

The arming of Australia : the politics and administration of Australia's self containment strategy for munitions supply 1901-1945

Author:

Ross, Andrew T.

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**The Arming of Australia : The Politics and
Administration of Australia's Self
Containment Strategy for Munitions Supply 1901–1945**

BY

A.T.ROSS

**A thesis submitted for the degree of Doctor of
Philosophy at the University College of
of the University of NSW, 1986.**

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A.T.Ross

CORRIGENDA

1. CONTENTS, Chapter 4 heading should read: "The MSB and the Plan to Organise Industry for War 1921-39."
2. Page iii, LIST OF ABBREVIATIONS should also have MSL, Munitions Supply Laboratories.
3. Page 21 fn.42, timbers should be Limbers
4. Page 100 Great Depressions's should be Great Depression's.
5. Page 188, animousity should be animosity
6. Page 195, Commzztee should be Committee
7. Page 203, forgot should be forget.
8. Page 213 fn.4, Senior Offices should be Senior Officers.
9. Page 236-37. The last sentence should read: It was also certain that the Army and other Services needed large quantities of many other things as well [65].
10. Page 280, Dominions should be dominions.
11. Page 340, Chapter should be chapter
12. Page 360, illfated should be ill-fated.
13. Page 374 fn. 201, omit footit.
14. Page 455, Lauvier should be Laurier.
15. Page 461, entry under Haycock R.G. should be Sir Sam Hughes : His Public Career. Ph.D., University of Western Ontario, 1976.

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ABSTRACT

The problem investigated by this thesis is the Self Containment Policy for munitions supply in Australia 1901–1945. The thesis examines how the policy was applied, and whether it succeeded in its goal of securing munitions supply in Australia during a major conflict.

The procedures followed have been to examine the records of the Department of Defence, the Department of Supply and Development, and the Department of Munitions. The records of other federal government departments were also investigated to supplement the documentary record contained in the first three departments. Personal papers in the Australian War Memorial, and National Library of Australia were also utilised to fill in gaps in knowledge. A significant number of personal interviews with surviving figures of the Self Containment Policy were also a valuable source of information. Newspapers were used sparingly. The Self Containment Policy was hardly ever a public issue, and was usually incorrectly reported by the public media. Secondary published sources were not especially helpful. The Self Containment Policy has never been of much interest to historians and scholars.

It has been possible to write a detailed account of the politics and administration of the Self Containment Policy. The policy as administered by the Munitions Supply Board, was well thought out, and ultimately successful in supplying the quantity and quality of munitions required for the defence of Australia during the Second World War.

Major conclusions are that economic difficulties during the period 1920-1939, and distrust of Britain as a reliable source of munitions, led Australian Governments to develop the Munitions Supply Board in preference to the Armed Services, in regard to the most serious level of military contingency. This investment paid a huge dividend during the Second World War, because the Munitions Supply Board and its laboratories and factories were able to teach commercial industry how to make the quantity and quality of munitions required at the critical stage of the war. It is unlikely that a Japanese invasion of Australia would have been successful. Areas of munitions technology for which no provision had been made in peacetime were not successfully implemented in wartime, despite the infusion of millions of pounds of finance.

LIST OF ABBREVIATIONS

AA	Australian Archives
AA gun	Anti Aircraft gun
AC1	Australian Cruiser Tank Mark 1
AIF	Australian Imperial Forces
AFV	Armoured Fighting Vehicles
AFVP	Armoured Fighting Vehicle Production
AT gun	Anti Tank gun
AWM	Australian War Memorial
BAM	Board of Area Management
BHP	Broken Hill Proprietary
CAC	Commonwealth Aircraft Corporation
CAS	Chief of the Air Staff
CC	Cartridge Case
CID	Committee of Imperial Defence
CGMS	Controller General of Munitions Supply
CGS	Chief of the General Staff
CNS	Chief of the Naval Staff
CMA	Chief Military Adviser
CPD	Commonwealth Parliamentary Debates
CSIR	Council for Scientific and Industrial Research
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAFVP	Directorate of Armoured Fighting Vehicle Production
DGM	Director General of Munitions
EFM	Explosives Factory Maribyrnong
FCT	Federal Capital Territory
FMC	Federal Munitions Committee

GMH	General Motors Holden
GOC	General Officer Commanding
ICI	Imperial Chemical Industries
ICIANZ	Imperial Chemical Industries Australia and New Zealand
LO	Liaison Officer
MGO	Master General of the Ordnance
MSB	Munitions Supply Board
NANZ	National Archives of New Zealand
NLA	National Library of Australia
NSW	New South Wales
OFM	Ordnance Factory Maribyrnong
OPD	Ordnance Production Directorate
Pdr	Pounder
PP	Commonwealth Parliamentary Papers
PSOC	Principal Supply Officers Committee
QF	Quick Firing
RAAF	Royal Australian Air Force
RAN	Royal Australian Navy
R and D	Research and Development
S	Series
SA	Small Arms
SAA	Small Arms Ammunition
SAF	Small Arms Factory
SAP	Semi Armour Piercing
SC	Solventless Cordite
SITR	Secondary Industries Testing and Research
SMG	Sub Machine Gun

1. R. H. H.

PREFACE AND ACKNOWLEDGEMENTS

The inspiration for this thesis topic was the belief of senior officers of the Department of Supply in the early 1970ies, that the problems of scientific and industrial preparation for war were being underestimated. The Armed Services, and the Defence Department, did not understand the scope and complexity of such preparations and consequently were loth to commit themselves readily to support the peacetime scientific and engineering infrastructure ^{which} the Department of Supply thought necessary. The senior officers of Supply considered that much of this situation might have been clearer if a detailed history and analysis of munitions preparations had been written as part of the official histories of the Second World War. However, the subject was not interesting enough, or too difficult, for any significant provision to be made by the official historians. This gap in knowledge became more pronounced with the partition of the Department of Supply in 1975. The division of functions destroyed the corporate memory and perspective of scientific and industrial preparations for war. This thesis, belated though it may be, is the writer's attempt to keep faith with those colleagues of the Department of Supply who for reasons best known to themselves, thought that he could write the necessary history and analysis.

Readers of this thesis will be aware that it is a large document. This was inevitable given that there were extremely few secondary sources the writer could cite which were relevant to the topic. This meant that even minor points of detail had to be supported by an elaborate web of primary references; increasing

the number and size of footnotes and expanding the main text. The impact of these influences has been contained by the use of annexes. The proper use of an annex is to provide valuable background information without destroying the flow of the main text; or to provide support for some secondary point in the main text. In the latter case, other thesis writers have been usually able to cite a secondary source for this situation, but I have found that the extensive use of primary sources has often led to elaborate 'sub arguments' which do not sit well in the main text. Consequently, annexes have been used in such situations. Despite these necessary devices, readers will find however, that the main text of the thesis is comprehensible without reference to the annexes.

The detailed documentation of the thesis follows normal academic practices except for the use of S in Australian Archives and some other references. S means series. The frequent use of combinations such as 1939/40–1944/45, may cause some confusion as well. 1939/40 means the financial year beginning 1 July 1939. 1939/40–1944/45 means the financial years beginning 1 July 1939 and ending 30 June 1945. Where ever the symbol / is used to separate two consecutive years eg. 1922/23, it always means the financial year. The symbol 1922–23 means the calendar year.

The writer has received much assistance in the completion of this thesis. The Australian War Memorial awarded him the C.E.W. Bean scholarship for postgraduate research, and this helped greatly in the financial support of the project. The staff of the Australian Archives in Brighton Victoria, and Canberra, provided exemplary assistance and advice on sources. Mr Colin Smith of CSIR Archives also was of great assistance. Dr Ron Haycock provided much

stimulating discussion and advice in the early days of research. Dr Frank Cain, Jack Knight, and Dr Tony Stimson have read patiently drafts of the thesis and extended useful advice and support. The writer is especially indebted for the wise counsel and guidance of his supervisor Dr J M McCarthy. A very pleasant and effective working relationship was established at the outset of the project, and continued for its duration, to the great benefit of the writer. The consistent support of A R Taylor and D McCallum was valued very highly by the writer. Basil McMillan advised on technical problems associated with information transfers from one word processor to another. Lastly, I wish to thank Elaine Lally and Di Jurd for their enormous contribution in the physical production and presentation of the thesis. The writer acknowledges the periodic assistance extended to him by many other generous people, but states that the final responsibility for what has been written is his alone.

INTRODUCTION

It is largely unappreciated today that during the period 1901–1939, Australian Governments implemented a detailed policy of establishing munitions production within Australia. This was called by the Defence Department and its ministers, the Self Containment Strategy (or Policy). Millions of pounds were spent in pursuit of the goal of making Australia independent of sources of munitions supply from Britain, and elsewhere, so that should British naval power have collapsed in the Far East, Australia could stand alone. To date no one has examined the importance of Self Containment in relation to Defence policy for the period. Consequently, the object of this thesis has been to examine the development of the Self Containment strategy, and its effectiveness during the Second World War.

In this respect it is important to note that the Self Containment strategy was applied mainly to armaments (eg. aircraft, guns, small arms, ammunition etc. and not to stock items such as blankets, shoes, uniforms, trucks, and food, which could be gained from civilian supply outlets. For economy in size this thesis has concentrated on the armaments studied by the Munitions Supply Board [MSB] which was the major producer of munitions in Australia between 1901–1945, and the key agency of Australian Governments' implementation of Self Containment. This excludes largely the consideration of aircraft, and radio and signal supplies, but nevertheless includes virtually all the munitions for which the Department of Munitions eventually held responsibility. Manpower

and materials supply have not been considered in any detail partly because they have been well covered in the official histories of the war, and because they only became important when the major technical and economic issues considered in this thesis, had been solved. Consideration of such issues has taken up all the space allowed for this thesis.

Chapter one of this thesis outlines the course of early munitions supply policy before and during the First World War. It highlights the plan to build a huge arsenal at Tuggeranong, ACT, and the attempts to stop this development. From the ruins of this misguided project, A E Leighton reoriented and rebuilt the concept of self containment in the light of British experience. He created the MSB of the Department of Defence, which carried out the Self Containment strategy of munitions supply from 1921 to 1939.

Chapter two is an account of how the MSB attempted to build up the scientific and engineering infrastructure required for self contained munitions supply. Contrary to the belief of the official historians and subsequent analysts, poor provision for the development of the Army and the Air Force during the 1930ies was the result of severe economic problems and not the result of the Australian Government's faith in British promises of naval defence against Japan. Australian Governments could not afford in peacetime the huge costs of developing air and land forces capable of defending Australia against invasion by Japan. They did the next best thing of preparing the scientific and production facilities which could equip such forces properly, should war emerge eventually. The munitions production facilities of the MSB were on a scale which envisaged the supply for major land battles in Australia; ie. they could produce at rates

vastly in excess of what was required for the official Government contingency (of defence against raids) which guided the development of the Armed Services. Because post war historians have largely ignored munitions supply policy and economic policy, they have missed the vital elements of the Government's pre war Defence policy.

Chapter three shows that the MSB was not just involved in building and running government laboratories and factories, but was also a stimulating influence on the development of secondary industry in Australia. The MSB engaged in tariff manipulation to assist industries of importance to defence, and extended extensive technical support with the aim of raising the level of technical achievement by local industry. It even created new industries. Through these developments the MSB hoped that secondary industry would become sufficiently advanced and competent to assist in all forms of munitions production should war begin. This objective received a major boost in 1936 when the Government decided to extend the growth of secondary industry to enhance Australian economic development. Current writers seem to think that the Trade Diversion was a clumsy attempt to gain increased meat exports with Britain; but it was an attempt to escape from British economic tutelage and develop new industries. The MSB expected to benefit from this initiative but found that the CSIR sought to dominate all such development including defence aspects. Leighton out manoeuvred this powerful rival so that the MSB retained its functional responsibilities in regard to secondary industry.

Chapter four describes the development of the MSB's plan to organise secondary industry for wartime production. It was an area in which the Armed

Services had a great professional interest. The general tendency of historians of World War Two has been to give the Services, particularly the Army, great credit for attempting before the war to persuade the Government to prepare industry for munitions production. This thesis shows that Service statements and actions on this matter were posturings and their real purpose was to gain control of the MSB. Against great Service obstruction, designed to show up the alleged incompetence of the MSB, the latter overcame all obstacles and produced a workable plan.

Chapter five relates the formation of the Department of Supply and Development, and the creation of the Department of Munitions. The former was imposed on the MSB, ignoring the advice of that board, and the British experience with the Ministry of Munitions during 1915 to 1918. The dominant influences were Shedden, the new Secretary of the Defence Department, and the Armed Services. The MSB power structure was destroyed, and Service control established. The elements of the MSB were now gripped in Shedden's tight system of 'co_ordination', which prevented effective progress on munitions supply policy and involved senior staff in endless committee meetings. The senior members of the old MSB rebelled in May 1940, helping to provoke a crisis in the Menzies Government over munitions supply. The result was the creation of the Department of Munitions where all responsibility and power to arrange munitions production was centered once more in one authority. This was the Director General of Munitions, and he held financial and administrative powers which outstripped even those of the defunct MSB.

Chapter six is an outline of the successive massive munitions production

programmes which followed May 1940, and the resulting relations between the Armed Services and the Department of Munitions. The chapter reveals that there were significant difficulties. In postwar histories there is virtually no mention for example, of the repeated incompetence of the Army's technical branches in matters of ordering and design. This culminated in the Owen gun scandal — a matter which has never been explained properly in public, probably because of the embarrassment it would have caused to the Australian Army. Army technical branch histories subsequently did much to ignore the Owen gun and other design problems in a more or less successful attempt to pretend that no significant problems existed in these areas.

