

Land Warfare Studies Centre

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**Australia**  
and the  
**Revolution**  
in  
**Military Affairs**  
by  
**Michael Evans**

August 2001

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## ACRONYMS AND ABBREVIATIONS

ADF	Australian Defence Force
AEWC	airborne early-warning and control aircraft
ADO	Australian Defence Organisation
ASP 97	<i>Australia's Strategic Policy 1997</i>
CDF	Chief of the Defence Force
CIT	Concept Initiation Team
CSBA	Center for Strategic and Budgetary Analysis (United States)
C2	command and control
C3I	command, control, communications and intelligence
C4	command, control, communications and computers
C4I	command, control, communications, computers and intelligence
C4ISREW	command, control, communications, computers, intelligence, surveillance, reconnaissance and electronic warfare
DSTO	Defence Science and Technology Organisation
DCP	Defence Capability Plan
EW	electronic warfare
GPS	global positioning system
IO	information operations
ISR	intelligence, surveillance and reconnaissance
JDAM	joint direct-attack munitions
MSEB	Military Systems Experimentation Branch
ONA	Office of National Assessment (United States)
ORMA	Office of the Revolution in Military Affairs
OTHR	over-the-horizon-radar
RAAF	Royal Australian Air Force
RAN	Royal Australian Navy
RMA	Revolution in Military Affairs
USJFCOM	United States Joint Forces Command
UCAV	uninhabited combat aerial vehicle
UAV	unmanned aerial vehicle

## ABSTRACT

This paper examines the way in which Australia has responded to the post–Cold War concept of a Revolution in Military Affairs (RMA). It argues that, between 1994 and the present, Australian thinking about an information-age military revolution has gone through two distinct phases: a period of informal debate and a period of institutional theorising. The informal phase of Australian RMA thinking lasted from 1994 until 1997 and represented a period of intellectual speculation under the rubric of Defence of Australia strategic guidance. During this time, research into the RMA was decentralised and was based largely on the single services and the Defence Science and Technology Organisation.

Beginning with the publication of *Australia's Strategic Policy* in December 1997, the Australian Defence Organisation's approach to the RMA moved into a second phase during which the debate about future warfare became institutionalised. The Howard Government formalised the theoretical concept of the Knowledge Edge under which Australia would seek to exploit new information technologies to achieve greater military effectiveness in the 21st century. An Office of the RMA (ORMA) was created in Australian Defence Headquarters to direct an indigenous information-age research and development program. The paper examines the methodology and progress of the Knowledge Edge program, including the impact of the White Paper, *Defence 2000: Our Future Defence Force*, on future Australian RMA-style research. Various challenges to the Knowledge Edge initiative—including the problem of balancing budget requirements, management practices and operational commitments and reconciling political differences about the ultimate purpose of the ADF—

are analysed. An assessment of the White Paper's ten-year Defence Capability Plan is also undertaken.

The paper suggests that, although the Knowledge Edge initiative will continue to face serious fiscal constraints as well as problems in maintaining coherent strategic analysis, the program has considerable long-term potential. In terms of RMA-style theorising, Australia is now second only to the United States, and this progress provides a valuable 'middle-power model' for other states to emulate. Finally, it is argued that Australia's adoption of a Knowledge Edge – RMA scheme represents one of the least understood, but one of the most significant developments in the Howard Government's five-year attempt to realign Australian defence strategy to meet 21st-century conditions.

## AUSTRALIA AND THE REVOLUTION IN MILITARY AFFAIRS<sup>1</sup>

*The military have always been accused of making preparations for past wars. And it is true that, in spite of some accurate predictions, almost nobody managed to foresee the character of future war. Nevertheless this labour of Sisyphus goes on. For it is better to err in forecasts, than yield to the idea that it is impossible to foresee the future of military affairs.*

General Makhmut Gareev<sup>2</sup>

In the decade since the collapse of the Soviet Union in 1991, Australian defence planners have confronted the painful reality that, while strategic environments can change quickly, military force structures cannot. At the beginning of the 1990s, in the immediate post–Cold War era, most of the foundations of Australia’s approach to defence planning were assailed and eroded by the fierce winds of international political change. In

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<sup>1</sup> This paper is an extended version of the author’s ‘Seeking the Knowledge Edge: The Revolution in Military Affairs and its Implications for Australia’, prepared for the Joint Center for International and Security Studies project, ‘The Information Revolution in Military Affairs: Prospects for Asia’. This project is a research partnership of the University of California at Davis and the US Naval Postgraduate School in Monterey, under the sponsorship of the US Office of the Secretary for Defense (Net Assessment).

<sup>2</sup> Preface in General Makhmut Gareev, *If War Comes Tomorrow? The Contours of Future Armed Conflict*, Frank Cass, London, 1998. Gareev was a leading theorist of the Soviet school of military–technical revolution during the 1970s and 1980s—a school that predated that of the RMA in the West. Following the collapse of the Soviet Union in 1991, he became the first President of the new Russian Academy of Military Sciences.

particular, since the late 1990s, Australian strategic planners have been confronted by what former Defence Minister, John Moore, has described as a 'sea of instability' stemming mainly from an unanticipated upsurge of insecurity in the Asia-Pacific.<sup>3</sup> This 'sea of instability' includes a fragile post-Suharto Indonesia, a mercenary outbreak in Papua New Guinea, the deployment of Australian forces to assist in the pacification of East Timor, and the 'Africanisation' of South Pacific islands such as Bougainville, Fiji and the Solomons.<sup>4</sup> To complicate matters further, Australia has now inherited an added strategic burden arising from New Zealand's decision to abandon maintaining even a niche high-technology warfighting capability.<sup>5</sup>

In addition to this growth in regional uncertainty, the demands of global technological modernisation and the impact of a long decline in Australian defence spending have presented Canberra with the complex task of crafting a new, more flexible and, above all, more multi-dimensional strategic policy. As a consequence, Australian defence planners have given considerable attention to the notion that there are practical benefits to be gained from acquiring selected

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<sup>3</sup> Speech by the Hon. John Moore, Minister for Defence, 6 December 2001, as quoted in *The Australian*, 7 December 2000.

<sup>4</sup> Ben Reilly, 'The Africanisation of the South Pacific', *Australian Journal of International Affairs*, November 2000, vol. 54, no. 3, pp. 261–9.

<sup>5</sup> In May 2001 New Zealand scrapped its Skyhawk combat air capability in favour of boosting its army's peacekeeping capabilities, *The Australian*, 9 May 2001. For a New Zealand perspective on information-age warfare see David Dickens, *The Revolution in Military Affairs: A New Zealand View, Part 1*, Working Paper 14/99, Centre for Strategic Studies, Victoria University of Wellington, Wellington, 1999, pp. 37–8.



information technologies arising out of the American-led Revolution in Military Affairs (RMA). For many official Australian strategists, an unfolding RMA offers developments in information technology that may represent one of the most important means to redesign Australia's approach to defence planning in the 21st century. Critical issues of military capability, force structure organisation and joint doctrine are seen as having at least partial solutions in the realm of RMA research and development.

It is important from the outset to try to qualify what is implied by the use of the term RMA in this paper. Taken literally, the term RMA suggests a sudden, dramatic phenomenon, when in fact the phrase more accurately describes a continuum of advances surrounding the advent of information technologies and their potential impact on advanced armed forces. The RMA is about the consequences of accelerating the integration of computer-age technologies into weapons systems and command-and-control networks. These technologies are of three general kinds: C4ISR (command, control, communications, intelligence and surveillance); long-range precision strike; and stealth or low-observable platforms.<sup>6</sup>

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<sup>6</sup> The literature on the RMA is extensive. For useful introductions to the main issues see Stephen Biddle, 'The Past as Prologue: Assessing Theories of Future Warfare', *Security Studies*, Autumn 1998, vol. 8, no. 1, pp. 1-74; Ryan Henry and C. Edward Peartree (eds), *The Information Revolution and International Security*, CSIS Press, Washington DC, 1998; Thierry Gongora and Harald von Riehoff (eds), *Towards a Revolution in Military Affairs? Defense and Security at the Dawn of the Twenty-First Century*, Greenwood Press, Westport, CT, 2000; Zalmay M. Khalizad and John P. White (eds), *The Changing Role of Information in Warfare*, RAND, Santa Monica, CA, 1999; Michael Ignatieff, *Virtual War: Kosovo and*

Furthermore, like most previous military revolutions, the RMA is emblematic of strategic concerns in Western circles about the likely contours for the use of armed force in a new age. If Napoleonic warfare signified the coming of the age of revolutionary nationalism, if the rise of mechanised warfare is indelibly associated with the age of European fascism, and if the rise of nuclear deterrence theory is associated with the Cold War, then the RMA clearly reflects ideas about the shape of warfare—both present and future—in the new global information age.<sup>7</sup>

As Jeremy Black, a leading historian of military revolution, has noted, the RMA incorporates both a political preference for minimum risk warfare and a technological quest for continued military potency by advanced Western liberal societies.<sup>8</sup> Such societies can apparently no longer countenance the mass mobilisation and ideological and social militarism of World

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*Beyond*, Metropolitan Books, New York, 2000; and Michael O'Hanlon, *Technological Change and the Future of Warfare*, Brookings Institution Press, Washington DC, 2000.

<sup>7</sup> The historical literature on military revolution is uneven, but key studies include Geoffrey Parker, *The Military Revolution: Military Innovation and the Rise of the West, 1500–1800*, Cambridge, Cambridge University Press, 1988; Clifford J. Rogers (ed.), *The Military Revolution Debate: Readings on the Military Transformation of Early Modern Europe*, Westview Press, Boulder, CO, 1995 and Jeremy Black, *War and the World: Military Power and the Fate of Continents, 1450–2000*, Yale University Press, New Haven, CT, 1998.

<sup>8</sup> Jeremy Black, *War: Past, Present & Future*, Sutton Publishing, Phoenix Mill, Gloucestershire, 2000, chaps 9 and 10. See also Clifford J. Rogers, “Military Revolutions” and “Revolutions in Military Affairs”: A Historian’s Perspective’, in Gongora and von Riehoff, *Towards a Revolution in Military Affairs?*, pp. 22–35.

War II and the first two decades of the Cold War. They therefore now tend to field what have been termed ‘volunteer-technical’ rather than ‘mass-reserve’ armed forces.<sup>9</sup> From a historical perspective, the contemporary RMA is best seen as a blend of political preference as well as a technological process in which Western democracies attempt to adapt to uneven, but continuous, military transformation under rapidly changing post-industrial and post–Cold War political conditions.

This paper, then, examines Australia’s official quest as an advanced Western-style liberal democracy to exploit the RMA as both a *preference* and a *process* in order to strengthen its defence capacity. Four areas are analysed. First, the essay examines the background to the rise of RMA thinking in Australia between 1994 and 1997. Second, the manner in which RMA thinking was institutionalised in Australian strategic thought in 1997 is outlined. Between 1997 and 2000, an indigenous concept of an information-based military revolution—called the Knowledge Edge—was developed by strategists within the Australian Department of Defence. The various measures introduced into Australian strategic policy under the Knowledge Edge concept are assessed.

