The Interplay between Technology, Tactics and Organisation in the First AIF

Ross Mallett
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Contents

Abstract

The purpose of this thesis is to investigate the interplay between the technology, tactics and organisation of the First AIF.

Warfare in the twentieth warfare is characterised by the presence of certain technologies that give it a distinctive nature and which first appeared in the Great War. It was in the Great War that the highly dispersed form of tactics that we know today emerged. Thus, it is a natural starting point not only for the examination of warfare in the era of technology but for considering the nature of technological change itself. My Australian perspective enabled issues to be looked at to a depth that would not be possible in a work of this length with a broader view.

I have argued that the Great War was characterised by the problem of trench warfare, and I have traced the progress of tactical, technological and organisational developments that ultimately supplied the solutions. I have also shown how the Great War was not only a war of technology in which new technologies were introduced and developed, but also one which saw the spread of new ways of thinking about military technology.

In preparing this thesis, I have inspected the actual battlefields in France, Belgium and Turkey. I have drawn on a broad range of published material, but the thesis is largely based upon the primary documents found in the Australian War Memorial and Australian National Archives.

Preface

A number of people deserve special mention for their help in the preparation of this thesis.

First and foremost among them is my supervisor, Professor Jeffrey Grey, whose assistance have been beyond price. He was instrumental in getting this thesis underway, in keeping it on track, and in ensuring that it eventually got completed. His comments at every stage have been constructive, insightful and valuable.

Lindley Walter-Smith served as a sounding board for many of the ideas contained herein. A wonderful person and a brilliant intellect, she has been my inspiration throughout. Major Garry Thompson and Captain Noel Mungovan have been immense sources of information. Noel can not only explain the pros and cons of various forms of barbed wire, but he arranged for me to attend an "Executive Stretch" at Ingleburn, NSW, where I was able to discuss various ideas with a number of officers and soldiers of the Regular Army and Army Reserve.

Various people have taken the time to explain various aspects of the thesis with me. Professor S. F. Wise spoke to me about the Western Front from a Canadian perspective. Peter Burness of the Australian War Memorial helped with the weapons and equipment of the Army in 1914. Dirk Bockman explained the intricacies of signals before the invention of transistors. My father, Ron Mallett, besides providing a great deal of encouragement, went into the details of old time mechanical transport for me. Jessica Eckhardt contributed to my knowledge of the care and upkeep of horses. Adam Begley proofread most of the drafts for me.

I must also thank Professor Peter Dennis, for his encouragement, especially of the Order of Battle, which he found disk space for. I am also indebted to Ross Glare for his help with JavaScript for the web pages.

Introduction

Warfare in the twentieth century is characterised by the presence of certain technologies that give it a distinctive nature. The Great War is a natural starting point not only for the examination of warfare in this era of technology but for considering the nature of technological change itself. This thesis will examine the technologies of modern warfare and their impact on the tactics and organisation of the Australian Army. This Australian perspective enables issues to be looked at to a depth that would not be possible in a work of this length with a broader view. Furthermore, the Canadian historian Bill Rawling has produced an excellent account of technology in the Great War from a Canadian perspective.[1] I hope that this thesis will provide an Australian counterpart to his work and thereby enhance our overall understanding of technology and the Great War. As we shall see, the Australian experience of the war was broadly similar to that of the Canadian, but remarkably different in many respects.

While accepting the continuity of both history and technology, it is my contention that the Great War represents a watershed in military history. For thousands of years, the battlefield had been a place where men fought shoulder to shoulder, often in close formations. The increased firepower of small arms made such formations obsolete in the 19th century but it was in the Great War that the highly dispersed form of tactics that we know today emerged. The Great War was above all a war of technology in which new technologies were introduced and developed and old ones revived, reevaluated and reconsidered. Not only would new technologies be introduced, but also new ways of thinking about technology.

