

Land Warfare Studies Centre

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**From Breitenfeld to Baghdad
Perspectives on Combined Arms Warfare**

Edited by

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and

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Land Warfare Studies Centre

The Australian Army established the LWSC in July 1997 through the amalgamation of several existing staffs and research elements.

The charter of the LWSC is to promote the wider understanding and appreciation of land warfare; provide an institutional focus for applied research into the use of land power by the Australian Army; and raise the level of professional and intellectual debate within the Army. The LWSC fulfils these roles through a range of internal reports and external publications; a program of conferences, seminars and debates; and contributions to a variety of professional, academic and community fora. Additional information on the centre may be found on the Internet at <http://www.defence.gov.au/army/lwsc/>.

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ABBREVIATIONS AND ACRONYMS

1ATF	1st Australian Task Force
ADF	Australian Defence Force
APC	Armoured Personnel Carriers
BEF	British Expeditionary Force
DSTO	Defence Science and Technology Organisation
FGA	fighter ground attack
JDAM	joint direct-attack munition
LMG	light machine-guns
MOLE	manoeuvre operations in a littoral environment
NATO	North Atlantic Treaty Organisation
NVA	North Vietnamese Army
OOTW	operations other than war
RMA	Revolution in Military Affairs
RPG	rocket-propelled grenades
TFM	Task Force Modernisation Mission
VC	Viet Cong

FOREWORD

Since 1996, the Australian Army, supported by the Defence Science and Technology Organisation (DSTO), has been reviewing its warfighting concepts, structures and capabilities through a program of deliberate studies. These studies have been aimed at ensuring that the Army provides relevant military options for government, remains aware of possible adversary capabilities, and is proficient across a range of probable tasks. The overall objective of the review has been to optimise the combat effectiveness of the land force while ensuring that future forces remain affordable and sustainable in the context of joint and coalition operations. The review process has embraced a series of initiatives, including the Army in the 21st Century study, the Restructuring the Army Trials, and the Army Experimental Framework program. DSTO has been a major participant in each of these initiatives and has provided independent analysis, scientific rigour, experimental tools, and data collection to assist the Army in its work.

The review process has been broadly future-focused and has been set within a time frame of approximately five to fifteen years. This time frame and the scheduling of specific studies corresponds to the need to develop appropriate contextual information that informs capability acquisition and retention decisions. In keeping with strategic guidance, early studies of Army capability focused on defending the Australian mainland, with scenarios, concepts and capabilities set in northern Australia. More recently, however, the review program has evolved to include studies appropriate to the littoral environment extending from northern Australia out to the inner archipelago of South-East Asia and the South-West Pacific. This change of focus has been responsible for the development

and analysis of a new Army operational concept: Manoeuvre Operations in the Littoral Environment (MOLE).

During the early stages of the review program, it became apparent that terrain, vegetation and climate would be major influences in defining concepts, tactics and capabilities for the foreseeable future for operations in the inner archipelago. As a result, overseas studies provided useful but essentially limited guidance for capability development in Australia's region of interest. Many international studies were, for example, predicated on capabilities appropriate to the less restricted terrain of mainland Europe.

A regular observation in DSTO's analysis and experimentation has been that, when military commanders are faced with significant uncertainty about the quality, completeness or timeliness of information concerning the enemy, they tend to seek better understanding using reconnaissance. When such uncertainty occurs in restricted terrain, ground forces are generally used to conduct this type of reconnaissance mission. The requirement for reliable operational information, coupled with the relatively limited 'permeability' of the region's terrain, gives opposing forces ample opportunity to prevent successful reconnaissance. The result is often close combat between adversaries, usually in the form of encounter or ambush battles.

Given the seemingly inevitable requirement to conduct close operations in the future, the Task Force Modernisation team undertook a detailed study of the requirements and nature of future close combat in the region. A specific close combat study was conducted using simulation that incorporated existing historical analysis from the United Kingdom. While detailed in content, the British research work lacked a

grounding link to the experience of the Australian Defence Force (ADF) in warfighting in the region. As a result, DSTO took the opportunity to engage Dr Robert Hall and Dr Andrew Ross of the Australian Defence Studies Centre at the Australian Defence Force Academy to analyse the experience of close combat during the Vietnam War—the last time the ADF undertook warfighting in the region. Dr Hall and Dr Ross were tasked to analyse specifically the data resulting from attacks by Australian troops against prepared enemy defensive positions during the Vietnam conflict. Because the vegetation and terrain of Vietnam are representative of the Asia-Pacific region, the battles undertaken by the 1st Australian Task Force remain relevant to potential future operations in the region. This reality is of particular relevance should Australia ever need to move from its current peacekeeping roles in the region (for example in East Timor) to a more intense operational or warfighting role.

In this publication, Dr Hall and Dr Ross present an in-depth study of Australian attacks on prepared defensive positions during the Vietnam War based on data from combat operations. The breadth of the data analysed—whether historical, simulated or anecdotal—clearly identifies an enduring requirement for supporting arms in combat missions undertaken within the region. The study also identifies the point at which a low-level military threat begins to have an effect on an attacking force in terms of casualties and mission effectiveness.

The research work of Dr Hall and Dr Ross is accompanied in this publication by two essays from Dr Michael Evans and Dr Alan Ryan of the Land Warfare Studies Centre. In an introductory essay, Dr Evans provides a brief historical background and a contemporary conceptual framework for

understanding the significance of combined arms in the conduct of land warfare. In the supporting paper, Dr Ryan reinforces the immutable lessons of combined arms organisation and warns against any diminution of such a capability. The essays in this publication are likely to stimulate a much-needed debate on land force capabilities, a debate that may challenge orthodox thinking on the use of armour on the direct-fire battlefields of the region. Finally, and perhaps most important of all, the research in this publication is almost certain to become an important frame of future reference for all Army capability development in the first decade of the 21st century.

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ABSTRACT

This working paper analyses the continuing importance of combined arms warfare in modern armed conflict. The paper consists of three edited essays: a conceptual introduction to the theory of combined arms combat; a case study of combined arms warfare based on the Australian Army's experience in Vietnam; and a concluding essay with historical and contemporary insights on the continuing relevance of all-arms combat.

The first essay by Michael Evans provides a conceptual context for understanding the relevance of combined arms warfare. The essay provides a historical snapshot of developments in combined arms warfare over three centuries. The article examines the tactical interaction of infantry, armour and artillery in close combat from the early 17th century, through World War I, to the recent military campaigns in Afghanistan and Iraq. The central message of Evans's essay is that success in contemporary warfare can only be achieved by the combined use of movement, firepower and protection. No single weapons system, no matter how lethal, can succeed in modern combat operations, if it is used in isolation.

The second essay by Robert Hall and Andrew Ross moves the analysis of combined arms from the general to the particular. The authors present an important case study of Australian combined arms assault operations in Vietnam between 1966 and 1971. This case study is based on a careful analysis of quantifiable data, including after-action reports from Australia's direct-fire battlefield in South-East Asia. Hall and Ross demonstrate how, in assaulting prepared defensive positions, a combination of infantry and armour remains vital to tactical success. The lesson from Vietnam is a timeless one:

in close combat, particularly in complex terrain, the Australian Army must be capable of employing well-equipped combined arms teams if it is to achieve tactical success. To think and act in a different way is to risk the lives of our soldiers. In a concluding essay, Alan Ryan points to the importance of American combined arms teams in the 2003 Iraq campaign. The use of such teams emphasises the continuing need for armies in the field to integrate their capabilities. Ryan argues that, in an era where low-cost munitions proliferate, the dismounted infantryman will always be vulnerable in action and must be protected by a direct-fire armoured vehicle.

All three essays in this edited working paper point to the need to conceive of the character and use of military force in more systemic terms. In the 21st century, the application of armed force has become a phenomenon in which the united effects of all weapons systems must be considered. In these conditions, the integration of combined arms capabilities remains fundamental and must be understood by all those concerned with the art of war.

General Monash's Orchestra

Reaffirming Combined Arms Warfare

Michael Evans

I formed the theory that the true role of the infantry was not to expend itself upon heroic physical effort, nor to wither away under merciless machine-gun fire, nor to impale itself on hostile bayonets, nor to tear itself to pieces in hostile entanglements . . . but on the contrary to advance under the maximum possible protection of the maximum possible array of mechanical resources in the form of guns, machine-guns, tanks, mortars and aeroplanes; to advance with as little impediment as possible.¹

These words by General Sir John Monash, Commander of the Australian Corps in World War I, are a classic statement of the advantages gained by employing a system of combined arms in warfare. In a vivid metaphor, Monash, one of the greatest masters of 20th-century all-arms tactics, went on to compare modern battle planning to preparing an orchestral composition in which the interaction of all of the various military arms and units resembled musical instruments. The aim in modern war, as in classical music, was harmony of purpose and the synchronisation of all resources, when in action, to bring about success.²

Throughout the 20th century, and now into a new millennium, those concerned with the efficient employment of ground forces have continued to emphasise Monash's teachings on combined arms. In essence, the history of modern tactics since

¹ John Monash, *The Australian Victories in France in 1918*, Lothian, Melbourne, 1923, pp. 75–6.

² *Ibid.*, p. 38.

1918 has been a history of fire, movement and protection, and their integration. In 1983, the leading Canadian operational analyst, Patrick Armstrong, writing in a major study of the mechanised battlefield, summed up the powerful effects of combined arms in modern ground warfare with the simple statement: ‘In military matters, one and one equals more than two’.³

Armstrong was referring to the way in which combined arms integration increases the combat power of a land, or joint force, by teaming together weapons systems with contrasting strengths and weaknesses. Successful tactics in battle usually revolve around the combination and exploitation of the mobility, protection or offensive firepower of different arms or weapons systems. For example, infantry and armour, often supported by artillery, must be employed in cohesive teams and orchestrated in the field in order to gain full advantage of each individual arm’s potential. Applying weapons in combination creates a synergism of effects that makes the whole of the system far more lethal than its component parts.⁴

So it is that dismounted infantry make useful observers on the battlefield, but if detected without armoured support, are easily pinned down by hostile fires against which their light weapons, such as machine-guns and mortars, are of little use. The

³ Patrick Armstrong, ‘On Combined Arms’, in Lieutenant Colonel J. A. English, Major J. Addicott and Major P. J. Kramers (eds), *The Mechanized Battlefield: A Tactical Analysis*, Pergamon-Brassey’s, Washington DC, 1983, p. 166. Armstrong was Head of the War Game Methodology Section in the Canadian Directorate of Land Operational Research.

⁴ Jonathan M. House, *Combined Arms Warfare in the Twentieth Century*, University Press of Kansas, Lawrence, KS, 2001, pp. 6–7.

mobility, protection and firepower inherent in modern armoured vehicles all save infantry lives in close combat. Yet, if tanks are deployed in isolation from infantry, they suffer from poor visibility and are vulnerable to well-concealed enemies employing antitank weapons. The American land warfare analyst, Stephen Biddle, sums up the central logic behind combined arms as follows:

When infantry and armor are combined...they mask one another's weaknesses. Infantry in the attack can detect concealed antitank defenses, while tanks can destroy hardened positions that would otherwise force the infantry to ground, enabling momentum to be maintained and thus reducing the infantry's vulnerability.⁵

This essay has four parts. First, it examines perceptions of combined arms combat in the era of the Revolution in Military Affairs (RMA)—an era in which disengaged precision strike has become perhaps the dominant public image of warfare. Second, the study provides a sketch of the evolution of combined arms from the age of gunpowder in the early 17th century to the industrial warfare age at the end of the 19th century. The third part of the essay presents a brief analysis of combined arms warfare in the 20th century, with a snap shot of case studies from such conflicts as World War I, Korea, the Yom Kippur War, the Russian campaign in Chechnya and the American intervention in Somalia. Finally, the essay offers a brief examination of combined arms warfare in the early 21st century, concentrating on preliminary lessons from the recent conflicts in Afghanistan and Iraq.

⁵ Stephen Biddle, 'The Past as Prologue: Assessing Theories of Future War', *Security Studies*, Autumn 1998, vol. 8, no. 1, p. 16.