Third, the essay examines the significance of the December 2000 Defence White Paper in the Australian process of exploiting selected information-age technologies to achieve a Knowledge Edge. Fourth, and finally, the paper assesses some of the major institutional challenges confronting Australia’s quest to redesign its armed forces around RMA ideas and technologies by the second decade of the 21st century.

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<sup>9</sup> For a stimulating discussion see John A. Lynne, ‘The Evolution of an Army Style in the Modern West, 800–2000’, *The International History Review*, August 1996, vol. 28, no. 3, pp. 505–45.

## **The Background to Australia and the RMA: The Era of Informal Debate, 1994–97**

The Australian Defence Organisation (ADO) did not adopt RMA thinking into its official defence policy until the end of 1997.<sup>10</sup> The early years of the Australian RMA debate—the era of informal ‘first-phase theorising’—have been outlined in considerable detail elsewhere.<sup>11</sup> It is useful, nonetheless, to summarise the main features of the Australian RMA approach in order to understand its character.

Between 1994 and 1997, the Australian RMA debate was largely the work of uniformed officers in the services and defence scientists who were concerned with analysing future warfare trends. Consequently, local examination of RMA developments tended to be singular and informal, rather than joint and institutional, in approach. There was little attempt to define the exact meaning of an information-age military revolution for Australia. Most early RMA thinking in this country concentrated on sifting through American ideas on the subject and on evaluating the impact of computers,

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<sup>10</sup> The Australian Defence Organisation is composed of two components: the Department of Defence and the Australian Defence Force.

<sup>11</sup> See Michael Evans, ‘The Middle Way: Australia’s Response to the Revolution in Military Affairs’, *National Security Studies Quarterly*, Winter 2000, vol. vi, issue 1, pp. 1–19; *Australia and the Revolution in Military Affairs: The Challenge for a Middle Power*, Working Paper, Pentagon Study Group on Japan and NE Asia, Japan Information Access Project, Washington DC, 24 July 2000 and Andrew Richter, ‘The American Revolution? How Advanced Western States are Responding to the Revolution in Military Affairs’, *National Security Studies Quarterly*, Autumn 1999, vol. 5, issue 4, pp. 14–18.

real-time data dissemination and precision munitions on the character of future warfare.<sup>12</sup>

Early RMA theorists included Colonel (now Major General) Peter Leahy, Brigadier (now Major General) Peter Dunn, Air Vice Marshal Peter Nicholson and scientists such as Dr Richard Brabin-Smith (formerly Chief Defence Scientist and now Deputy Secretary for Strategy).<sup>13</sup> The early theorists paid particular attention to analysing the potential benefits of information technology in overcoming the problem of defending Australia. This approach was encouraged by Australia's strategic guidance between 1994 and 1997. During this period, strategic guidance emphasised the policy of Defence of Australia—a policy first outlined during the later stages of the Cold War in 1987—and one that was based on the enduring value of continental strategic geography.<sup>14</sup> Since Australia is a country covering 12 per cent of the earth's surface but containing only 1 per cent of the earth's population, the attraction of new technology that might help compensate for the country's weak force-to-space ratios was obvious. To put the task of defending the continental landmass into context, it should never be forgotten that Australia's northern frontier extends for the same distance as that between London and Beirut.

The first-phase theorists focused on the roles of command, control, communications, computers and intelligence (C4I), and command and control warfare. By 1996 there was a

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<sup>12</sup> Evans, 'The Middle Way: Australia's Response to the Revolution in Military Affairs', pp. 2–8.

<sup>13</sup> *Ibid.*

<sup>14</sup> Department of Defence, *Defending Australia: Defence White Paper 1994*, Australian Government Publishing Service, Canberra, 1994, chaps 1–5.

general consensus amongst senior uniformed professionals such as Leahy, Dunn and Nicholson that Australian Defence Force (ADF) operations would have to be transformed, as the technological changes of information-age warfare became more apparent.<sup>15</sup> A 1996 paper by Air Vice Marshal Peter Nicholson, Air Commander, Australia, saw the key to an Australian RMA response as lying in sensor suites and data fusion that gave improved situational awareness in operations. Nicholson called his approach to the RMA one of ‘knowledge dominance’—an idea that was subsequently to assume great importance in official Australian defence circles.<sup>16</sup>

The views of the uniformed theorists were supported by research from the Defence Science and Technology Organisation (DSTO). As Chief Defence Scientist, Brabin-Smith argued that Australia stood to benefit in the early 21st century from emergent technologies in information, surveillance and reconnaissance (ISR), command and control (C2) and precision strike.<sup>17</sup> A significant practical development in the Australian RMA debate was the decision by the DSTO in 1996 to launch the Takari Program—a scheme aimed at delivering a viable and integrated command, control,

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<sup>15</sup> Evans, ‘The Middle Way: Australia’s Response to the Revolution in Military Affairs’, pp. 2–8.

<sup>16</sup> Air Vice Marshal P. G. Nicholson, ‘Operating the RAAF Beyond 2000’, in Alan Stephens (ed.), *New Era Security: The RAAF in the Next Twenty-five Years*, Air Power Studies Centre, Canberra, 1996, pp. 249–64.

<sup>17</sup> Richard Brabin-Smith, ‘The Impact of Emerging Technologies’, in J. Mohan Malik (ed.), *The Future Battlefield*, Deakin University Press in association with the Directorate of Army Research and Analysis, Melbourne, 1997, pp. 139–50.

communications and intelligence (C3I) capability to the ADF for operations on the battlespace of the future.<sup>18</sup>

Australian thinking on the importance of the RMA was also strongly influenced by exposure to US experimentation. Australian analysts studied programs such as the US Army's Force XXI scheme, its Advanced Warfighting Exercises, its digitisation program and its use of battle laboratories. In addition, joint American–Australian military exercises under US Pacific Command demonstrated the use of C4I and battlespace detection systems in improving the speed and efficiency of military decision-cycles.<sup>19</sup>

A decisive event in the development of an official Australian RMA initiative was the election in March 1996 of a Liberal–National Coalition Government led by John Howard. Under Minister for Defence, Ian McLachlan, the new administration demonstrated an early interest in the possibilities of RMA technology. In June 1996, McLachlan argued that the long-term changes in information technology would be as profound for military organisations in the 21st century as the coming of

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<sup>18</sup> Dr Jason Scholz, 'DSTO and the Australian RMA Initiative', Presentation at the Australian Defence Organisation Revolution in Military Affairs Seminar, 8–9 November 1999. Copy in author's possession. See also Evans, 'The Middle Way: Australia's Response to the Revolution in Military Affairs', p. 5.

<sup>19</sup> Evans, 'The Middle Way: Australia's Response to the Revolution in Military Affairs', pp. 6–7 and Lieutenant Colonel G. T. Peterson, 'The Impact of the Revolution in Military Affairs on the Australian Defence Force', *Yolla: Journal of the Joint Services Staff College Association*, October 1996, IV, i, fn 16.

the internal-combustion engine in the early 20th century.<sup>20</sup> He identified the RMA's key components as being fourfold: lethality of weapons; projecting force over increased distances; speed of information processing; and growing capacities for intelligence gathering.<sup>21</sup> The Minister pointed to other benefits such as the potential of unmanned aerial vehicles (UAVs) and increased interoperability with allies. He warned, however, that Australia had to be 'careful to pick only those parts of RMA technology that address our needs'.<sup>22</sup>

By the end of 1996, Australian–American cooperation on the RMA increased dramatically. Australian defence strategists became immersed in the full range of American ideas on information warfare. These ideas included Admiral William A. Owens's theory of the 'emerging systems of systems'; notions of battlespace awareness and dominant manoeuvre; precision strike, sensor-to-shooter links and simultaneity; the potential of joint direct-attack munitions (JDAM), global positioning systems (GPS) and brilliant sub-munitions.<sup>23</sup> From 1996 onward, American future-warfare specialists from the Office of Net Assessment (ONA), the Centre for Strategic and Budgetary Analysis (CSBA) and the American war colleges became regular visitors to Australia.

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<sup>20</sup> The Hon. I. M. McLachlan, 'Defence Challenges in New Era Security', in Stephens, *New Era Security*, pp. 3–8.

<sup>21</sup> *Ibid.*, p. 4.

<sup>22</sup> *Ibid.*, pp. 4–5.

<sup>23</sup> For the impact of American ideas see the proceedings of the first Australian RMA conference in Keith Thomas (ed.), *The Revolution in Military Affairs: Warfare in the Information Age*, Australian Defence Studies Centre, Canberra, 1997.



In early 1997, Andrew Marshall, the distinguished American strategic thinker and Director of Net Assessment in the Pentagon, pointed out that Australia stood to benefit from several RMA developments. He singled out automated combat systems, long-range precision-strike, stealth and sensor technology as new techniques that would permit control of Australia's huge northern sea-air gap in a way not possible before. Marshall also thought that the US Marine Corps concept of *Sea Dragon*—in which small units operated with logistics and firepower from a distance—might be a useful model for Australia to emulate in terms of projecting power in the future.<sup>24</sup> Significantly, from the beginning of 1997, ONA consultants became influential in helping to mould the Department of Defence's institutional approach to the RMA debate.

### **Australia's Institutional Embrace of the RMA, 1997–2000**

In December 1997, a new defence review, *Australia's Strategic Policy, 1997* (ASP 97), adopted a maritime concept of strategy and attempted to align Australian strategy with post-Cold War realities—including the notion of an RMA.<sup>25</sup> The new strategic review became the first official document to acknowledge the potential of the RMA in helping Australia to shape its future strategic environment. ASP 97 argued that the application of information technology within the ADF would permit higher cost-effectiveness in force structure through 'exploiting technology, doctrine and geography'.<sup>26</sup> The review went on to state:

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<sup>24</sup> Andrew Marshall, 'Introduction', in Thomas, *The Revolution in Military Affairs*, pp. 3–5.

<sup>25</sup> Department of Defence, *Australia's Strategic Policy 1997*, Directorate of Publishing and Visual Communications, Canberra, 1997.

<sup>26</sup> *Ibid.*, p. 55.

For Australia it [the RMA] has particular significance. Not only will new technology provide military personnel with an expansive breadth and depth of information about the battlefield, but sophisticated strike weapons will give advanced forces the capability to destroy targets with an unparalleled degree of precision and effectiveness.<sup>27</sup>

Mastery of information technology would be an area where the small, 50 000-strong ADF could aspire to continuing excellence.<sup>28</sup> ASP 97 described Australia's highest capability priority in the future as being the achievement of a Knowledge Edge. The Knowledge Edge construct was an apparent refinement of Air Vice Marshal Nicholson's earlier concept of 'knowledge dominance' and reflected the research work of the DSTO.<sup>29</sup> The Knowledge Edge was defined in ASP 97 as 'the effective exploitation of information technologies to allow us to use our relatively small force to maximum effectiveness'.<sup>30</sup>

Exploiting information-age technology to achieve a Knowledge Edge was seen as holding out three important strategic advantages for Australia. First, information capabilities offered the possibility of greatly improved surveillance of Australia's vast maritime approaches. Second, information technology—when applied to the command,

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<sup>27</sup> *Ibid.*

<sup>28</sup> *Ibid.*

<sup>29</sup> For the development of Nicholson's ideas on knowledge dominance, see Air Vice Marshal Peter Nicholson, *Controlling Australia's Information Environment or Decision Superiority and War-fighting*, Paper Number 65, Air Power Studies Centre, Canberra, June 1998. The DSTO's Electronics and Surveillance Research Laboratory also carried out important work on the Knowledge Edge in 1996 and 1997.