Tactics may be defined as procedures for carrying out tasks in a manner that maximises benefits to one's own side while minimising those to the enemy.[2] They may be considered to involve four aspects: (1) location, the finding of targets on the battlefield, (2) communication, the conveying of that information to tactical elements, (3) acquisition, the bringing of weapons to bear on a target, whether that be through range or movement and (4) destruction, the use of these weapons to destroy the target. These aspects are interdependent and in most practical cases may be considered constraints, because, for example, the deployment of a tactical asset so that it has acquisition is likely to expose it to the risk location, acquisition and destruction by the enemy. Each aspect has both positive and negative aspects; preventing the enemy from achieving

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1 Rawling, Bill, Surviving Trench Warfare. Technology and the Canadian Corps 1914-1918, Toronto, University of Toronto Press, 1992

2 This is my definition, not the current Australian Army doctrine, for which see *The Fundamentals of Land Warfare*, Georges Heights, NSW, Southwood Press, 1993, p. 23

location, communication, acquisition and destruction is a part of most tactical systems. In the 20th century, tactics invariably are also technics, which is to say, skills and methods for employing technologies, due to the pervasiveness of technology.

Tactics are also memes, which are defined as living ideas capable of evolution through natural selection. A meme is both a replicator and a unit of cultural transmission. Just as genes propagate in the gene pool by leaping from body to body via sperms and eggs, so memes leap from brain to brain by a process of imitation. Tunes, catch phrases and fashions are all forms of memes.[3] Over time, inferior tactics are abandoned in favour of better ones through this process. The battlefield forms an excellent environment for natural selection, because inferior tactics can result in the death of the proponent. Two memes may both contain truth, but natural selection may still favour one over another, for a diverse number of reasons. I shall trace this process as it occurred for tactical memes during the Great War.

In postmodern terms we might say that tactics are the software and weaponry and equipment the hardware. Technology is normally thought of as including both elements. There is also a symbiotic relationship between them. Tactics necessarily involve making optimal use of the available technologies. However, over time technologies can be developed or adapted in conformance to our tactical doctrine. This is the normal pattern of events and the source of the general rule that form follows function, or in this case, technology follows tactics. However, it is also possible for technologies to be developed that alter the tactical environment to the extent that it now favours different memes. It is my contention that this situation did indeed occur in the Great War. The result constitutes the core of this thesis.

That such a situation can arise may sound odd for, after all, have not the technologies been constructed in conformance with the original memes? However, like cities, technological artifices are not only man made but inhabited by people as well and are not capable of rapid reconstruction. Moreover, the avoidance of undesirable and potentially disastrous consequences is not necessarily an aspect of the meme. Rather, it is natural selection that must take care of killing off degenerate memes. Thus, in the short term, technology can appear to be out of control. It must be emphasised that what is critical is not the physical environment but the perception of it, the reaction of the memes to the situation.

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3 The notion of a meme (which rhymes with cream) was introduced by Richard Dawkins in his 1976 work, *The Selfish Gene*. See Dawkins, Richard, *The Selfish Gene,* Oxford, Oxford University Press, 1989, pp. 192-201, 322-323. For the development of the meme since then, see Dawkins, Richard, "The Selfish Meme", *Time,* 16 April 1999, pp. 68-69

Doctrine is a set of fundamental principles by which military forces guide their actions.[4] Doctrine should not be confused with dogma, which is doctrine proclaimed by authority to be true. Military doctrine is authoritative, but requires judgement in application. Tactical doctrine is that part of doctrine devoted to tactics. In discussing both tactics and doctrine, one must not lose sight of the fact that we are talking about memes. In seeking to understand them, we seek an understanding of the way that people thought, not a simple matter even for a period of history not so long ago and a culture still very much alive.

In 1914, doctrine was in the hands of the General Staff, and was copied from the British Army. Officially, there was no such thing as British doctrine because the British Army rejected the very notion. In practice, a semi-official one emerged in the form of the *Field Service Regulations*, which Major General W. T. Bridges memorably described as being "as useful to most Australian militia officers as the cuneiform inscription on a Babylonian brick".[5] For others, the *Field Service Regulations* were gospel, to be memorised chapter and verse. What the *Field Service Regulations* actually were was a collection of advice for commanders garnered from Britain's 19th century colonial wars.