Chapter seven is an attempt to give an assessment of the level of success associated with the Self Containment strategy during World War Two. It shows that where adequate laboratory and engineering capabilities had been established for a particular munitions technology, related munitions production was established successfully by the Department of Munitions throughout secondary industry. In particular, the laboratories and factories established by the MSB successfully taught commercial industry in munitions production. This showed the validity of Leighton's concept of self containment. Where his concept was not applied, and no technical infrastructure existed naturally outside of the Defence Department to cover a particular technology, related munitions production was not established successfully. This was the fate of armoured fighting vehicles. Beyond these facts, the chapter shows that the Department of Munitions successfully produced the quantity of munitions required by the Services at the time of greatest strategic need. Furthermore, this entire pro-

duction effort was achieved at remarkably small cost to the Government. The massive costs in wartime were the Armed Services, and not the provision of the production facilities to supply munitions to them. Such facilities retained much of their capital value after the war, allowing the Government to recoup much of its expenditure.

CHAPTER 1

THE EMERGENCE OF THE SELF CONTAINMENT STRATEGY, 1901-21

Dependence on Britain and the Impact of War

On the act of Federation in 1901, the new Commonwealth Government of Australia, inherited the defence forces of the federating colonies, and their modest attempts to establish sources of munitions supply. Victoria had been the state with most initiative and had encouraged the establishment of a small arms ammunition [SAA] factory which was run by the British Colonial Ammunition Company. This assembled imported components into 0.303 ammunition. Very little else had been achieved in munitions supply, if one excludes items such as clothing and food.

This did not mean that the states had been uninterested. In the last years of the nineteenth century, defence matters, including supply, had become an increasing preoccupation and had provided one of the major impulses towards Federation. Colonial governments had begun to realise that defence could not be approached effectively on an individual colony basis. The geography of Australia was such that defence was most sensibly defined and analysed as a continental problem. Consequently action on many defence issues was postponed until they could be considered by the new Australian Government, which had the power to implement defence and supply policy for the whole continent of Australia. The need to give attention to munitions supply was emphasised in February 1900 when the British War Office informed the Premiers of New South Wales [NSW] and Victoria, that on account of the South African War, it was unable to meet requirements for supplies of cordite for SAA. It went on to suggest that inducements should be offered to manufacture cordite locally in

Australia[1].

In the years immediately following Federation, the Australian Government examined the problem of munitions self reliance. The significance of the cessation of munitions supplies during the South African War was appreciated widely within the new Defence Department:

‘When the War in South Africa broke out, the manufacturing resources [of Britain] were strained to the utmost extent and the requirements were barely fulfilled. Even if this were not so, it would be madness to depend upon the import of large quantities of ammunition after an outbreak of War. It appears therefore, to be an axiom of Commonwealth policy to be independent in this respect’[2].

The Secretary of the Defence Department, Captain R.M.Collins, and the General Officer Commanding in Australia, E.T.H.Hutton, were both active in prompting the Government to take some action[3]. In 1904 Hutton proposed the building of an arsenal and was supported by the Government. However, the Colonial Defence Sub-Committee of the Committee of Imperial Defence in Britain discouraged the idea. In their opinion the arsenal would be too little, very expensive and too centralised. It suggested that Australia should concentrate on smaller items such as saddles, clothing, and harness, and leave the more complicated production to Britain[4].

1. AA MP598, S37, Box 2.

2. AA MP598, S30, Box 1, item 1, Sir George Sydenham Clarke (British defence expert and Governor of Victoria), to Deputy Quarter Master General, 20 May 1902.

3. See J.K.Jensen, ‘Defence Production in Australia ...’ unpublished manuscript, Office of Defence Production Library Canberra (also AA Brighton Victoria), Vol.1, Ch.1, pp.48-61.

4. AA CP 78/1, bundle 25, file on the establishment of an arsenal in Australia 1904, Prime Minister to Governor General, 8 June 1904, 18 July 1904, Colonial Defence

The Government was discouraged for only a short time. In February 1904, the Russo/Japanese War had begun. By March 1905, the Japanese had won two major land victories at Port Arthur and Mukden, and, by the end of May, had destroyed Russian naval strength in the Far East. At its first meeting, the new Australian Council of Defence, decided to continue enquiries on the building of munitions factories in Australia[5]. An intense public defence debate in Australia began with the conclusion of the Russo/Japanese War in September. The Japanese victory suggested to many defence analysts that there was the possibility that the British Fleet could become anchored in European waters facing the German naval threat, and might not also be strong enough to check the Japanese in the Pacific[6]. Sealines could become threatened, ending the flow of munitions (which had resumed from Britain after the South African War) to Australia. The only reliable solution, therefore, was to establish the sources of munitions supply in Australia, thereby maintaining the military and naval forces operating in defence of the continent of Australia. Government efforts gained further stimulus with the modernisation by Britain of munitions factories in India[7].

It is not intended to give a detailed account of the Government's ac-

Committee Memorandum 'Australian Military Manufacturing Establishments', 24 January 1905.

5. AA Council of Defence A2032, Minute 12 May 1905, file 05/5018/585.

6. N.Meaney, *The Search for Security in the Pacific, 1901-14*, Sydney University Press 1976, Chapters 5-7. Horner, D.M., 'Australian Estimates of the Japanese Threat 1905-1941' in *Estimating Foreign Military Power*, P.Towle (ed.), Croom Helm, London, 1982, pp.139-40.

7. Ernest Scott, *Australia During the War*, Vol.XI of the Official History of Australia in the War of 1914-1918, Angus and Robertson, Sydney, 1936, pp.236-37.

tions up to 1914[8]. It is sufficient to note that Napier Hake, the Government's chief chemical adviser, was sent to Britain in 1907 to determine if cordite could be made in Australia; and by 1908 the Government had decided to support his recommendations to build a factory[9]. It also accepted Hake's suggestion to employ the assistant manager of the Government Cordite Factory at Aruvankadu, India, Mr A.E.Leighton, to construct and manage the Australian enterprise. Arthur Edgar Leighton was born in London in 1873, and was to become the most important person in the development of self-containment of munitions production in Australia. Leighton attended Wesleyan College, Westminster and Birkbeck College at the University of London. He later joined the industrial research laboratory of MacNab and Hake where he specialised in explosives and interior ballistics, and published several papers. The originality of these helped apparently helped to gain the job with the Indian Cordite Factory. McNab and Hake noted that he had a first rate theoretical and practical knowledge of chemistry, and that he was a very pleasant person with whom to work[10]. Part of this aspect of his character stemmed from his impish sense of humour which, according to his daughter, was a reaction to his strict methodist upbringing[11]. In later years, as Leighton assumed more eminent and important civil service responsibilities, his sense of humour was not as obvious, as he tended to distance himself from his junior officers and assumed the management style expected for

8. For this see J.K.Jensen, 'Defence Production ...', *op.cit.*, Vol.1,

9. AA Cabinet Supplementary Folder 1905-1913, Defence Department Minute to Cabinet, 7 October 1908.

10. J.K.Jensen, 'Defence Production ...', *op.cit.*, Vol.1, Ch.1, pp.82-3. W.MacNab to E.G.Burls 31 March 1903, H.W.Hake 30 March 1903, papers in the possession of Anne Leighton.

11. Anne Leighton, interview with writer, 24 January 1984.

his position. He could become quite intimidating when the occasion required, and he was regarded with respect and awe by his subordinates[12]. However, there was no trace of this with his family or his personal friends. Indeed, it was normal to find Leighton, during weekends, playing cricket with the local children. He had played County cricket for Shropshire and was an outstanding allround sportsman[13]. In the world of munitions manufacture he expected high standards of work from himself and all his subordinates, and would not be satisfied with anything less. As this thesis will reveal, Leighton also had other talents in organisation and bureaucratic manoeuvring, which were to be extremely important for the future of munitions production in Australia.

The Government had also decided in 1908 to build a small arms factory. Field Marshal Kitchener's report on the defence of Australia in 1910, noted that factories for war materiel were being planned[14]. The need to implement Kitchener's more important recommendations (e.g. universal military training) outlined an enlarged requirement for rifles, military clothing and SAA. Andrew Fisher's Labor Government decided that these extra military supplies would be made in Australia. Thus an increased importance was given to the existing plans for munitions supply.

12. R.E.Summers, interview with writer 19 January 1984, 23 January 1984. CSIRO Archives VM10/13, S3, N.Esserman to Sir George Curry, 10 April 1969.

13. Anne Leighton, interview with the writer 24 January 1984. Miss Leighton recalls that her father was an active sportsman until his early seventies, and was also a gifted motor mechanic.

14. AWM Pearce Papers B6,2, 'Defence of Australia: Memorandum by Field Marshall Viscount Kitchener of Khartoum', 12 February 1910. See also J.K.Jensen, 'Defence Production in Australia...', *op.cit.*, Vol.1.

These decisions were inspired by Senator George F. Pearce[15], who as the Minister of Defence in the Fisher Government, took over the projects on munitions supply initiated by his predecessors, and brought them to completion. He was unwavering in his support and by the middle of 1913, had used his political skills to achieve the establishment of five munitions factories: Small Arms Factory [SAF] at Lithgow, the Cordite Factory at Maribyrnong and a harness and two military clothing factories[16]. Pearce was to be involved in even larger plans for munitions supply during and after the 1914–18 War and was to be the politician most associated with the implementation of the policy of self containment.

The outbreak of war in August 1914 faced the Australian Government with a severe shortage in munitions. To a certain extent this was self-inflicted, as the Cook Government, which had replaced that of Fisher, promised the British Government that it would send an expeditionary force of 20,000 men immediately to what ever destination was required, equipped, maintained, and despatched at cost to the Australian Government. This was in excess of what could be sent without reducing dangerously the stocks of shells, guns, rifles and small arms ammunition required for the defence of Australia itself. The promise had been made by Cook on the mistaken belief that Canada had already promised a force of 30,000 men, and that an Australian contingent of less than

15. For an account of Pearce's life see Peter Heydon's *Quiet Decision: A Study of George Foster Pearce*, Melbourne University Press, 1965. See also G.F. Pearce, *From Carpenter to Cabinet*, Hutchinson, London 1951.

16. AWM Pearce Papers B5,2, 'Memorandum by the Hon.G.F. Pearce on Relinquishing Office as Minister of State for Defence, 23 June 1913'.

20,000 would compare poorly with the sister dominion's efforts in support of Britain[17].

The area of primary difficulty was the despatch of a large proportion of the Army's field guns and gun ammunition with the expeditionary forces[18]. This prompted the Chief of the General Staff (CGS) Colonel J.G.Legge, to insist that efforts should be initiated immediately, to begin manufacture in Australia, of the standard British field gun of the day (the 18 Pdr QF field gun) and its ammunition[19]. No military supplies of any consequence were expected to be available from Britain for many months. This action may have seemed curious, since the only conceivable danger to Australia was Japan, which had become an ally of Britain and France. However, Legge was deeply suspicious of Japan, as were many Australian politicians[20].

17. AA Cabinet Supplementary Folder 1913-1915, Cook Ministry, Meeting of 2 August 1914, see Lieutenant General C.B.B. White Memorandum on origin of AIF dated 1 October 1919. E.Scott, *Australia During the War*, *op.cit.*, pp.11-2.

18. PP C5176, 'Confidential Memorandum upon the Establishment of an Arsenal at Tuggeranong, Federal Territory', 16 May 1917, p.1. Copy in AA CRS A1, item 12204.

19. PP F3570 of 14 March 1917, 'Proposed Federal Arsenal: Memorandum re Establishment of, and Site for, etc.', p.1.

20. Legge's attitude reflected a view held by many Australians which had begun certainly by 1905 or earlier. This fear was not wholly irrational for as soon as Britain was involved in Europe, the Japanese Government in early 1915 presented the so-called 'Twenty-One Demands' to China. The diplomatic offensive was a crude attempt to reduce Chinese independence and to allow the Japanese Government to supervise China. In the end, the Japanese forced an agreement with China transferring German interests in Shantung and giving new privileges to Japan both in South Manchuria and in the eastern part of Inner Mongolia. Japan also seized the German Pacific colonies in the Mariana, Caroline and Marshall Islands. During most of the First World War, Australian politicians and senior administrators were careful not to openly identify Japan as an enemy because this would have disturbed British foreign policy. By early 1916 the Australian Defence Department, noting Japanese ambitions, was concerned at Japanese activity in the islands to the

George Pearce, sympathetic to Legge's arguments, telegraphed, on 30 September 1914, the Secretary of State for the Colonies for full details of the manufacture of the 18 pdr field gun and its ammunition. The Australians also wanted to engage some experienced munitions foremen. However, despite determined attempts, the Australians were unable to get anything out of the British, who were too busy with the burgeoning war[21]. Colonel Legge was unimpressed with British priorities and on 11 November he wrote:

'It is strongly urged that the same crisis referred to ... operates here. In view of the possible results of this war, I think neither time nor money nor energy should be spared in placing us in a position to make artillery ammunition within twelve months'[22].

Pearce agreed with Legge's strategic assessment[23], because he too was suspicious of the Japanese, and also because he saw a unique political opportunity to build a large scale munitions supply organisation in Australia. This meant the capability to produce all of the Army's munition requirements, excluding the Lee-Enfield rifle and its ammunition, which was all that could be manufactured in 1914. Pearce knew that such a scheme would be expensive[24]

north of Australia. The Prime Minister, W.M.Hughes, wrote to Defence Minister Pearce on 21 April 1916 stating that he feared Japan might change sides and join Germany. R.Story, *A History of Modern Japan*, Pelican 1968, pp.151-53; D.Horner, 'Australian Estimates of the Japanese Threat 1905-1941', *op.cit.*, p.140. See N.Meaney, *op.cit.* and L F FitzHardinge *The Little Digger 1914-52...* Angus and Robertson 1979 chapter 7.

