten the Army's ability to effectively operate if held by adversaries, or working with allies to achieve similar effects. Retaining the capacity to understand and evaluate the military implications of emerging technology is essential.

35. Technological advances will enable military and paramilitary forces to conduct precise and discriminating targeting at greater distances to achieve strategic goals.²⁵ Improved munitions have considerably increased the range, accuracy and target-end effect. This has significantly enhanced the lethality of weapon systems. These advances are mirrored in many of the weapon systems employed by land forces. The diffusion of 'smart' targeting solutions to traditional weaponry such as firearms, artillery, bombs and rockets will allow increased firepower at a more manageable cost.

36. Given the growing modernisation of militaries in our region, fragmentation, anti-armour and anti-aircraft munitions will continue to proliferate over the next decade.²⁶ Systems such as the RPG-7 series are likely to become more prolific due to their multi-purpose nature and their effectiveness against a variety of platforms. Advances in thermobaric and chemical warhead technology, adapted to simple weapon systems such as the RPG or the RKG series anti-vehicle grenade, provide a highly lethal weapon system at low cost per unit and with minimal training liability. As the number of countries developing and acquiring these munitions increases, proliferation to non-state actors is probable.

37. Lethal threats may also extend to those capabilities that provide strategic mobility and support to land forces. Regional powers armed with connected networks of long-range sensors, precision-guided missiles and other anti-access technologies may have the capacity to seriously inhibit the projection of land forces.²⁷ This has significant implications for Australia's amphibious capability and for strategic air transport. Maritime forces operating in the littoral environment are potentially threatened by the proliferation of submarines, anti-ship cruise missiles and sea mines, while ballistic missiles can target an expeditionary force in its mounting base. Anti-ship ballistic missiles, such as the Chinese DF-21D, are reportedly capable of targeting moving vessels out to 1500 kilometres from their launch point.²⁸ The land force must ensure it has access to, and is well rehearsed in, different modes of strategic deployment to ensure resilience and the capacity to meet government requirements despite the actions of its adversaries.

38. **Implications of a lethal environment.** As a result of the ongoing proliferation of more lethal technology, the base level of protection and mobility required of land forces must be improved. Consequently, systems such as armoured vehicles should remain a priority. The ability of such vehicles to provide a supporting hub of communications, situational awareness and all-weather precision fires will enhance the capacity of the ground force to absorb surprise and achieve overmatch against an adversary.

39. Active Protection Systems that use a sensor, computer processor and interceptor engineered to identify, track and destroy incoming enemy fire will mature and become more widespread in coming years. This technological trend will reduce the vulnerability of military vehicles of all types. Advances in ultra-strong lightweight materials will boost the protection and mobility of land forces. Weight reduction through the improvement of armour plate, carbon fibre, ceramic and appliqué technologies will continue to improve combat body armour as well as enhancing the physical protection and thus the tactical mobility and endurance of combat vehicles.

40. All of the Army's modernisation initiatives will use these technologies when appropriate. While increased protection is a positive development, it comes at increased financial cost. Land platforms are therefore likely to increase in complexity and cost, with most if not all fitted with a variety of counter-measures, defensive systems and appliqué armour packages scaled and tailored to meet specific threat profiles.

41. Fixed infrastructure, such as headquarters and logistic bases, will become increasingly vulnerable due to their size and electromagnetic signatures. The land force may be required to develop more dispersed headquarters and decentralised logistics infrastructure in its future operating concepts to reduce exposure to long-range kinetic and cyber attacks. Protection against these systems must also include the hardening of fixed installations and security of strategic mobility assets in home stations. This is a challenge that our recent operational experiences has not highlighted. A return to austere, low signature operating practices will confront many approaches developed in the last decade.

42. Capabilities such as the Switchblade system (an armed, disposable micro-UAV), recently deployed operationally by the United States Marine Corps, offer cheap, precise lethality and similar systems will potentially populate the inventories of many nations.²⁹ These types of low-cost capabilities also offer opportunities for the Army to enhance the individual lethality of its soldiers in an austere budget environment.