Perceptions of Combined Arms Warfare in the Era of the Revolution in Military Affairs

Today, nearly every professional soldier accepts the employment of combat power in a combined arms team as an immutable tenet in the development of modern tactical theory. Unfortunately, what is so obvious to soldiers that it is almost part of military folklore is not well understood by those outside the profession of arms. One only has to survey the academic literature of the Revolution in Military Affairs (RMA) over the past decade to realise that there is a dichotomy between what professional soldiers understand and what many academic defence observers believe about the character of warfare. In the era of Global Hawk and Predator, there are influential schools of thought in Western defence circles that discount combined arms warfare in favour of a conviction that aerial precision weapons have rendered close combat by infantry and armour as obsolete as the cavalry charge with sabre and lance.⁶

Few would deny the military significance of what has been called the ‘precision revolution’ based on missiles and electronic surveillance capabilities. It remains equally important, however, to understand the limitations of stand-off strike warfare. In their exhaustive study of precision-guided aerial warfare during the 1990s, the authors Michael Russell Rip and James M. Hasik, have warned that missile strikes are not magical silver bullets.⁷ Frequently, during the 1990s, US

⁶ For a useful discussion of contending RMA schools of thought see Michael O’Hanlon, *Technological Change and the Future of War*, Brookings Institution Press, Washington, DC, 2000, chapter 2.

⁷ Michael Russell Rip and James M. Hasik, *The Precision Revolution: GPS and the Future of Aerial Warfare*, Naval Institute Press, Annapolis, MD, 2002.

employment of cruise missiles against targets in Iraq and Afghanistan presented the strange paradox of a superpower basing policy goals on a form of physical destruction that often did not lead to political decision—the ‘empty building’ syndrome. Moreover, an unhealthy reliance on coercive ‘cruise missile diplomacy’ may have helped to persuade at least one adversary, Osama bin Laden, that the enemies of the West could attack the United States of America and survive retaliation by aerospace power.⁸

‘Precision engagement’, note Rip and Hasik, ‘is problematical, and the strategy, doctrine, and advanced technology that define it can be nullified by relatively simple and inexpensive asymmetrical responses, such as decoy targets, camouflage, dispersal and deception’.⁹ They go on to warn that autonomous precision weapons are of limited utility against skilled and mobile enemies:

If politicians are unwilling to send real soldiers to hunt down evasive targets, their [precision] weapons may be found to be powerless against meaningful, mobile targets. Consequently, war planners will seek unimportant fixed sites to turn to rubble. The results will continue to be impressive battle-damage imagery, public acclaim at home, and very little effect on the political system of the targeted country.¹⁰

In the information age, long-range weapons systems cannot predominate in isolation, because successful combat is now

⁸ *Ibid.*, pp. 361–80; 421 and John Carroll, *Terror: A Meditation on the Meaning of September 11*, Script Publications, Melbourne, 2002, p. 7.

⁹ *The Precision Revolution: GPS and the Future of Aerial Warfare*, p. xii.

¹⁰ *Ibid.*, p. 421.

combined and joint. The success of modern operations is determined by fire, strike and manoeuvre from air, sea, land and, increasingly, from space.¹¹ Moreover, many of the central RMA ideas about network-centric warfare and a ‘system of systems’ are based on the combined arms ideal.¹² Network-centric warfare envisages connecting sensors, shooters, long-range and short-range missiles, and data-processing devices to maximise combat power, the basic principles of which Monash would have intuitively understood.

Part of the problem in the gulf of understanding that often exists between military professionals on the one hand, and many defence policy-makers and academics on the other lies in the educational legacy of Cold War strategic studies. In the English-speaking West it was possible, for over thirty years, to become a defence analyst in a university or a policy ‘think tank’ without any real knowledge of military operations. Between the late 1950s and the late 1980s, the areas of strategic studies that mattered to governments were those related to the nuclear weapons balance: deterrence, arms control, systems analysis and international security—subjects linked more to political decision-making than to the art of war in the classical sense.¹³

The main effect of Cold War strategic studies was to give civilians the means to breach the professional military’s

¹¹ Makhmut Gareev, *If War Comes Tomorrow? The Contours of Future Armed Conflict*, Frank Cass, London, 1998, p. 104.

¹² See Vice Admiral Arthur K. Cebrowski and John J. Garstka, ‘Network-Centric Warfare: Its Origin and Future’, *US Naval Institute Proceedings*, January 1998, vol. 124, no. 1, pp. 28–35.

¹³ Richard K. Betts, ‘Should Strategic Studies Survive?’, *World Politics*, October 1997, vol. 50, pp. 7–33.

monopoly as strategic advisers to governments. In the 1960s when challenged over strategic planning by an experienced senior military officer, Alain Enthoven, the archetype Pentagon ‘whiz kid’, famously replied: ‘General, I have fought just as many nuclear wars as you have’.¹⁴ Given these conditions, the philosophy of Cold War strategic studies was aptly summed up by Bernard Brodie in 1946 when he wrote: ‘Thus far the chief purposes of our [the United States’] military establishment has been to win wars. From now on its chief purpose must be to avert them’.¹⁵

Unfortunately, declaring an aversion to war is not the same as abolishing military conflict. America’s military agony in the Vietnam War showed the dangers of conducting a campaign according to what one critic has called ‘the academic theory of limited war’.¹⁶ In the wake of defeat in Vietnam, the military antidote to an apparent decline of warfighting skills was the elevation by the US and other leading Western militaries of the operational level of war and of the operational art. Yet, with its emphasis on ensuring synchronisation between tactics, operations and strategy, the rise of the operational art in the 1980s and 1990s only served to widen the gulf in knowledge between policy specialists

¹⁴ Fred Kaplan, *The Wizards of Armageddon: Strategists of the Nuclear Age*, Simon and Schuster, New York, 1983, p. 254, fn. 6.

¹⁵ Bernard Brodie, *The Absolute Weapon*, Harcourt Brace, New York, 1946, p. 76.

¹⁶ Colonel Harry G. Summers Jr., ‘Military Doctrine: Blueprint for Force Planning’, *Strategic Review*, Spring 1992, p. 9.

schooled in strategic studies and military professionals whose prime focus was mastery of warfighting.¹⁷

In the early 21st century, with a decade of military operations behind us in places as diverse as Somalia, Bosnia, East Timor, Afghanistan and Iraq—along with a global ‘war on terror’—the worlds of policy and warfighting can no longer afford to inhabit separate intellectual universes. A philosophical approach to defence matters that separates policy issues from operational issues leads to a situation that risks, at best, misunderstanding and, at worst, disaster. Policy analysts must be encouraged to cultivate interest in the area of warfighting, while military professionals must learn to appreciate the workings of the policy realm. The most common features of military operations in the 21st century are speed and technical complexity—elements that both policy makers and uniformed professionals cannot avoid.

Such elements are especially evident in the process of battlefield interaction involving the integration of different weapons systems in conditions of casualty limitation, real time media transparency and instant communications. In these conditions, it is tactics that become the most dynamic area of military art, simply because the effects of any new weapons systems are first reflected in tactics. The tactical effects of weapons in action are also easily captured on television screens. It remains vital, therefore, that all those concerned with the application of military force fully understand the evolution and likely future direction of combined arms warfare.

¹⁷ Brian Holden Reid, ‘Military Intellectuals in Britain’ in his *Studies in British Military Thought: Debates with Fuller and Liddell Hart*, University of Nebraska Press, Lincoln, NE, 1998, pp. 11–12.

From Musket to Machine-gun: The Evolution of Combined Arms Warfare

Combined arms warfare may be defined as military operations undertaken by ‘a fighting organisation composed of either two or three of the principal combat arms of infantry, artillery, and armor and can receive support from engineers, air defense artillery, fighter-bombers, and other assets’.¹⁸ As indicated by Monash, in a combined arms concept of warfare, the whole is greater than the parts and different combat arms are seen as being most efficient when they are integrated to deliver decisive effect. The idea of combining weapons systems in battle is, of course, age-old. From the coordination of chariots, archers and spearmen in the armies of the ancient world to the cavalry, musketeers and pikemen in the age of gunpowder, commanders have long sought to use their various arms in sequence or unison.¹⁹

In the early 17th century, improved firearms technology and military organisation created the world’s first recognisably modern combined-arms force, in the form of the Swedish Army of Gustavus Adolphus. The Swedish monarch fielded infantry brigades deploying a new triad of infantry musketeers and pikemen, field artillery and heavy cavalry in a manner that combined fire and manoeuvre, missile and shock in a single system of warfighting. In September 1631, at the battle of Breitenfeld in northern Germany during the Thirty Years War, Gustavus confronted the Catholic League Army composed of traditional heavy-infantry squares, or *tercios*—phalanx-like

¹⁸ Michael D. Doubler, *Closing with the Enemy: How GIs Fought in Europe, 1944–1945*, University Press of Kansas, Lawrence, KS, 1994, p. 8.

¹⁹ House, *Combined Arms Warfare in the Twentieth Century*, p. 32.

formations first made famous by the Spanish a century earlier. The Swedes, employing a sequence of musketry volleys, pike charges, cavalry shock and barrages from field guns, decisively defeated the Catholic forces under the Flemish commander, Count Tilly.²⁰

Breitenfeld showed how it was possible—through combining the three arms of infantry, artillery and cavalry—to wield firepower and offensive shock in battle. The innovations demonstrated at Breitenfeld became an inspiration and blueprint for European soldiers from Turenne to Frederick the Great. During the French Revolutionary and Napoleonic Wars between 1792 and 1815, the triad of infantry, cavalry and artillery was eventually refined into the self-contained *corps d'armée* system—a system that has been described as ‘the French secret weapon of the Napoleonic Wars’.²¹

In the mid-19th century, the industrial revolution transformed the character of warfare expanding the size of the battlefield and creating mass armies based on railway movement and telegraph communication. Yet, despite dramatic technological change, the theory of fire, movement and shock on the battlefield remained Napoleonic in character. European armies, such as those of Prussia under Field Marshal Helmuth von

²⁰ Gunther E. Rothenberg, ‘Maurice of Nassau, Gustavus Adolphus, Raimondo Montecuccoli and the “Military Revolution” of the Seventeenth Century’, in Peter Paret (ed.), *Makers of Modern Strategy from Machiavelli to the Nuclear Age*, Princeton University Press, Princeton, NJ, 1986, pp. 32–63; and Russell F. Weigley, *The Age of Battles: The Quest for Decisive Warfare from Breitenfeld to Waterloo*, Pimlico, London, 1991, pp. 3–23.

²¹ David Chandler, *Napoleon*, Weidenfeld & Nicholson, London, 1973, p. 202.

Moltke the Elder, continued to organise themselves around the triad of infantry, artillery and cavalry. Modern battle was seen as an arithmetical and linear collision of tactical masses struggling to erode each other with cannon and rifle fire as a prelude to offensive shock by cavalry.²²

The classical envelopment of flanks and annihilation of enemy armies along the lines of such battles as Cannae and Austerlitz, remained the tactical ideal in the European officer class. Revolutionary weapons such as the machine gun and quick-firing field artillery such as the French 75 mm, or *soixante-quinze*, were not integrated into a modern concept of battle based on interacting weapons systems. As a result, by the eve of World War I in 1914, the tactical theory of modern armies had become increasingly divorced from technology while the volume of fire available had eclipsed the capacity for movement.²³

Combined Arms Warfare in the 20th Century

In World War I, the technology of defensive firepower shattered the traditional triumvirate of infantry, cavalry and artillery first demonstrated in modern form at the battle of Breitenfeld and refined over almost three centuries. World War I represented essentially a crisis in tactics—a crisis caused by the divergence between military theory and military

²² Shimon Naveh, *In Pursuit of Military Excellence: The Evolution of Operational Theory*, Frank Cass, London, 1997, pp. 59; 78–80.