21. J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.5, Vol.3, pp.6-9. E.Scott, 'Australia During the War', *op.cit.*, pp.239-40.

22. 'Confidential Memorandum ...', 16 May 1917, *op.cit.*, p.2.

23. J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.5, Vol.3, p.9.

24. The Assistant Manager of SAF, Ratcliffe, estimated in November 1914, the cost of a production unit to produce 18 pdr shells to be nearly £100,000. This was a small part of what was contemplated. See J.K.Jensen, 'Defence Production ...', *op.cit.*, Vol.3, Ch.5, pp.9-10.

but he thought that Parliament would be more inclined to accept its necessity during, rather than after the war. This is the explanation of why he was so persistent throughout the war in attempting to achieve his objective, despite the enormous responsibilities he shouldered in the day to day running of the Australian war-effort[25]. For the remainder of 1914 and the first half of 1915, Pearce sanctioned a stream of cables to Britain, requesting assistance[26] much to the bewilderment of the British authorities, who could not understand why Australia wanted to attempt to take away vital machines and tools from the centre of the war effort, to a place where they would be of little use without specially trained manpower[27]. The British were not able to assist very much during this period.

The Arsenal

It is doubtful that Pearce had any clear idea of the form his munitions supply organisation should take. In all probability, he envisaged initially a simple extension of activities in the three different locations of the current munitions factories. Indeed, this started to happen at SAF Lithgow and the Cordite

25. This interpretation differs somewhat from that offered by the Official Historian, E.Scott, *op.cit.*, p.263. He thought that Pearce's project was launched to take advantage of the munitions crisis in Britain. I have never found any reference to this in official papers or anywhere else. See also NLA MS 1927, S5, item 2364-83 for an account of Pearce's wartime duties.

26. See, for example, J.K.Jensen, 'Defence Production ...', *op.cit.*, Vol.3, Ch.5; Vol.4, Ch.6. His material is based on AA MP598 S30, Boxes 2-5.

27. AA CRS AA1968/391, Folder 45, 'Report on Various Aspects of the Munitions Question' by Major S.H.E.Barraclough, 1 June 1916, PP-C8314. Other points which bewildered the British were that Australia had chosen the time when prices were at their highest for machinery, and that specially trained labour was impossible to gain from Britain or anywhere else.

Factory at Maribyrnong early in 1915[28]. However, when the plans for the SAF extension reached the Department of Home Affairs, the Director General of Works, Colonel Percy Owen (formerly Chief Engineer in the Permanent Military Forces) suggested a new concept — an arsenal[29]. Owen had been obsessed, since 1911, with the idea that SAF should have been built in the Federal Capital Territory [FCT], and now he raised the issue again[30]. He planned to establish cordite and SAA production alongside the small arms [SA] manufacture in a single enterprise. Owen was confident that this was the most efficient way to conduct munitions production. The fact that this arsenal would be in the FCT gave complete control, in all aspects, to the Australian Government, and made it inaccessible from attack from the seaboard. Owen also thought that the FCT gave a good environment for a garden settlement for workmen, and much space for extensions.

Pearce liked Owen's concept and ordered Legge to consult with Owen and Colonel H.W.Dangar (Chief of Ordnance) on the selection of a site for the arsenal in the FCT. He also added field gun and shell manufacture to the scheme on the suggestion of a hitherto obscure public servant, J.K.Jensen[31]. Jensen was to become Leighton's closest collaborator, and Secretary of the Department of Munitions in 1942. In 1915, he was in his thirties, and had risen quickly to the position of head of the newly formed Factories Branch of

28. See J.K.Jensen, 'Defence Production ...', *op.cit.*, Vol.3, Ch.5, pp.47-8. 'Proposed Federal Arsenal ...', 14 March 1917, *op.cit.*, p.2.

29. AA MP598 S30, Box 5, item 8, P.T.Owen to Secretary Department of Home Affairs, 6 March 1915.

30. AA MP598 S30, Box 5, item 8.

31. J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.5, Vol.3, p.11; Ch.6, Vol.4, p.3.

the Defence Department. His ability in administration and attention to detail caused him to be noticed by Pearce, with whom Jensen formed a close bond during the war years. When Jensen attempted to volunteer for the AIF in 1916, Pearce intervened and had Jensen retained in the Defence Department because he considered Jensen was too valuable to lose. The acting Secretary of the Defence Department, Trumble, agreed fully with Pearce on Jensen's qualities. For all this, Jensen did not have a vivacious character, being humourless and introverted; but he had the confidence of his subordinates and was known to be scrupulously fair. He also was one of the best informed persons in the Defence Department because of a personal intelligence system he ran in the Department[32].

On the day Pearce ordered Legge to find a site for an arsenal, 18 March 1915, he also agreed to send Leighton to India and Britain, to study the developments in explosives and propellant technology, which had occurred under the impact of war. Leighton had been examining, for the Navy, the prospects of making big gun cordite and also the requirements in cordite for expanding SAA production for the Army. Both Services were concerned at the cessation of supplies from Britain[33]. It is certain that Pearce's motive was to incorporate Leighton's

32. AA Personalities Index, Notes on Jensen, J.K. AA MP598 S30, Box 2, Jensen to Trumble, 25 January 1916; Minute by Pearce, 1 February 1916. J.L.Knight, interview with writer 27 January 1984. R.E.Summers, interview with writer 19 January 1984, 23 January 1984. In contrast to Leighton, Jensen had no formal technical background. His forte was financial matters.

33. AA MP598 S30, Box 2, item 4; Box 5, item 8. Leighton requested that he should be sent overseas, Leighton to Trumble (acting Secretary of Defence) 27 February 1915, Pearce approved 18 March 1915. See also J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.5, Vol.3, pp.46-48.

acquired knowledge into the design of the arsenal. Leighton seems to have been uninterested in promoting the arsenal's fortunes and rather more absorbed in quitting the Australian backwater for the main stream of new technical developments — wartime Britain and France.

As Leighton sailed to India and Britain, the concept of an arsenal in the FCT continued to grow in the mind of Pearce, who set about devising a strategy to gain Parliamentary approval. Percy Owen's influence grew, as he became in effect, Pearce's technical advisor. The main opposition was expected to come from Lithgow, which stood to lose SAF. Rather than reveal that he favoured the FCT, Pearce chose to let some neutral body reach the same conclusion from the evidence Owen had presented. The all party Federal Parliamentary Standing Committee on Public Works selected itself logically, and duly reached the favoured conclusion in its report of 8 July 1915[34]. Cabinet approved the duplication of SAF shortly afterwards[35]. The existing SAF could not be moved immediately without interrupting the production of rifles for the war effort.

This comfortable progress was halted when the Government revealed its intentions in the House of Representatives and received a mixed response. Lithgow residents had been actively lobbying the Members of Parliament to

34. First report of the Parliamentary Standing Committee of Public Works, PP 1914-1917, Vol IV, pp513, No306 F2674.

35. AA Cabinet Papers 1901-18, Supplementary Folders 1913-15, 3rd Fisher Ministry — Minute by Pearce, 19 July 1915, which also records Cabinet's decision. J.K.Jensen, 'Defence Production . . .', *op.cit.*, Ch.6, Vol.4, p.3.

keep all small arms production at Lithgow[36]. Pearce retrieved the situation in the Senate where he indicated that the SAF works in Lithgow would not be disturbed for the duration of the war and the issue would then be open to another vote of Parliament. The Senate then supported overwhelmingly the Government's plan to erect a duplicate of SAF in the FCT[37]. Throughout all these events, and others which followed in 1916, Owen was supplying Pearce and Jensen with arguments with which to rebut the critics of the FCT arsenal[38].

However, the activities of 1915 were all a little unrealistic because Pearce did not know how to organise the arsenal, nor how to equip it properly, assuming that equipment could still be bought overseas. Despite his expertise, Owen had little more idea of this problem than anyone else in Australia. A possible solution was suggested by Leighton from India, 2 July 1915. He thought that the Indian arsenals could provide a better model for Australia than those of Britain because of similar problems of great distances and similar amounts of finance available for munitions. Leighton recommended the despatch of an investigation committee to India[39]. It was appreciated as well from Leighton's letter, that India could perhaps provide a source of equipment and detailed technical advice. Cabinet approved the creation of such a committee and Owen was appointed

36. AA MP598 S41, *The Age*, 14 August 1915. Queanbeyan had been lobbying for the ACT proposition but Lithgow seems to have been more successful. Another view which might have had some influence was presented by J.Cook, who thought that the Government was concentrating on expanding its own factories without considering the benefits of using private enterprise.CPD, Vol LXXVII, p.4100, 17 July 1915.

37. AA MP598 S41, *The Age*, 19 August 1915, 21 August 1915.

38. See AA CRS A2023, Box 32, file E 168/3/118.

39. AA MP598 S30, Box 5, item 8.

its leader[40].

The arsenal committee did not leave for India until October 1915, by which time the soundness of this approach had been confirmed by the Canadian Government. The Canadians had gained tremendous value from their Dominion arsenal, in training and advising commercial industry in munitions manufacture, but recognised that for Australia, India was a more appropriate example to follow because of similarity of climate[41].

The arsenal committee completed its investigations in India by 5 December and its report of 21 December 1915 presented a comprehensive plan for an arsenal considered adequate for the munitions requirements of Australia[42]. The committee suggested that the site for the arsenal should be Tuggeranong in the FCT; a choice with which the Federal Parliamentary Public Works Committee concurred on 28 February 1916[43]. The arsenal committee's report was well received by the Defence Department, which used it as the basis of

40. *ibid.*

41. AA MP598 S30, Box 5, 'Report on a Visit to India by Arsenal Committee 1915', 21 December 1915, pp.1, 9. AA MP598, S40, FMC minutes of 22 July, 10 August, 27 October, 3 December 1915. AWM Pearce papers B7,54 Cable by H.W.Gepp to Pearce, 8 August 1915. AA CRS A457 file 551/1/1 Prime Minister of Canada to Prime Minister of Australia, 18 November 1915.

42. 'Report ...by the Arsenal Committee 1915', *op.cit.*, pp.1, 6-7, 9. The arsenal was to be capable per year (at eight hours per day) of manufacturing the following range and quantities of munitions: Small arms: to be determined; SAA: 40,000,000; 18 pdr and other QF ammunitions: 60,000; Shells, high explosive and shrapnel: 60,000; Guns, 18 pdr, complete with timbers and carriages: 100; Wagons - ammunition: 600; Military vehicles: 2000; High Explosive: to be determined; Cordite for SAA (tons): 100; Cordite for Guns (tons): 100.

43. 'Site for a Commonwealth Arsenal within Federal Territory', by Parliamentary Standing Committee on Public Works, 1 March 1916, PP-F2211.

a Cabinet submission on 14 March 1916. Apart from presenting the arsenal project in a form and detail which could allow Cabinet approval, the submission also nominated a general manager of the arsenal[44]. This had been at the initiative of Jensen who, in January 1916, wrote that he thought the project needed someone to give overall direction and coordination. Jensen's early action seems to have been to forestall Percy Owen, who had nominated himself to manage the arsenal[45]. Jensen and Pearce preferred Leighton, possibly because he had more appropriate experience.

Leighton was by now in Britain, where his services had been co-opted by the Ministry of Munitions. He held the position of special advisor on explosives production, and was involved heavily with building and running explosives and propellant factories. Leighton accepted the position of manager of the arsenal on 18 September 1916, which was to be held in conjunction with his British office. All plans on the arsenal were to be sent to him in London, where he would have a planning staff, and be represented by a deputy in Australia[46].

44. AA MP598 S30, Box 5, item 8, Memorandum to Cabinet, 14 March 1916.

45. J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.6, Vol.4, pp.20-5, 73-4. Jensen still retained a high regard for Owen and continued, with Pearce, to use him for another two years. Memorandum to Cabinet 14 March 1916, *op.cit.*, note by Pearce on submission implies that Cabinet approval was gained on 29 June 1916. Owen wanted to be considered for the position and also go to Britain to study munitions layouts. Cabinet favoured Leighton, and seems to have referred the matter to Hughes in Britain on 10 June 1916. The matter was resolved by 29 June. AA, CRS A2 file 'Proposed Arsenal' March 1915-November 1916 item No.1916/3973.

46. 'Proposed Federal Arsenal ...', 14 March 1917, *op.cit.*, p.4. Leightons planning staff consisted of two professors of engineering (Barraclough and Gibson), the acting manager of the Small Arms Factory, Lithgow (Ratcliffe), the Defence Department Chemical Advisor (Bell), the assistant manager of the Cordite Factory (Topp) and the Inspecting Ordnance Officer of the Department of Defence (Major Gipps).

This organisation was not functioning properly until early 1917 and until then, Leighton had little idea of what had happened in relation to the arsenal. Pearce and Owen knew little of what was happening in Britain in regard to munitions production. The ground work had been laid for a major mistake.