Central to British doctrine was the notion that offensive posture was intrinsically stronger than defensive:

> *Decisive success in battle can be gained only by a vigorous offensive...* Superior numbers on the battlefield are an undoubted advantage, but skill, better organisation, and training, and above all a firmer determination in all ranks to conquer at any cost, are the chief factors of success.
>
> *Half hearted measures never attain success in war, and lack of determination is the most fruitful source of defeat.*[6]

Defensive posture was something that "must only be assumed in order to await or create a favourable opportunity for *decisive offensive action*".[7] Cavalry was crucial: "a successful cavalry will retain for a commander the initiative he has gained or regain it for him if it has been lost",[8] but artillery was ancillary to the infantry: "*the object of their fire is to assist the infantry advance*".[9] Seeking the decisive battle was the object

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4 The Fundamentals of Land Warfare, p. 7

5 Bean, C.E.W., The Official History of Australia in the War of 1914-1918 Volume V: The AIF In France During the Main German Offensive 1918, Sydney, Angus and Robertson, 1933, p. 522

6 Field Service Regulations, Army Council, War Office, 1912, p. 107. Emphasis original.

7 *Field Service Regulations*, p. 108. Emphasis original.

8 *Field Service Regulations*, p. 109

9 *Field Service Regulations*, p. 115. Emphasis original.

of a military campaign. The battle was considered to consist of three parts: the advance to the battlefield, the struggle for superiority of fire, and the infantry assault.[10]

This doctrine was the result of a long process of military thinking. The principal weapon of the infantryman in the 18th and early 19th centuries was the bayonet rather than the rifle or musket. Muskets had a smooth bore, were not very accurate, couldn't fire lethally very far and were muzzle loaded, which meant that besides being single shot, reloading was a complex operation that could not be carried out quickly. Tactics were built around the limitations of the weapon. Men massed together in order to get enough firepower; reloaded together by numbers, so no one jammed his weapon or accidentally shot one of his mates; and fired in volleys from as close to the enemy as possible, the weapon being most accurate at about 200 metres. If the enemy got much closer than that, then reloading was impossible and recourse would be made to the bayonet, an edged weapon dating back to the 17th century. It was disciplined bayonet charges rather than firepower that usually carried the day for European armies in the colonial wars of the 18th century.[11]

This gradually changed during the 19th century as a result of several technological developments. Cartridges made the rifle quicker to load and more reliable. Conoidal bullets flew faster and truer than musket balls. Rifling - the cutting of spiral grooves inside the barrel - increased the range and accuracy of the weapon. This had been developed in the 16th century but handmade rifled muskets were slow and costly to manufacture and the need for accuracy was not apparent when the target was a mass of infantry 150 metres away.[12]

The Industrial Revolution affected the economics of manufacture and the effect was dramatic. During the 18th Century, some 40% of casualties were caused by small arms; by the American Civil War (1861-1865), thanks to the rifled musket and conoidal bullet, the proportion had shot up to 75%.[13] Further developments were already underway. Breech loading sped up the reloading and firing cycle. The bolt action allowed the firer to fire faster still, reinserting a bullet into the breech from the magazine with a simple action. Putting all these together, the Prussians came up with the Needle Gun, a true modern rifle. As a result of this weapon and other rifles such as the Chassepot that

10 *Field Service Regulations*, pp. 110-112, 117-119

11 Pursell, Carroll, *The Machine in America: A Social History of Technology*, Baltimore, Maryland, John Hopkins University Press, 1995, p. 13

12 Hogg, Ian, *The Story of the Gun: From Matchlock to M16,* London, Boxtree, 1996, pp. 22-23

13 Dyer, Gwynne, *War,* London, The Bodley Head, 1985, pp. 63, 78

inevitably followed, the proportion of casualties caused by small arms during the Franco-German War (1870-1871) was 90%.[14]

In this, these early industrial wars would prove to be very different from the Great War, where artillery played a far more important role. Yet no revolutionary change occurred. Rather, there was a long period of steady, incremental technological improvement. One change was the introduction of smokeless powder. The British Army adopted Cordite, a mixture of 58% nitroglycerine, 37% gun cotton and 5% Vaseline, which served to make it waterproof. The name comes from the fact that originally it was made in cords but by 1914 tubes had replaced cords to give a more regular ignition and complete combustion. The result was to increase still further the range of the weapon while lowering its trajectory and thus increasing its lethality.[15]