43. Autonomous and robotic systems are expected to increase in sophistication and capability. While this will bring tactical advantages, it will also raise doctrinal and ethical questions for militaries around the globe. Autonomous robots offer considerable initial scope for increased safety and effectiveness in route clearance, bomb disposal and reconnaissance missions. Eventually, robotic systems may be capable of a much broader range of functions that are currently the preserve of humans. Advances in robotics and remote-controlled capabilities will also increase the Army's effectiveness in cases of natural disaster and humanitarian crises in Australian and overseas. Dual-use technologies mean that equipment designed for the Army's core function — warfighting — also offer capability in a wider range of scenarios. The Army's ability to deliver non-military solutions with amphibious, aerial and robotic forces in humanitarian aid, peacekeeping and disaster response will continue to demonstrate its utility to government.

44. Close combat will always involve a human presence. Beyond 2025, increasing levels of physical and mental robustness and resilience in soldiers will be essential. Physical and cognitive enhancements such as 'exosuits' or long-lasting

stimulants need to be considered in the context of amplifying performance and also for their potentially unintended physical and mental health consequences. The study of the physiological effects of these emerging technologies should continue and may evolve into a separate discipline of military medicine, similar to the way aviation psychology matured between 1940 and 1975.

A collective environment

45. The term 'collective' is used to describe a security or burden-sharing arrangement in which parties cooperate to form a cogent total response to common threats and breaches of the prevailing order. The last two decades have seen a rise in military deployments in support of security and stabilisation operations and a commensurate trend towards joint, combined, coalition and inter-agency military operations.³⁰ Joint and inter-agency operations require high levels of integrated planning, and this in turn requires military participants to understand the perspectives and priorities of a variety of civilian actors who may be attempting to achieve a range of non-military objectives alongside military forces.

46. Collective action is achieved through cooperation with a mix of traditional and non-traditional actors. Traditional partners include allied and friendly state military forces and government departments, all of which are routinely engaged in the planning and conduct of what is referred to as combined military operations. Non-traditional parties could include, but are not limited to, non-government organisations, host nation governments, indigenous security forces, sanctioned representatives of corporations and non-state security elements. The incorporation of these non-traditional actors may be essential to achieve the desired outcomes but can add complexity to the force's composition.

47. 'Collective' also describes the relationship between the Army and other elements of the Australian Defence Force. This is commonly referred to as joint operations. The Army has sought to effectively structure and train to work as part of the joint force within Australia's maritime strategy and recognises the absolute necessity of pursuing future joint capability and operational outcomes. Collective action through cooperation is an important force multiplier, and has the potential to reduce the impact of constrained budgets both in Australia and among our partners. But it also has implications for states and their military forces.

48. **Implications of a collective environment.** There are several implications of operating in the collective environment. For governments a significant implication is that collective actions require the acceptance of a degree of vulnerability in acceding to the interests of the wider group. This has a direct impact on national and military strategic objectives and force structures.

49. The Army must become more accustomed to relying on the effects of the other branches of the Australian Defence Force and external partners to achieve its operational objectives. This has implications for the development of a multilateral operational capacity for training and force development. The Army will need to enhance its focus on domestic and international relationships. Activities such as professional military education programs and participation in and leadership of joint exercises will be increasingly important as Western countries seek to realise the benefits of collective action.

50. There is potential for 'jointery' to continue its expansion into areas such as force generation and organisation over the next two decades. The Army must not only contribute to this approach, but assess how this enhanced 'jointery' might impact on the Army itself. Reliance on joint capabilities allows greater efficiency and reduced duplication, but also imposes risks. Understanding areas of vulnerability that result from reliance on joint capability with single points of failure is essential. Where necessary, the Army must consider ways to reduce risk should access to joint effects be disrupted or severed during operations.