²³ Hew Strachan, ‘From Cabinet War to Total War: The Perspective of Military Doctrine, 1861–1918’, in Roger Chickering and Stig Förster (eds), *Great War, Total War: Combat and Mobilization on the Western Front, 1914–1918*, Cambridge University Press, Cambridge, 2000, pp. 26–30.

technology.²⁴ In 1914, tactical envelopment failed. Encirclement gave way to frontal assault, seeking penetration and break-in of enemy lines in a *bataille de rupture*. Tactical break-in could not, however, be converted into operational breakthrough because heavy cavalry, the traditional *arme blanche* of decision in the past, had become obsolete at the hands of the weapons technology of the direct-fire battlefield.²⁵

World War I and the 'Combined Arms Revolution'

In World War I, the main reason that tactical offensives from Verdun to the Somme failed so bloodily lay in the technical inaccuracy of indirect artillery fire to suppress fixed defences.²⁶ It took until late 1917 for new targeting techniques—including sound ranging, flash spotting and aerial photography—to emerge on the Western Front. These new techniques facilitated sudden and effective artillery bombardment to suppress previously impenetrable defences. Radical improvements in the science of gunnery during 1917–18 paved the way for what Williamson Murray has

²⁴ Paul Kennedy, 'Military Effectiveness in the First World War', in Allan R. Millett and Williamson Murray (eds), *Military Effectiveness*, vol. 1: The First World War, Unwin Hyman, London, 1988, p. 329–50.

²⁵ Gary Sheffield, *Forgotten Victory: The First World War: Myths and Realities*, Review, London, 2001, pp. 108–13; 118–33.

²⁶ Tim Travers, *The Killing Ground: The British Army, the Western Front and the Emergence of Modern Warfare, 1900–1918*, Unwin-Hyman, London, 1987, pp. 71–8; 152–90; and Robin Prior and Trevor Wilson, *Command on the Western Front: The Military Career of Sir Henry Rawlinson, 1914–18*, Blackwell, Oxford, 1992, pp. 36–43.

called ‘the combined arms revolution’ of the Western Front.²⁷ The development of accurate indirect artillery fire was combined with decentralised all-arms tactics that emphasised fire, manoeuvre and exploitation by attacking forces.

By the beginning of 1918, attacking infantry was in a position to employ combined arms tactics that exploited artillery fire, a variety of infantry support weapons and a new invention—the armoured tank—first fielded by the British at the battle of Cambrai in November 1917. In the later stages of World War I, the theory of combined arms was rapidly developed at a tactical level, often below the division, and in a manner that sought to fuse mobility with protection and offensive power.²⁸

To this end, the Germans created an all-arms tactical system that combined concentrated artillery bombardment with detachments of storm troops using specialised assault tactics.²⁹ In Operation *Michael*, in March 1918, the Kaiser’s forces

²⁷ Williamson Murray, ‘Thinking about Revolutions in Military Affairs’, *Joint Forces Quarterly*, Summer 1997, p. 107. See also Jonathan B. A. Bailey, ‘The First World War and the Birth of Modern Warfare’, in Macgregor Knox and Williamson Murray (eds), *The Dynamics of Military Revolution, 1300–2050*, Cambridge University Press, Cambridge, pp. 132–53 and Colin S. Gray, *Strategy for Chaos: Revolutions in Military Affairs and The Evidence of History*, Frank Cass, London, 2002, chapter 7.

²⁸ J. F. C. Fuller, *The Foundations of the Science of War*, Hutchinson, London, 1926, p. 148.

²⁹ See Timothy Lupfer, *The Dynamics of Doctrine: The Changes in German Tactical Doctrine during the First World War*, Leavenworth Papers 4, Combat Studies Institute, US Army Command and General Staff College, Fort Leavenworth, KS, July 1981; and Bruce I. Gudmundsson, *Stormtroop Tactics: Innovation in the German Army, 1914–18*, Praeger, New York, 1989.

launched a huge artillery–infantry offensive that initially proved shattering to the Allies. The Germans, however, lacked a protected direct-fire vehicle, the tank, to exploit artillery cover and to support an infantry assault. German overemphasis on tactical–infantry assault at the expense of a tactical–technical mix of movement, protection and fire meant that tactical break-in could not be converted into operational breakthrough and strategic decision.³⁰ In World War I, the firepower of the defensive could only be overcome by protected mobility involving infantry, fire support and armour.

In contrast to the Germans, in 1918, the British Expeditionary Force (BEF) sought a judicious mixture of tactical and technical means to break the trench deadlock. The BEF emphasised a more balanced blend of all-arms, air–ground model of warfare in which armour, aircraft and infantry operated under the powerful and abundant ‘long black arms’ of the artillery.³¹ BEF commanders, notably Monash, were careful not to neglect employment of the latter’s ‘maximum possible array of mechanical resources’ in the form of tanks, aeroplanes and a variety of infantry support weapons including Lewis guns, rifle grenades and trench mortars.

It is worth noting that the reason tanks were invented in World War I was not to fight other tanks. On the contrary, armoured vehicles were invented in order to provide a direct-fire vehicle to protect and assist infantry in assaults against field

³⁰ Tim Travers, *How the War was Won: Command and Technology in the British Army on the Western Front 1917–1918*, Routledge, London, 1992, p. 108.

³¹ J. P. Harris, *Amiens to the Armistice: The BEF in the Hundred Days Campaign, 8 August – 11 November 1918*, Brassey’s, London, 1998, p. 23.

fortifications such as trenches and bunkers. Such operations required a careful combination of movement, fire and protection. In July 1918, in a model all-arms battle at Hamel, Monash used tanks, artillery and infantry with great skill, achieving notable success against well-protected German positions. Then, at Amiens, on 8 August 1918—‘the black day of the German Army’—the BEF demonstrated what could be achieved by an army deploying an all-arms attacking force equipped to overcome strongpoints and entrenchments in close battle. In an Allied combined-arms onslaught, the German Second and Eighteenth Armies lost 27 000 men and 450 field guns. Amiens became the turning point of the war on the Western Front and marked the beginning of the Hundred Days campaign that led to Allied victory in November 1918.³²

The BEF’s Hundred Days campaign of August–November 1918 has been aptly described as ‘a milestone in the history of land warfare . . . for it marked the first successful use of high-performance teams using high-performance machines in the attack’.³³ Ultimately, the armies of the British Empire and their allies employed an innovative combined-arms form of ‘mechanical war’—symbolised by the liberal application of tanks, artillery and well-equipped infantry—to win the war. In a grand offensive, the Allies succeeded in inflicting strategic defeat on the German Army through a succession of breakthrough battles along the Western Front.³⁴

³² Prior and Wilson, *Command on the Western Front*, pp. 291; 311–15.

³³ Shelford Bidwell and Dominick Graham, *Fire-Power: British Army Weapons and Theories of War, 1904–45*, George Allen & Unwin, London, 1982, p. 133.

³⁴ Sheffield, *Forgotten Victory*, pp. 237–63; Tim Travers, ‘The Army and the Challenge of War, 1914–1918’, in David Chandler and Ian

The military significance of the BEF's Hundred Days campaign in 1918 was not unlike that of Sweden's northern German campaign of 1631. Just as at the battle of Breitenfeld, Gustavus Adolphus founded the triad of infantry, cavalry and artillery for the gunpowder age, so did the BEF—spearheaded by Australian and Canadian shock troops at Amiens—provide a model of all-arms warfare for the mechanised age. The celebrated Allied blueprint for victory in World War I, Plan 1919—drawn up by the armoured warfare pioneer, J. F. C. Fuller—anticipated, in all of its essentials, the mechanised all-arms campaigns of 1939–41. As Fuller later noted, 'in modified form, this tactical theory [Plan 1919] was put to the test in 1939, and became known as *blitzkrieg*'.³⁵

Combined Arms Warfare, 1918–2003

During the inter-war period, the combined arms warfare that had emerged on the Western Front in 1917–18 was rapidly refined in countries such as the Soviet Union and Germany to include a central role for improved armoured vehicles, mechanised infantry and close air support. The invention of radio and rapid advances in tank technology restored the old triumvirate of infantry, artillery and cavalry—albeit with armoured vehicles assuming the shock role once performed by horse soldiers.³⁶

Beckett (eds), *The Oxford Illustrated History of the British Army*, Oxford University Press, Oxford, 1994, pp. 238–40.

³⁵ J. F. C. Fuller, *The Conduct of War, 1789–1961*, Methuen, London, 1961, p. 244.

³⁶ G. D. Sheffield, 'Blitzkrieg and Attrition: Land Operations in Europe 1914–45', in Colin McInness and G. D. Sheffield (eds), *Warfare in the Twentieth Century: Theory and Practice*, Unwin Hyman, London, 1988, pp. 51–79.

The course of World War II saw most advanced armies develop deep elastic defence, integrated fire and movement plans, and sophisticated combined-arms organisation.³⁷ From this perspective, *blitzkrieg* can be seen as representing little more than a short-lived episode in which, between 1939 and 1941, the Germans exploited a temporary lead in armour and mechanisation to score a series of victories over less well-prepared opponents. At the climactic battle of Kursk in 1943, the Soviet Army blunted the German *blitzkrieg* by employing a combined arms defence that destroyed 2900 German tanks. By 1945, World War II had much more in common with the methodical BEF offensives of 1918 than with the German *blitzkrieg* of 1940.³⁸

During the Cold War, especially between the 1950s and the 1970s, all-arms combat was neglected because of the conjunction of the nuclear revolution, the rise of strategic air power and the development of revolutionary warfare. In both North Asia and the Middle East, however, the dangers of armies abandoning combined arms were vividly demonstrated. In 1950, at the beginning of the Korean War, the US Army's 'Task Force Smith'—a light force built around infantry,

³⁷ For two illuminating studies of combined arms warfare in World War II see Doubler, *Closing with the Enemy: How GIs Fought the War in Europe, passim*; and Peter R. Mansoor, *The GI Offensive in Europe: The Triumph of American Infantry Divisions, 1941–1945*, University Press of Kansas, Lawrence, KS, 1999, especially chapters 5–8.

³⁸ Stephen Biddle, 'Land Warfare: Theory and Practice', in John Baylis, James Wirtz, Eliot Cohen and Colin S. Gray, *Strategy in the Contemporary World: An Introduction to Strategic Studies*, Oxford University Press, Oxford, 2002, p. 100.

without tanks or antitank weapons—was overrun by North Korean forces spearheaded by T-34 tanks.³⁹

In 1973, the Israelis discovered the perils of fielding armour without supporting infantry during the Yom Kippur War. Believing that dismounted infantry would slow armoured mobility and operational tempo, the Israelis launched all-tank attacks like mailed fists against Egyptian infantry positions—only to see many of their armoured vehicles destroyed by precision-guided munitions. In order to recover the military initiative and overwhelm the Egyptians, the Israelis were forced to improvise combined arms operations using infantry and armour in tightly integrated fire and movement operations.⁴⁰

The danger of neglecting combined arms, displayed in the Yom Kippur War, was not lost on other armies. The Soviet military's development of Operational Manoeuvre Groups in the 1970s, designed for deep exploitation missions in Europe, was solidly based on a combined arms organisation. Similarly, in the 1980s, the US Army doctrine of Air–Land Battle adopted a combined arms system with the principles of fire, manoeuvre and protection at its heart. The all-arms approach stood the US Army in good stead and contributed to rapid American victory during the 1991 Gulf War.⁴¹ After Operation *Desert Storm*,

³⁹ T. R. Fehrenbach, *This Kind of War: A Study in Unpreparedness*, Macmillan, New York, 1963, pp. 97–107.

⁴⁰ Jac Weller, 'Armor and Infantry in Israel', *Military Review*, April 1975, vol. 55, no. 4, pp. 3–11; and House, *Combined Arms Warfare in the Twentieth Century*, pp. 231–8.

⁴¹ Martin Edmonds, 'Land Warfare', in Roger Carey and Trevor C. Salmon (eds), *International Security in the Modern World*, Macmillan, 1996, pp. 199–202. See also David Glantz, *Soviet Military Operational Art: In Pursuit of Deep Battle*, Frank Cass,

a captured Iraqi battalion commander wryly commented: ‘On 17 January [1991], I started with thirty-nine tanks. After thirty-eight days of aerial attacks, I had thirty-two [tanks], but in less than twenty minutes with M1A1 [Abrams main battle tank], I had zero’.⁴²

In the decade following the 1991 Gulf War, combined arms warfare was neglected by both the Russian and the American militaries. In the First Chechen War between 1994 and 1996, Russian tanks were employed in the city of Grozny without infantry screens. As a result, during the street fighting, Chechen rebels used rocket-propelled grenades to destroy large numbers of Russian armoured vehicles.⁴³ In 1999, during the Second Chechen War, the Russian performance in urban warfare improved only when tank–infantry cooperation was re-established. In urban operations, Russian storm detachments employed tanks, BMP infantry combat vehicles, BTR armoured personnel carriers and IMR combat engineer vehicles, all of which were protected by dismounted infantry.⁴⁴

London, 1991; and John J. Romjue, *From Active Defense to AirLand Battle: The Development of Army Doctrine, 1973–1982*, United States Army Training and Doctrine Command, Fort Monroe, VA, June 1984.