The arsenal concept which Owen and his arsenal committee brought back from India was obsolete when judged against development in wartime Britain. The traditional view of an arsenal was to bring all co-related manufactures of munitions under one management, and more importantly, to one site, located beyond the range of naval bombardment. This was the Woolwich arsenal model, which kept all munitions production confined to a handful of government arsenals and commercial armament manufacturers. This system was adequate for small colonial wars but nearly collapsed during the South African War 1899–1902. By early 1915, it did finally collapse under the huge demands created by the First World War. The new system developed by the Ministry of Munitions to overcome this problem, recognised that the massive demand for munitions could only be met by utilising the whole of commercial industry. This dictated a different form of organisation from the arsenal concept. The various forms of manufacture, e.g. explosives, small arms, shells, guns, etc., now had to be separated and placed amidst the commercial industries which would assist particular forms of munitions manufacture. This made the transfer of technical knowledge much more efficient and had the additional advantage of placing these new government factories close to large reservoirs of labour, facilitating expansion[47]. Much of Leighton's work in Britain was in fulfilling this pol-

47. See *History of the Ministry of Munitions*, Vol.VIII, HMSO, 1922; and R.J.Q.Adams,

icy in relation to explosives production. However this new approach had not reached India in late 1915. Owen was told, by the Indian Director General of Ordnance, that Australia had a great opportunity for the concentration of its warfare manufactures. The Director General thought that a strategic advantage of concentration was that it left:

‘only one arsenal to defend instead of half a dozen. Where warfare manufactures are scattered each of them has to be protected efficiently, because if the enemy destroyed one arsenal, he might break a link in the chain which would make the rest of small value’[48].

This confirmed a similar view put forward by the new Australian CGS, Colonel G.G.Irving, in August 1915[49]. Thus Owen, who admitted that his only knowledge of arsenals came from his visit to India, became the proponent of an obsolete doctrine[50].

Pearce, the Army and Jensen were all in accord with Owen. No one thought to check the information more widely, particularly in Britain. Nobody in Australia was capable of questioning the Tuggeranong arsenal concept from a strategic or technical point of view. The opposition which emerged was mainly political and in regard to Lithgow, had been answered. The Minister for Home Affairs, King O’Malley, was a more formidable opponent.

In his earlier term of office as a Minister between 1910–13, O’Malley

Arms and the Wizard . . ., Cassell, London, 1978, pp.58–70.

48. AA MP598 S30, Box 5, ‘Report of the Parliamentary Standing Committee on Public Works 1 March 1916’, *op.cit.*– Minutes of Evidence, Colonel Percy Owen.

49. AA MP598 S30, Box 5, CGS to Pearce, 11 August 1915.

50. Minutes of Evidence to Parliamentary Public Works Committee *op.cit.*, Owen’s evidence. During the later years of the war, India adopted the new British system of organisation for munitions production. See footnote 88.

had been instrumental in developing the idea of Canberra as the garden-city, capital of Australia. He still adhered strongly to this vision in early 1916 and so was opposed to the plans for the Tuggeranong arsenal, as they threatened to undermine the detailed plans developed by Walter Burley Griffin (the Director of Design and Construction for the Federal Capital). In early February, O'Malley asked Griffin to prepare a critique of the arsenal scheme. He came up with many objections which outlined the new direction of criticism[51]. Griffin argued that the arsenal created a totally new situation, contrary to the intent of all the previous considerations whether of parliaments, committees or advisers responsible for the Federal Capital project. He added that this development would involve in a few years the immediate juxtaposition of two cities, one being the Federal Capital, Canberra, and the other a manufacturing centre not coordinated in plan nor ideals, and the population of the latter probably greatly exceeding that of the former. He was also worried about the constant danger of an explosion associated with the arsenal, which would have an important effect on the planning and the character of the new capital. Griffin noted that the Federal Capital was already the headquarters of military education. He thought that adding a national arsenal would contribute to other elements of military control of the resources of the Commonwealth to the point:

'...where an ambitious "man on horseback" clothed with brief authority might aspire, under circumstances of which history affords parallels in every democracy to make it permanent by a "coup d'état" with every advantage against the constituted representative government'[52].

51. AA CRS A1, item 12204, Griffin to O'Malley, 5 February 1916.

52. *ibid.*

When the Acting Prime Minister, Pearce, chose to use the neutral Parliamentary Standing Committee on Public Works once more, to approve the Tuggeranong site, O'Malley sought to influence the Committee's decision in the following way:

'...I need hardly remind the Committee that they will investigate a problem, not only for the living present, but for future unborn generations, and that they will best guard the hopes of democracy by submitting such a proposition as will relieve the City [of Canberra] of fear at once of the incendiary and of the military despot, who might seize the arsenal and train his guns on the Parliament House ...'[53].

The Standing Committee on Public Works decided in favour of the arsenal at Tuggeranong[54]. O'Malley immediately informed Pearce that he opposed this decision and raised Griffin's argument on the incompatibility of an industrial city with the garden concept of Canberra[55]. Griffin had also raised originally some important economic and strategic arguments which foreshadowed the arguments raised by Leighton in late 1917. These were that an arsenal in the FCT was without the necessary natural advantages, being mineral and industrially devoid of resources and convenience; and that there was no strategic advantage because the development of aircraft, in the near future,

53. AA CRS A1, item 12204, O'Malley to Chairman of Public Works Committee, 9 February 1916. Pearce had ordered O'Malley, as the Minister responsible for Public Works, to refer, on the behalf of Cabinet, the question of the Tuggeranong site to the Public Works Committee. AA CRS A271, file 18/101. O'Malley's letter was not impartial.

54. Parliamentary Standing Committee on Public Works Report on arsenal site, *op.cit.*, PP-F2211, 1 March 1916. Cabinet knew the result in late February.

55. AA CRS A2, file 17/3787. O'Malley to Pearce, 29 February 1916. Griffin's arguments were attached.

would expose the arsenal to air attack[56]. O'Malley now brought these issues to the notice of Pearce and added some shrewd observations of his own. He claimed that the arsenal would never be finished before the conclusion of the war, and so there was no need to treat the project as a high priority. Furthermore, it was probable that the arsenals for the immediate future would differ considerably from those on which the Australian arsenal was based. He noted that there was virtually no one with any experience on arsenals in Australia. He advised that the Government should reconsider its whole arsenal project using British experience as a guide[57]. These thoughts of both Griffin and O'Malley revealed accurately the basic weaknesses of Pearce's arsenal project. However, they were ignored[58] largely because Griffin and O'Malley had no credibility as strategists compared to the Army, and that Pearce had to have completed most of his arsenal during the war because he believed it would lack political support when peace returned.

Probably the most painful aspect to O'Malley of the rejection of his views was that the most influential adviser to Pearce was O'Malley's own Director General of Works, Percy Owen. Owen and O'Malley had been in conflict since 1911 when O'Malley became convinced that Owen and the Secretary of Home Affairs, Colonel David Miller, were circumventing his ministerial directions. After O'Malley had left office in 1913, Miller, Owen and the Chief Architect, Murdoch, had opposed his personal friend, Griffin, by trying to insert their own

56. AA CRS A1, item 12204, Griffin to O'Malley, 5 February 1916.

57. AA CRS A2, file 17/3787, O'Malley to Pearce, 29 February 1916.

58. AA MP598 S30, Box 5, Pearce to O'Malley, 13 March 1916.

plan for Canberra[59]. O'Malley returned to the Ministry of Home Affairs in 1915 and sided with Griffin, resuming conflict with the senior officers in his Department[60]. When Owen was sent to India with the arsenal committee in October 1915, O'Malley tried to send him on a prolonged trip to Europe and America, in a rather obvious attempt to get Owen out of the Home Affairs Department[61]. Owen returned to Australia in December 1915 and became progressively more involved in duties associated with the arsenal. This was a tolerable arrangement for O'Malley because both men avoided professional contact[62].

It broke down steadily however, because O'Malley was slow and unenthusiastic in co-operating with the Defence Department over the arsenal, throughout 1916. Both Pearce and Owen were determined to push on with the work with all speed, and had received the approval of Cabinet on 29 June 1916[63]. Owen began to circumvent the obstruction of his Minister, by getting approvals for planning from Pearce. By September, the initial construction of the arsenal at Tuggeranong was imminent and Owen had to resume a prominent role in Home Affairs. In accordance with approved Cabinet policy, Pearce now requested the

59. A.R.Hoyle, *King O'Malley: The American Bounder*, Macmillan, 1981, pp.119, 149. NLA, MS460, S1.

60. A.R.Hoyle, *op.cit.*, p.155. J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.6, Vol.4, pp.24-5. O'Malley had taken to referring to Miller and Owen as 'gilt spurred roosters', a derogatory reference to their Army background.

61. AA CRS A197, S25/304, O'Malley to Pearce, 15 November 1915.

62. AA MP598 S30, Box 5, item 8. Minutes of arsenal committee, 24 April 1916, show that Owen's office was now in Canberra, outside his Department.

63. J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.6, Vol.4, p.25. AA CRS A2, file 16/3973.

commitment of Owen to the fulltime supervision of construction. O'Malley refused on the basis that Owen had been accused of incompetence and wasting public funds, along with other senior officers of the Department of Home Affairs. Owen would not be released until he was cleared by the Blackett Royal Commission. O'Malley professed to be frightened of entrusting Owen with the great expenditure at Tuggeranong because of the risk of even greater maladministration than Owen was already accused of, and for which he, O'Malley, could then be held responsible[64]. O'Malley probably had a point, but since he was one of the influential forces behind the Royal Commission, and opposed the arsenal, and disliked Owen, his action could also be seen as an attempt to get rid of Owen and the arsenal at once. Pearce seems to have thought this. He pointed out that Owen had not even been suspended from duty, despite the Royal Commission. He ordered O'Malley to implement the Cabinet decision of 29 June 1916 in regard to Owen. He obviously did not believe O'Malley would respond for he also wrote to the Prime Minister requesting a new Cabinet decision[65]. No action was taken because the Prime Minister's attention was fixed on the Conscription Referendum scheduled for late October. O'Malley, being a pacifist[66], opposed Hughes and Pearce who were the chief proponents in the Government of an affirmative vote for conscription. After the referendum was lost, the Labor Government of Hughes split, with Pearce and Hughes and

64. AA MP598 S30, item 8. O'Malley to Pearce, 29 September 1916.

65. See J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.6, Vol.4, pp.26-7. See attachment (dated 25 September 1916) to minute from Trumble to Attlee Hunt of January 1917, AA CRS A1, item 12204. AA CRS A2, item 17/3787, Pearce to O'Malley, 9 October 1916. AA MP598 S30, Box 5, Pearce to Hughes, 9 October 1916.

66. A.R.Hoyle, *King O'Malley ...*, *op.cit.*, pp.145-46, 162.

their followers, eventually forming a coalition Government with the conservative parties, and O'Malley remained with the rump Labour Party in opposition[67].

The events of November 1916, and the eventual formation of a coalition government in early 1917, all helped to delay progress with the arsenal project. The former Labor Government had approved the arsenal scheme and the selection of the Tuggeranong site, but now a new government held office and was not necessarily bound by previous decisions. Pearce had survived as Defence Minister, and although his new coalition colleagues had not expressed any serious objections to his scheme while in opposition during 1915-16, Pearce now had to convince them the project should continue to proceed. The year of 1917 *redundant* was to show that although no-one opposed the principle of the setting up of an arsenal, there would be further arguments on the location, and an attempt by the Treasurer to downgrade the arsenal's financial priority.

In February 1917 the Defence Department began to transfer £50,000 to the Department of Works and Railways[68] to expedite the building of a railway

67. *ibid.*, pp.162-66. The postscript on O'Malley and Owen was that the March 1917 report of the Royal Commissioner on the administration of the Department of Home Affairs confirmed that much in-fighting had been taking place with detrimental effects on the Department's efficiency. The Royal Commissioner roundly criticised the bureaucratic behaviour of Percy Owen and the Chief Architect Murdoch, as helping to contribute to this situation. O'Malley was exonerated. Interestingly, Hughes' Government refused to take any action against any of the senior officers, and the Deputy P.M. declared he was entirely satisfied with the efficiency and loyalty of the officers of his Department, who included most of those accused by the Royal Commissioner, including Owen. AA CRS A197, S25/304, Watt, 3 April 1918.

68. Formerly contained within the Department of Home Affairs and Works, but this department was split in early 1917 into the new departments of Home Affairs, and Works and Railways.

connection to Tuggeranong, the erection of a power line, and the clearing of the construction site of the arsenal. The new Treasurer, Sir John Forrest, objected to this action on the grounds that Parliament had not approved the transfer, and probably had not even approved the proposed site[69]. There were, in fact, plenty of instances in which Parliament had approved matters relating to the arsenal. The purpose of Forrest's unnecessary legalism became clear on 22 March 1917, when he wrote to the Prime Minister and stated that he was opposed in principle to the site of the arsenal being in the Federal Capital. He raised arguments which were similar to Burley Griffin's about the undesirable effects of a great industrial centre in the near proximity of Canberra. Forrest suggested that the arsenal should be removed to Dalgety in New South Wales[70].

Forrest may have held these views sincerely, but he also probably saw opposition to the arsenal at FCT as a promising issue around which to collect supporters for his interterminal desire to be Prime Minister[71]. What must have satisfied Forrest was that in attacking the placement of the arsenal in the FCT, he was discrediting Pearce, who was personally associated with the scheme. Forrest was a conservative in his political and social attitudes and recognised his fellow Western Australian, Pearce, as the leader of the political forces which he

69. AA MP598 S30, Box 5, Treasury to Defence Department, 12 March 1917, quoting Treasurers refusal.

70. AA CRS A1 item 12204, Forrest to the Prime Minister, 22 March 1917.

71. E.Scott, *Australia During the War ...*, *op.cit.*, pp.172-73, 434. The Governor General wrote on 21 February 1917, 'He [Forrest] has given a deal of trouble lately, for he is old, and would dearly love to be Prime Minister. Consequently he has been very difficult to satisfy ...'. See also L F FitzHardinge, Vol 1, *op.cit.* p267.

opposed in his own state. He never appreciated Pearce's capacity and potential, never liked him nor accepted his rise to power. Now they were members of the same government. Pearce for his part regarded Forrest's ideas as outdated and his political cunning as overrated. He had enjoyed scoring points off Forrest in Western Australia and was occasionally criticised for overdoing it[72].