51. Australia's plans to work with security partners to standardise equipment, doctrine, training and information and intelligence systems are well advanced and are formalised through agreements such as the Australia, Canada, Britain and America program and through treaties and alliances. Australia's organic defence industry has also demonstrated a capacity to engage in collective problem-solving and information-sharing between Australia and its partners. Engagement and building partnerships are likely to become an increasingly important aspect of the Army's role.

52. Land forces must continue to train and experiment with the other services to develop joint capabilities, and this cooperation will extend to non-traditional partners at both the state and sub-state levels. Foremost among these capabilities are command, control, communications, computers, intelligence, surveillance and reconnaissance and network-centric capabilities. Consequently, the Army must be able to 'plug into' these (and other global systems) if it is to sustain the skills to effectively contribute to decisive combat operations in a multinational operation.

Significant political, military and commercial investment will be required, not least in the fields of defence cooperation, technology transfer and intelligence-sharing. Cultural differences between nations, services and non-government organisations require most attention in a collective environment. The integration of people into a truly joint organisation is critically important.

53. The Army's individual and collective training must also focus on developing commanders capable of intuitively understanding, utilising and exploiting joint and inter-agency capabilities. To achieve this, the manner in which the joint force exercises command and control of any joint inter-agency task force may require review. The adoption of common planning processes that are understood by all stakeholders is fundamental to developing an effective future force.

54. Simulation will provide an increasingly capable and cost-effective means of conducting individual and collective training. The creation of a joint synthetic training environment that enables the land force to train within a joint, inter-agency, inter-governmental and potentially multinational military community will be necessary. This will become increasingly crucial to maintaining capability, particularly as the Army faces increased fiscal challenges.

A constrained environment

55. Land force operations in the future operating environment will be affected by the ongoing major changes to Australia's economic, demographic and social environment.

56. Economic pressures are likely to remain prevalent in the short to medium term. The commitment by both sides of Australian politics to responsibly control public spending will place pressure on future defence budgets across the timeframe envisaged by this report. The focus on financial management and division of government revenue is common to all Australia's traditional allies and partners. The economic environment directly influences the Army's approach to managing the challenge of capability development and recruiting and retaining its most important resources, its people.

57. The evolving demography of Australian society in terms of age, ethnicity and health is increasingly influencing traditional recruiting methods. The Army is experiencing challenges in attracting the required number of potential candidates from its traditional recruitment pool. Changing employment practices and employee

aspirations and expectations such as a desire for multiple careers within a working lifetime, more individual autonomy, and an avoidance of what are perceived as rigid, hierarchical organisations are all factors that influence Army recruitment in a constrained environment.

58. These economic and demographic influences are also changing societal expectations of the role of the military. These expectations include a greater responsibility for undertaking humanitarian operations and an assurance of the ethical use of force. These may impact on the Army's ability to offer government a wide range of effective response options to emerging crises.

59. **Implications of a constrained environment.** The Australian Defence Force will continue to experience budgetary pressures as governments attempt to responsibly manage public spending and place national budgets on a long-term sustainable footing. For the Army this not only imposes a continuing obligation to provide cost-conscious capability development options, but also to develop capabilities that have greatest utility across the broadest range of potential operational scenarios. Budgetary pressures also influence Australia's Western alliance partners, particularly the United States. Conversely, regional defence spending has generally increased in recent years. A continuation of this trend, if unmatched, will eventually erode the technological superiority that the Australian Defence Force has traditionally enjoyed.

60. The development of interoperability with international partners will have a significant effect on Army capabilities in a range of areas. Interoperability may offer strategies to combat a shrinking recruitment pool and fiscal austerity such as 'leapfrogging' (retiring some existing capabilities early in order to invest the savings in future capabilities and leapfrog a generation in technology). Establishing informal coalitions with citizenry and industry, and increasing burden-sharing and the sharing of niche assets are other options, although these will need to consider alliance or foreign partnership implications. These decisions will always be based on the detailed analysis of national interests, commitments, threat assessments and capability requirements. Defence must be cautious about capability decisions that make it beholden to or dependent on an alliance partner.