The Russo-Japanese war of 1904-5 demonstrated that massing infantry in drill formations was no longer possible but left open the question of whether it was still possible for a trench to be "rushed". Experiments in 1908 showed that 18 per cent of shots fired from the hip by men advancing at double time against men showing head and shoulders over a trench would be hits at between 50 and 150 metres range. By 1914, more powerful sights and ammunition had extended the lethal range of rifles and machine guns from 600 to 800 metres.[16] In the 1902 *Field Service Regulations*, the concept of the bayonet charge had been dropped but in field exercises the struggle for "superiority of fire" tended to degenerate into a drawn out firefight. The feeling was that eventually the infantry would have to take their chances:

> Troops under cover, unless enfiladed, can seldom be forced to retire by fire alone; a decision by fire, even if possible, takes long to obtain. To drive an enemy from the field assault, or the immediate threat of it, is almost always a necessity.[17]

Thus, British thinking started to follow that of the French, who had given up on the idea of winning superiority of fire before getting on with the assault. That such a battlefield would be a dangerous place had not escaped notice. The response of British tacticians like Brigadier General R.C.B. Haking was that the infantry (and artillery) must be prepared psychologically for heavy casualties. Thus, the human factor was considered to be as important as ever and "moral power in war predominates over physical as greatly

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14 Dupuy, T. N., *Understanding War: History and Theory of Combat*, New York, Paragon House, 1987, pp. 201, 203

15 Bethell, H.A., *Modern Guns and Gunnery,* London, F.J. Cattermole, 1910, pp. 147-148

16 Bidwell, Shelford and Graham, Dominick, *Fire-Power. British Army Weapons and Theories of War 1904-1945*, London, Allen and Unwin, 198, p. 29

17 *Field Service Regulations*, p. 17

as formerly".[18] This was a well-established meme and it flourished in an environment where it was easier to effect social changes than technological ones. In the 20th century when one piece of technology could do the work of many, it was regressive.

The meme that heavy casualties were inevitable had other negative aspects as well, for a general who anticipates heavy casualties is less likely to take every possible step to prevent them. This kind of self -fulfillment is frequently a characteristic of successful memes, for it simultaneously reinforces their logic and discourages searching for alternatives, which may lead to a preference for another meme.

In the case of this particular meme, the environmental problem is that technology is capable of order of magnitude improvement, far in excess of anything that can be accomplished with human factors. So far from being paramount, technological change can render human factors like morale and courage marginal. Worse, it could actually render them negative qualities that were more likely to get the brave - those who persist in the face of danger and fear - killed.

One such technology in 1914 was the machine gun. This weapon dates back to the 18th century but the first practical models appeared in the late 19th century as a result of the work of an American inventor, Hiram Maxim. Between 1882 and 1885 Maxim, working from his laboratory in London, systematically studied and patented every practical way to create a machine gun. By 1885 he had produced a gun powered by its own recoil that could fire 600 rounds per minute.[19]

The machine gun is a good example of the problems encountered by a new weapon. In the early years, the machine gun was heavy, requiring a wheeled mounting. It had problems with reliability and breakdowns were frequent. The reliability of a machine gun could not equal that of a rifle even with the most careful handling of gun and ammunition. An extensive tool kit was carried. Maxim would spend the next years working on this problem. Because the machine gun had to be sited before battle, it was considered a defensive weapon. In 1888 the gun was used in action for the first time by a British punitive expedition in Gambia under the command of Brigadier General F. de Winton. With the General himself operating the gun, the expedition opened fire on the small fortified town of Robari, apparently making quite an impression on the natives.[20] Thus, it was shown that the machine gun could also be used offensively. Still, by 1901 a

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18 Travers, Tim, The Killing Ground: The British Army, the Western Front and the Emergence of Modern Warfare 1900-1918, London, Routledge, 1993, p. 48

19 Hogg, Ian and Bachelor, John (illustrator), *The Machine Gun,* London, Phoebus, 1976, p. 14

20 Hogg, The Machine Gun, p. 16

British War Office Committee concluded its "tactical role was not well understood".[21] This is fairly common for a radically new technology because a revolutionary technology requires correspondingly revolutionary technics and a correspondingly large organisational adjustment.