<sup>30</sup> *Australia's Strategic Policy 1997*, p. 56.

positioning and targeting of forces—would enable military deployment to maximum effect. Information technology offered a means of mastering Australia’s geography.<sup>31</sup>

Third, through its strong assets in domestic information technology and its alliance with the US, the ADF could look forward to creating a defence architecture that integrated the three elements of capability: intelligence, command and its supporting systems, including communications and surveillance.<sup>32</sup> ASP 97 foresaw the meshing of sensors, platforms, space-based surveillance, long-range UAVs, over-the-horizon radar (OTHR) and airborne early-warning and control aircraft (AEWC) into an overall system to provide comprehensive real-time information to the ADF in the field.<sup>33</sup>

*The Office of the RMA and the Futures Directorates: The Establishment of Australia’s Future Warfare Organisation*

During 1998 and 1999, the Howard Government introduced several further measures in order to support an Australian RMA effort as part of what has been styled ‘a strategy for revolution’.<sup>34</sup> Spending by the DSTO on RMA-related research and development into C4, ISR and EW was increased by \$10 million. In addition, military cooperation with the US

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<sup>31</sup> *Ibid.*

<sup>32</sup> *Ibid.*, pp. 56–60.

<sup>33</sup> *Ibid.*, p. 57. For an analysis of the implications of the Knowledge Edge see Paul Dibb, ‘The Relevance of the Knowledge Edge’, *Australian Defence Force Journal*, no. 134, January/February 1999, pp. 37–48.

<sup>34</sup> Patrick Walters, ‘A Strategy for Revolution: Defence Goes on to the Front Foot’, in Murray Waldren (ed.), *Future Tense: Australia Beyond Election 1998*, Allen & Unwin, Sydney, 1999, pp. 247–52.

Army's battle laboratories was extended.<sup>35</sup> However, the Government's most important measure was the decision, in April 1999, to create the Office of the Revolution in Military Affairs (ORMA) in the Military Strategy Branch of Australian Defence Headquarters. The formation of a dedicated RMA organisation in the heart of Australia's defence machinery ensured that what has been called 'second phase' theorising on information-age warfare would be more formalised, institutional and, above all, more tri-service in approach.<sup>36</sup>

The ORMA was to be headed by the ADF Director General of Military Strategy, a one-star officer, who was to report directly to the Secretary of Defence and the Chief of the Defence Force (CDF), and through them to the Minister.<sup>37</sup> The main objective of the new organisation was to extract 'the maximum value from the RMA for the ADF—be it in equipment acquisition and development, training, doctrine development or alliance relations'.<sup>38</sup> In particular, the ORMA was to seek to identify those aspects of technological change that were most likely to affect major long-term capabilities.

The ORMA became responsible for coordinating three important tasks. First, in close cooperation with the United

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<sup>35</sup> Australian Defence Headquarters, Military Strategy Branch (Office of the RMA), Minute, 'Public Discussion Paper—"The Revolution in Military Affairs and the Australian Defence Force"', 16 September 1999, p. 1.

<sup>36</sup> Evans, 'The Middle Way: Australia's Response to the Revolution in Military Affairs', pp. 11–12.

<sup>37</sup> The first Head of the ORMA was Brigadier S. H. Ayling. In June 2001 he was succeeded by Air Commodore John N. Blackburn.

<sup>38</sup> Brigadier S. H. Ayling, Office of the RMA, 'Foreword', *Australian Defence Force Journal*, no. 144, September/October, 2000, p. 2.

States, the Office was charged with developing an implementation strategy for adapting selected aspects of RMA technology to Australia's circumstances. Second, the new organisation was to identify and analyse future warfare concepts that could be used to incorporate organisational, doctrinal and technological changes into the current ADF. Third, the ORMA was to prepare for the Minister for Defence a paper on the ADF and the implications of information-age technology that explored policy options and alternatives.<sup>39</sup>

Parallel to the formation of the ORMA, the single services refined their input into the environmental specialties of information-age conflict. Dedicated future-warfare directorates were formed in the Australian Army, the Royal Australian Air Force (RAAF) and the Royal Australian Navy (RAN) to facilitate wider collaboration and cross-pollination in research.<sup>40</sup> In the land environment, the Army's Future Land Warfare Directorate was created in 1999 to examine future land warfare trends out to 2030. The directorate employs a 'concept-led, capability-based' philosophy involving aspects of network-centric warfare and synchronised operations in the

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<sup>39</sup> Australian Defence Headquarters, Military Strategy Branch (Office of the RMA) Minute, 'Public Discussion Paper—"The Revolution in Military Affairs and the Australian Defence Force"', 16 September 1999.

<sup>40</sup> For background to the services' futures directorates see Air Commodore John N. Blackburn, AM, Director General Policy and Planning—Air Force, Commodore Lee Cordner, Director General Navy Strategic Policy and Futures and Brigadier Michael A. Swan, "Not the Size of the Dog in the Fight": RMA—The ADF Application', *Australian Defence Force Journal*, no. 144, September/October 2000, pp. 65–9.

battlespace.<sup>41</sup> Similarly, in the RAAF, Project Oracle 2030 was created to try to ‘pre-adapt the RAAF’ for 21st-century operations by examining such approaches as effects-based operations.<sup>42</sup> During 2000, the RAN created a Strategy and Futures Directorate to try to fuse together blue-water responsibilities with the growing need in the 21st century for integrated operations in the littoral using network-enabled operations and UAVs.<sup>43</sup>

Between 1999 and early 2000, the formation of the ORMA and the creation of the dedicated single-service future-warfare directorates did much to establish an institutional framework for the disciplined analysis of RMA concepts. The ORMA and the future-warfare directorates also contributed decisively to the notion that there was an affordable way for Australia to absorb and benefit from the rigorous challenges arising from military conflict in the information age.

*Project Sphinx: Australia’s Methodological Approach to the RMA and Future Warfare*

Between 1999 and 2000, the ORMA developed a methodological strategy for an Australian approach to information-age warfare called Project Sphinx. The project also provided Australia with a coordination mechanism to

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<sup>41</sup> See Australian Army, *Land Warfare Doctrine 1, The Fundamentals of Land Warfare*, Combined Arms Training and Development Centre, Sydney, 1999, chap. 6; *The Army Continuous Modernisation Plan, 1999–2004*. Draft as at 12 July 1999, pp. 8–17.

<sup>42</sup> Blackburn, Corder and Swan, “‘Not the Size of the Dog in the Fight’: RMA—the ADF Application’, p. 68.

<sup>43</sup> *Ibid.*

develop concepts whereby the ADF could meet the needs of warfare in the information age.<sup>44</sup>

To date, Sphinx has sought to provide a collaborative methodology to analyse RMA developments. The focus of the project has been on identifying conceptual issues related to capability and doctrinal usage, thus providing a firm intellectual foundation for research and development into RMA-style technology.<sup>45</sup> The overall objective is to use Sphinx to help create what is described as a strategic-level Enterprise Architecture Model within the ADO that unites policy, operations, systems and technical processes. Sphinx is seen as the vehicle by which it may be possible to identify the most plausible future-warfare concepts and to assess their likely long-term capability investment implications for Australia through to the year 2025.<sup>46</sup>

Central to Australia's Sphinx methodology are three strategic propositions. First, the Asia-Pacific region is regarded as fundamental to Australia's security. Second, there is firm Australian belief that the information age has ushered in a new era in warfare. Third, there is a general strategic conviction that the post-Cold War security environment is peculiarly

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<sup>44</sup> Australian Defence Headquarters, Strategic Policy and Plans Division, 'Project Sphinx', Briefing Paper by Air Vice Marshal P. G. Nicholson, Head, Strategic Policy and Plans Division, 7 April 1999. Document in author's possession.

<sup>45</sup> *Ibid.*, p. 1.

<sup>46</sup> Australian Defence Headquarters, Vice Chief of the Defence Force, 'Capability Executive Meeting, 10 December 1999: Outcomes', pp. 2–3. Document in author's possession.

volatile and extremely difficult to predict.<sup>47</sup> So far, Project Sphinx has attempted to grapple with the problem of identifying and exploring concepts of future warfare and their capability consequences by employing three processes: *concept generation*, *concept evaluation* and *concept consultation*. Concept generation was originally facilitated by the formation of Concept Initiation Teams (CITs). These teams, drawn from wide expertise throughout the Department of Defence, provide a means to assess the impact of emergent information-age warfare techniques.<sup>48</sup>

Throughout 1999 and 2000, CITs examined various categories of future warfare in information-age conditions. These categories included ISR, C2 and adaptive interoperability, tailored effects (or precision firepower), force projection, force protection and force sustainment. The aim of each team was to refine concepts that could serve as potential pathways to guide future ADF capability planning and force structure.<sup>49</sup> In order to link concept development to capability assessment, a Military Systems Experimentation Branch (MSEB) was created within the DSTO at the end of 2000.<sup>50</sup>

The second process in the Sphinx program has been concept evaluation, mainly through the use of campaign wargames known as the Krait strategic seminar series. Strategic

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<sup>47</sup> Brigadier S. H. Ayling, 'Future Warfare Concepts: Designing the Future Defence Force', *Australian Defence Force Journal*, no. 144, September/October 2000, p. 6.

<sup>48</sup> *Ibid.*

<sup>49</sup> *Ibid.*, pp. 6–7.

<sup>50</sup> Author's notes at Australian Department of Defence RMA Working Group meeting, 30 June 2000. The MSEB was to become operational during 2001.



wargaming was introduced into the ADO in order to evaluate the feasibility of future-warfare concepts in various conflict scenarios that might emerge in the first quarter of the 21st century. The Krait process has been viewed as important in testing the various warfare concepts in order to establish which ones offer the best possibilities for exploiting military advantage in future joint, combined and coalition operations planning. The ORMA believes that wargaming will eventually be accepted as an important intellectual exercise in the Australian capability development process.<sup>51</sup>

Between 1999 and 2000, however, Australian wargaming relied heavily on American rather than indigenous expertise.<sup>52</sup> The ADO contracted consultants drawn from US organisations such as the CSBA and the Science Applications International Organisation. Australian defence planners regarded the CSBA's experience in conducting the 20XX Series of futuristic wargames for the US Office of Net Assessment as being particularly valuable.<sup>53</sup>

Most recently, in January 2000, the Military Strategy Branch established a liaison position with US Joint Forces Command (USJFCOM) for collaboration in future-warfare experimentation. The objective of this relationship was to

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<sup>51</sup> Department of Defence, Australian Defence Headquarters, Brief for HSPP, 'Project Sphinx: Concept Initiation Teams', 3 May 1999 and 'Concept for the Krait Series of Wargames', June 1999; Ayling, 'Future Warfare Concepts: Designing the Future Defence Force', p. 7.

<sup>52</sup> Department of Defence, Directorate of Future Warfare Discussion Paper No. 1, 'Project Sphinx: Military Challenges and Warfare Concepts for the ADF in 2025', no date but clearly early 1999, pp. 1–8. Document in author's possession.