61. Should the Army choose to eliminate selected capabilities in order to reduce hollowness in the wider land force, it will need to understand how to rapidly rebuild these capabilities if required. This may include maintaining capabilities in embryonic form (technical expertise, plant and equipment and skill sets, for example) within the land forces or within the Reserve force. The force may also need to look to

its allies and partners who possess such capabilities and maintain competence through information and personnel exchanges. The ramifications of such policies require careful analysis as these impact directly on the Army's most important resource, its people.

62. The Army has already embarked on several innovative career management strategies designed to provide tailored education and training that better matches an individual's skills and aspirations with the Army's needs. All these strategies will need to be expanded in coming years to overcome organisational rigidities and structural impediments to gaining the greatest value from the Army's personnel capabilities.

63. The Australian Defence Force has traditionally recruited from a relatively narrow section of Australian society. Limitations on an already reduced recruiting pool are not demographically sustainable. Measures to redress this will create an increasingly diversified work force in terms of age, gender and ethnicity. Defence will need to increase and enhance incentives to retain personnel for longer periods and embrace a greater variety of career progression pathways. Measures could also include creating a pathway to citizenship through military service; greater use of Reserve forces alongside the Regular component and increased ability to transition easily between Regular and Reserve service, more use of lateral recruiting from overseas and tailored salary and conditions in service packages. These options may assist the Army to attract highly skilled workers from within a broader section of Australia's population, while simultaneously reaping the benefits of soldiers with experience and understanding of a more diverse range of professional backgrounds and cultures.

64. Changing Western ethical and social norms will continue to affect the conduct of future operations. Such norms may lead to an increase in public expectation of Australian Defence Force participation in humanitarian assistance and disaster relief operations. Similarly, media connectivity may lead to pressure on government for overseas interventions by land forces, particularly where the concept of 'responsibility to protect' is evoked and threatened minorities are able to communicate their plight to the outside world. While both humanitarian assistance and intervention tasks are legitimate land force missions, they can have a distorting effect on force structures and capabilities if not carefully managed.

65. The increasing difficulty of discriminating between combatants and non-combatants is likely to require more extensive targeting preparation and an increased need for target audience analysis. In addition, the operational and moral

requirements to avoid, or at least minimise, collateral damage and casualties have resulted in an increased use of precision weapons. However, the use of such weapons still carries risk. While public awareness of battlespace operations continues to rise as media and social networks carry more information, public understanding of the nature of warfare remains low. The gap between perceptions of bloodless precision and the reality of close combat will be difficult to bridge.

66. While some self-imposed reservations on the use of certain weapons already exist, international legal norms may evolve to increasingly restrict the use of some more advanced weapons and systems, such as fully autonomous systems, directed energy weapons and some controversial non-lethal weapons.³¹ Legal, moral or ethical constraints, which are deemed to uphold the legitimacy and legality of Western military operations, are unlikely to restrict the actions of potential adversaries.³²

67. Restrictions based on ethical or evolving legal norms are different to the predominately technical limitations discussed above. At present, autonomous technology is in its infancy; in time the effect of these systems on the conduct of future war is likely to be profound. Significant questions remain concerning the ethics and legality of arming autonomous platforms and empowering these systems to use lethal force. The land force will require a detailed understanding of these issues before any decision to acquire such systems is made.

Convergence

68. The five meta-trends examined throughout this report demonstrate the changing character of conflict and some of the implications that this may have on shaping policy. In addition to each meta-trend having characteristics that will affect future conflict, many of the elements of the trends are mutually reinforcing. This will amplify their effect.