⁴² Quoted in Wes Kitchens, ‘Weapons Technologies for Joint Vision 2010’, Office of the Director of Joint Research and Engineering, US Defense Technical Information Center, 48th Annual Bomb and Warhead Technical Symposium, 11–14 May 1998. Copy in author’s possession.

⁴³ Timothy L. Thomas, ‘The Battle of Grozny: Deadly Classroom for Urban Combat’, *Parameters: US Army War College Quarterly*, Summer 1999, vol. XXIX, no. 2, pp. 87–102.

⁴⁴ Michael Orr, ‘Better or Just Not So Bad? An Evaluation of Russian Combat Effectiveness in the Second Chechen War’ and ‘Technology and the Second Chechen Campaign: Not All New and

The Americans also suffered a serious reverse in the environment of urban warfare that demonstrated a neglect of combined arms principles. In the 1993 battle of Mogadishu in Somalia, American light infantry from Task Force Ranger suffered heavy casualties in a bitter urban firefight because of their lack of direct fire-support from armour. Like the Russians in Grozny, the Americans in Mogadishu discovered that, in the modern urban maze, the presence of civilians, the confines of buildings, and the restricted ranges and angles of fire all combined to diminish the value of high technology.⁴⁵

In the United States, for the remainder of the 1990s, the unsatisfactory outcome of the battle for Mogadishu appeared to encourage a narrow instrumental preoccupation with the application of precision air power at the expense of both combined arms and joint-service warfare. American military strategy for post-Cold War military interventions came to be based mainly on the use of stand-off aerial precision weapons. Yet, what is striking about the use of autonomous aerospace power in the 1990s is the relative political ineffectiveness of this form of warfare, particularly against determined adversaries such as Saddam Hussein and Osama bin Laden. Even in the most successful of the air campaigns of the 1990s—the American-led North Atlantic Treaty Organisation's (NATO)

Not That Much', in Anne Aldis (ed.), *The Second Chechen War*, The Occasional No. 40, Strategic and Combat Studies Institute, Shrivenham, September 2000, pp. 90–6 and 106–7.

⁴⁵ Brian Steed, *Armed Conflict: The Lessons of Modern Warfare*, Ballantine Books, New York, 2002, pp. 149–70. For a comprehensive analysis of the challenge presented to the US Army by urban warfare see Roger J. Spiller, *Sharp Corners: Urban Operations at Century's End*, Combat Studies Institute, Fort Leavenworth, KS, 2000.

1999 war against Yugoslavia over Kosovo—it is far from clear that the Serb leader, Slobodan Milosevic, capitulated to Western demands because of precision air power alone. Serb ground forces were not incapacitated by NATO air strikes and preparations for ground intervention were, according to the Supreme Allied Commander, Europe, General Wesley K. Clark, a major factor in Milosevic's decision to concede to NATO demands.⁴⁶

Combined Arms Warfare in the 21st Century

In the new conditions of a 'war on terror' that exist at the beginning of the 21st century, Western military power is now being viewed more realistically as a joint phenomenon in which each service contributes core skills and capabilities. As a result, advanced armies are busy revalidating the art of combined arms warfare. In 2000, a major RAND report warned of the risks of exclusive reliance by the US Army on light ground forces in rapid-deployment operations. The report stated that a rapid-reaction force such as the Division Ready Brigade of the US 82nd Airborne Division—composed of three airborne battalions, one artillery battalion and various air defence and helicopter assets—would be hard-pressed to prevail decisively in an encounter against a heavier opponent deploying a combined arms tactical organisation.⁴⁷

⁴⁶ General Wesley K. Clark, *Waging Modern War: Bosnia, Kosovo and the Future of Combat*, Public Affairs, New York, 2001, pp. 424–5.

⁴⁷ See John Matsumura et al., *Lightning over Water: Sharpening America's Light Forces for Rapid Reaction Missions*, RAND Arroyo Center, Santa Monica, CA, 2000, chapters 2–5.

A 2002 study of the US-led campaign to oust the Taliban Government and the al-Qa'ida movement in Afghanistan comes to similar conclusions about the value of combined arms warfare. The study, drawing an analogy with the over-reliance on bombardment in World War I, states:

Just as weeks of bombardment failed to kill the entirety of 1916's trench garrisons, so 2001's precision-guided fire support killed many but not all of its al Qaeda opponents . . . The key to success, whether in 1916 or 2002, is to team heavy, well-directed fires with skilled ground maneuver to exploit their effects and overwhelm the surviving enemy'.⁴⁸

Moreover, even in the age of remote sensor technology, complex terrain and the confined spaces of urban areas continue to degrade and confound reconnaissance and targeting capabilities. In such conditions, what the Russians call the art of *maskirovka* (concealment and deception) comes into play.⁴⁹

For instance, in March 2002, during Operation *Anaconda* in Afghanistan's Shah-i-Kot mountains, assaults employing precision munitions such as the joint direct-attack munition (JDAM) and fires from AH-64 Apache attack helicopters both failed to destroy the resistance of many al-Qa'ida fighters concealed in well-entrenched defensive positions. To achieve success against such positions, two battalions of US regular infantry from 101st Airborne and the 10th Mountain Infantry divisions supported by special forces from seven nations were forced to resort to orthodox combined-arms fire-and-

⁴⁸ Stephen Biddle, *Afghanistan and the Future of Warfare: Implications for Army and Defense Policy*, Strategic Studies Institute, US Army War College, Carlisle, PA, November 2002, p. viii.

⁴⁹ Rip and Hasik, *The Precision Revolution: GPS and the Future of Aerial Warfare*, pp. 402; 495, fn. 16.

manoeuvre tactics.⁵⁰ One of the main military lessons of Afghanistan would appear to be that advanced armies continue to require ‘dismount-led combined arms forces for close combat in potentially complex terrain’.⁵¹

In Iraq, during the US-led Coalition’s drive on Baghdad in Operation *Iraqi Freedom*, the importance of combined arms warfare appears to have again been underlined. An official British report on operations in Iraq states, ‘Challenger 2 [tanks], Warrior [infantry-carrying vehicles] and AS90 [self-propelled guns] proved to be battle-winning equipment’.⁵² Similarly, American sources note that, while attack helicopters such as the Apache suffered adversely from the effects of small-arms fire, the protection, manoeuvre and fire support afforded by Abrams main-battle tanks and by Bradley infantry and cavalry fighting vehicles proved their worth in close battle. A postwar US Marine Corps battalion after-action report from Operation *Iraqi Freedom* points out:

When faced with the near simultaneous effects of suppressive or destructive fires combined with rapid maneuver, the enemy elements that were not destroyed tended to surrender or flee. The volume or type of fire support did not seem to qualitatively alter this effect. The only important factor was that fires combined with and supported maneuver. Fires and maneuver were the two

⁵⁰ Biddle, *Afghanistan and the Future of Warfare: Implications for Army and Defense Policy*, p. 25.

⁵¹ *Ibid.*, p. 57.

⁵² United Kingdom Ministry of Defence, *Operations in Iraq: First Reflections*, Directorate General Corporate Communications, London, July 2003, p. 27.

warfighting functions that created the dilemma for the enemy. Fires in isolation did not.⁵³

The age of mass tank armies may have passed into history, but the age of direct-fire armoured mobility vehicles is still with us. For so long as infantry have to assault well-defended and fortified positions in difficult terrain, armoured vehicles will continue to be essential in close combat. As Ralph Peters reminds us, the key to the future use of armour ‘lies in disregarding what we expect a tank to be in order to focus on what we need the tank of the future to do’.⁵⁴

Conclusion

From Breitenfeld in 1631 to Baghdad in 2003, the ability to combine fire, protection and movement by different arms has been the key to success in close combat and represents an important measure of an army’s professional effectiveness. In close combat, no one single arm or weapons system can succeed alone: infantry must be teamed with tanks and both must be linked to artillery. Monash’s famous orchestral analogy remains a useful description of the principles that govern all-arms tactics:

A modern battle plan is like nothing so much as a score for an orchestral composition, where the various arms and units are the instruments, and the tasks they perform are their respective

⁵³ Third Battalion, 7th Marines, 1st Division, United States Marine Corps, ‘After Action Review (AAR) and Lessons Learned from Operation Iraqi Freedom (OIF)’, 30 April 2003, Enclosure Five, ‘Fire Support and Aviation AAR’, p. 5-3. Copy in author’s possession.

⁵⁴ Ralph Peters, ‘The Future of Armored Warfare’, *Parameters: US Army War College Quarterly*, Autumn 1997, vol. XXVII, no. 3, p. 52.

musical phrases. Each individual unit must make its entry precisely at the proper moment, and play its phrase in the general harmony . . . Every infantryman, every heavy or light gun, every mortar and machine-gun, every tank and aeroplane must respond with punctuality.⁵⁵

Because of their complexity, combined arms tactics often represent the acme of a field officer's military skill. A competent commander must avoid fratricide, link suppressive fire to unit manoeuvre, and assess the effects of both indirect fires and direct fires in a close engagement. Such skills are of even greater significance on the increasingly complex and non-linear battlespace of the 21st century. Thus, while Monash could conceive of all-arms operations on the linear battlefield like a stately conductor of a classical music concert, future commanders may resemble vibrant jazz players in a music hall, improvising notes and instruments, and striving for harmony through syncopated rhythms.

Disengaged deep-precision fires remain important in shaping the character of battle. Such fires may, however, deny ground, but they cannot always secure it, especially in the face of entrenched resistance from resolute opponents. In the early 21st century, the realities of operating in complex terrain that degrades sophisticated surveillance and sensor technology will present significant challenges to the execution of rapid, decisive air-ground operations. Urban warfare, in particular, seems to present a special challenge for advanced ground forces; this challenge can only be successfully met by the use of technology-enhanced combined-arms teams. In any case, no matter what the conflict environment, when confronted by entrenched and skilled defenders, commanders must be able to

⁵⁵ Monash, *The Australian Victories in France in 1918*, p. 38.

call on a close-combat capability based on direct-fire armoured vehicles and infantry. In the foreseeable future, particularly in an age of asymmetric military response, precision weapons, for all their ubiquity and deadliness in combat, are unlikely to render combined arms irrelevant.

Historically, the essence of war on land has always lain with troops being able to unite the age-old elements of mobility, protection and direct offensive firepower into a tactical system. While the elements of mobility, protection and firepower interact continuously because of changes in technology, they remain present in most tactical equations and must be carefully studied. Western defence analysts who downgrade the importance of combined arms warfare have misunderstood the enduring features of ground conflict. Unwittingly, perhaps, they put the lives of combat soldiers at risk from ‘the song of the dark guitar’—the eerie whine that emanates from unsuppressed fires. Above all, such defence analysts have failed to ponder the haunting question posed by the soldier-scholar Dominick Graham: ‘when the [infantry] companies disappear into the smoke, who shall save them?—themselves they cannot save’.⁵⁶

⁵⁶ Dominick S. Graham, ‘The Ascendancy of Firepower’, in English, Addicott and Kramers, *The Mechanized Battlefield: A Tactical Analysis*, p. 64. Graham, a distinguished Canadian military scholar, was awarded the Military Cross while serving as an artillery officer in World War II.

Lessons from Vietnam

Combined Arms Assault against Prepared Defences

Robert Hall and Andrew Ross

Introduction

Using the combat files held by the Australian War Memorial, this essay examines the role of combined arms cooperation in Australian operations in South Vietnam from 1966 to 1971. The paper presents the findings of a more extensive technical report undertaken for the Task Force Modernisation Mission in Land Operations Division, the Defence Science and Technology Organisation (DSTO). The essay highlights the difference that direct and indirect fire-support made when Australian forces were required to carry out attacks against prepared defensive positions, or bunker systems, as they were called during the Vietnam War.