Pearce moved quickly to outmanoeuvre his old rival and tabled in Parliament on 14 March 1917, a full statement of the position of the arsenal[73]. This detailed the number of times the arsenal had been the subject of ministerial statements and Parliamentary votes. Two months later Pearce produced a much expanded document, which sought to produce an unanswerable argument in favour of the arsenal. It was sent to every member of Cabinet, with a covering letter which said the project was of vital importance and would be submitted to Cabinet as soon as possible[74].

Oddly enough, however, Pearce did not bring the issue before Cabinet. Forrest, however, had been stifled for the moment and planning for the arsenal continued steadily. In August, Pearce returned in Parliament to his theme that Australian defence demanded the creation of the arsenal. At the same time, to counter the opposition to Tuggeranong as the site, he commissioned the

72. P.Heydon, *Quiet Decision . . .*, *op.cit.*, p.176. J.Merritt, 'George Foster Pearce . . .', in *University Studies in History*, edited by J.I.W.Brash, University of WA Press, 1965, pp.32-3.

73. 'Proposed Federal Arsenal . . .', 14 March 1917, PP F3570.

74. J.K.Jensen, 'Defence Production . . .', *op.cit.*, Ch.6, Vol.4, p.38. 'Confidential Memorandum . . .', 16 May 1917, PP C5176. AA.CRS A1 item 12204, Pearce to Minister of Works and Railways, 16 May 1917.

preparation of yet another statement to deal with this very issue[75]. Forrest, however, was far from finished. In October he attempted to reduce the financial allotment to the arsenal[76]. In his view, clearly the proposal did not rank very highly on the scale of possible war expenditures. Pearce refused to accept the financial reductions. He released his new statement on the arsenal to all Ministers[77]. His covering letter emphasised Tuggeranong as the best site in Australia, and dismissed the current notion that the workers could be a threat to Parliament[78].

In order to resolve this impasse, Cabinet appointed, in mid October, a subcommittee of Ministers — Cook, Pearce and Watt — to consider the question of a site for the arsenal. This in turn appointed an investigating committee to report on the claims of Tuggeranong, Lithgow, Albury, Lyndhurst and Bathurst[79]. The selection of some of these sites for investigation had not been necessarily in the spirit of objective comparison, but because of representations,

75. J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.6, Vol.4, p.38.

76. AA MP598 S30, Box 5, Forrest to Pearce 3 October 1917.

77. *ibid.*, Pearce to Forrest, 8 October 1917. 'Memorandum Upon the Suitability of Tuggeranong, Federal Territory as a Site for an Arsenal', 5 October 1917, CRS A1, item 12204.

78. AA CRS A1, item 12204, Pearce to all Ministers, 8 October 1917. Pearce submitted a minute to Cabinet on 16 October 1917 which pointed out that a unanimous resolution of the Imperial War Conference of 1917 supported the development of capacity for the production of munitions in all important parts of the Empire. MP598 S30, Box 5.

79. The committee consisted of seven people plus a secretary who was none other than J.K.Jensen. Pearce appears to have been able to stack the membership with his own men, i.e. Major General Legge was Chairman, while Colonel Owen, J.J.King-Salter and N.K.S.Brodribb were Defence Department employees and/or known adherents to the Tuggeranong scheme. See 'Memorandum upon the Establishment of an Arsenal ...', 17 May 1918, *op.cit.*, p.13. J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.6, Vol.4, p.40.

through Parliament, by municipal bodies and politicians, for their localities to be chosen. Lithgow was particularly prominent in this movement, because it expected the removal of SAF to wherever the arsenal was to be situated[80]. The choice of a site was eventually determined on a technical basis. Only Albury and Tuggeranong could supply the quantity of fresh water required for the Cordite component of the arsenal. Albury was dismissed because it was dry and dusty in summer, which posed a serious danger in explosives manufacture. The investigating committee chose, unanimously, Tuggeranong on 17 November 1917[81]. The Government was back to the position reached by Hughes' Labor Government in June 1916.

The Economic Dimension of Military Strategy

Towards the end of 1917, Pearce had been able to answer all the critics of the arsenal at Tuggeranong. The weaknesses of the project had, in some measure, been raised by people such as O'Malley and Griffin but they were not strategists and thus lacked credibility on one central issue. The Army insisted, on strategic grounds, that the arsenal had to be well away from the coast. Therefore it was not necessary to consider any plan which placed the components of the arsenal, collectively or separately, in major population centres, because in Australia

80. See 'Memorandum upon the Suitability of Tuggeranong . . .', 5 October 1917, *op.cit.*, p.4. See Pamphlet by Lithgow Town Committee, AA CRS A1, item 12204. See also 'Memorandum upon the Establishment of an Arsenal at Tuggeranong . . .', 17 May 1918, p.23, AA CRS A1, item 12204.

81. AA CRS A271, file 18/76. Other sites were considered in early 1918; they were Mudgee, Cadia, Tumut, Cootamundra and Gundagai. The investigating Committee still came to the same conclusion.

all centres were on the coast. On that basis, the FCT Tuggeranong site was probably the most desirable for several reasons, which will be explored shortly.

It was Percy Owen who most ably summed up the Army's position in May 1916[82]. It was possible, Owen argued, that the British navy could lose in the current war or in the future, command of the sea. This condition would then make possible a landing in Australia by an enemy. If Australian troops were available they would be brought speedily to oppose such an enemy, but they had to be supplied with munitions. All major items of munitions supply had therefore to be manufactured within Australia. However, the enemy could be expected to concentrate his efforts in paralysing the supply of munitions to the Australian forces opposing him. Munitions supply should, Owen argued, be established inland to make it difficult for an enemy having access to Australian shores, to interfere with the working of Australian factories. It was thought that interference with even one of the essential manufactures might atrophy the military fighting organisation, so that every manufacture of munitions essential for the field army should be inland.

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'Strategic reasons set absolutely to one side the proposal to manufacture munitions near seaboard cities'.

Owen concluded that the protection for one complete arsenal strategically situated inland at the FCT could be more readily accomplished than the independent protection of several factories distributed here and there near the coast.

82. AA MP598 S30, Box 5, 'Notes Prepared for the Minister of Defence, in May 1916, When the Founding of Small Arms Factory and Arsenal, within Federal Territory, was under Consideration', pp.1-3. This paper was based on what Owen learnt in India, and arguments raised originally in August 1915 by the CGS, Colonel G.Irving.

Owen's position was endorsed by the Army in 1917. It remained adamant that the arsenal had to be well away from the coast[83]. The Defence Department was quick to think of other reasons for concentrating on the FCT. The establishment of an arsenal at Tuggeranong was expected to give the FCT a useful industry which would help to defray the cost of supplying civil infrastructure and of supporting the population of administrative officials for Australia's future capital city. Considerable expense had already been incurred by Government in establishing a suitable water supply and a source of cheap electricity for the FCT. The FCT was seen as a veritable sink hole for finance unless it could be made self-supporting as soon as possible. The placement of the arsenal in the FCT also had the advantage of giving the Australian Government sole control of all matters associated with its operation. No clash of federal and state powers or question of states' rights could ever arise. This reasoning had carried much weight in the choice of the FCT as the site for the Royal Military College of Duntroon and the Royal Naval College. The Department of Defence was currently having problems of this nature with the City of Footscray over adequate electricity supply to the Cordite Factory, and with the Municipality of Lithgow in making a road to SAF[84].

Late in 1917, a cable had been sent to Leighton asking whether he and the British Ministry of Munitions could give an opinion on the arsenal. Despite being General Manager of the arsenal, Leighton had not taken a direct interest in the scheme until after June 1917. He had then discussed the scheme with

83. 'Confidential Memorandum ...', 16 May 1917, *op.cit.*, p.7, views of Major General Legge and Brigadier Foster, acting CGS.

84. *ibid.*, pp.9-10.

nearly all the principal officials in the Ministry[85]. Leighton's personal view was received in Australia early in November 1917, at the same time that Pearce was getting on top of the arsenal critics. Leighton attacked the whole concept of the Tuggeranong arsenal and challenged the validity of the Army's strategic reasoning. Leighton could not be dismissed as easily as O'Malley and Forrest because he was an acknowledged expert on building munitions factories[86].

Leighton's primary objection was based on an economic analysis of Australian industry. The arsenal relied on secondary industry to produce its raw materials. In Australia these industries were spread amongst the major population centres along the eastern and southern seaboard. The loss of any or all of these industries removed the ability to make munitions at the arsenal, although

85. Joint Committee of Public Accounts, Minutes of Evidence on the subject of 'Expenditure on Munitions Supply', 1924, PP-F14497, evidence by Leighton. J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.6, Vol.4, p.42. Leighton had, of course, been very involved in the huge British munitions expansion, which reached its peak in 1917. However, he had found in 1915, time to reopen the channel for technical information between Britain and Australia. The Ministry of Munitions gave Leighton access to all technical information, probably because he was only on loan and could be withdrawn by the Australian Government if the British had remained uncooperative. Hitherto, Leighton had been convinced the information sent to Australia was only what the British had time to process and what they wanted Australia to know. He also launched in 1915, a scheme by which chemists, and later engineers, had been sent to work in Britain to alleviate the chronic shortage of technical staff in munitions production. All men were placed on Leighton's advice and he made sure they would gain experience which would be useful ultimately to the industrial development of Australia. Jensen claimed, after the Second World War, that the majority of these men were to be found holding executive positions in the chemical and metallurgical industries of Australia by 1939. See AA MP598 S30, Box 5, item 8, Leighton to Trumble, 2 July 1915; J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.4, Vol.2, pp.428-49; and, E.Scott, *Australia During the War ...*, *op.cit.*, pp.265-74.

86. AA MP598 S30, Box 5, Leighton's cable of 6 November 1917 and attachment; Leighton's letter of 26 November 1917 and attachment.

this might be deferred for a short time by stockpiling raw materials inland. In fact, the main source of munitions strength lay in the industrial undertakings of the seaboard towns. A successful defence of Australia had to presume the security of these places. The Army's strategic argument for the placement of the arsenal inland was therefore invalid, for any defence of Australia which ignored the seaboard industrial areas would quickly fail for lack of munitions for the field army. Whether the Army liked it or not, it had to split its forces and defend the eastern and southern seabords. The attempt to base the defence of Australia on an inland arsenal would fail for lack of raw materials[87].

Of the remaining arguments of the Defence Department for the placement of the arsenal at Tuggeranong, only that of giving the FCT an industry remained relevant. Leighton argued that war experience had shown that government munitions factories could only be expected to supply a fraction of the munitions required for an intensive war. Commercial industry had to be relied upon for the bulk of all supplies. The major objectives of government factories were to meet peacetime demands for munitions, but most importantly to teach commercial industry how to make munitions, when the appropriate time came. This was not an easy process, but worked best, according to war experience, when commercial industry and government factories were situated closely together[88]. Since Australian commercial industry was situated on the east-

87. *ibid.*

88. This principle had been followed during the war in the siting of munitions factories in India as well as Britain. The former had been used as an example for the Tuggeranong arsenal, i.e. the centralisation of functions at a distant inland location, yet now it followed different principles from those the arsenal committee had believed in 1915. AA MP598 S30 , Box 5, item 8, Leighton's letter of 26 November 1917. See also 'Report

ern and southern seaboard, that was where Australian government munitions factories should be. The arsenal at Tuggeranong in this perspective would be placed where contact with commercial industry would be minimal, and reserves of labour difficult to obtain when rapid expansion of production at government factories was required in war[89].

Pearce and Jensen were disappointed in Leighton's views which were highly embarrassing, threatening Pearce's whole project[90]. In an attempt to re-establish the strategic arguments they gave Leighton's cable of 6 November to the CGS, Legge, who also favoured Tuggeranong. In his minute of 12 November 1917, Legge ignored Leighton's arguments but sought to bolster the Army's strategic view by pointing out the difficulty of defending coastal locations because of Australia's small navy, and the consequent necessity of preserving some form of prolonged armed resistance by placing the arsenal inland away from danger. This might have preserved the arsenal from naval attack, but did it preserve it from air attack? Legge thought so, and pointed to the small damage caused by air attack on British munitions factories in London[91].

This was a poor attempt to rebut Leighton, but it satisfied the Defence Department which sent Legge's comments to London. Leighton appears to have

... by Arsenal Committee 1915', *op.cit.*, and *History of the Ministry of Munitions*, Vol.VIII 1922, *op.cit.*, Refer to footnote 50.

89. AA MP598 S30, Box 5, Leighton's cable 6 November 1917, Leighton's letter 26 November 1917 and attached memorandum, *op.cit.*

90. AA MP598 S30, Box 5, Jensen to Leighton, 22 November 1917, Jensen said that although he had drawn up the Parliamentary Paper of 16 May 1917 on the arsenal, it represented Pearce's ideas, and that Pearce was disappointed in Leighton's attitude and still favoured Tuggeranong strongly. So did Jensen.