69. The crowded urban environments will also contain dense connected networks. Recent experience has shown that non-state threats have developed a sophisticated understanding and ability to exploit civil communications networks to coordinate their activities, gain information and shape public perception. Access to satellite imagery, precision geo-location and timing, and communication through various electronic means (including social media) all provide opportunities for increased threats from non-state actors. The land forces must develop capacities to stay abreast of revolutionary technological changes, including those in the civilian domain.

70. The connectivity within crowded environments will potentially amplify the effects of enhanced lethality while also enhancing opportunities for friendly forces to protect themselves against such threats. The capacity of a variety of threats to collect, share and analyse data will improve the precision of attacks on our forces. These attacks will be cross-domain in nature, exploiting cyber means and traditional kinetic effects. Similarly, networks provide Australian forces with access to coalition data and research that improves our own force protection, as well as access to intelligence and targeting databases that enhance the land forces' ability to generate precise and discriminating effects.

71. Connectivity will provide opportunities for the rapid exploitation of events and the shaping of local and global perceptions following incidents involving Australian forces. Given advancing technology, it will become increasingly possible for threats to misinform populations. These types of threat information actions can be agile and persistent and, if counter strategies are not developed, they could significantly impact on tactical, operational, strategic and political outcomes.

72. While it is possible to identify signs of this convergence, the nature of human interaction dictates that it will generate unforeseen and unanticipated events. This uncertainty drives a continuous requirement to better integrate available civilian and military resources to improve operational capacity, physical resilience and intellectual capacity in our people and units. This resilience will provide the foundation for an adaptable and relevant land force that can operate and succeed in the most arduous of operational circumstances.

Conclusion

73. The nature of war is enduring. The actions of individual soldiers, enabled by their training and technologically advanced equipment, will remain the most integral component of the future Australian Army. Notwithstanding this, the character of the environment in which wars are fought continues to evolve, and the Army's future land force must be capable of surviving and prevailing in an operating space that is crowded, connected, lethal, collective, constrained and converging. These operations will be conducted across land, sea, air, cyber, and space domains.

74. Over the coming decade the Army is likely to face its most demanding intellectual challenge — providing a rationale for the maintenance of ready and relevant land forces in the face of constrained defence budgets. Despite this, the Army must be able to analyse and thrive in the future land warfare environment if it is to continue to offer utility to government. There are abundant opportunities that the Army can exploit to improve its strategic utility and tactical effectiveness.

75. Under initiatives such as Plan Beersheba, the Army is transforming to meet a new security environment, focused on the power of joint effects and enabled by amphibious operations. Success will be measured by the Army's capacity to prepare for, conduct, and conclude military operations as part of a joint force. Integration and interoperability will be critical issues in joint, combined and coalition operations. The environment in which the land force will operate will most likely be the urban littoral, characterised by the meta-trends identified in this report.

76. In any discussion of future war, it is important to understand the predominant themes which will define the nature of such conflict. Australia's recent operational experiences and those of other militaries have identified a number of technological and conceptual themes that will define the operational art out to 2035. These are:

- a. Success will be dependent on the Army's ability to contribute to the achievement of joint effects, drawn from all elements of national power, in a truly joint and integrated way.
- b. Decision superiority, through the provision of those support tools that generate rapid information exchanges in order to support near-instant decision speed, is a critical enabler.
- c. The application of rapid overmatching power at decisive points — whether kinetic or non-kinetic in their composition — is crucial.

77. This *Future Land Warfare Report* is designed to invigorate and refocus the Army's capability-based and concept-led approach to modernisation, while also informing the Chief of Army's modernisation priorities. The contemporary security environment continues to challenge our common assumptions. Accelerating technologies in which information and precision dominate also make it increasingly difficult for the Army to marry this technology with its core tasks in what is an increasingly cost-conscious Australian Defence Force. Against such a backdrop, this analysis of future land warfare and its implications for the Australian Army is critical, given that an intimate understanding of these implications remains at the heart of the Army's operational art and pervades its doctrine and training.