Perhaps the most significant findings of this work relate to the relative advantage afforded by the presence of heavy armour on the battlefield. There is a widely held misapprehension that armour is of limited utility in close country and that consequently, given the nature of Australia's immediate neighbourhood, Australian land forces can afford to operate without such support. This study disproves that assertion. It is an analytical study, based on quantifiable data, and might run the risk of being considered a dry and dusty topic. The reality, however, is quite different. We need to see past the bare statistics to the brutal reality of vulnerable soldiers pitting their

bodies and weapons against a prepared and dedicated enemy that was committed to holding its position. As the accompanying essays by Evans and Ryan demonstrate, overcoming the problems associated with closing with the enemy remains the essential conundrum of close combat.

The recent war in Iraq has provided ample evidence that, despite all the technological wizardry in the world, there remains a requirement for land forces to close with the enemy and defeat them on ground of their own choosing. Any commander must see past the comparison of anonymous force ratios and loss statistics, and visualise the faces of his troops. The results of this research are uncontestable and its lessons need to be carried into training, tactical thinking and capability development.

As Michael Evans's essay shows, tanks were originally designed to breach obstacles and defeat troops in prepared defensive positions. The requirement for tanks to destroy other tanks is a more recent innovation, born of the circumstances of open-country warfare. In Vietnam, the Australian Army rediscovered the value of having infantry work with the protected, direct-fire capability that armour provides. This essay demonstrates that, in low-level operations such as those in Vietnam, where visibility was limited by jungle cover, indirect fire alone does not provide a winning advantage; it does, however, help significantly in suppressing enemy fire. The combination of the firepower, shock action, protection and immediate physical presence of heavy armour remains the most notable factor in enhancing the effectiveness and efficiency of attacks on prepared defensive positions.

This paper makes three points about different modes of attack on prepared positions. First, attacks made on bunker systems

by infantry alone could be successful against small groups of enemy when Australians outnumbered their opponents significantly. However, they generally resulted in the Australians' sustaining unacceptably high casualties, with the loss ratio operating in the enemy's favour. Second, attacks conducted with indirect fire-support—mortars, artillery and aerial support—did not produce an overwhelming advantage for the Australians. Even when force ratios favoured the Australians, such attacks resulted in loss ratios of about one to one. Fire support did help in suppressing the enemy, but the casualties inflicted on our own forces would not be seen as acceptable by Australian commanders or indeed the general public, either then or now.

Third, when attacks were carried out with both indirect fire-support and armour, loss ratios significantly favoured the Australians. This remained the case when the ratio of attacking forces to defenders approached parity. In response to the presence of Australian armour in these attacks, the enemy increasingly chose to withdraw from their bunker systems before attacks developed. This finding demonstrates that the accepted standard that attacking forces should outnumber defenders by a ratio of at least three to one is not necessarily the case when Australian forces can call on superior firepower resources.

The Vietnam War is not so remote in time that we can afford to ignore its lessons. Should Australian soldiers need to conduct operations against an enemy that uses prepared positions and the protection afforded by difficult terrain and thick foliage, they will need similar capabilities and tactics to those that were used in Vietnam. The Australian Army is required by the Government to maintain 'sufficient firepower, protection and mobility to provide clear advantage in any likely operations in

defence of Australia or in our immediate region'.⁵⁷ Consequently, it appears clear that, if the Army wishes to retain the capacity to conduct offensive operations, it will have to retain an armoured, direct-fire capability compatible with that which was deployed in Vietnam.

Background: Firepower and Jungle Warfare

During the Vietnam War, the enemy sought to nullify the great firepower advantage enjoyed by the Allies. In the main, they sought to avoid battle with the Allies except under circumstances deemed favourable to themselves. Major enemy units operated widely dispersed, deep in the jungle. They concentrated only to carry out carefully planned offensive action. For additional security, particularly for larger organisations such as headquarters and hospitals that could not achieve security through dispersion, the enemy built bunker systems. These were complexes designed primarily to provide their occupants with security against Allied attack, including artillery, mortar or air bombardment.⁵⁸ In 97 per cent of the attacks launched by the 1st Australian Task Force (1ATF) against prepared defensive positions, the objective was the capture of a bunker system.

⁵⁷ Commonwealth of Australia, *Defence 2000: Our Future Defence Force*, Defence Publishing Service, Canberra, 2000, p. 82.

⁵⁸ See, for example, Peter Edwards and Greg Pemberton, *Crises and Commitments: The Politics and Diplomacy of Australia's Involvement in Southeast Asian Conflicts 1948–1965*, Allen & Unwin in association with the Australian War Memorial, Sydney, 1992; Ian McNeill, *To Long Tan: The Australian Army and the Vietnam War 1950–1966*, Allen & Unwin in association with the Australian War Memorial, Sydney, 1993; Robert H. Scales Jr., *Firepower in Limited War*, Presidio Press, Novato, CA, 1995.

During the course of the war there were about 160 attacks by units of 1ATF against prepared defensive positions.⁵⁹ In a war in which 1ATF had approximately 3500 contacts with the enemy, 160 such attacks may not seem to be very many.⁶⁰ The main explanation for this apparently low number is that the nature of the Vietnam War determined, in large measure, the incidence of Australian attacks. As already mentioned, the Viet Cong (VC) and the North Vietnamese Army (NVA) tended to avoid head-on contact with Allied Forces because the latter's superior firepower could inflict crippling losses on enemy formations. However, in order to maintain their infrastructure for command and control, and logistic re-supply, the enemy had to maintain a system of base camps throughout South Vietnam. These were well concealed, generally sited in remote locations, and could be evacuated at short notice. Occasionally the Australians were able to attack and catch the enemy in one of their camps. Even more rarely, the enemy chose to seize and fortify a village or town, and challenged the Australians to remove them.

The term *prepared defensive positions* refers to any attempt by the enemy to gain a tactical advantage, by improving the natural defensive characteristics of the local environment through some form of engineering prior to contact. In the context of Australian operations in Vietnam, such obstacles usually meant the construction of bunkers, but they occasionally resulted in urban fortifications as well. Consequently, many of the findings of this research would be of equal applicability to operations in urban terrain. For the

⁵⁹ *Attacks on Prepared Defended Positions Database, 1st ATF, Vietnam 1966–1971*, created by Andrew Ross and Robert Hall.

⁶⁰ *Ibid.*

purposes of this paper, however, the phrase *prepared defensive positions* is limited to the enemy's bunker systems encountered by Australian troops on operations in Vietnam.

Bunker systems were one of the enemy's responses to the Australian advantage in indirect firepower. Individual bunkers were essentially rectangular holes in the ground, roofed with logs on top of which were layers of rocks and compacted earth. Bunkers were usually grouped together and could be linked by trenches and tunnels. The number of bunkers in a system was related to the purpose of the system. For example, a platoon or company base might consist of ten bunkers, while a battalion headquarters might consist of twenty to thirty. In some systems that the enemy had spent many months developing, there might be as many as fifty to sixty bunkers spread across an area of about 200 by 250 metres. Typically, the bunkers would be arranged in all-round defence, so that fire from one bunker could cover its neighbours.

There were no flanks to VC or NVA bunker systems. The systems sometimes had elaborate defences. Mines (including command-detonated claymore mines and unexploded bombs rigged for command detonation) and booby traps were often sited on the most obvious approach routes and in depth within the systems. The enemy could often produce heavy volumes of fire from these positions using light machine-guns (LMG), rocket-propelled grenades (RPG) and AK47 assault rifles, and consistently demonstrated good fire discipline. In many cases the enemy had taken great pains to conceal the bunkers and had also prepared concealed fire lanes. Australian patrols bumping unawares into a bunker system would often find themselves engaged at ranges as short as 5 metres. Attacks against bunker systems presented serious tactical problems.

Methodology: Interpreting Combat Data

During the Vietnam War, commanders filed a standard ‘Combat After-action Report’ describing the contact in detail after each contact with the enemy. To undertake this study, over 170 of these reports on bunker system attacks were studied and entered into a database program of experimentation in order to identify and validate concepts and capabilities. The analysis underpinning these experiments includes studies of the archived combat data of past combat operations. This historical approach is used to identify and better understand some of the enduring aspects of land warfare.

This study examines Australian attacks against enemy defensive positions—with and without the support of artillery, air strikes and armour—and compares their respective outcomes. Such an approach enables us to assess the contribution to combat power of supporting arms in the context of the Vietnam War (and by inference, other low-level operations). Over the 161 attacks studied, any significant difference in the outcome of the combat could reasonably be attributed to the presence or otherwise of combined arms elements, and would therefore indicate any contribution to combat power that the indirect and direct fire-support had made.

The study examined combat after-action reports and other records held by the Australian War Memorial. After studying a sample of the files, the project team designed a data pro-forma document in order to capture what were identified as the key items of data. Files were then examined and the relevant information was entered into the various data fields on the data pro-forma document. The completed database became the *Attacks on Prepared Defended Positions Database*.

The Pattern of Attack Against Bunker Systems

Analysis of the database revealed that attacks against prepared defensive positions in Vietnam could be classified as follows:

Unsupported attacks (without any direct or indirect fire-support)

- Against light bunker defence (five enemy or less)
- Against heavy bunker defence (six enemy or more)

Supported attacks

- Employing indirect fire-support (from artillery, mortars or air support)
- Employing direct fire-support (tanks), either with or without indirect fire-support

Unsupported Attacks

Of the 161 bunker attacks studied, seventy-two were unsupported. Of this group of seventy-two attacks, forty-seven were against bunker systems in which the enemy strength was five men or less. Given these small numbers, this level of resistance was classified as 'light bunker defence'. In these attacks against light bunker defence, the force ratio was never less than 4:1 in favour of the Australians and the average force ratio was 8:1 in favour of the Australians. The Australians suffered seventeen casualties in these forty-seven attacks, while the enemy suffered fifty casualties. This gives a loss ratio of 1:2.9 in favour of the Australian forces carrying out attacks against light bunker defence.

Attacks against heavy bunker defences involving six or more enemy generally provided examples of miscalculations on the part of the Australian commanders involved. Such a situation

is quite understandable since junior commanders in contact with the enemy had to make quick decisions, often based on no reconnaissance, about whether to attack or withdraw from the source of enemy fire. Dense jungle and good enemy fire discipline complicated these decisions. In one out of every three unsupported attacks—that is, twenty-five cases out of the total of seventy-two attacks—the platoon commander found that he had made a mistake and met stiffer opposition than he had expected. The loss rate per attack against heavy bunker defence was 4.25, compared with 0.4 casualties for light bunker defence. The average force ratio advantage for the Australians was 2.4:1.

In Australian attacks against heavy bunker defence, the enemy's loss rate rose from one casualty to 1.6 casualties per attack. However, this was much lower than the Australian loss rate. More importantly, total Australian casualties in attacks against heavy bunker defence were 106 and those of the enemy were forty-one, which gives a loss ratio of 1:2.6 in favour of the enemy. Thus, in attacks against heavy bunker defence, the loss ratio had swung completely round from a loss ratio of 1:2.9 in favour of the Australians in light bunker defence.

These figures demonstrate that the unsupported Australian infantry platoon lacked the combat power to deal effectively with six or more enemy in a prepared defensive position. This lack of combat power was largely due to the conditions of visibility, which seldom exceeded 10 metres in the dense jungle in which the enemy chose to build their bunker systems.

Supported Attacks: Infantry with Air and/or Artillery

Sixty-eight attacks were launched by Australian forces, with air and/or artillery support, against prepared defensive positions—that is, almost as many as those attacks that were carried out without any support. Force ratios continued to favour Australian forces, but not to the same margin as for attacks against heavy bunker defence. The lower margin of superiority probably means that Australian officers and non-commissioned officers correctly judged that the enemy was strong, and that the use of indirect fire-support was prudent.

The loss ratio for these attacks was 1.1:1 marginally favouring the enemy. The Australian loss rate per attack declined from 4.25 for heavy bunker defence to 3.8 casualties in these supported attacks. The force ratio had also declined from 2.4:1 for heavy bunker defence to 1.5:1. Lower levels of force superiority tended to result in fewer casualties per attack because of the assistance of air strike and artillery support. The enemy's casualty rate per attack rose from 1.6 for heavy bunker defence to 3.5 for Australian attacks against prepared defensive positions, supported by air strike and/or artillery.