What the British Army really wanted was a machine gun that could be carried by an infantryman like a rifle - an automatic rifle - and by 1910 theorists were openly calling for one. Incredibly, in January 1914 the Committee on Automatic Rifles, after testing several, submitted a final report concluding that the automatic rifle was still years away, although automatic rifles like the Danish Madsen and American Lewis were already on the market.[22]

What might have been surprising earlier in the 19th century was that serious, scientific thought was being applied to the infantry arm. By contrast, the artillery had always been considered a technical arm. But throughout the 19th Century, the artillery arm had been in decline. In the 18th Century, 40 per cent of casualties had been inflicted by artillery;[23] by the 1870s it had fallen to just 9 per cent.[24] Then a technological breakthrough came in 1897 when the French introduced the *Soixante-Quinze*, a 75mm Quick Firing gun. The gun incorporated a hydrostatic buffer, which absorbed the recoil, and a recuperator to restore the firing position. In earlier field guns the whole gun had been blown back by the recoil and had to be repositioned. What the hydrostatic buffer meant was that the next round fired would land roughly at the same place as the previous one without any further action by the gunners. This allowed the gun to be fired as fast as it could be reloaded. Ammunition was fixed, meaning that propellent and projectile were contained in a single shell. This meant that loading was also quick. The gun could fire six rounds per minute normally, and up to twenty rounds per minute in a crisis. By contrast, the earlier guns of the 19th century could fire no more than 8 or 9 rounds per minute.[25]

There are two ways of firing on a target. The first is called direct fire. This means that the gun layer can observe the target through his gun sight. Of course, this probably also means that the target can observe the gun. To stop the enemy infantry from picking off the gunners with their rifles, a gun shield was added to the front of the gun, a distinctive feature of guns of the first half of the 20th Century. Prior to the invention of the Quick Firing gun, the gun lurched back each time it was fired, so the gunners had to stand

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21 Travers, The Killing Ground, p. 64

22 Travers, The Killing Ground, p. 65

23 Dyer, *War,* p. 63

24 Bloch, I. S., *Is War Now Impossible?*, London, Grant Richards, 1899, p. 330

25 Gower, S.N., *Guns of the Regiment*, Canberra, Australian War Memorial, 1981, pp. 126-132

clear, and no shield was possible. The gun shield enabled the gun to be deployed from gun pits in forward locations.

The other method is indirect fire. In this case the target is not visible to gun layers, probably because the gun is hidden behind a hill. However, it may be visible to a spotter who is in communication with the battery. The gunners set the range and point the gun in the correct direction and fire. The spotter notes where the shot lands and adjusts the fire of the gun until the shot falls on target. Indirect fire can be a much slower process than direct fire but is much safer for the battery, which, being completely out of sight, is harder for the enemy to locate and fire upon. Alternatively, one can dispense with the spotter and fire off the map, setting the elevation according to the range and direction according to the compass.

There was some controversy as to which method of fire was the better one. Clearly, indirect fire was safer but the infantry wanted direct, visible support from the artillery in the attack. In particular they wanted the artillery to take out the enemy artillery, either by firing on it or by making themselves the prime target. The wisdom of this was subject to debate.

The third of the three traditional arms, cavalry, had also been in visible decline and there had been a great deal of controversy about the future of cavalry or lack thereof in both Britain and Australia. On the one hand, many felt that cavalry was obsolete given the vulnerability of horses to modern weapons. On the other, there was a vocal school of thought which held that this vulnerability had been exaggerated; horses are not as vulnerable to bullets as men and unless a bullet strikes a leg bone or major organ it is unlikely to bring down a horse. They therefore argued that even traditional cavalry armed with solely with edged weapons still had a role to play on the battlefield. This point of view was reflected in the *Field Service Regulations* and represented an important doctrinal difference between Britain and Australia. While the British Army went much further than other European armies in that its cavalry were trained for both mounted and dismounted action, it did not go as far as the Australian and abolish the edged weapons for mounted action entirely. [26]

[26] Badsey, Stephen, "Cavalry and the Development of Breakthrough Doctrine", *British Fighting Methods in the Great War,* Frank Cass, London, 1996, pp. 140, 145-146

Commonwealth Military Journal 1911-1913
Australian Articles by Topic

Topic	**Articles**
Training	16
Compulsory Service	13
Organization	10
History	7
Technical	7
Aviation	7
Tactics	6
Musketry	5
Topography	4
Mechanization	4
Legal/ Ethical Issues	4
Medical	4
Machine guns	2
Naval	2
Horses	1
Total	**92**