<sup>53</sup> 'Concept for the Krait Series of Future Wargames', p. 2.

‘provide a specialist liaison and representation link between the ADO and USJFCOM on issues related to the RMA’. Important emphasis was placed on C4ISR work, operational procedures such as effects-based operations and RMA wargames.<sup>54</sup>

Using largely CSBA methods, Krait wargames have modelled several Asia-Pacific conflict scenarios, ranging from major war through regional coalition operations to the unilateral use of Australian forces in a ‘failed state’.<sup>55</sup> In 1999 and 2000 Krait wargames also tested future-warfare concepts such as force projection and force protection, ISR, command and control, force sustainment, tailored effects, and special operations. The most recent Krait seminar has involved a workshop on developing a Joint Warfighting Concept for the ADF in information-age conditions. The Krait process is supported by another series called Taipan, which concentrates on refining campaign concepts and force structure analysis.<sup>56</sup>

The third process in Project Sphinx, that of concept consultation, was facilitated by the creation in August 1999 of an RMA Working Group. The latter was formed by drawing on the intellectual resources of the Department of Defence, academics and industry to help refine Australia’s future-warfare concepts. The initial RMA Working Group included

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<sup>54</sup> Department of Defence, Military Strategy Branch, ‘Terms of Reference: ADF Liaison Officer Placement with USJFCOM’, January 2000, pp. 1–3; Australian Liaison Officer US Joint Forces Command, Minute, ‘Weekly Activity Report, Appendix: Concept Summary: Effects-based Operations’, 26 July 2000. Documents in author’s possession.

<sup>55</sup> ‘Concept for Krait Series of Future Wargames’, pp. 6–7.

<sup>56</sup> Ayling, ‘Future Warfare Concepts: Designing the Future Defence Force’, p. 8.

an eclectic collection of policy makers, defence analysts, research scientists, uniformed professionals, academic consultants and representatives from private industry. During 1999 and 2000, members of the group participated in conferences, seminars and various informal meetings.<sup>57</sup>

The activities of the RMA Working Group were at least partly responsible for the spread of the notion amongst both military practitioners and defence scholars that Australia stood to benefit from the long-term implications of an RMA. As a former Chief of the Defence Force, General John Baker, told one audience, ‘Australia is one of the relatively few nations with the education, scientific, industrial, attitudinal and geographic assets to make best use of RMA possibilities’.<sup>58</sup> Similarly, the veteran Australian strategic thinker, Professor Coral Bell, observed:

The Revolution in Military Affairs offers the most promising set of systems yet evolved to solve Australia’s permanent strategic dilemma: how to defend a very large territory and a long and vulnerable coastline with forces which will always remain very small by global or regional standards.<sup>59</sup>

In broad terms, Project Sphinx has done much to make Australian RMA thinking the most advanced in the Asia-Pacific region. Nowhere was this reality more clearly demonstrated than at a major international conference in Canberra in May 2000 entitled, ‘The RMA in the Asia-Pacific:

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<sup>57</sup> *Ibid.*

<sup>58</sup> General John Baker, AC, DSM (Rtd), ‘Australia’s Defence Posture’, *Australian Defence Force Journal*, no. 143, July/August 2000, p. 16.

<sup>59</sup> Coral Bell, ‘Security Regionalisation and the Future of the Australian Defence Forces’, *Australian Defence Force Journal*, no. 143, July/August 2000, p. 21.

Challenge and Response'. The conference, initiated by the ORMA and the Australian Defence Studies Centre at the Australian Defence Force Academy, attracted over 200 delegates from Australasia, Europe, the Asia-Pacific and North America. The keynote speaker was Dr Andrew Krepinevich, the Director of the CSBA in the United States.<sup>60</sup>

During the proceedings there was clear evidence, if not of a 'knowledge edge', then certainly of a 'knowledge gap' between Australian defence analysts and most of their Asia-Pacific counterparts. Australian speakers at the conference talked about a future battlespace environment in which network-enabled synchronised operations, tailored effects, cyber-manoeuvre and joint warfighting would predominate.<sup>61</sup> In contrast, most Asian speakers stressed the marginal position that the RMA held in their current strategic thinking. The Malaysian scholar, J. N. Mak, summed up the position of many Asia-Pacific strategic analysts when he pointed out that, with the exception of Singapore, the conditions for an RMA in South-East Asia did not exist.<sup>62</sup>

Mak conceded that, while there was considerable expenditure on conventional arms, this development was related mainly to changing international dynamics and the needs of internal

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<sup>60</sup> The proceedings of the conference are contained in a special edition of *Australian Defence Force Journal*, no. 144, September/October 2000.

<sup>61</sup> Blackburn, Cordner and Swan, "Not the Size of the Dog in the Fight": RMA—The ADF Application, pp. 65–9 and Jason B. Scholtz, 'Network-enabled Force Synchronisation', in *Australian Defence Force Journal*, no. 144, September/October 2000, pp. 70–7.

<sup>62</sup> J. N. Mak, 'The RMA in South-East Asia: Security and External Defence', *Australian Defence Force Journal*, no. 144, September/October 2000, pp. 31–5.

security rather than being the product of a conscious drive towards military modernisation.<sup>63</sup> He stated:

The RMA is of minimal utility today to South-East Asia . . . there are no conscious attempts in the region to work towards a Revolution in Military Affairs. This is because the RMA is still a little irrelevant to the needs of the sub-region. Regime security still remains the primary paradigm for South-East Asia'.<sup>64</sup>

In terms of theory, if not yet capabilities, there is little doubt that Australia has already achieved a substantial 'knowledge edge' in South-East Asia. Only Singapore would appear to have any potential to match Australia in RMA thinking.<sup>65</sup>

By the beginning of 2000, then, Australia's response to the RMA had four characteristics. First, Australian planners tended to use a 2020 time frame for assessing the value of RMA technologies. Second, most official Australian strategists tended to view information networking—the essence of the Knowledge Edge philosophy—involving the rapid dissemination of real-time surveillance and targeting data as the most realistic outcome likely to emerge from RMA technologies over the next two decades. Third, while accepting the necessity for American assistance, Australian policy-makers were careful to avoid the more grandiose ideas of

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<sup>63</sup> *Ibid.*

<sup>64</sup> *Ibid.*, p. 31.

<sup>65</sup> Lieutenant-Colonel Hugh Lim, Singapore Armed Forces, 'Impact of RMA on Command and Control—An SAF Perspective', *Australian Defence Force Journal*, no. 144, September/October 2000, pp. 21–6. For a review of Singapore's military technological capacity see Robert Karniol, 'Country Briefing: Singapore—"Deconstruction" forges ahead', *Jane's Defence Weekly*, 27 June 2001, vol. 35, issue no. 36, pp. 18–25; 32.

American RMA advocates. Australian future-warfare analysts opted consciously for a modest ‘middle way’ response to RMA trends. This ‘middle way’ strategy was based on adapting information-age technologies to specific needs, such as surveillance, intelligence and interoperability. Fourth, Australian policy-makers concentrated on trying to refine a set of indigenous concepts and ideas while relying heavily on the DSTO for expertise in technological experimentation.<sup>66</sup>

### **Towards an Australian RMA: Developing the Knowledge Edge, 1999–2001**

Between the end of 1999 and the beginning of 2001, the ADO concentrated on developing the concept of a Knowledge Edge as the centrepiece of a potential Australian RMA. Between late 1999 and the beginning of 2001, a series of official reports, discussion papers and briefings were produced examining the implications of an information-based military revolution. In December 2000, a Defence White Paper confirmed the concept of the Knowledge Edge as being at the heart of Australia’s defence planning in the first decade of the 21st century.

#### *The RMA Paper, Defence Review 2000 and the Knowledge Staff*

In November 1999, the ADF’s Military Strategy Branch defined a revolution in military affairs as comprising ‘fundamental changes in the conduct of military operations resulting from innovative use of technologies, concepts and organisations in response to political, economic, security and social uncertainty’.<sup>67</sup> Such a holistic definition placed a

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<sup>66</sup> See Evans, ‘The Middle Way: Australia’s Response to the Revolution in Military Affairs’, pp. 13–16.

<sup>67</sup> Brigadier S. H. Ayling, ‘The Implications of the Revolution in Military Affairs’, Presentation at the Australian Defence

premium on outlining an integrated approach to an Australian RMA. As Brigadier S. H. Ayling, Director General Military Strategy, put it in May 2000, '[in an RMA it is] the combination of organisation, doctrine and technology that leads to a superior military capability'.<sup>68</sup>

Between late 1999 and early 2000 there was a systematic attempt to come to terms with the multi-dimensional demands of the RMA through the Military Strategy Branch's preparation of a major paper entitled, 'The Revolution in Military Affairs and the Australian Defence Force'.<sup>69</sup> This official document attempted to map the direction of a distinctly Australian approach to an RMA and began the process of explaining the strategic significance of achieving a Knowledge Edge. 'The Revolution in Military Affairs and the Australian Defence Force' was originally conceived for release as a public discussion paper during 2000. Although a final version of the paper was completed and even quoted in the media, ultimately the document was not released for public debate.<sup>70</sup>

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Organisation Revolution in Military Affairs (RMA) Seminar, Russell Offices, Canberra, 8 November 1999. Copy in author's possession.

<sup>68</sup> Ayling, 'Future Warfare Concepts: Designing the Future Defence Force', p. 6.

<sup>69</sup> Department of Defence, Military Strategy Branch, 'The Revolution in Military Affairs and the Australian Defence Force: A Public Discussion Paper', 2nd draft, December 1999. Copy in author's possession.

<sup>70</sup> See, for example, the editorial in *The Australian*, 4 January 2000 on the discussion paper. The document was sidelined by the Government's decision in early 2000 to proceed with a broader public discussion paper on the future of Australian defence policy that incorporated aspects of the RMA.

The official RMA paper called for a specifically Australian approach to the emergent information-based RMA.<sup>71</sup> Such an approach needed to be based on a judicious mixture of enabling technologies, upgraded platforms, appropriate organisational change and new military doctrine.<sup>72</sup> C4ISR technologies, information operations (IO) and integrated logistics support were identified as central to the ADF's ability to undertake effective joint and combined operations in the 21st century.<sup>73</sup> The problem of maintaining interoperability with the United States while maintaining an ability to be able to undertake independent operations in the Asia-Pacific region was also emphasised.<sup>74</sup>

Several of the central ideas in the ORMA paper were subsequently reflected in *Defence Review 2000—Our Future Defence Force: A Public Discussion Paper*, an official publication released in June 2000.<sup>75</sup> The paper was published as a companion document to the work of a Community Consultation Team headed by former Foreign Minister and Ambassador to the United States, Andrew Peacock. The aim of *Defence Review 2000* was twofold. First, it was hoped that the document would assist the Community Consultation Team in gauging public opinion on strategic issues at a time when, because of the deployment of elements of the ADF to East Timor, defence policy had achieved a high national profile.

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<sup>71</sup> 'The Revolution in Military Affairs and the Australian Defence Force: A Public Discussion Paper', pp. 1-2; 4-1.

<sup>72</sup> *Ibid.*, p. 1-2.

<sup>73</sup> *Ibid.*, pp. 3-1 – 3-7.

<sup>74</sup> *Ibid.*, p. 4-8.