91. AA MP598 S30, Legge's comments 12 November 1917.

ignored them, particularly those on air attack. He knew that the development of aircraft was unlikely to be frozen at the low level of performance at which it presently existed and noted that the Tuggeranong arsenal was only 100 miles from the coast, within easy range of seaplanes[92]. Furthermore, the British Ministry of Munitions in London supported Leighton's analysis and criticism of the arsenal project[93]. On 8 January 1918, a special meeting of senior Ministry officials was held with Leighton, to give an opinion on the arsenal[94]. The meeting agreed that the whole fabric of Australia's life would collapse if the principal coastal towns were taken by an enemy. The country could not fight on stocks accumulated at some inland arsenal. The meeting decided that the selection of a locality for a government arsenal, from a technical point of view, should, in the first place, be situated to fulfil properly the following functions; firstly, to serve as a school or nucleus of trained men who, in the event of war, should go out to appropriate commercial factories to act as leaven to bring the latter into action as munitions factories; secondly, to meet, in part, the peace demands for munitions. Subject to this, the locality should be convenient to the headquarters of the military advisors of the Government[95].

92. *ibid.*, Leighton's cable 6 November 1917, Leighton letter of 26 November with attached memorandum. See also Minutes of Meeting with Ministry of Munitions, 8 January 1918.

93. *ibid.*, Sir Charles Ellis to Major Gibson, 28 November 1917.

94. These were: Mr G.M.Booth, Deputy Director General of Munitions Supply; Major General the Hon. F.R.Bingham, Director General of Munitions Design; Sir Keith Price, Director General of Explosives Supply; Sir John Hunter, Director General of Iron and Steel; Mr O.C.Allen representing Sir Charles Ellis; and Messrs. Leighton, Bell and Barraclough attending for Australia.

95. AA MP598 S30, Box 5, Leighton's letter of 21 February 1918 and attached Minutes of meeting with Ministry of Munitions of 8 January 1918.

The minutes of this meeting arrived in Australia on 19 April 1918, with a covering note from Leighton which stated that the views put forward by the Ministry of Munitions were the anti-thesis of Percy Owen's paper of May 1916[96]. Jensen decided that they supported the Defence Department's position, and drafted a memorandum for Pearce, urging that the Government should now take a decision in favour of the Tuggeranong project. Pearce used this as his minute to Cabinet, and recorded on 30 April that Cabinet had approved the arsenal[97]. He also ordered the preparation by Jensen of a revised printed statement on the arsenal for circulation to members of Parliament.

Jensen had written the three previous printed statements which Pearce had used in his propaganda against Forrest's obstruction. He was now the most influential person in the Defence Department on munitions policy, enjoying not only Pearce's confidence, but that also of Trumble (the Acting Secretary of Defence). This was an exhilarating experience for a person of only 32 years and no technical background. Jensen was now to compound his misrepresentation of Leighton and the Ministry of Munitions. In the new printed statement which Pearce signed on 17 May 1918, Jensen claimed that the Ministry of Munitions, Leighton, and his deputy in Australia, Major A.J.Gibson, all supported the site at Tuggeranong[98]. This could only be claimed if one ignored all the economic and technical arguments raised about the disposition of Australian industry,

96. *ibid.*, Leighton to Trumble 21 February 1918. Owen's Paper was 'Notes Prepared for the Minister of Defence, in May 1916 ...', *op.cit.*

97. J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.6, Vol.4, pp.54-6, AA MP598 S30, Box 5, Pearce Memo to Cabinet 26 April 1918.

98. 'Memorandum on the Establishment of an Arsenal at Tuggeranong ...', 17 May 1918, PP C7034, p.13, AA CRS A1, item 12204.

and then also quoted out of context. Jensen's reason for doing this appears to have been that he did not understand Leighton's arguments properly[99]. He was joined in this by Trumble who had seen all of Leighton's correspondence, and probably also Pearce. This problem was complicated by Jensen's belief that there was little difference between his and Leighton's views.

Jensen and his allies, Owen and Legge, appear to have seen the arsenal essentially as a physical entity — a large collection of buildings and specialised equipment gathered together in one place. The erection of this edifice was their primary objective, and the detailed training of technical staff and the collection of scientific information was a secondary matter[100]. They did not believe that any serious munitions endeavour could begin anywhere in Australia until the arsenal had been built[101]. Nor did they perceive, until December 1916, that an arsenal had a central role in training commercial industry to make munitions. Jensen learnt this from A.J.Gibson who had explored this matter in the Defence Department, and through Queensland University, where he was Professor of Engineering[102]. Although Jensen and the Defence Department

99. This is shown clearly in Jensen's Ch.6, Vol.4, pp.54–6 of 'Defence Production ...', *op.cit.*, where some 40 years after the events, and with the advantage of all the documents and hindsight, he still gets the issues confused.

100. Marcus Bell who became the Superintendent of the Defence Laboratories in 1916, wrote to Leighton in June 1918 and claimed that in early 1917, both Jensen and Owen were attracted to the arsenal because it was 'a big symmetrical objective' and that they were ambitious to father such a scheme and direct the policy. AA MP598 S30, Box 5, Notes by Bell June 1918.

101. See J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.4, Vol.2, pp.387–88. Leighton said later in 1919 that this was an invalid line of reasoning which drew too sharp a distinction between munitions and normal industry (Leighton Report 27 May 1919, AA MP598 S30, Box 9).

102. AA MP598, S37, item 23, Gibson's paper to the Queensland University War Com-

inserted this idea in all four of the printed statements on the arsenal, they did not realise as did Leighton and Gibson (who had joined Leighton in London) that it was technically impossible to impart such training efficiently from an arsenal at Tuggeranong. It was 200 miles from Sydney, the nearest industrial centre and significant source of labour[103].

In contrast to Jensen, Leighton saw the idea of an arsenal in more abstract terms. It was a combination of specially trained people and scientific knowledge. Munitions production in Australia did not have to wait until an arsenal was physically constructed. In Leighton's belief an arsenal existed if there was appropriate technical knowledge, for this could be applied to utilise commercial industry[104]. Consequently, Leighton thought the primary objective for setting up an arsenal was the accumulation of technical data, specifications, drawings, and production plans from Britain, and the proper training for technical staff. It was with this objective in mind that late in 1917, he created the Technical Enquiry Staff. This consisted of hand picked young engineers, chemists and other technologists sent to Britain for training and experience in particular

mittee, June 1915. Gibson's 'Memorandum on the Organisation of Factories for the Rapid Production of Munitions and Equipment on the Outbreak of War' October 1916, and Jensen's covering minute of 12 December 1916. Jensen claimed at the time that he was thinking of something similar, but plainly believed that the arsenal should be completed first - and he would worry about commercial industry later. He did not appreciate that the structure of the arsenal would be influenced by the established needs of commercial industry in Australia, and so Gibson was justified in trying to tackle this problem in advance of the construction of the arsenal. Trumble supported Jensen, but Pearce was impressed with Gibson's ideas and ordered them to be placed before the Council of Defence as soon as it was recreated.

103. J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.6, Vol.4, pp.47-8, 54-6. See AA MP598 S30, Box 5, Legge's comments 12 November 1917.

104. *ibid.*, Leighton's letter of 21 February 1918.

military technologies such as gun or small arms production. On the completion of their training, these people were to return to Australia, where their specialised knowledge would provide the basis for particular munitions projects[105]. Such projects could be conducted with the aid of commercial industry, or if it was more convenient, by government factories. The construction of a large arsenal was only one of a number of routes to success made possible by the acquisition of knowledge and trained staff.

When Leighton came to the problem of training commercial industry, in munitions production, he saw value in rudimentary attempts being made to make basic munitions, either in appropriate commercial enterprises or government instrumentalities. This would help his trained staff to determine the extent to which Australian industrial technique and practice differed from British methods, and would enable them to modify British manufacturing designs for particular munitions so that they were easier to make by commercial industry in Australia. This was the reason why government factories had to be close to commercial industrial centres, because the process of technology-transfer was based on very close interaction between trained arsenal staff and business executives. In this respect Leighton did not approve of the Defence Department's fixation on physically completing the Tuggeranong arsenal, before beginning any attempt at munitions production. Valuable lessons could be learned immediately, he thought, without any reference to Tuggeranong[106].

105. J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.6, Vol.4, pp.48-54, 97-107. AA MP598 S30, Box 5, Leighton's letter of 29 November 1917.

106. *ibid.*, Leighton's letter 29 November 1917, Leighton's letter 21 February 1918, Leighton's letter 26 November 1918.

The Leighton image of an arsenal also included the concept of central research laboratories. This organisation was to study the physical and chemical properties of materials used in munitions manufacture, with particular reference to Australian materials. Leighton believed that progress of any significant degree in any scheme of self containment of munitions supply was impossible without true knowledge of materials. With such knowledge it was possible to substitute common and cheaper Australian materials for less common materials listed in British munitions specifications, without altering a munitions performance. It also allowed new methods of production to be devised to suit Australian industry[107]. These and other related functions[108] were assigned to the central research laboratories, which were actually the nerve centre of Leighton's arsenal. Leighton had no hesitation in describing them as the most important part of any arsenal. He and Marcus Bell, Superintendent of Defence Laboratories, had devised the concept between them after much observation of British organisations[109]. It would result in the first industrial research laboratory organisation built in Australia. By contrast the Jensen/Owen concept only envisaged small laboratories devoted entirely to the quality control and

107. Joint Committee of Public Accounts, Minutes of Evidence ... 1924, *op.cit.*, p.2. AA MP598 S30, Box 5, Leighton's letter 21 February 1918, Leighton's letter 30 August 1918.

108. Such as the Metrology section for setting standard measurements for munitions; and the collection of scientific information on Australian and overseas industry and new munitions designs — see J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.5, Vol.3, pp.221-23 for the approved list of functions of Leighton's central research laboratories.

109. AA MP598 S30, Box 9, Leighton's Report 27 May 1919, pp.5, 11. J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.6, Vol.4, p.53. Joint Committee of Public Accounts Minutes of Evidence ... 1924, *op.cit.*, p.58.

testing of Tuggeranong arsenal products[110]. Leighton's laboratories would not do this, but would engage in fundamental physical and chemical research, and industrial problem solving. The routine matter of testing products would be left to the munitions factories own small laboratories[111]. The significance of those views of Leighton on self containment are made clearer in Annex A.

Leighton was aware of the confusion being caused unwittingly by the zealous Jensen in Australia, and appears to have sought, in late 1917, to get Jensen sent to London where he could exercise his administrative talent and not be drawn so much into policy making. Leighton appointed Jensen secretary of the arsenal, but did not succeed in extricating him until the middle of 1918, by which time, Pearce had persuaded the Cabinet to back the Tuggeranong scheme. Leighton had foreseen this, and sent A.J.Gibson back to Australia, as his deputy, to present his arguments against the Tuggeranong proposal[112].

Gibson succeeded in this mission, although he had to wait until Jensen's departure before he could make any impression on the Defence Department[113].

110. See 'Report ... by Arsenal Committee 1915', *op.cit.*, p.16. See Marcus Bell's comments June 1918, *op.cit.* Bell had originally subscribed to the 'small laboratory view', but his experiences in Britain had changed his mind.

111. Joint Committee of Public Accounts Minutes of Evidence ... 1924, *op.cit.*, pp.58-9.

112. AA MP598 S30, Box 5, Leighton's letter 29 November 1917.

113. Jensen held all his responsibilities tightly in hand, showing at this time, little inclination for delegation and a considerable desire to grasp new areas of control. A.J.Gibson wrote to Leighton shortly after Jensen had left for Britain in June, suggesting that Jensen needed to be disciplined because he consistently overstepped his new position as secretary of the arsenal and tried to be the accountant as well. Jensen also wanted to be the clerk of Tuggeranong City when it was built for workers at the arsenal. (AA MP598 S30, Box 5, Gibson to Leighton 13 July 1918). Jensen knew that Gibson regarded him as overly ambitious and zealous, and many years later tried to have destroyed certain of

On 12 November 1918 as the acting general manager of the arsenal, Gibson wrote for Pearce a memorandum on the future of the arsenal with the ending of the war in Europe[114]. Gibson raised all the issues again and pointed out that while the existing site of most of the Government factories (Maribyrnong) satisfied Leighton's objections, it would also lead to great financial savings if the new government factories scheduled for Tuggeranong were instead built at Maribyrnong. The Government would not have the need to build a completely new city, and such factories would have a better and more economical access to supplies of labour and materials. Gibson also thought that the new factories would begin operations more quickly if they were associated with a going concern such as Maribyrnong. SAF was to remain at Lithgow.

Pearce immediately organised a meeting with most of the antagonists[115]. It took place on 18 and 20 November 1918 and supported Leighton's general philosophy and Gibson's specific recommendations. There were two dissenters, the CGS, Legge and the Director General of Works, Owen. However their written objections were the same as the arguments answered by Leighton in late 1917[116]. Pearce ignored Legge and Owen, and on 27 November wrote

Gibson's papers which showed that Gibson was not just an iconoclast (as portrayed by Jensen) but contributed a number of important ideas to Leighton's concept of an arsenal (see Jensen, 'Defence Production . . .', *op.cit.*, Ch.7, Vol.5, p.5; Ch.6, Vol.4, pp.182-83, see AA MP598, S37, Box 2, item 23).

114. AA MP598, S37, item 23, Gibson's memo, 'Matters Affecting the Establishment of the Commonwealth Arsenal at Tuggeranong, Federal Territory, and Recommendations Thereon', 12 November 1918.

115. Attending were the Military Board (including Major General Legge), Gibson, Marcus Bell, Owen, and two representatives from the Navy. Leighton was still in London, as was Jensen.