One organ for the showcase and dissemination of Australian ideas was the *Commonwealth Military Journal*, published by the Training Branch of the General Staff in Melbourne. By and large it reprinted articles by British thinkers like Kiggell and Haking from British journals. However, from the first they published at least one Australian article in each issue, even if they had to write it themselves. The *Journal* deliberately canvassed as many and varied topics as possible. All articles were written by officers, except one by a woman. The most common topics were training and the compulsory service scheme. There was a fascination with new technologies, particularly those capable of cutting the Australian continent down to size, such as radio, motor vehicles, motorcycles and aviation.

Defence planning was in terms of the home defence of Australia, fighting off an invasion or at least holding out until help arrived from overseas. With Australia as the battlefield under consideration, thinking was in terms of defending an immense land area with relatively small numbers of troops. The conclusion was that due to these factors, the next war would be a highly mobile one.

Perhaps due to this defensive strategic posture, British (and French) ideas of the offensive seem to have been lost in translation. Great emphasis was placed on the power of entrenchments. If an attack could not be delivered because superiority of fire could not be achieved, fine. If the enemy got up and charged, even better. In a pair of articles on the lessons of the Wilderness Campaign of the American Civil War, published in the *Commonwealth Military Journal* (April and May 1912), Colonel John Monash (who won first prize for his article) and Major F.A. Dove discussed this, amongst other issues. Both gave the "cult of the offensive" the short shift. According to Monash:

> It was abundantly demonstrated that direct assaults by troops of whose courage and *élan* there could be no question, with all the assistance of covering fire, and concentration of artillery fire, were impotent against field fortifications of the character in question when manned by troops of equal calibre *but only one half in numbers*.[27]

Dove went further:

> A point that should be kept in view in the training of our troops is that they will have to meet men who will undoubtedly be taught that a resolute bayonet charge is sure to give them victory... But if troops who are about to be attacked with the bayonet be good shots, and not hopelessly outnumbered, I consider that no infantry could get near enough to them to use the bayonet...[28]

Because the Australian Army was assumed to be the one on the defensive, this was not considered to be a problem. In any case, direct assault on well-fortified positions seemed hardly necessary in the vast, open spaces of Australia, where there would always be ample room for manoeuvre. Both men placed great confidence in the attributes of the Australian soldier, particularly his independent attitude, Monash perceptively noting that it was "the utility of that independent local initiative... to which may be attributed, more than any other circumstance, the success of the German arms in the [1870] war with France".[29]

Thus, the tactics and organisation of 1914 had been carefully considered. There were, it is true, a number of theorists such as I. S. Bloch who, writing around the turn of the century, argued that the next war would be a stalemate fought between entrenched armies.[30] Many people questioned the continued value of cavalry and edged weapons. In retrospect, the trend in this direction is clear but cavalry continued to function on the battlefield and bayonet charges continued to occur. Most thinkers did not believe that

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27 Monash, "Lessons of the Wilderness Campaign, 1864", *Commonwealth Military Journal*, April 1912, p. 280

28 Dove, "Lessons of the Wilderness Campaign, 1864", *Commonwealth Military Journal*, May 1912, p. 442

29 Monash, "Lessons of the Wilderness Campaign, 1864", *Commonwealth Military Journal*, April 1912, p. 276

30 Bloch, I. S., *Is War Now Impossible?*, London, Grant Richards,1899

incremental developments could trigger revolutionary changes. Such a phenomenon is rare in military history but it is well known in the history of technology.

A bewildering array of technologies is available in twentieth century warfare. Tactical doctrine therefore needs to derive scales of organisation and equipment that strike some balance between their needs to be transported and sustained and the needs of probable missions. It is of course possible to restructure and re-equip to meet the specific needs of the situation, and I shall trace how this was done during the Great War.[31]

31 An Order of Battle is a useful adjunct to the comprehension of the organisation of the AIF but none has been published. The author has compiled one but it was too large to include in this thesis as an appendix, so it has been made available on the World Wide Web on the ADFA web site at:

http://www.adfa.edu.au/~rmallett/