These attacks were conducted in thick jungle and scrub where the visibility was between 2 and 15 metres, and occasionally rose to 16 to 40 metres. It is reasonable to conclude that the reduction in the Australian casualty rate per attack, and the increase in the enemy's casualty rate, was due to the interaction of Australian infantry units and their air and artillery support. It seems paradoxical that the addition of indirect fire-support to the attack did not produce more substantial results; however, the documents that we examined

revealed various limitations to the effectiveness of indirect fire-support.

The mainstay of Australian artillery support was the 105 mm Field Artillery Regiment in support of 1ATF. Throughout the existence of 1ATF, this capability provided highly accurate and effective support in battles such as Long Tan, Coral and Balmoral, as well as in thousands of lesser support tasks, carried out at short notice and under difficult conditions.⁶¹

The 105 mm gun could not penetrate the heavy jungle canopy and the overhead protection of enemy bunkers. With enemy bunkers often located in dense jungle consisting of trees from 20 to 40 metres in height, tree bursts were a common danger. Attacking forces were exposed to the risk of being killed or wounded by their own artillery fire, unless they withdrew substantial distances. Tree bursts were also a problem with mortar fire, but less so than for artillery with its flatter trajectory. Mortars, however, lacked the weight of fire to do significant damage to bunker systems. Similarly, many bunker systems were located on ridges where crest clearance problems sometimes limited the effectiveness of artillery support. The key issue was that the destruction of bunkers required a direct hit from a 105 mm field gun or preferably heavier artillery. Unless prodigious numbers of rounds were fired at bunker systems, most bunkers were not hit and their occupants remained ready to fight.

⁶¹ See Ian McNeill, *To Long Tan*; Lex McAulay, *The Battle of Coral: Vietnam Fire Support Bases Coral and Balmoral May 1968*, Century Hutchinson, Sydney, 1988; *Friendly Fire Database for 1 ATF, 1966–1971*, created by A. T. Ross and R. A. Hall, June 2002.

Heavier artillery, such as 8-inch guns or 155 mm guns, were more destructive. They too had their limitations, however. They were usually firing at longer range than the 105 mm guns (which could be relatively easily deployed to a forward fire-support patrol base) and hence their trajectories were flatter and their beaten zone longer. This factor also increased the spread in the shell dispersal pattern in Australian areas of operations. Such dispersion from heavy guns made it even more difficult to score a direct hit on a bunker than it was using fire from lighter, forward-deployed 105 mm artillery. From the records associated with the *Attacks on Prepared Defended Positions Database*, it is obvious that Australian officers and Forward Observers generally did not trust the accuracy of such artillery for the close work required for bunkers. It was used rarely, except in a cut-off role at some distance from the bunker system.

Air strikes also had their limitations. Generally they covered the target area but achieved few direct hits on bunkers. Individual bunkers were obscured by trees and dense vegetation and, in any case, fighter ground attack (FGA) aircraft rarely delivered more than eight to ten bombs (excluding B52 strikes) and a cannon attack. The enemy was not shaken by near misses and their bunkers could sometimes withstand near misses by 250-pound bombs. Post-air strike reports by Army engineers rarely recorded any hits on bunkers by this method of attack. The use of napalm was not particularly effective in those circumstances when the enemy was in cover within their bunkers.⁶²

⁶² The records associated with the *Attacks on Prepared Defended Positions Database* regularly demonstrate the inaccuracy and ineffectiveness of air strikes against bunker systems. However, these strikes did have some intimidatory effect. The Commanding

B52 strikes were sometimes employed against large bunker systems. These strikes were in high demand and were expensive assets that could not be used without careful control. They, too, had their limitations. B52 strikes within a certain distance of civilian access areas required clearance at the province and district level. This imposed delay and loss of security on the strikes. Furthermore, because of the inherent inaccuracy and highly destructive power of the strikes, Allied forces were required to withdraw 3 kilometres from the target before the strike. These factors gave the enemy the necessary forewarning of a B52 strike and the opportunity to withdraw from the target area.

On the other hand, helicopter gunship support possessed the capacity to provide intimate fire-support capable of suppressing enemy fire from individual bunkers, and to within 10 to 15 metres forward of friendly forces.⁶³ This fire was, however, relatively light and incapable of destroying the bunkers and their occupants.

The redeeming feature of Allied support fire was that it helped to suppress enemy fire, although it could not usually dislodge the enemy. In this role, 105 mm artillery and mortars were very useful because of their accuracy. The gunships were even more useful because they could engage individual bunkers. Having been pinned down by enemy fire, many platoons were rescued

Officer of 4RAR, Lieutenant Colonel L. R. Greville, noted that 'The enemy remains in bunker systems to inflict casualties on own troops trying to assault the positions, but withdraws prior to or after the first air strike.' AWM 290, 4/R569/1/71, Combat After-action Report on Operation *Overlander*.

⁶³ The battle descriptions, which form part of the *Attacks on Prepared Defended Positions Database*, regularly demonstrate the effectiveness of light-fire team and heavy-fire team gunship attacks.

from dangerous positions by helicopter gunships firing directly at the offending bunkers.

Although air strike and artillery support did not have the impact that they had on a more conventional battlefield, techniques and skills were nevertheless perfected. These techniques and skills allowed air and artillery assets to be used in close support for attacks on prepared defensive positions in a jungle environment. The contribution made by air strike and artillery support resulted in a reduction in Australian casualties, and a doubling of enemy casualties.

Generally, increasing pressure from infantry and supporting fire, and the inevitability that he would be subjected to an assault forced the enemy to abandon the bunker systems. At some point every prepared defensive position ceases to be a tactical advantage and becomes a deathtrap. This result was sometimes achieved after a prodigious expenditure of ordnance. In some cases targets were hit with up to 1000 105 mm artillery and 81 mm mortar shells, several air strikes consisting of up to four Napalm bombs and four 250-pound bombs for each strike, and several gunship missions. This bombardment sometimes succeeded in dislodging only ten to fifteen enemy soldiers. The latter usually withdrew, leaving the Australian forces with similar numbers of casualties.

Supported Attacks: Infantry with Armour as well as Air Support and Artillery

There were twenty-one attacks in which infantry assaulted prepared defensive positions supported by armour. These attacks sometimes had additional air and artillery support. In these attacks, force ratios favoured Australian forces (1.2:1),

but at levels well below the two to three margin of superiority normally deemed necessary, in military theory, for a force attacking another in a prepared defensive position.

The use of armour, particularly tanks, resulted in the Australian casualty rate per attack dropping to 3.3 from 3.8 for infantry with only air and/or artillery support. At the same time, the enemy's casualty rate increased from 3.5 per attack by Australian infantry with air and/or artillery support to 15.6 per attack by Australian forces supported by armour, with (or without) air strike and artillery support. The loss ratio was now 0.2 Australian casualties for every one enemy. Visibility was usually 5 to 15 metres and the range at which contacts took place only 10 to 20 metres. These figures clearly demonstrate that armour made a major contribution to the combat power of the combined arms team in these attacks.

Success in Seizing the Objective

Unsupported attacks against light bunker defence were successful 98 per cent of the time. This result was to be expected, given the very large force ratios in favour of Australian forces, and an enemy with weak resolve. Unsupported attacks on heavy bunker defence represented a miscalculation by Australian commanders of the enemy's strength and determination. These attacks achieved a success rate of only 64 per cent; this low success rate can be ascribed to misjudgment on the part of junior commanders regarding the force that would be required to take a prepared position. These assessments, based on incomplete information, or just an underestimation of what was required, resulted in a higher number of failed attacks than might otherwise have occurred.

Infantry attacks supported by air and/or artillery represented an assessment by Australian officers that the enemy was strong and well entrenched. However, artillery and air support suffered from various limitations that reduced their impact on the enemy. The success rate for infantry attacks supported by air or artillery was 65 per cent. The combination of infantry, armour (particularly heavy armour), air strike and artillery was a potent and flexible instrument. Moreover, it was an instrument that rarely failed to seize its objective with a success rate of 95 per cent.

Range of Contact

The enemy tended to select locations for their bunker systems that were heavily camouflaged by natural vegetation. Infantry forces attacking such prepared defensive positions consequently found that the range of contact was short. Range of engagement seldom exceeded 25 metres because of the density of the natural vegetation. The initial ranges (in metres) of engagement for the four categories of attack are described in Table 1.

Category of Attack	Lowest Range	Highest Range	Median Range	Average Range
Light bunker defence	5	40	15	17
Heavy bunker defence	4	50	15	21
Infantry + Air and/or Artillery	2	50	15	21
Infantry + Armour and/or Air/Artillery	10	80	15	22.5

Table 1: Initial Range of Engagement for the Four Categories of Attack

It could be argued that the average initial range of contact for light bunker defence reflects the fact that enemy forces were very small, and so could not maintain security around their

defended areas. It was easier for Australian patrols to achieve surprise and open fire at shorter ranges. In the other three types of attack, for which the average initial range was about 21 metres, the enemy generally had larger forces, allowing better security for their bunker systems.

The Australians could not approach so close without being seen. The median initial ranges are all the same. The highest initial ranges are similar, except that for infantry supported by armour with (or without) air strike and artillery, the range increases to 80 metres. This observation is almost anomalous and reflects a single battle: the battle of Long Tan, in which Armoured Personnel Carriers (APC) opened fire on the enemy at 80 metres in the relatively open terrain of a rubber plantation. However, range of engagement dropped to 20 metres after the initial engagement. In each of the categories of attack, none of those contacts that were initiated at the longest ranges were maintained at those ranges. The firefight was mostly conducted at a much shorter range.

Duration of Contact

Table 2 presents an analysis of duration of contacts in minutes and reveals how the more complex an attack was, the longer such an activity took to complete, and consequently attacking troops were vulnerable to enemy fire for a longer time.

Category of attack	Shortest duration	Longest duration	Median duration	Average duration
Light bunker defence	1	90	10	22
Heavy bunker defence	5	420	30	88
Infantry + Air support and/or Artillery	30	660	130	152
Infantry + Armour and/or Air/Artillery	30	600	180	216

Table 2: Duration of Categories of Attack

It should be no surprise that attacks on light bunker defence took the shortest time to complete. Such assaults were the simplest form of attack, launched with little preparation. Heavy bunker attacks were of the same form, except that they met unexpected resistance and the attacks began to go wrong. More time was needed to fight through the objective against tougher-than-expected opposition or to extract the sub-unit under heavy fire.

Infantry attacks supported by air strike and/or artillery were complicated operations requiring the coordination of artillery fire, air strikes and infantry movements. Such coordination was required to avoid casualties resulting from friendly fire, and to gain the effective concentration of fire on the enemy position. Infantry attacks combining armoured support with air strike and artillery were even more complicated operations. Tanks needed infantry protection in close vegetation to prevent short-range attacks by the enemy with RPGs. This environment made it difficult for tank crews to see the infantry as the tanks pushed through the vegetation. The infantry found it difficult to communicate with tank crews shut down in Centurion tanks. This situation required a careful and cautious approach to avoid

enemy fire, and to avoid running over the protecting infantry. Air strikes and artillery fire added a further complexity to the attack.

Expenditure of small-arms ammunition per attack

An examination of ammunition consumption by Australian troops in battle can help us to understand the nature of the combat action undertaken. This knowledge is of particular importance when examining the problems of storming a prepared position, the very purpose of which is to minimise the effect of the assaulting force's weapons. Expenditure of small-arms ammunition across the four categories of attack is outlined in Table 3.

Category of Attack	Ammunition Expenditure			
	Lowest	Highest	Median	Average
Light bunker defence	13	500	110	150
Heavy bunker defence	140	1000	390	513
Infantry + Air support and/or Artillery	240	14000	2000	2689
Infantry + Armour and/or Air/Artillery	1850	26500	4100	9530

Table 3: Ammunition Expenditure across the Categories of Attack

Once again, the table shows four distinct patterns. Attacks on light bunker defence have the lowest expenditure of ammunition by the infantry. There are several reasons for these low usage rates. These attacks were exclusively launched by platoons exploiting surprise, against small enemy forces disinclined to offer strong resistance. They were over in short order. The firefight was neither intense nor long-lasting. Attacks on heavy bunker defence had a higher level of small-arms expenditure

because the enemy was more numerous and was more determined to fight, leading to longer and more intense firefights.