<sup>75</sup> Department of Defence, *Defence Review 2000—Our Future Defence Force: A Public Discussion Paper*, Defence Publishing Service, Canberra, June 2000.



Second, the consultation exercise was intended to help Australian policy-planners engaged in drawing up the first Defence White Paper of the 21st century to focus on strategic areas and budget issues that were revealed as being of public concern.

Significantly, the report of the Community Consultation Team found that ‘there was widespread agreement that Australia should maintain the knowledge edge in intelligence, surveillance and reconnaissance capabilities’.<sup>76</sup> This finding coincided with a basic premise of *Defence Review 2000* that, in the 21st century, the Australian military would rely increasingly on two features: information technology systems—especially ISR and C2 capabilities—and the skills of highly trained military personnel.<sup>77</sup>

*Defence Review 2000* extended ideas first mooted in ASP 97 and the ORMA paper. The document suggested that the importance of information technology would grow for Australia for two reasons. First, the trend towards the modernisation of military capabilities in the Asia-Pacific showed no signs of abating. The discussion paper pointed out that the numbers of various advanced combat aircraft, anti-ship missile and surface-to-air missile systems and electronic warfare capacities had dramatically risen in the region during the 1990s.<sup>78</sup>

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<sup>76</sup> Department of Defence, *Australian Perspectives on Defence: Report of the Community Consultation Team*, September 2000, pp. 6–7. The Community Consultation Team held twenty-eight public meetings, surveyed 2000 people and accepted 1157 submissions.

<sup>77</sup> *Defence Review 2000*, p. 46.

<sup>78</sup> *Ibid.*, p. 14. For good analyses of Asian military modernisation see Paul Dibb, ‘Defence Force Modernisation in Asia: Towards 2000

As a result, Australia's traditional advantage in maritime and air platforms was gradually being eroded. The RAAF's seventy-one F/A-18 Hornet tactical fighters were gradually losing parity with the best regional air-forces. Upgrades in avionics, electronic warfare and missiles to Australia's F/A-18s and to its F-111 strike bombers, along with the acquisition of AEW/C aircraft, were critical to regaining air-combat parity.<sup>79</sup>

The emphasis on aircraft upgrades and improved avionics in *Defence Review 2000* highlighted the second reason why information technology was vital to Australia's security: most of the ADF's major air-sea platforms were facing block obsolescence between 2007 and 2020. The discussion paper pointed out that, by 2015, the list of platforms at the end of their service cycle would include the RAAF's F/A-18 Hornet, the P-3C Orion maritime-patrol aircraft and C130H transport fleet; the RAN's guided-missile frigates, its amphibious-support and afloat-support ships; and many of the Army's wheeled vehicles. In addition, by 2020, Australia's F-111 bombers, described as 'the muscle of our strike force', would have reached the end of their operational effectiveness.<sup>80</sup>

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and Beyond', *Contemporary Southeast Asia*, March 1997, vol. 18, no. 4, pp. 347–60 and 'The Revolution in Military Affairs and Asian Security', *Survival*, Winter 1997–98, vol. 39, no. 4, pp. 93–116. Dobb views Singapore, China and Japan as the only three Asian states with a significant RMA potential.

<sup>79</sup> *Defence Review 2000*, pp. 36–9.

<sup>80</sup> *Ibid.*, pp. 36; 37–9; 54. The discussion paper set out the ADF's current capabilities in a companion document: Department of Defence, *The Australian Defence Force: Capability Fact Book*, Defence Publishing Service, Canberra, June 2000.

Australia thus faced a huge financial burden to re-equip the ADF for 21st-century military operations. Between 2000 and 2020, the sum required for new investment was estimated by the discussion paper as between \$80 billion and \$100 billion—a sum that exceeded current levels for investment by almost 50 per cent.<sup>81</sup> The most critical investment challenge was in the realm of aerospace combat power. A suitable replacement fighter for the F/A18-Hornet would cost at least \$10 billion.<sup>82</sup>

In the light of the twin challenges of growing regional military capabilities and an ADF heading towards obsolescence, *Defence Review 2000* reinforced the importance of the Knowledge Edge in giving Australia ‘a critical military capability edge’ in the future.<sup>83</sup> In terms of re-equipping the Australian Defence Force, the paper announced that ‘the application of technology associated with the “Revolution in Military Affairs” . . . may present innovative capability solutions that could yield financial savings’.<sup>84</sup>

The discussion paper suggested that an RMA-style approach to defence modernisation was now vital for Australia. ‘Information capabilities’, the document stated, ‘are about applying the ideas of the knowledge economy to the business of fighting wars’.<sup>85</sup> The most critical ADF assets in the future would lie not simply in the power of platforms and weapons, but increasingly in the integration of systems and skills to produce combat effects. The document went on to observe:

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<sup>81</sup> *Defence Review 2000*, p. 54.

<sup>82</sup> *Ibid.*, p. 55.

<sup>83</sup> *Defence Review 2000*, p. 46.

<sup>84</sup> *Ibid.*, p. 54.

<sup>85</sup> *Ibid.*, pp. x; 47.

Information warfare . . . the ‘Revolution in Military Affairs’ . . . is where our comparative advantage over potential adversaries is likely to last longest. In coming years, it will be harder for Australia to match regional numbers of platforms such as ships and aircraft, but we are well-placed to keep a lead in our ability to use what we have to the best effect.<sup>86</sup>

In order to exploit sophisticated information-age capabilities, the Australian–American alliance was of fundamental importance. The Peacock Review reaffirmed that ‘our alliance with the US, which leads the world in these [information capabilities] areas, is vital to giving us affordable access to this technology’.<sup>87</sup>

Alongside the RMA content in the public discussion paper, ADF Headquarters continued to refine the concept of the Knowledge Edge as ‘a fundamental basis for the achievement of warfighting superiority for the ADF in the Asia-Pacific region’.<sup>88</sup> In June 2000, a concept paper drawn up by Defence Headquarters extended the definition of the Knowledge Edge:

*A Knowledge Edge exists when, as a result of leveraging and exploiting information, communications and other technologies, and by the application of human cognition, reasoning and innovation, there is a comparative advantage in those factors that influence decision making and its effective execution.*<sup>89</sup>

The paper describes attaining decision superiority over opponents as the central advantage to be gained from RMA-style technologies. The key to achieving a Knowledge Edge

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<sup>86</sup> *Ibid.*, p. 46.

<sup>87</sup> *Ibid.*

<sup>88</sup> Department of Defence, Australian Defence Headquarters, ‘Brief for Vice Chief of the Defence Force on the Knowledge Edge’, 22 June 2000, p. 1. Document in author’s possession.

<sup>89</sup> *Ibid.*, p. 1. Emphases in original.

lay therefore in a skilful combination of command-and-control, information, surveillance, reconnaissance and electronic-warfare (C4ISREW) capabilities. With an infrastructure based on this suite of capabilities, Australia could eventually move towards ‘a “network enabled” approach to warfighting, leveraging the connectivity between sensors, commanders and weapon systems’.<sup>90</sup>

As C4ISREW capabilities provided improved connectivity in network-enabled military operations, there would have to be corresponding changes in the non-technological areas of Knowledge Edge activity. The latter included developing suitable doctrine for joint and combined operations; reforming both military organisation and military education; realigning leadership and command authority to meet information-age requirements; and maintaining suitable cohesion and morale within the ADF.<sup>91</sup> A recent draft of the ADF’s capstone doctrine lists the Knowledge Edge as one of the five ‘Australian Characteristics of Warfare’.<sup>92</sup>

By mid-2001 the Department of Defence had formed a Knowledge Staff headed by a Chief Knowledge Officer, Air Vice Marshal Peter Nicholson. As noted earlier, Nicholson was an early proponent of ‘knowledge dominance’ as a central feature of an Australian RMA. The main tasks of the current

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<sup>90</sup> *Ibid.*, p. 2.

<sup>91</sup> *Ibid.*, pp. 3–4.

<sup>92</sup> Department of Defence, Australian Defence Force Publication (ADFP), draft dated October 2000, ADFP 1, *Foundations of Australian Doctrine*, pp. 5-3 – 5-4. Document in author’s possession. The other four characteristics are Manoeuvre, Cooperation in Military Operations, Versatility and Flexibility in Military Operations, and Justifiable Action.

Knowledge Staff are to examine complex technical issues, such as interoperability with allies and the coordination of simulation exercises. A Directorate of Intelligence, Surveillance, Reconnaissance and Electronic Warfare within the Knowledge Staff has the responsibility of developing an integrated national surveillance system using sensors, platforms and synthetic aperture radar.<sup>93</sup>

### *The 2000 Defence White Paper and the Knowledge Edge*

In December 2000, the publication of a new White Paper, *Defence 2000: Our Future Defence Force*, provided the most detailed rationale so far advanced by Canberra's strategic planners for Australia's embrace of the Knowledge Edge. In terms of the RMA, the 2000 White Paper represented the culmination of thinking that had begun in ASP 97. The new strategic blueprint reflected over three years of close analysis of both technological innovation and the potential for revolutionary changes in the character of warfare. As one observer has noted, 'the White Paper acknowledges the overriding importance of the Revolution in Military Affairs at all levels of the ADF'.<sup>94</sup> The document contained both a general assessment of the RMA and a specific analysis of Australia's requirements from it in order to maximise the Knowledge Edge.

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<sup>93</sup> Department of Defence, Australian Defence Headquarters, 'The Knowledge Staff', 23 May 2001. Document in author's possession. See also Gregor Ferguson, 'JP 129 Awaits Surveillance Report', *Australian Defence Magazine*, March 2001, vol. 9, no. 3, pp. 33–4.

<sup>94</sup> Gregor Ferguson, 'Army Blessed by White Paper', *Australian Defence Magazine*, vol. 9, no. 3, March 2001, p. 38. On the central importance of the RMA in the White Paper see also Geoffrey Barker, 'Defence gets a shot of realism', *The Australian Financial Review*, 7 December 2000.

The White Paper reconfirmed the Australian conviction that the RMA was firmly based on a global information-technology revolution. The document stated, ‘the most important development changing the conduct of warfare is the ability to increase vastly the speed and capacity to collect, organise, store, process, tailor and distribute information’.<sup>95</sup> Indeed, *Defence 2000* is peppered with statements such as ‘effective use of information is at the heart of Australia’s defence capability’ and ‘for Australia effective exploitation of information capabilities will be critical to maintaining our edge’.<sup>96</sup>

The main characteristics of the RMA were identified in the White Paper. These characteristics were listed as a trend towards the integration of military forces for joint operations, the networking of individual systems and capabilities to achieve whole-of-force effects and multiplied combat-power, and changes to military organisation and doctrine.<sup>97</sup> As *Defence 2000* puts it:

RMA technologies impart the ability to know more than one’s adversary in relevant areas. This can result in a decisive military advantage when linked with appropriate weapons and concepts of operation. Indeed, this will probably be one of the decisive factors in warfare over the coming decades.<sup>98</sup>

As foreshadowed in ASP 97 and *Defence Review 2000*, the White Paper committed Australia to the development of an advanced information-technology infrastructure based on major investment and cooperation with the United States.<sup>99</sup>

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<sup>95</sup> *Defence 2000*, p. 108.

<sup>96</sup> *Ibid.*, pp. 84; 56.