116. AA MP598 S30, Box 5, Minutes of the Military Board meeting 18 and 20 Novem-

to the acting Prime Minister, Watt, advising that with the war's end, three new factors had to be taken into account in regard to the Tuggeranong arsenal project. The first was that a large amount of munitions had been released in Britain which were potentially for Australian use. The second was that the forthcoming peace conference could succeed in giving much greater security to nations like Australia than had hitherto been possible in international relations. The last was that experts, including Leighton, were now available to come to Australia to examine munitions schemes. Pearce concluded that action on the Tuggeranong arsenal should be deferred until at least Leighton could return to Australia, and/or the other factors had been clarified. Cabinet agreed to this action on 28 November, and the acting Prime Minister released an appropriate statement[117]. The next day, Watt, when speaking on Loans Bill No.2 reassured the House of Representatives that the Government was still committed to an arsenal system, as the war had shown that such a concept was vital to munitions supply[118]. Late in November Gibson wrote again to Leighton:

'... I think that this is really the first time that the project has had a chance of being thoroughly considered in relation to the whole scheme of things and in which all the people concerned had been brought together for a consideration of the matter. Going back over the old files I have come to the conclusion that there has been a great deal of camouflage about the matter in that certain aspects of the question have not been given the prominence that they should have had and that others have been made unduly prominent. This is, perhaps, a matter that you could discuss with

ber 1918 on the Establishment of a Commonwealth Arsenal, and attachments (dated 21 and 23 November 1918). See also Trumble to Leighton 4 December 1918, AA CRS A3934 SC15(19) Naval and Military Requirements.

117. AA MP598 S30, Box 5, Pearce to Watt 27 November, Watt to Pearce 28 November 1918.

118. CPD Vol LXXXVII, pp8582, speech by Watt 29 November 1918.

Jensen ...'[119].

The Creation of the MSB

On 4 February 1919, the Cabinet ordered Leighton to return to Australia to assist in establishing munitions supply policy[120]. This had been anticipated, and British authorities, including the Minister for Munitions, Winston Churchill, were highly complimentary about Leighton's contribution to the war effort[121]. Leighton left a scene of great orderliness for the chaotic Australian environment described by A.J.Gibson as being:

'...almost hopeless owing to the cross currents and opinions that constantly have to be met and the want of a really comprehensive grip of the whole situation'[122].

Gibson chose to return to being Professor of Engineering at Queensland University, shortly after having written this, and Leighton thus lost his closest confidant on munitions policy. In a remarkable coincidence, Gibson later became an engineering partner to Leighton's inveterate enemy, G.A.Julius, chairman of the Executive Committee of the Council of Scientific and Industrial Research [CSIR]. Gibson seems to have retained the confidence of both men[123].

119. AA MP598 S30, Box 5, Gibson to Leighton 15 November 1918 plus addition 20 November 1918.

120. AA Cabinet Records 1919-1922, CRS A2717, Vol.1 F4, Cabinet Meeting of 4 February 1919.

121. AA CRS A457, file 551/1/5; see also J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.6, Vol.4, pp.95-7. The Controller of Explosives, D.G.Duff, commented: 'Mr Leighton possesses great technical and managerial ability which has secured for him a prominent position in the councils and work of the Explosives Supply Department of the Ministry of Munitions'.

122. AA MP730 S30, Box 9, Gibson to Leighton, 17 December 1918.

123. Leighton thought very highly of Gibson's personal and professional qualities and

When Leighton resumed duty in Australia on 1 April 1919, he was confronted with the complete refusal by Acting Prime Minister Watt, to allow any expenditure on munitions supply until he had received a report from Leighton[124]. Leighton had suggested in 29 November 1918 that the whole of the plant for the arsenal could be acquired cheaply from the British Government as it was disposing of excess factory plant, machine tools and laboratory equipment left over from the war. Watt's direction had held up all action on this matter while Leighton was at sea, bound for Australia[125]. Many bargains were slipping away.

On 27 May 1919, Leighton produced his report which he thought would '... yield an organisation capable of transmitting Munitions knowledge and practice to the industries of the country'[126].

wished to persuade him to become the chief engineer of the arsenal. Gibson was interested, but Public Service regulations prevented him from being paid a salary commensurate with his value as an engineer. He returned briefly to Queensland University, but in 1919 became the Superintendent of Construction of the BHP steelworks at Newcastle. In 1922 he joined the engineering firm of Julius, Poole and Gibson in Sydney. His partner, Julius, was destined to become the Chairman of the CSIR in 1926, and to be Leighton's most persistent foe (see Ch.3). AA MP598 S30, Box 5, Leighton to Trumble 25 June 1918, 26 November 1918. F. Matthews of Julius, Poole and Gibson, to writer 23 November 1983.

124. AA MP598 S30, Box 9, Minute by acting general manager of the arsenal, 14 February 1919. J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.6, Vol.4, p.137; Ch.7, Vol.5, p.7.

125. AA MP598 S30, Box 6, Leighton to Gibson, 29 November 1918. AA PM's Department CRS A457, file 551/1/5, Watt to Pearce, 8 March 1919. Leighton's cable to Defence Department, 23 December 1918: 'Defence — Very urgent — With reference to purchases of machinery from Ministry of Munitions for Arsenal purposes as Ministry being rapidly liquidated and all machinery being sold off our chance of obtaining requirements at salvage prices will disappear unless we act promptly. Strongly urge therefore that I be authorised to negotiate with Ministry for our minimum requirements'.

126. AA MP598 S30, Box 9, Leighton to secretary of Department of Defence,

Basically Leighton reviewed the arguments that he and Gibson had been placing before the Defence Department for the last two years, and concluded that his concept of an 'arsenal' was much preferred to that of the Tuggeranong arsenal. Munitions factories would not be concentrated at Tuggeranong, but would be spread around Australia to those places that could give economic support to such factories — major population and resource centres. This dispersal Leighton thought especially advisable in Australia where communications were long and liable to interruption[127]. All supply activities would be gathered under one authority which would be supported administratively by the old Arsenal Branch, now more appropriately renamed the Munitions Supply Branch[128]. Leighton also outlined a development programme to increase Australia's degree of self containment in munitions supply. This was very similar to that proposed in 1916 for the Tuggeranong arsenal, but was to be centred at Maribyrnong, Melbourne, and would include central research laboratories[129]. The Maribyrnong nucleus would provide the basis for the repeating of factories throughout Australia as population centres developed and new security demands needed to be met[130]. [Similarly for SAF at Lithgow] However, Leighton believed that fun-^{Not a Sentence}damental advances in self containment would always be dependent not only on

27 May 1919.

127. *ibid.*, pp.8-10.

128. *ibid.*, p.3.

129. *ibid.*, pp.11, 13. The program was, SAA — 33 million rounds, Rifles — 17,000, Machine Guns — 250, Pistols — 1000, Gun ammunition — 160,000, Grenades — 200,000, Trench Bombs — 52,000, Aerial Bombs — 12,000, Guns 18 pdr — 30, Guns 4.5" — 8, 3" Stokes — 40, 6" Newton — 32, Planes — 50, Engines — 50, Rates of annual production calculated on 275 days of 8 hours — which leaves open the prospect of 3 shifts in 24 hours.

130. *ibid.*, pp.12-3.

building government factories and laboratories, but also on the civil development of raw materials and manufacturing in Australia as a whole[131]. Thus self containment depended also on the encouragement of appropriate primary and secondary industries which could supply the necessary processed raw materials. Leighton concluded his report with the reasons why the Government ought to adopt it:

'The existence of Australia as a white man's country depends upon the supremacy of the British in the East, and for her own sake, Australia should see to it that a continued flow of men and munitions to vital points East of Suez is assured. We have, in Australia, an industrial system which is purely British, it owes nothing to subject races, and should be trained to function in war, for therein lies our own safety and our duty'[132].

The reference to the White Australia Policy was most appropriate because the Prime Minister, Hughes, at the Versailles Peace Conference, had just fought off an attempt by the Japanese Government to have a carefully worded racial equality clause inserted into the League of Nations Covenant. The Australian delegation was convinced that the Japanese had planned to use it as a weapon against the White Australia Policy to further Japanese immigration[133].

Leighton's Report did not bring immediate Government acceptance, but instead initiated a process of prevarication which was to last two years; something Jensen had foreseen would happen with the abandonment of Tuggeranong at the end of the War[134]. Initially the report was submitted to a

131. *ibid.*, pp.5-7.

132. *ibid.*, p.18.

133. T.J.O'Rourke, 'Australian Policy and Attitudes Towards Collective Security 1919-1939', PhD Thesis Queensland University 1979, pp.58-9.

134. AA MP598 S30, Box 1, Jensen to Kerr (acting secretary of the arsenal), 21 Febru-

special committee on 'Matters of Defence Policy' headed by the Honourable G.Swinburne[135]. Swinburne observed on 30 June 1919 that after full consideration of the economic and the military questions involved, his committee agreed with Leighton's report. There was only one dissenter on the Committee — Major General Legge.

There was one more dissenter, not associated with the committee, but rather more important. George Pearce was in Britain attending to repatriation matters, but was also attempting to persuade Cabinet to seize some of the factory equipment bargains being offered by the British Government[136]. He was being advised closely by Jensen, now located in London in charge of the arsenal inquiry staff. On hearing of the Swinburne committee view, Pearce called the acting Minister of Defence, Russell, 25 August 1919, stating that he was still in favour of the Tuggeranong arsenal, but was prepared to approve Leighton's scheme if Lieutenant General Brudenell White, CGS of the AIF, raised no major strategic objection[137]. Jensen had warned Leighton on 5 June 1919 that Pearce:

'...still strongly adheres to the Tuggeranong proposal ...'[138];

ary 1919: 'I am rather sorry about the upheaval in regard to the arsenal business, not so much because I was wedded to Tuggeranong, but because of the inevitable delay. Such stoppages [are] always seized upon by politicians for preventing work which is inevitable, but nevertheless delayed for indefinite periods of time'.

135. Other members were Lt. General Sir Brudenell White, Major General Honourable Sir J.W.McCay, Major General J.G.Legge, Mr H.C.Reading. AA Cabinet Records 1919-1922, CRS A2717, Vol.1 F4, Folio 126.

136. AA PM's Department CRS A457, file 551/1/5, Pearce to Watt, 2 April 1919.

137. AA MP598 S30, Box 9, Pearce to Russell, 25 August 1919.

138. J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.6, Vol.4, pp.138-39.

and indeed, despite the Acting Prime Minister's direction of 29 November 1918, that work on the arsenal site and railway were to cease, Pearce had on 24 January 1919 instructed his department to continue work not involving expenditure on the site, and as authorised by the Treasurer[139]. White agreed with Leighton[140], but despite Pearce's promise that the matter would be taken to Cabinet, no further action ensued.

One reason for this was that Pearce was probably more interested in trying to persuade Cabinet in Australia to act on some of the bargains in munitions production equipment being offered by the British. For its part, Cabinet was not interested in making any commitment until the Prime Minister returned and future defence policy had been decided. It refused, despite Pearce's promptings, to depart from this policy during an election period[141]. Pearce persisted, under Jensen and Leighton's frantic urging, and was successful in getting Cabinet

139. AA MP598 S30, Box 9, A.J.Gibson to Leighton, 31 March 1919.

140. *ibid.*, Lieutenant General C.B.B.White to Secretary of Defence Department 2 September 1919, 'If great sources of munitions supply such as Arsenals can be far removed from probable attack, measures should, of course, be taken accordingly - But as I understand Mr Leighton's proposals he adopts the modern practice and aims at the creation of a 'Munitions Supply Branch' rather than a great Arsenal. If this is correct then it becomes important that such an organisation should be located in the centre of trade, as far as that is possible. Maribyrnong fulfils the requirement just mentioned ...'.

141. AA Cabinet Records 1919-1922, CRS A2717, Vol.1 F4, Cabinet Meeting 12 August 1919 — Cabinet defers decision on purchase of plant for munitions from Britain. AA PM's Department 1921-1923, CRS A457, file B551/1/9, Jensen to Secretary Defence Department, 27 October 1919. British War Cabinet offered to sell, to Australia, munitions plant worth £300,000 at 50% discount. Pearce to Watt 4 November 1919, encouraged purchases. Watt to Pearce 8 November 1919, 'whole question [of arsenal] was considered by Cabinet after Armistice and it was decided not to purchase any such plants ... [until] future defence policy [decided] by Cabinet and PM on his return. It appears to me quite impossible to depart from that position during election period, however tempting might be the offer of the British Government'.

approval on 21 January 1920 for an acceptance of a very generous offer from the British Government[142]. This was just as well, because Jensen during 1919, had been engaged in purchasing shell, forging and laboratory equipment bargains on his own authority, in disregard of Cabinets directive that no purchases were to be made. However, he had the sympathy of Pearce and Hughes, who were in Britain, and considered that if his activities were uncovered, they might protect him[143]. It seems that Jensen informed Leighton in more detail of what he was doing and expected his support:

‘I felt somebody had to be game enough to order the stuff otherwise we would never get it started as it should be. I suppose there will be a racket now but if you stand behind me it will come out all right’[144].

The commitment of the Cabinet to significant expenditure on factory plant and equipment, also committed it to a development programme in expanding the scope of munitions production in Australia, for it made no sense to purchase equipment for gun ammunition and guns, if no such factories were then built to accommodate it. Hughes realised this, and was responsible for approving Defence Council minutes of 12 April 1920, which recommended defence expenditure of £8.25 million of which £800,000 was earmarked for munitions construction[145]. On 18 May Hughes spoke in Parliament of the continued

142. AA MP598 S30, Box 6, F2, Jensen to Leighton, 27 November 1919. By this time Pearce had returned to Australia, and took the submission to Cabinet himself on 21 January 1920. See also J.K.Jensen, ‘Defence Production ...’, *op.cit.*, Ch.6, Vol.4, pp.165, 173–178.