The battle more often turned against the Australians, causing higher expenditure of small-arms ammunition as the Australians fought to disengage. The launching of attacks with artillery and/or air strikes was also associated with much higher rates of small-arms ammunition use. Such attacks are consistent with the more careful and deliberate planning associated with assaults against larger enemy forces. As we have seen, however, indirect fire-support added only marginally to combat power available to the Australians. Hence, the fight against these larger enemy forces continued to be carried in the main by small-arms fire.

Infantry attacks supported by armour with (or without) air strike and artillery support were also deliberately planned, and tended to be executed against larger occupied bunker systems. The nature of these objectives justified the assembly of substantial infantry and armoured forces. Company-sized attacks were much more common in this category. Furthermore, infantry operating against bunkers with the close support of armour probably knew instinctively what this study has revealed: that such attacks were more likely to achieve success and were less likely to result in Australian casualties.

An isolated platoon in battle against a bunker system might have carefully husbanded its ammunition against the possibility of being pinned down, or of having to deal with an enemy counterattack. Infantry supported by armour might, however, be more ready to expend ammunition knowing that they had the security of the armoured vehicles to fall back on. Also, armoured vehicles routinely carried extra small-arms ammunition to replenish the infantry if necessary. Knowing

that this extra ammunition was readily available may have encouraged the infantry to fire more freely.

Conclusion

Bunker systems were used in Vietnam as an effective, cheap, low-technology response to the Allied advantage in direct and indirect fire-support. Their construction required nothing more than hand tools. With sufficient time to develop a system, bunkers capable of withstanding direct hits from 105 mm artillery could be built. Their construction was so easy that the VC/NVA were able to build many more bunker systems than they required. This excess capacity added to the security bunker systems provided against Allied heavy weapons. Individual bunker systems were of low value even to the VC/NVA, who were not forced to fight in order to retain them. In future low-level operations, bunker systems may continue to be the 'poor man's' response to our advantage in heavy weapons.

Of all the different types of operation carried out by 1ATF, the most dangerous, in terms of producing Australian casualties, were attacks on prepared defensive positions.⁶⁴ This study shows that the category of attack least likely to result in Australian casualties was when the bunkers contained less than five enemy soldiers. Since the basic operating unit for the Australians in Vietnam was the platoon (25 to 30 men), it should be no surprise that an average force ratio of 8:1 was achieved over the enemy in this category of attacks. Using only infantry weapons, Australian forces had no trouble evicting the enemy from his positions. In doing so, they suffered a loss ratio of only 0.3:1 over the enemy.

⁶⁴ See R. A. Hall, *Combat Battalion: The Eighth Battalion in Vietnam*, Allen and Unwin, Sydney, 2000, p. 44.

The success of these platoon attacks against light bunker defence relied on aggressive junior command and the achievement of surprise against an enemy made irresolute by the odds against them. These are perennial factors in infantry minor tactics and are likely to remain relatively unchanged by the application of modern technology. However, new sensors available to the individual infantryman, coupled with intra-platoon communications, may make surprise easier to achieve. Increasing the firepower of the rifle platoon offers one solution. The addition of a light, simple, inexpensive, short-range 'bunker busting' weapon may raise the threshold for redefining light bunker defence above the 'five or less enemy soldiers' as experienced in Vietnam. In this way, increased firepower may enable the infantry platoon to defeat, on its own, prepared positions defended by more than five enemy soldiers.

The most dangerous category of unsupported attacks on prepared defensive positions was when the enemy force consisted of six or more soldiers. These attacks were initiated by Australian commanders who underestimated the enemy's actual strength. Analysis of the after-action reports completed for these attacks shows that correctly judging enemy strength was highly difficult because of thick vegetation around prepared defensive positions, good camouflage and concealment, and good fire discipline by the enemy.

Despite a force ratio of 2.4:1 in their favour, the Australians suffered losses almost nine times the loss ratio for attacks on bunker defences containing less than six enemy soldiers. A more accurate impression of actual enemy strength would have led Australian officers to attack with at least air and/or artillery support. In this regard, more modern technology might help to eliminate attacks on heavy bunker defences in future

low-level conflicts. The key to success is to be able to reveal the number of enemy in a heavily foliated prepared defensive position, over ranges of at least 100 metres. Such a range is necessary to allow the detection and identification of enemy from beyond the screen of sentry posts that the enemy is likely to deploy. Also, remaining as far from the enemy position as possible minimises the risk of injury to the detector from indirect fire brought down on the target. Although this aim is simple enough, its practical implementation is much more difficult, requiring detection of humans through thick vegetation and earthen bunkers.

When Australian infantry used air and/or artillery support to attack prepared defences, their casualties fell and those of the enemy rose. However, while artillery, mortars and air support could hit the selected general target area of an enemy position, individual bunkers were rarely hit by these area weapons. Enemy sheltering within their bunkers could resume fighting as soon as the indirect fire-support ceased. The requirement for Australian infantry to withdraw a safe distance from the target gave the enemy ample time to prepare to meet the infantry assault (or to withdraw from the system). The most important contribution of indirect fire-support seems to have been its ability to suppress enemy fire. Suppression tended to reduce Australian casualties and allowed the infantry to be more effective in inflicting casualties on the enemy with their own weapons.

The future accuracy of air strike and artillery support could obviously be improved by the use of laser-designated guided munitions.⁶⁵ However, it is difficult to see how such

⁶⁵ There is a problem in trade off with using expensive guided munitions against very cheap bunkers holding only one to four

technology could be effective in a combat environment similar to that in Phuoc Tuy Province in South Vietnam. First, a laser designator would have to be capable of designating the target through jungle. The operator would have to expose himself to short-range enemy fire while he operated his designator. Second, reflected laser light would have to penetrate the forest canopy above the target. Third, since most contacts occurred at a range of 20 metres or less, the target designator would likely be destroyed by the precision-guided weapon when it hit the target. However, the responsiveness of indirect fire-support could be improved by global positioning systems (GPS). More accurate information about the location of the supported infantry could result in artillery or mortar rounds on the target in much less time than was the case in Vietnam. Of course, the enemy is likely to deploy GPS jammers and that might negate this improvement.

Another opportunity to improve the effectiveness of the supporting arms may reside with helicopter gunships. During the gathering of data for this study, it became obvious to the authors that gunships were able to give suppressive fire-support 10 to 15 metres ahead of friendly troops. The helicopter pilots could see the hidden bunkers as they fired on Australian troops and hence could target them directly. In the Vietnam context, the fire support provided by helicopter gunships was too light to cause significant damage to bunkers. A helicopter gunship firing heavier weapons capable of destroying a bunker might make a significant contribution to future attacks against prepared defensive positions.

enemy soldiers. This may be an acceptable exchange for an enemy engaged in a classic low-level war, in that it makes the war very expensive for a technological power, and saps the political will to accept the continuing expense of destroying such low-priority targets.

When Australian infantry used armour support with (or without) artillery to attack prepared defensive positions, their casualties fell further and those of the enemy rose higher. Tanks were versatile in that they could clear jungle cover away from bunkers, destroy bunkers with gunfire, crush them and give a large amount of protection to accompanying infantry. However, they often took some time to reach the point of contact unless the contact area was near a formed road or the tanks were accompanying the infantry as part of grouping for the operational task. The addition of tanks to the Australian order of battle in Vietnam made a major contribution to the problem of fighting the enemy in his bunker systems. Tanks are likely to remain an important means of attacking prepared defensive positions in any future low-level war. Their continuing effectiveness derives from a combination of their armour protection (particularly against hand-held anti-armour weapons), and their heavy-calibre armament. It is difficult to escape the conclusion that, given the ease with which bunker systems can be constructed, heavy armour should continue to be part of the Australian order of battle.

This study has shown that, in attacks on prepared defensive positions, the range of contact was usually 20 metres or less, and in only one case was over 50 metres. These ranges were dictated by the density of the vegetation. The enemy sought to build his bunker systems in the most densely vegetated areas in order to provide him with cover from observation. It is most likely that, in any future low-level war in similar terrain, an enemy will seek to achieve the same use of cover to nullify our advantage in observation on the ground or from the air. As a result, ranges of engagement will be similar to those experienced in Vietnam. This reality has significant implications for weapons design, doctrine, training and minor tactics.

This study also collected data on the duration of attacks on prepared defensive positions, and the amount of small-arms ammunition used in such attacks. Generally, both duration and expenditure increased through each category of attack, starting with light bunker defence and ending with infantry supported by armour with (or without) air and artillery. If modern technology results in better identification and targeting of the enemy in such attacks, combat duration and small-arms ammunition expenditure will probably fall from levels experienced in Vietnam. However, the infantryman has a finite capacity to carry ammunition and other equipment. A balance needs to be struck between ammunition and the sensors and other high-technology equipment that the infantryman of the future might need to carry. New technologies may assist the infantryman to get into contact with the enemy, but ammunition will enable him to sustain the battle.

Combined Arms Cooperation in the Assault Historical and Contemporary Perspectives

Alan Ryan

We have gotten into the fashion of talking of cavalry tactics, artillery tactics, and infantry tactics. This distinction is nothing but a mere abstraction. There is but one art, and that is the tactics of the combined arms.

Major Gerald Gilbert, Indian Army, 1907.⁶⁶

Introduction

In late March and early April 2003, as Coalition troops launched their attack into Iraq, the old lessons were learnt the hard way once again. Coalition troops were required to assault prepared defensive positions in both open and more complex terrain in Iraq. In the battles for Al-Hillah, Nasiriyah, Najaf, Basra and Karbala, Saddam Hussein's troops attempted to blunt the overwhelming force of the coalition offensive by forcing attacking units to assault prepared defensive positions. As the United States V Corps commander, Lieutenant General William Wallace, commented in the immediate aftermath of the campaign:

I think Saddam's forces were trying to draw us into the cities, where they thought they had an advantage. Instead, we turned the cities into a disadvantage, with our armored raids taking out their heavy equipment, technical vehicles, and bunker complexes. Once we did that with our heavy armored forces, we switched to light infantry, backed by heavy reinforcements, to do the more detailed clearing operations. In the process of those fights, we not

⁶⁶ Gerald Gilbert, *The Evolution of Tactics*, Hugh Rees, London, 1907, pp. 183–4.

only secured our lines of communication and diminished the enemy's capabilities, but we also began to take control of population centers.⁶⁷

The greatest surprise of the campaign was the rapid collapse of opposition in Baghdad as American combined arms teams broke into the city and operated unimpeded. Armchair strategists all over the world were confounded by the fact that their prophesied urban bloodbath did not eventuate. The protection afforded by heavy armour and the ability to dismount infantry in order to provide protection against anti-armour weapons enabled the attacking forces to do what no-one had forecast. Even General Wallace admitted that the sheer capability of the combined arms team came as a surprise:

We learned that armor could fight in the city and survive, and that if you took heavy armored forces into the city—given the way Saddam was defending the city with technical vehicles and bunker positions—we could knock all of those defenses out and survive. As a result of [the Battle of] Najaf, I think our soldiers also gained an extraordinary appreciation for the survivability of their equipment. So Najaf made decisions associated with being more aggressive when we got to Baghdad a hell of a lot easier. We didn't have to be as cautious as we had anticipated, because by the time we got to Baghdad we had learned some important lessons along the way, and we applied them to the Baghdad fight.⁶⁸

One of the principal lessons of the war in Iraq has been that light units cannot succeed in combat on their own. They need the leverage provided by direct fire-support to crack the nut represented by prepared defensive positions. If we expect our

⁶⁷ James Kitfield, 'Attack Always', *National Journal*, 25 April 2003, <<http://www.govexec.com/dailyfed/0503/050603db.htm>>, downloaded 24 June 2003.