<sup>97</sup> *Ibid.*, p. 108.

<sup>98</sup> *Ibid.*, pp. 108–9.

<sup>99</sup> *Ibid.*, p. 109.

Information technology, the document declared, could confer long-range precision strike using networked platforms employing stealth technology and electronic self-protection. Sensors would increase automation and remote control would help reduce personnel numbers.<sup>100</sup>

The White Paper announced that the early 21st-century ADF would be based on a mixture of new and upgraded platforms, information and space-based capabilities. The FA/18 would be upgraded using stealth technology; new combat aircraft would be acquired in 2006–7, with the first fighters to enter service in 2012.<sup>101</sup> The RAN's Anzac frigates would receive anti-ship missile defence, and a new class of three air-defence-capable ships would be locally built, beginning in 2005–6. Armoured personnel carriers would be upgraded but the Army would also be equipped with a new armed reconnaissance helicopter and shoulder-fired missiles.<sup>102</sup>

Space-based technologies such as UAVs and uninhabited combat aerial vehicles (UCAVs) were identified in *Defence 2000* as emergent systems that offered a great deal of potential for surveillance, reconnaissance, information gathering and eventually the delivery of combat power.<sup>103</sup> The White Paper

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<sup>100</sup> *Ibid.*, pp. 109–10.

<sup>101</sup> No replacement combat fighter has been decided upon, but speculation centres around aircraft such as the F-22 Raptor and the Eurofighter as well as a possible role for the Tomahawk Land Attack Missile (TLAM). See Evans, *Australia and the Revolution in Military Affairs: The Challenge for a Middle Power*, pp. 17–18.

<sup>102</sup> See Kevan Wolfe, 'Australia's Defence White Paper—An Overview', *Asia-Pacific Defence Reporter*, December/January 2001, vol. 26, no. 7, pp. 21–2.

<sup>103</sup> *Defence 2000*, pp. 109–11.



announced that advances in biological procedures and nanotechnology would be monitored in order ‘to select and acquire expertise and capability in those technologies that offer the most advantages in gaining and maintaining the knowledge edge’.<sup>104</sup> Advanced RMA-style technology would also be applied to improve the performance of individual soldiers. In the future, the use of micro-vehicles, night-vision equipment and sophisticated navigation techniques would assist soldiers ‘to move faster and see further, conduct operations over 24 hours in all terrains and have vastly improved firepower at his or her fingertips’.<sup>105</sup>

To meet the demands of 21st-century warfare, an organisational review of the DSTO was necessary. The organisation will ‘undertake a fundamental review of its program of work and its structures to ensure that it is poised to take best advantage of the emerging RMA, information and other technologies’.<sup>106</sup> The DSTO would liaise with industry in its research into software for guided-weapon combat systems, data management, signal processing and C4 systems integration.<sup>107</sup> Australia would also pursue a cooperative project in a major UAV program with the United States and would undertake extensive research into information operations, simulation, and modelling in a series of both qualitative and quantitative wargames.<sup>108</sup>

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<sup>104</sup> *Ibid.*, p. 111.

<sup>105</sup> *Ibid.*, p. 111. In East Timor, Australian troops found that night-vision equipment was a key factor in gaining dominance over Indonesian-backed militia forces.

<sup>106</sup> *Defence 2000*, pp. 112–13.

<sup>107</sup> *Ibid.*, pp. 99–100.

<sup>108</sup> *Ibid.*, pp. 111–12.

To facilitate the drive toward cutting-edge RMA – Knowledge Edge research, the White Paper designated Information Capabilities to be an integral part of a \$16 billion, ten-year Defence Capability Plan (DCP) unveiled in the document. Under the DCP, Information Capabilities—comprising intelligence and surveillance, communications, information warfare, command and headquarters systems, logistics and business applications plus the stealth capabilities embedded in existing air platforms—became for the first time a separate grouping in order to ensure their strategic priority.<sup>109</sup> Between 2001 and 2011, \$2.5 billion will be spent on developing Information Capabilities. Indeed, in terms of capital expenditure, information technologies now rank third in Australia’s defence-spending hierarchy—behind air combat (\$5.3 billion) and land forces (\$3.9 billion), but well ahead of maritime forces (\$1.8 billion) and strike (\$0.8 billion).<sup>110</sup>

The order of these priorities demonstrates the importance that the Department of Defence now assigns to information techniques in 21st-century warfare. According to *Defence 2000*, the objective is to apply the components of the Information Capabilities grouping, so positioning Australia to harness RMA-style advances. Thus the ADF will be assured of timely, accurate and secure information to exploit individual and unit combat effectiveness.<sup>111</sup>

Accordingly, there is to be sustained investment in enhanced intelligence capabilities—described in the document as critical to providing a ‘war-winning edge to forces in the field’.<sup>112</sup>

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<sup>109</sup> *Ibid.*, pp. 57; 94–5.

<sup>110</sup> *Ibid.*, p. 97.

<sup>111</sup> *Ibid.*, p. 95.

<sup>112</sup> *Ibid.*, pp. 95–6.

These capabilities include enhanced signal intelligence and imagery collection; improved geo-spatial information systems; and deeper levels of US–Australian cooperation in key information systems. A specific objective is to finalise a comprehensive national surveillance system to provide continuous coverage of Australia’s vast and extended northern maritime approaches. Data from the Jindalee Operational Radar Network project, due to go into service in 2002, would eventually be fused with other sensor systems to provide an integrated 24-hour national surveillance picture.<sup>113</sup>

Australia would continue to seek to use information technology to overcome its geographic size and distance. In this respect, there is to be investment to create a networked command system to support deployed forces on operations using a single, collocated theatre headquarters and two deployable joint-force headquarters for concurrent operations.<sup>114</sup> Finally, there are requirements to maximise integrated logistics systems for complex operations at short notice, provide protection against hostile information operations and maintain a high level of interoperability with major allies.<sup>115</sup>

The priority afforded to the Information Capabilities grouping has been justified in *Defence 2000* on two main grounds. First, the White Paper now clearly views RMA developments as offering Australia unique advantages in American-style information technology that were ‘unthinkable even a few years ago’.<sup>116</sup> Second, the authors of the document believe that

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<sup>113</sup> *Ibid.*, p. 96.

<sup>114</sup> *Ibid.*, pp. 96–7.

<sup>115</sup> *Ibid.*, pp. 95–6; 107.

<sup>116</sup> *Ibid.*, p. 94.

embracing information technology works to a national strength since Australia enjoys widespread and high levels of computer literacy. The combination of RMA information technologies and high computer literacy is seen by many Australian strategic planners as providing a societal base to ensure that ‘the “knowledge” edge . . . will be the foundation of our military capability over the coming decades’.<sup>117</sup>

The pursuit of a 21st-century Knowledge Edge will also require even closer cooperation with the United States. In this respect, the decision in July 2001 to award the development of a new combat system for the RAN’s Collins-class submarines to the United States Navy rather than to a German company conforms with overall Knowledge Edge requirements. As the Minister for Defence, Peter Reith, put it, ‘the Government has decided that a comprehensive arrangement with the US Navy on submarine issues is in Australia’s strategic interests’.<sup>118</sup> It has been suggested that this decision ‘represents a radical recasting of the 25-year-old Australian policy of defence self-reliance’.<sup>119</sup> Yet it is important to note that, for nearly fifteen years, Australia has conceived of defence self-reliance as being a policy that must be ‘pursued within a framework of alliances and agreements’.<sup>120</sup> Given the operational demands of the post-Cold War security environment—which has involved Australia in coalition missions ranging from the Gulf War to East Timor—the demands of domestic self-reliance need to be

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<sup>117</sup> *Ibid.*

<sup>118</sup> See the statement by the Hon. Peter Reith, Minister for Defence, in *The Australian*, 10 July 2001.

<sup>119</sup> Robert Garran, ‘Navy locked into US aims’, *The Australian*, 11 July 2001.

<sup>120</sup> As officially articulated in Department of Defence, *The Defence of Australia 1987*, Australian Government Publishing Service, 1987, p.1.

balanced against securing vital international interests. Accordingly, it is more accurate to view the Collins combat system decision in the international context of Australia's post-1997 RMA – Knowledge Edge approach of maximising national access to the world's most advanced information-age technology—and that technology is invariably American.

### **The Convergence Crisis and the Institutional Challenge to the Australian Knowledge Edge, 1999–2000**

Although Australian defence planners expect much from the long-term benefits of the Knowledge Edge, success depends not simply on ideas and concepts but on implementation and resources. If the Knowledge Edge is to fulfil its promise, Australia must overcome a major institutional challenge to its national security: the need to fund adequately both operational commitments and future capabilities. In early 2000 the Secretary of Defence, Alan Hawke, identified 'a convergence crisis' stemming from the combined impact of financial, management, planning and strategic pressures.<sup>121</sup> At the heart of this convergence crisis is a frozen defence budget and organisational methods that remain rooted in Cold War practice. During 1999 and 2000 the need to increase defence spending to balance the requirements of both current operations and RMA-style investment emerged as the single greatest problem facing Australian defence planners.

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<sup>121</sup> Department of Defence, 'Money Matters', paper based on an Address to the Royal United Services Institute for Defence Studies of Victoria by Dr Allan Hawke, Secretary of the Department of Defence, 27 April 2000, pp. 1–3 (henceforth cited as Hawke, 'Money Matters'). Document in author's possession.

In 1999 and 2000, at the very time the ORMA was being established and the Knowledge Edge concept was being developed, Australia fell into the most serious defence budget crisis since the late 1930s. The budget crisis in the Defence Department was exacerbated by cost blow-outs—notably in the ADF's Collins submarine program—that were associated with poor management practices.<sup>122</sup> The convergence crisis within the ADO had the effect of focusing political attention on future military capabilities. In turn, the rise of political concern over defence matters highlighted a division within the Howard Government's National Security Committee of the Cabinet over the expenditure required to re-equip the ADF for the early 21st century. In December 2000, the White Paper's Defence Capability Plan attempted to resolve the funding crisis in order to allow the ADF to move towards attaining the goal of a Knowledge Edge.

*'The Coming Train Smash': The Dilemma of Low Defence Spending*

In 1984 Australia was spending 2.9 per cent of GDP on defence. By 1999 the figure had dropped to 1.8 per cent (\$11.2 billion)—the lowest percentage since 1938—representing a drop of 35 per cent over fifteen years.<sup>123</sup> By

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<sup>122</sup> As an example of the fiscal crisis the cost of the Collins submarine project had blown out from \$6 billion to \$7.5 billion. See Department of Defence, *Report to the Minister for Defence on the Collins Class Submarine and Related Matters*, Commonwealth of Australia, Canberra, June 1999, chaps 2, 4 and 8.