Endnotes

- 1 For more on the methods and perils of investigating the future, see D. Orrell, *The Future of Everything: The Science of Prediction*, Basic Books, February 2008; W. Bell, *Foundations of Futures Studies: Human Science for a New Era: History, Purposes, Knowledge*, Transaction Publishers, August 2010.
- 2 This second edition has been produced through a collaborative approach with a range of individuals and external organisations. In particular, the Army wishes to recognise the contribution of the distributed decision-making and critique activity conducted by **Wikistrat** in late 2013 and the report produced as a result.
- 3 Major events that could potentially disrupt our regional or the global environment include: major state-on-state global conflict; a regional or global disease pandemic over-stressing public health systems and economies worldwide; rapid climate change or a significant natural disaster adversely affecting population flows, sovereign integrity and environmental damage; the collapse of the United States' global dominance as a result of financial crisis, a major terrorist attack provoking an isolationist response, or defeat in a major conflict; the demise of the nation-state due to increased population mobility and pressure from supra-national and sub-national entities; the development of breakthrough technologies rendering even the most advanced forms of warfare in 2013 obsolete, thus erasing the capability edge of the major powers worldwide.
- 4 The term '**crowded**' encompasses a range of factors that interplay to create complex human, informational and urban physical terrain, including urbanisation, rural to urban migration, population growth, resource scarcity and environmental and regional political instability. The term '**connected**' refers to the flattening effect of the interconnected global economic, social and communications systems on the future operating environment. The term '**lethality**' describes the effectiveness of a weapon system or object in inflicting death and the destruction of materiel. The ability to produce high levels of lethality is not restricted to nation-states and regular armed forces. Land forces may encounter individuals or groups with extremely high lethality in any type of operation. The term '**collective**' refers to a security or sharing arrangement, both regional and global, in which each party cooperates to form a cogent total response to common threats to, and breaches of, the prevailing order. The term '**constrained**' encapsulates limitations and restrictions that will define, influence and constrain the way the land force conducts future land warfare.
- 5 Clausewitz's *On War* remains the most unambiguous statement on the nature of war. See C. Clausewitz, *On War*, M. Howard and P. Paret (ed. and trans.), Princeton University Press, 1984.
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- 7 Department of Defence, *2013 Defence White Paper*, Australian Government, Canberra, 2013, pp. 9–11.
- 8 National Intelligence Council, *Global Trends 2030: Alternative Worlds*, Office of the Director of National Intelligence (US), 2012, p. iv, at: <http://www.dni.gov/index.php> (accessed 3 October 2012).
- 9 Ibid., p. v.
- 10 Population Division of the Department of Economic and Social Affairs of the United Nations, 'World Urbanization Prospects, the 2011 Revision' (2012), http://esa.un.org/unup/Maps/maps_urban_2025.htm, p. 4 (accessed 3 October 2012).
- 11 Ibid.
- 12 These are: Mumbai, Tokyo, Seoul, New York City, Mexico City and Karachi.

- 13 Canadian Forces, Chief of Force Development, 'The Future Security Environment 2008-2030', http://www.cfd-cdf.forces.gc.ca/documents/CFD%20FSE/Signed_Eng_FSE_10Jul09_eng.pdf, p. 23 (accessed 3 October 2012).
- 14 United Nations, 'World Urbanization Prospects, the 2011 Revision', p. 18.
- 15 Pacific Institute of Public Policy, 'Climate Security', 23 March 2012, at: <http://pacificpolicy.org> (accessed 3 October 2012).
- 16 See A. Wolman, 'The Metabolism of Cities', *Scientific American*, Vol. 213 (3), pp. 179–90. On the application of this theory to the conduct of military operations, see D. Kilcullen, *Out of the Mountains, the Coming Age of the Urban Guerrilla*, Oxford University Press, Melbourne, 2013.
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- 25 D. Deason and M. Lewis, 'The War Fighter's Need for Science and Technology', *Air and Space Power Journal*, Vol. XIX, No. 4, Winter 2005, pp. 12–25.
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