⁶⁸ *Ibid.*

troops to be able to attack—surely a basic requirement for an army—then we must provide them with the capabilities to do so. This requirement calls for the integration of combined arms. As emphasised by Michael Evans’s essay, no single weapons system can guarantee victory on the battlefield. Enemy troops adapt their tactics to defeat our weapons, but if we maintain the flexibility to be able to produce variable combinations of infantry, armour, artillery and engineers, together with direct aerial support, then we can assault any position. Major General Paul Blackwell, then commander of the United States 24th Armoured Division Mechanized, pointed out in 1993:

Combat experience from World War II onward compels the increasingly complex integration of combined arms. There is no pure ‘heavy’ or light scenario; the surest way to achieve success is to balance the array of tactical forces . . . The combined arms concept requires teamwork, mutual understanding, and the right recognition by everyone involved of the critical roles performed by other arms. There is no place for parochialism or ignorance; success of the mission and the lives of our soldiers will depend on the ability to understand and synchronize the light–heavy force.⁶⁹

To ignore this requirement is to court disaster, and to risk unnecessary and wasteful casualties among our own troops. No commander, capability manager, or politician is going to want to explain to Australian families that their loved ones died because a fundamental combat capability was lacking in the Australian Army. This working paper provides the arguments

⁶⁹ Cited in Colonel Frank Stone, ‘Heavy–Light Operations at the National Training Center: Getting the Most Out of the Light Force’, Center for Army Lessons Learned, 1996, <http://call.army.mil/products/ctc_bull/armor/novdec96/hvy-ltop.htm>, downloaded 26 March 2003.

that support the maintenance of a world-class combined-arms capability in the Australian Army.

A key issue that emerged in the course of the War in Iraq was termed, somewhat inelegantly, ‘survivability’. Simply put, this term referred to the ability of heavy armoured vehicles to absorb hits from short-range, anti-armour weapons without harm to the crew. The weapons are to be found all over the world and make their presence felt in combat operations ranging from terrorist attacks to peace enforcement to warfighting. The ubiquitous Soviet-designed rocket-propelled grenade (RPG) is available in the markets and bazaars of the underdeveloped world for only a few dollars. These weapons will destroy a soft-skinned vehicle and in most cases will cause great damage to, and casualties within, an armoured personnel carrier. It was these cheap, uncomplicated weapons that brought on the disastrous street battle in Mogadishu in 1993 that was publicised in the book and the film *Black Hawk Down*. In that case these weapons were used in an anti-aircraft role, bringing down two helicopters and damaging a third. Most vehicles and low-level aircraft are vulnerable to this type of simple, essentially asymmetric use of a low-cost munition. These weapons will not, however, do much damage to a main battle tank.

The relatively high level of protection afforded by heavy armour enables it to go where light vehicles, helicopters or foot soldiers cannot go. Very few likely opponents will have the sophisticated weapons systems that can harm a tank. When a tank is threatened by a weapon that can do it harm, infantry or indirect fire-support can be called upon to remove the threat. On the direct-fire battlefield, these tactics are not only efficient and effective, they are the safest for our troops.

As new and innovative weapons systems are brought into service, it is easy to be awed and convinced by the promise of capability that they might deliver. Yet combat is a deeply human activity. At the point at which the clash of wills and of arms occurs, no single capability will prevail. As Professor Jonathan House, the leading scholar of combined arms warfare, has concluded: ‘the combined arms concept is the basic idea that different combat arms and weapons systems must be used in concert to maximise the survival and combat effectiveness of the others. The strengths of one system must be used to compensate for the weaknesses of others’.⁷⁰ There is nothing novel about this finding; the art of tactical and operational command down through the ages has been to achieve the greatest advantage with the mix of forces available. Even in information-age precision warfare, that imperative persists—perhaps even more so in conflicts where asymmetrically minded adversaries seek to negate our technological advantage by preventing us from using our superior weapons. Professor House points out that:

No matter how powerful a single arm—tanks, attack helicopters, or whatever—may be, that arm has many of the same strengths and weaknesses as its counterpart in the opposing army. As a practical matter, therefore, a carefully adjusted mixture of different weapons will almost always prove superior to a single type of weapon.⁷¹

The study of combined arms operations in Vietnam by Robert Hall and Andrew Ross uses verifiable historical data and contemporary experience to demonstrate that, on the direct-fire battlefield, land forces are vulnerable unless they possess a

⁷⁰ Jonathan M. House, *Combined Arms Warfare in the Twentieth Century*, University Press of Kansas, Lawrence, KS, 2001, p. 4.

⁷¹ *Ibid.*, p. 3.

range of capabilities to overcome the tactics and weapons used against them. Most importantly, the authors discuss the effects that are required if an armed force needs to dislodge an enemy from a prepared defensive position.

As Australian operations in Vietnam demonstrated, and as has been seen more recently in Iraq, an enemy that is technologically outmatched is going to seek to lure its opponents into battle on ground of its own choosing. In Vietnam, that imperative meant that the Viet Cong and North Vietnamese Army often chose to fight from the protection afforded by bunker complexes. In Iraq, Saddam Hussein hoped to defeat the coalition by drawing them into battle against defended positions in built-up areas. The experience of both wars demonstrated that it is the orchestrated use of the combined arms team that wins battles. Going into battle without key capabilities is not an option.

Prior to the Vietnam War, the conventional wisdom was that there was no role for armour in the complex terrain that characterises our region. While military technology has come a long way since the end of that war, nothing has occurred that has made the dismounted infantryman invulnerable to weapons fire. Given the choice, no infantryman would want to walk into harm's way without the back-up and security represented by an armoured, direct-fire vehicle. Nor have we any right to ask him to do so.

For the foreseeable future, the Australian Army will be required to maintain and continue to develop a balanced and lethal combined arms capability if it is to be able to fulfil its mission of fighting and winning the land battle. This finding is of critical importance for the future of capability development within the

Army. As has occurred in the past, capability development can be constrained or misdirected by faddish or misinformed thinking. The ability of armed forces to produce necessary effects in battle can be lost with the single stroke of an accountant's pen—and the consequences are dire. Lives are invariably lost when soldiers are sent into combat without the full suite of capabilities that are available.

The stakes have never been so high as they are in the contemporary battlespace. The firepower that is available to even relatively 'low-tech' forces could make any assault unbearably costly, unless our troops have the necessary tools to crack a prepared defence. If land forces are to be capable of conducting combat operations, they need the individual soldier's versatility and ability to discriminate. That, however, is not a sufficient condition. The forces that are called to move forward against fire require the mobility, firepower, protection, and shock action of armoured forces; the precision and battlespace awareness of aerial assets; and the decisive intervention that is available from indirect fire-support.

The armies of the world are engaged in an ongoing debate as to how combined arms will be employed in the future. It is a debate that has persisted ever since early military forces devised different techniques of improving mobility, increasing the effect of weapons and maximising the use of shock action on the battlefield. Only a century ago, the term *combined arms* was restricted to the coordination of cavalry, artillery and infantry. Today the notion has expanded to include heavy armour; light armour; aerial firepower—both from manned and remotely controlled vehicles; a broad array of artillery and rocket types; engineers; and, of course, infantry.

Combined arms operations can be conducted to lethal or non-lethal effect, as a part of warfighting operations or operations other than war (OOTW). What is more, in less than a century, the idea that combined arms have a necessary utility in all areas of military activity has overcome the traditional and inefficient approach of compartmentalising operations. Combat is no longer played out in conventional force-on-force encounters on clearly demarcated battlefields that suit a limited array of weapons. While massed infantry, cavalry and muzzle-loaded artillery were limited in the ways that their effects could be brought to bear on an enemy, the same limitation does not restrict the capabilities of information-age forces. Consequently, given the appropriate tools, all elements of the modern combined-arms force can be used to extraordinary effects across the complex battlespaces of modern conflict.

This working paper represents a response to a dogmatic and often poorly informed school of thought about the capabilities required by Australia's land forces for the conduct of future combat operations. Generally, this opinion is expressed as scepticism about the continuing need for tanks in the modern Australian Army. While the issue is not merely a matter of the possession of an armoured capability, the continuance in service of tanks has become a stalking horse for those that wish to trade off a land combat capability for other, perhaps more attractive, platforms. Critics have made the various arguments that tanks have limited mobility in Australia's immediate neighbourhood; have been superseded by more modern weapons systems; or are of little use in lower-level operations. This flawed thinking is not driven by a clear appreciation of the needs of soldiers exposed to the direct-fire battlefield; rather it is driven by a perception that the limited resources

available to the Australian Defence Force (ADF) require the sacrifice of ‘outmoded’ weapons systems.

It is one thing to abandon a weapons system because it is obsolete, but it is quite another to phase out a capability without a full appreciation of the contribution that such a system makes to the combined arms fight. Certainly, the Leopard 1 tanks currently in service with the Australian Army are reaching their end-of-life. Few Australian families would consider driving a car that first drove off the production line in 1965 as the Leopard did. However, the firepower capabilities of this weapons system remain unmatched by any other weapon in our inventory. Only the tank’s main armament can provide direct-fire, kinetic effects—firing penetrating munitions that can breach almost any known defensive protection. The retention of this capability is essential until such time as it can be replaced in the combined arms toolbox. At the moment no alternative weapons system is even on the drawing board.

As this working paper demonstrates, the retention of key capabilities is too important to be left to a resource-driven whim. Serious and verifiable analysis of past, present and future operational needs should shape capability development. Of course the future of combined arms is not just about the survival of an armoured capability. Nonetheless, the two essays by Evans and Hall & Ross convincingly demonstrate that the Australian Army will continue to require a vehicle that performs the functions of a tank for the foreseeable future. The ability to produce combat effects depends largely on the development and maintenance of balanced combined-arms capabilities. It would be the height of negligence to remove a capability from the Army’s order of battle without

guaranteeing a replacement capability that can produce the same effects at least as effectively.

Australia's experience of combined arms cooperation is unique. Historically, combined arms doctrine was developed to meet the needs of open-country warfare in northern Europe and adapted to the billiard table conditions of desert warfare in the Middle East. The Australian Army, on the other hand, has often had to use combined arms cooperation in extremely close country or against well-prepared defences.

Australian experience has been less the war of rapid movement and massed armour, and more the integrated cooperation of small assault teams. At the Battle of Hamel in July 1918, Australians were among the first to use combined arms cooperation as it was originally conceived—to reduce prepared defensive positions with minimal losses among our own troops. In December 1942 Australian infantry and tanks punched through the wickedly effective Japanese bunker systems in the dense coconut plantations at Buna. During the Korean War, combined arms cooperation was used to decisive effect in breaking entrenched Chinese defences on terrain considered impassable to tanks.⁷²

Hall and Ross analyse the orchestration of infantry, direct fire-support and indirect fire-support in the jungle in Vietnam, and conclude that the direct-fire capabilities and protection afforded by armour remain essential in the assault—even on lower-level operations. While the Australian Army's

⁷² Lida Mayo, *Bloody Buna*, Australian National University Press, Canberra, 1975, pp.163–5; Peter Brune, *The Spell Broken*, Allen and Unwin, Sydney, 1997, pp. 211–25; Headquarters Training Command, *The Battle of Maryang San*, Australian Army, 1991.

experience of integrating firepower with assaulting troops has been different from the Air–Land war concept that has dominated elsewhere, it is nonetheless valid. Moreover, contemporary experience in Iraq has shown that other armies are just as dependent on the integrated assault team when they become engaged on the defended margins of urban areas.

We should not lose sight of the immutable lessons of combined arms operations, nor should we allow the fashionable theories that prevail in peacetime to diminish our warfighting capabilities. The data set out in this working paper provides firm, verifiable evidence that the integration of combined arms capabilities remains as important as ever—something that any combat soldier knows instinctively. One of the most pugnacious and renowned combat commanders once made this point in his typically trenchant fashion. In the aftermath of the Louisiana Manoeuvres in 1941, which prepared the United States Army for the shock of mechanised warfare, the then Major General George S. Patton concluded that:

We still fail to use every weapon every time . . . Each time we fight with only one weapon when we could make use of several weapons, we are not winning a battle, we are making fools of ourselves.⁷³

⁷³ Quoted in Christopher Gabel, *The U.S. Army GHQ Maneuvers of 1941*, Centre of Military History, Washington D.C., 1991, p. 121.

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