<sup>123</sup> For details of Australian defence expenditure see Derek Woolner, *Affordable Self Reliance?: Past Patterns in Defence Finance and Prospects after the 1994 White Paper*, Research Paper No. 16, Parliamentary Research Service, Canberra, December 1994,

early 2000, there appeared to be an unresolved tension at the heart of Australian defence policy between a desire for advanced technology and a need for a credible force-in-being for operations in the immediate Asia-Pacific region.<sup>124</sup> It became clear that, unless the defence budget was substantially increased, the ADO would not be able to undertake even a modest, ‘middle way’ or niche-capability RMA and simultaneously retain high preparedness for current regional contingencies such as the peace enforcement mission in East Timor.<sup>125</sup> In 1999, the leading Australian strategic analyst, Paul Dibb, predicted a ‘coming train smash’ in Australian defence policy. A collision between ends and means would occur because the Government’s ambition to invest in information-age capabilities was unmatched by increased defence spending. Dibb argued that the purchase of new systems and platforms—along with expenditure on upgrades, enhancements, refits and operational deployments—could not be met from within a static defence budget.<sup>126</sup>

During 2000 defence spending became an acute political issue. In April, Hawke stated bluntly, ‘the bottom line is that

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pp. 1–23 and ‘The Revolution in Military Affairs and the Australian Defence Force: A Public Discussion Paper’, pp. 5–8.

<sup>124</sup> Derek Woolner, *Pressures on Defence Policy: The Defence Budget Crisis*, Research Paper No. 20, Foreign Affairs, Defence and Trade Group, Parliament of Australia, Canberra, April 2000, pp. 3–11.

<sup>125</sup> Evans, ‘The Middle Way: Australia’s Response to the Revolution in Military Affairs’, pp. 14–15 and *Australia and the Revolution in Military Affairs: The Challenge for a Middle Power*, pp. 15–20.

<sup>126</sup> See Paul Dibb’s views as quoted in *The Australian*, 19 September 2000. Of \$11.2 billion, \$6.52 billion was spent on current capability, \$3.3 billion on future capability, \$220 million on research, \$840 million on personnel services and \$375 million on resource administration, *Defence Review 2000*, p. 51.

Australia can no longer afford a balanced, self-reliant, capable and ready defence force of 50 000 with its current capabilities on 1.8% of GDP'.<sup>127</sup> The Secretary pointed out the nature of the *fin-de-siècle* convergence crisis:

The irony of our professional military performance in East Timor is that it masks the reality we face. *Australia's national security is challenged by a convergence of financial, management, planning and strategic pressures.* The Australian Defence Organisation's ability to present a range of capability and military response options to Government will be severely constrained if these combined pressures are left unchecked. This crisis, which has been building over the last [post-Cold War] decade, has now come to a head due to increased personnel costs and the costs of expanding and re-equipping the capabilities of the ADF.<sup>128</sup>

The weakness of the defence budget was exacerbated by the problem of unreformed Cold War organisational and managerial practices. Hawke remarked that the Department of Defence had undergone 'more reviews than *Gone With the Wind* and [had become] a lucrative hunting ground for consultants'.<sup>129</sup> In the relatively predictable strategic environment of the later Cold War—when short-notice ADF operational deployments were rare—the ADO had developed the unhealthy practice of holding down operations and personnel budgets in order to fund capability and platform modernisation.<sup>130</sup> In the more unpredictable conditions of the

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<sup>127</sup> Hawke, 'Money Matters', p. 3.

<sup>128</sup> *Ibid.*, p. 2. Emphasis added.

<sup>129</sup> Quoted in Eric Andrews, *The Department of Defence, The Australian Centenary History of Defence*, vol.V, Oxford University Press, Melbourne, 2001, p. 296.

<sup>130</sup> Woolner, *Pressures on Defence Policy: The Defence Budget Crisis*, pp. 3–12. In 1985 the Australian Defence Organisation consisted of 70 000 uniformed personnel and 40 000 civilians. By 2000, these



post–Cold War era—when ADF operational deployments increased markedly—this approach to managing capital equipment and projects proved to be untenable. By the late 1990s the needs of capability development and short-notice military deployments could not be met simply by scaling back spending on operational needs and personnel.<sup>131</sup>

By 2000 there was not enough money available to meet the triple demands of technology upgrades to existing platforms, the purchase of new platforms, and acquiring RMA – Knowledge Edge systems. A Defence Resource Assessment Report warned that Australia could not afford to maintain even its present range of capabilities at levels of regional comparability unless there was an increase in spending.<sup>132</sup> With a defence expenditure base of 1.8 per cent of GDP, the possibility of developing both advanced high-technology military capabilities and maintaining a credible ADF for current contingencies seemed rather bleak. As Hawke put it, ‘at present and anticipated levels of funding, the ADF as we know it today will cease to exist’.<sup>133</sup>

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numbers had fallen to 50 000 and 16 000 respectively, *The Australian*, 23 February 2000.

<sup>131</sup> Hawke, ‘Money Matters’, pp. 4–5; Evans, *Australia and the Revolution in Military Affairs: Challenge for a Middle Power*, pp. 15–18. In the decade between 1990 and 2000 there were twenty-two ADF deployments, including large-scale operations in Somalia and East Timor, *Asia-Pacific Defence Reporter*, February 2001, p. 29.

<sup>132</sup> See the remarks by the former Deputy Secretary for Strategy, Hugh White, in *Defence Information Bulletin*, June 2001, pp. 8–9.

<sup>133</sup> ‘Hawke, ‘Money Matters’, p. 10. See also Woolner, *Pressures on Defence Policy: The Defence Budget Crisis*, pp. 19–25.

*The Politics of Defence: The 'Hi-End-Low-End' Division of 2000*

The budget crisis in the ADO was not easily resolved. During 2000, defence spending and the problem of unreformed managerial practice became the focus of a political debate in the National Security Committee of the Howard Government.<sup>134</sup> Division developed over whether Australia required a 'high-end' (shorthand for an expensive, high-technology) or a 'low-end' (shorthand for a cheaper, lower-technology) military establishment. As one defence correspondent, Robert Garran, observed succinctly, 'at the heart of the debate [in the Howard Government] is whether the Australian Defence Force should focus on peacekeeping and low-level contingencies in the region or whether it needs a powerful high-tech capability'.<sup>135</sup>

According to various press reports, those that supported a high-end force included John Moore, the Minister for Defence, and Alexander Downer, the Foreign Minister. Sceptics of the high-end force were reported to include the Treasurer, Peter Costello; the Finance Minister, John Fahey; and the influential Secretary of the Department of the Prime Minister and Cabinet, Max Moore-Wilton.<sup>136</sup> The national daily newspaper, *The Australian*, recorded the progress of this complex, internal political debate.<sup>137</sup> In a series of editorials and opinion pieces, the newspaper warned against the idea that the East Timor

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<sup>134</sup> For a useful overview see Graeme Dobell, 'The Politics of the White Paper', *Australian Defence Force Journal*, no. 147, March/April 2001, pp. 31–3.

<sup>135</sup> Robert Garran, 'Defence Splits Cabinet', *The Australian*, 19 September 2000.

<sup>136</sup> *Ibid.*

<sup>137</sup> See, especially, Paul Kelly, 'All quiet on the spending front', *The Australian*, 23 February 2000.

peace-enforcement experience could serve as a model for Australia's future military-force structure. In January 2000, in an editorial on the national implications of the RMA, *The Australian* stated: 'for "revolution in military affairs" read "information revolution" . . . the attempts by the military . . . to deliver the capability of destroying targets with unparalleled precision'. To exploit the RMA, Australia required a clear strategic approach in order to permit the ADF to 'determine the best mix of [information] technologies'.<sup>138</sup>

In August 2000, those favoring a low-end force and restricted defence spending in the National Security Committee of the Cabinet appeared to score a major victory when the Government reduced the number of AEWCs wanted by the RAAF from seven to four aircraft. It was noted that Australia's East Timor deployment was expected to cost over \$4 billion in the period from 1999 to 2003. One low-end advocate in the cabinet was reported as prefacing his opposition to advanced warning aircraft by asking rhetorically of Defence officials: 'What use would AEWCs have been in Timor?'.<sup>139</sup> In September 2000, in yet another hardline editorial, *The Australian* warned the Government that 'the capability to defend ourselves should be paramount in Cabinet thinking. It would be a national disgrace—as well as irresponsible—to argue that we can ignore the need to sustain capable military forces'.<sup>140</sup>

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<sup>138</sup> 'Revolution Raises Policy Questions', *The Australian*, 4 January 2000, editorial.

<sup>139</sup> Robert Garran, 'Defence's Strategy for Survival', *The Australian*, 10 October 2000.

<sup>140</sup> 'Defence Lacks Coherent Strategic Lead', *The Australian*, 21 September 2000, editorial.

*The White Paper's Defence Capability Plan: Future Implications for an Australian RMA – Knowledge Edge*

By the end of 2000 it was clear that, despite tactical reverses over AEWC capabilities, the advocates of a high-end ADF had prevailed in the political debate over defence spending in the National Security Committee of the Cabinet. In its December 2000 White Paper, the Howard Government sought to provide a long-term resolution to the convergence crisis. The political aim was to balance strategic demands, defence capabilities and levels of defence funding by introducing the ten-year DCP.<sup>141</sup> This plan—with, as already noted, a strong emphasis on the RMA – Knowledge Edge—was unveiled as the cornerstone of *Defence 2000*.

The aim of the DCP was to establish parameters against which defence spending could be increased by an average of about 3 per cent per annum in real terms between 2001 and 2011.<sup>142</sup> Significantly, Prime Minister Howard declared *Defence 2000* to be the ‘most comprehensive reappraisal of Australian defence capability for decades’.<sup>143</sup> The victory of the Government’s high-enders was captured by *The Australian*’s banner headline on the White Paper: ‘Enter the cyber warriors’.<sup>144</sup>

Under *Defence 2000*’s ten-year capability plan, the Australian defence budget is to increase by \$500 million between 2000 and 2001; by \$1 billion between 2002 and 2003; and thereafter by 3 per cent real growth per year until 2010. Some sources

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<sup>141</sup> *Defence 2000*, pp. vii; 6.

<sup>142</sup> *Ibid.*, p. 117.

<sup>143</sup> Statement by Prime Minister John Howard, *The Sydney Morning Herald*, 7 December 2000. Emphasis added.

<sup>144</sup> *The Australian*, 7 December 2000.

estimate that there will be a \$23.5 billion increase in expenditure in real terms over the first decade of the 21st century. In theory, by 2010, defence spending will stand at \$16 billion as opposed to \$11.2 billion in 2000.<sup>145</sup> Paul Dibb has suggested that the firm financial commitment under the DCP has made the new strategic blueprint ‘a benchmark Defence White Paper’.<sup>146</sup>

The principal author of the White Paper, former Deputy Secretary for Strategy, Hugh White, has expressed his confidence that the implementation of *Defence 2000* is unlikely to be disturbed over the next decade.<sup>147</sup> It is, however, important to note that the DCP remains an unbinding commitment on future Australian governments. For this reason, some observers are pessimistic about the future of a high-technology ADF with a Knowledge Edge capability. As Greg Sheridan, the foreign editor of *The Australian*, has observed, a real cause for concern with the DCP is that no government has ever sustained a real increase of 3 per cent in defence spending for ten years.<sup>148</sup> In a later article, he went on to point out gloomily:

Australia is now a substantially less secure country than it was five years ago. Our defence capacity is declining. Our security environment is more complex and less stable. The nations of our region are spending money on military acquisitions at an

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<sup>145</sup> See Wolfe, ‘Australia’s Defence White Paper—An Overview’, pp. 22–4.

<sup>146</sup> Paul Dibb, ‘Defence Paper is Evolutionary’, *Australian Financial Review*, 7 December 2000 and ‘Australia’s Best Defence White Paper?’, *Australian Defence Force Journal*, no. 147, March–April 2001, pp. 27–8.

<sup>147</sup> Interview with Hugh White, *Defence Information Bulletin*, June 2001, p. 7.

<sup>148</sup> Greg Sheridan, ‘New equipment aside, post-coital blues are inevitable’, *The Australian*, 1 December 2000.

unprecedented rate—indeed, the Asia-Pacific is the fastest growing military market in the world.<sup>149</sup>

In Sheridan's view, 'the Government's White Paper is all about Australia's strategic decline. It's about managing, slowing, but above all accommodating, our national strategic decline'.<sup>150</sup> Only time will tell whether optimists such as Dibb and White, or pessimists such as Sheridan, are right.

## Conclusion

In his masterly 1961 essay, *Science and Government*, the British scholar C. P. Snow wrote that, for official technological research to succeed in Western democracies, three important conditions must always be met. First the objective of scientific research must be both clear and 'not too grandiloquently vast'.<sup>151</sup> Second, there must be a research committee or organisation that is strategically placed within the bureaucracy to interact with key policy-makers throughout the 'great underground domain of science and government'. Third, the committee or research organisation concerned must be armed with powers of action, inspection and follow-up.<sup>152</sup>

So far, the Australian RMA – Knowledge Edge initiative has fulfilled the first two of Snow's three conditions. As Dr Ian Chessell, the Chief Defence Scientist, observed recently, the

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<sup>149</sup> Greg Sheridan, 'They're beautiful weapons, but we need more of them', *The Australian*, 8 December 2000.

<sup>150</sup> Greg Sheridan, 'Chronicle of strategic decline', *The Australian*, 7 December 2000.

<sup>151</sup> C. P. Snow, *Science and Government; The Godkin Lectures at Harvard University, 1960*, Oxford University Press, London, 1961, pp. 74–5.

<sup>152</sup> *Ibid.*

purpose of the Knowledge Edge must be to keep abreast of appropriate and relevant RMA technologies and integrate them into the ADF's combat systems.<sup>153</sup> Such an ambition is both clear and 'not too grandiloquently vast'. Second, the ORMA is located inside the Military Strategy Branch—the very heart of Australian Defence Headquarters—and the organisation is thus well-positioned to coordinate the ADO's activities on future-warfare research. Snow's third condition—that of action, inspection and follow-up—exists so far only in the Australian world of information-age theory. It is probable, however, that, as evidentiary methods of practice emerge over time, Australia's Knowledge Edge organisation—in conjunction with the DSTO—will gain increasing influence over capability decision-making.

Although much has been written recently about the Department of Defence's capacity to balance its budget, management practices and operational commitments, there are three other pitfalls that Australia must avoid if it is to develop a credible Knowledge Edge. In the first place, it is important that discussion of an Australian RMA initiative be conducted in accessible and clear language, with a minimum of 'jargonese' employed. In August 2000, a future-warfare briefing on the contours of information-age operations to a committee of senior policy-makers and military professionals in Defence Headquarters at Russell Offices was overly rich in acronyms and jargon. In particular, the phrase *cyber-manoeuvre* was used frequently, but without sufficient explanation or qualification. At the end of the briefing, there was a studied silence from the members of the committee. Then, one of the generals present, a

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<sup>153</sup> Interview with Dr Ian Chessell, Chief Defence Scientist, *Australian Defence Magazine*, May 2001, vol. 9, no. 5, pp. 37–8.

shrewd Vietnam veteran with over thirty years of distinguished service, asked the question that was hanging in the air: ‘Yes, but what does cyber-manoeuvre actually *mean*’.<sup>154</sup> This episode is a cautionary warning to all those defence planners working on future-warfare concepts. The need for clarity and precision when expounding RMA-style ideas should always be of paramount importance.

Second, it will be of vital importance for the Defence Department to nurture itself as a ‘learning organisation’.<sup>155</sup> Based on historical precedents, the evidentiary demands of the Knowledge Edge will probably require, more than any other factor, a strong intellectual investment in strategic analysts.<sup>156</sup> Despite Australia’s advances in RMA theorising—which are arguably second in the world only to those of the United States—there is a growing shortage of a new generation of younger strategic thinkers. Fewer and fewer of the cream of

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<sup>154</sup> Author’s personal observation, Russell Offices, Canberra, 15 August 2000.

<sup>155</sup> See Emily O. Goldman, ‘Thinking About Strategy Absent the Enemy’, *Security Studies*, Autumn 1994, vol. 4, no. 1, pp. 40–85; ‘The US Military in Uncertain Times: Organisations, Ambiguity and Strategic Adjustment’, *The Journal of Strategic Studies*, June 1997, vol. 20, no. 2, pp. 31–74 and Michael Evans, ‘Fabrizio’s Choice: Organisational Change and the Revolution in Military Affairs Debate’, *National Security Studies Quarterly*, Winter 2001, vol. vii, issue 1, pp. 1–25.

<sup>156</sup> For comparative historical analyses of military innovation see Emily O. Goldman and Richard B. Andres, ‘Systemic Effects of Military Innovation and Diffusion’, *Security Studies*, Summer 1999, vol. 8, no. 4, pp. 79–125.



Australia's university graduates are choosing to study strategy and international relations.<sup>157</sup>

A defining characteristic of coherent strategic analysis lies in exploring the relationship between the empirical and the hypothetical—particularly when research is focused on the crucial task of integrating policy with operations, systems and technology. Such work requires sophisticated minds that can distinguish between information and knowledge. As Henry Kissinger has warned:

It is commonplace to describe the information age as one of the great intellectual revolutions of history . . . But what shapes the conduct of international relations and therefore the course of history is not only the number of people with access to information; it is more importantly how they analyse it. Since the mass of information tends to exceed the capacity to evaluate it, a gap has opened up between information and knowledge and, even beyond that, between knowledge and wisdom.<sup>158</sup>

Over the long term, the shortage of highly educated strategic specialists will make itself felt in the Australian assessment of RMA developments. A partial solution to the shortage of analysts is the creation by the ADF of a Joint School of either Advanced Warfighting or Military Studies based on the US Marine Corps model. Such a school would produce specialised

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<sup>157</sup> For a discussion see Paul Dibb, 'The Evolution and Future of Australian Defence Policy', in Coral Bell (ed.), *Nation, Region and Context: Studies in Peace and War in Honour of Professor T. B. Millar*, Canberra Papers on Strategy and Defence No. 112, Strategic and Defence Studies Centre, 1995, pp. 47–8 and 'A Trivial Strategic Age', *Quadrant*, July–August 2000, pp. 11–17.

<sup>158</sup> Henry Kissinger, *Does America Need a Foreign Policy? Towards a Diplomacy for the 21st Century*, Simon & Schuster, New York, 2001, p. 284.

‘knowledge officers’ and help to reinforce the linkages between the worlds of policy, military theory and operational practice. In any event, the ADO needs to consider all the educational options available in Australia in order to encourage advanced intellectual study amongst its ‘best and brightest’ minds. It must be recognised that, in generating a practical transition strategy from the world of RMA theory to the world of RMA practice, Australia will need a strong civil–military cadre of highly educated planning experts to sustain Project Sphinx and the Knowledge Edge in the future.

Third, and related to the second point, Australia’s official strategic planners must, at all costs, avoid the belief that information-age technology through ‘dominant battlespace knowledge’ will abolish the concepts of friction and uncertainty in war. Some of the more enthusiastic members of the American-led RMA movement tend to reflect the Jominian, mechanistic vision of war reminiscent of the systems philosophy adopted by the McNamara Pentagon of the 1960s—an approach that failed spectacularly in the rice paddies of Vietnam. All RMA advocates need to remember that the use of military force continues to remain more of an art than a science, for ‘all sciences have principles and rules; war has none’.<sup>159</sup> Accordingly, Carl von Clausewitz’s famous dictum that, in ‘the whole range of human activities, warfare most closely resembles a game of cards’, continues to be fundamental to realistic strategic thinking.<sup>160</sup> Australian RMA

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<sup>159</sup> Marshal Maurice de Saxe, ‘My Reveries Upon the Art of War’, translated by Brigadier General Thomas R. Phillips in Brigadier General Thomas R. Phillips (ed.), *Roots of Strategy*, vol. 1, Stackpole Books, Harrisburg, PA, 1985, p. 189.

<sup>160</sup> Carl von Clausewitz, *On War*, ed. and trans. by Michael Howard and Peter Paret, Princeton University Press, Princeton, NJ, 1976,

specialists should temper their ideas concerning battlespace precision by reference to Thucydides's great work, *The Peloponnesian War*.<sup>161</sup> Thucydides's account of the warning of the Athenians to the Spartans about the uncertainty of military conflict remains timeless:

Think, too, of the great part that is played by the unpredictable in war: think of it now before you are committed to war. The longer a war lasts, the more things tend to depend on accidents. Neither you nor we can see into them: we have to abide by their outcome in the dark. And when people are entering upon a war they do things the wrong way round. Action comes first, and it is only when they have already suffered that they begin to think.<sup>162</sup>

It is important to note that Australia's institutional embrace of an RMA initiative is less than five years old. In the face of conditions of financial stringency, much of value has been achieved in that short period. Indeed, the creation of an RMA organisation to analyse the implications of information-age warfare has been one of the least understood, but nevertheless one of the most significant, developments in the Howard Government's 'strategy for revolution'. Despite the old adage that it is always easier to design the future than to predict it, the development of the Knowledge Edge program represents an

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p. 86. For useful discussions of Clausewitz's continuing relevance see Barry D. Watts, *Clausewitzian Friction and Future War*, McNair Paper 52, Institute for National Strategic Studies, National Defense University, Washington DC, October 1996 and Stephen C. Cimbala, *Clausewitz and Chaos: Friction in War and Military Policy*, Praeger Publishers, Westport CT, 2001.

<sup>161</sup> Thucydides, *The Peloponnesian War*, trans. by Rex Warner, Penguin Books, Harmondsworth, Middlesex, 1972.

<sup>162</sup> *Ibid.*, pp. 81–2.

important step towards the goal of transforming Australia's defence strategy to meet 21st-century conditions.

The Australian RMA initiative has moved from an informal, service-driven debate about 'knowledge dominance' in 1996 through to the official formulation of the Knowledge Edge between 1997 and 1999, to the emergence of a special Knowledge Edge Information Capabilities group in the December 2000 Defence White Paper. The designation of Information Capabilities as a separate capability grouping—with more funding than that assigned to improving current strategic strike—is perhaps the most fundamental indication of how Australia has come to view the Knowledge Edge as the foundation stone of its military capability in the 21st century.

Finally, technology is a crucial agent of change in any culture of modernity, but it never operates in a pristine setting. The Australian approach to the RMA demonstrates how technological factors are conditioned by a nation's institutional values and by its political and strategic context. Ultimately, Australia's search for a Knowledge Edge may yield broad lessons that are applicable to other middle powers that choose to pursue military modernisation within the parameters of limited financial budgets. This process may help illuminate a key intellectual problem of the information age: how new strategic theory is articulated by a professional community, and how questions of technology are nearly always mediated by a combination of policy, resources and operational expertise.