143. See J.K.Jensen, ‘Defence Production ...’, *op.cit.*, Vol.4, Ch.6, pp.130–43.

144. AA MP598 S30, Box 5, Jensen to Leighton, 2 February 1920.

145. AA Council of Defence Minutes, A2028 11th meeting, 12 April 1920.

need for an arsenal[146]. The curious thing was, despite the Government's apparent willingness to commit itself, no decision was made on where the new factories should be located. The Tuggeranong arsenal issue was still open.

This was largely Pearce's responsibility. While he continued to be successful in gaining Cabinet support for further purchases of equipment from Britain, allowing Jensen to continue his determined purchasing activities in London[147], Pearce vacillated on Leighton's Report. In January he referred it to the Conference of Senior Officers of the Australian Military Forces which met between 22 January and 6 February 1920. The conference considered other matters besides munitions, but in respect of the latter, it recorded that:

'Mr Leighton has submitted a comprehensive scheme for the creation of a Munitions Supply Branch and the erection of an arsenal at Maribyrnong. With these proposals the Conference is generally in agreement ...'

'The Conference has considered the relative merits of Maribyrnong and Tuggeranong as a site for the Government arsenal, and has no hesitation in reaffirming that the balance of advantage is in favour of the former site'[148].

146. AA CRS A457 file B551/1/9,CPD,VolXCH, p2144, 18 May 1920.

147. With the approval of large scale purchases of equipment by Cabinet in January 1920, and knowing of his subordinate's energy and initiative, Leighton sent Mr A.Mealand, an engineer, to London to keep Jensen on a tight rein, so that he did not purchase too many 'fancy' machines '... it would be quite unfair to leave you in London without further technical assistance'. Jensen was not deceived, and quickly reduced Mealand to the role of a subordinate adviser, with Jensen taking all the decisions as usual. AA MP598 S30, Box 6, Leighton to Jensen 5 February 1920, Jensen to Leighton 11 February, Leighton to Jensen 24 February 1920. See also J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.6, Vol.4, pp.178-85.

148. NLA Pearce Papers MS1827 Series 1, 'Report on the Military Defence of Australia by a Conference of Senior Officers of the Australian Military Forces 1920', Vol.II, pp.18, 20.

Percy Owen was called as a witness (as was Leighton) and Major General Legge was a member of the Conference. Their strategic arguments evidently were not appreciated by the other members of the Conference[149].

This still did not convince Pearce, and no further decision was made for 1920 except to approve the building of the central research laboratories (soon to be called the Munitions Supply Laboratories) at Maribyrnong; and there is reason to believe that this was sanctioned only because the laboratory equipment was piling up in Melbourne as it arrived from Britain[150]. However, Leighton was quietly consolidating his power. If he could not get Pearce to make a decision, he would turn to bureaucratic stealth to get Pearce to approve his scheme incrementally.

In 1914 the supply functions within the Department of Defence had been totally fragmented. The Factories Branch (headed by Jensen) provided administrative support for the existing munitions factories; but factory managers were virtually autonomous, answerable directly to Parliament, and deferred to the Secretary of the Defence Department only on general administrative matters. One munitions factory was even outside the control of Parliament — the SAA factory which was owned by the Colonial Ammunition Company. A second branch existed to supervise the placement of orders on the government mu-

149. The other members were Lieutenant General Sir H.G.Chauvel (Chairman), Lieutenant General Sir J.Monash, Major General Sir J.W.McCay, Major General Sir J.J.T.Hobbs, Major General Sir C.B.B.White. The drafting of those portions of the Conference Report dealing with the manufacture of munitions was done by Monash. (Joint Committee of Public Accounts Minutes of Evidence ... 1924, *op.cit.*, p.90).

150. See J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.6, Vol.4, p.176; Ch.7, Vol.5, p.15.

munitions factories and commercial industry — the Contract and Supply Board. This was chaired by a Serviceman and answered to the Secretary of the Defence Department. A third branch was that of the Chemical Adviser which existed, amongst other things, to support the munitions factories and Armed Forces on quality control, and the testing of explosives. This was led by Marcus Bell and was a semi-independent fief. A fourth area was that of Inspection, and this was under the Quarter Master General of the Army. This situation became even more complex in mid 1916 with the formation of a fifth area — the Arsenal Branch under A.E. Leighton, who held his appointment from Cabinet and Parliament and deferred to the Secretary of Defence only on general administrative matters.

Under the influence of Jensen, the Arsenal Branch began to swallow some of these supply functions in 1916. Jensen persuaded the Secretary of Defence to propose, on the basis of economy of management and maintenance, the absorption of the Chemical Advisers Branch into the arsenal organisation. Bell's Laboratory (of only five professional staff) was amalgamated with the proposed arsenal laboratory, and he became Superintendent. Pearce approved the change on 14 December 1916. Jensen also ensured that the small laboratory at SAF Lithgow was also swept up in this administrative change[151]. Early in 1917, the manager of SAF, Ratcliffe, was summoned to London by Leighton to assist him in planning for the arsenal. An acting manager was appointed, and during the change over, Jensen persuaded the Secretary of Defence to make

151. AA MP598 S30, Box 4, items 7, 9. J.K. Jensen, 'Defence Production ...', *op.cit.*, Ch.5, Vol.3, pp.217-21.

SAF subordinate to the Arsenal Branch. There is evidence that this was a deliberately planned coup behind Ratcliffe's back[152]. The acting manager was in no position to oppose the change.

When Leighton returned to Australia in April 1919, his Arsenal Branch had gathered in the Cordite Factory and Acetate of Lime Factory as well[153]; one suspects through similar acts by Jensen. The SAA Factory remained under the control of Colonial Ammunition Company, and the Clothing, Harness and Woollen Factories remained under the Secretary of Defence. Inspection remained with the Army, and the Contract and Supply Board remained a separate branch. Leighton's ambition

'... was to bring the whole of these services within one group and so build up a comprehensive supply organisation'[154].

Using the British Ministry of Munitions as an example, Leighton persuaded Pearce to transfer Inspection to the Arsenal Branch on 11 November 1919[155]. The next to fall was the SAA Factory. Early in 1915, Jensen had noted that Colonial Ammunition Company's bankers had refused to advance it £25,000 for the purchase of raw materials to fulfill the Australian Government demand that production be lifted to two million rounds of SAA per week. He concluded shrewdly that the Company was probably in financial trouble, and initiated

152. AA MP598 S30, Box 9, Jensen to Leighton 31 October 1919. In this letter Jensen also suggests the same treatment for the Government Woollen Mills on the resignation of the then current manager.

153. Joint Committee of Public Accounts Minutes of Evidence ... 1924, *op.cit.*, p.4.

154. *ibid.*, p.4.

155. AA MP598 S30, Box 4, item 7, Leighton to Secretary of Defence, 13 October 1919, Ministerial approval 11 November 1919.

the proposal to purchase the SAA Factory and gained Cabinet's support. At the same time the Defence Department refused to give the company a new long term contract, which, since it was the factory's only customer, placed great pressure on the Colonial Ammunition Company[156]. When the company made an offer to sell, Jensen decided the price was too high and persuaded the Defence Department to inform the company of the Government's intention to build its own SAA factory at Tuggeranong and that it was no longer interested in a sale[157]. While the company was left to ponder the uncertainty of its future, Jensen was responsible for a new and tough contract being forced on the company, and it came into effect on 23 July 1919. As planned by Jensen, the company in late 1920, informed the Department of Defence that it could no longer operate under the terms of the agreement. It agreed to lease its factory to the Government on very reasonable terms from January 1921. Jensen's comment to Leighton, on 20 April 1921, was:

'It has been my ambition ever since the war broke out for the Department to get its clutches on the place, so I am pleased it has come off at last'[158].

It is easy to see from this incident why Leighton found Jensen so useful, despite an occasional mistake. Jensen was a good planner and very determined to achieve his objectives.

156. J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.5, Vol.3, p.60.

157. J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.5, Vol.3, p.64. AA MP598 S30, Box 2, item 4, General Manager Colonial Ammunition Company to W.M.Hughes, 11 May 1916; Secretary of Defence to Manager of Colonial Ammunition Company, 4 August 1916.

158. J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.8, Vol.7, pp.180-81. See also AA MP598 S30, Box 6, F1, Leighton to Gibson, 29 November 1918. Colonial Ammunition Company were attempting to conduct a business deception of their own.

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By September 1920, Leighton had persuaded Pearce to create a Board of Factory Administration for the management of all munitions factories. This was a statutory body, under the chairmanship of Leighton, and included control of the SAA Factory when it became available[159]. However, it did not include the Contracts and Supply Board. This became the next step in the advance[160]. On 21 March 1921, Leighton wrote once more to Pearce on his proposal to establish a Munitions Supply Branch in the Defence Department. Among other things, he noted the advantages to be gained in efficiency from a single supply branch (i.e. with the Contracts and Supply Board under the Factory Board) and pointed out that such an administrative unit would be in effect an embryo Ministry of Munitions, which could be taken easily out of the Defence Department when an emergency arose, and supply activities had to expand[161]. He noted that the Department of Works and Railways refused to accept that Tuggeranong had been abandoned by Cabinet and so would not consider designing buildings for Maribyrnong. Unless the Defence Minister finally resolved this matter, there could be no progress in the development of the new factories[162].

This forced Pearce to take action. Leighton was appointed to the new position of Controller General of Munitions Supply. On 13 August 1921, the Munitions Supply Board (MSB) was created as a statutory body with control

159. J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.7, Vol.5, pp.11-3.

160. Joint Committee of Public Accounts Minutes of Evidence ... 1924, *op.cit.*, p.4.

161. The idea seems to have originated from Jensen (see AA MP598 S30, Box 6, F1, Jensen to Leighton, 21 February 1918 'Notes on Allotment of Duties').

162. AA MP598 S30, Box 9, Leighton's memorandum 21 March 1921.

over supply activities including the Contracts and Supply Board[163]. Pearce had finally accepted Leighton's concept of an arsenal, and also the necessity of developing Maribyrnong instead of Tuggeranong. Why he clung so tenaciously to the Tuggeranong arsenal, in the face of all evidence, is not clear, for Pearce himself never said anything about it even in his autobiography. His behaviour was unusual when compared to his normal administrative practice which emphasised swiftness and clarity of action[164]. At least from Leighton's point of view, Pearce made the right decision in the end.

The MSB supplanted the Board of Factory Administration and the former Chairman Leighton, now became the Chairman of the MSB as well as the Controller of General Munitions Supply[165]. This meant he had a major say in policy for the MSB, as well as the responsibility for the day to day technical administration of the MSB. His co-members were the Finance Secretary of the Defence Department, Colonel T J Thomas, and Mr M.M.Maguire, the Assistant Secretary of Defence. The MSB appointed a secretary and this was J.K.Jensen, formerly secretary of the arsenal. Jensen also became Chairman of the Contract and Supply Board when it was remodelled in 1922.

The MSB was responsible directly to the Minister for all matters of supply to the Armed Services, thus removing the Secretary of the Defence Department from any direct responsibility, and giving the Controller General of Munitions Supply a unique form of power in the public service. Leighton

163. J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.7, Vol.5, pp.16-8.

164. See E.Scott, *Australia During the War*, *op.cit.*, pp.50-1. Peter Heydon, *Quiet Decision ...*, *op.cit.*, pp.146, 148.

165. AA MP730, S8, Box 6, MSB Agenda No.236 of 7 July 1921.

was the Government's expert adviser on supply and could ignore the Secretary of Defence if he chose. In fact Leighton never operated in this manner and preserved an amicable working relationship with all the permanent heads of the Defence Department. They were always kept informed of what he proposed to do, even if he were taking a matter directly to the Minister.

The MSB's powers and responsibilities in regard to supply were very wide. It supervised, through the Contracts and Supply Board, the purchase of all goods and munitions for the Armed Services. It was also in charge of all research and design, and the administration and development of all government munitions factories. Inspection of all supplies obtained in Australia, other than food, forage and fuel supplies, fell within its purview[166].

The MSB considered that it had four major objectives. *The first* was the establishment of scientific and technical staffs, with the necessary laboratory equipment, for the investigation, from the munitions standpoint, of the resources in Australia. The laboratories were also to study and develop manufacturing processes so that in time of war there would be a centre from which such information could be rapidly disseminated[167].

The second objective was the erection of factories for the production of

166. *ibid.* In actual fact, despite the active support of numerous Ministers of Defence, the MSB was unable to exercise its inspection function for the Navy as the RAN refused to surrender the responsibility. The Admiralty supported initially the RAN in its opposition. During the 1920's this division of responsibility was not regarded as being important as the MSB did most of its work for the Army. It became more significant in the 1930's when Naval demands began to increase.

167. AA MP730, S8, Box 6, MSB Agenda No.703 of 20 March 1923. MSB First Report 13 August 1921 to 30 June 1922, PP F12528 of 24 August 1923, p.4.

munitions that were either not obtainable from commercial sources, or that were required in peace time in such small quantities as to render the encouragement of private enterprise uneconomical or undesirable. Such factories were not expected to be able to meet war requirements, but with their moderate turnover, the factories were to provide training for staff and employees in the technique of manufacture according to local conditions, and to provide models for expansion and duplication when a war emergency occurred, as well as acting as the technical schools for commercial establishments when the latter were being converted to produce war demands[168].

The third objective was the preparation of a scheme for the organisation of the whole industry of the nation in time of war[169].

The fourth objective was to make possible the local production of Armed Services supplies by keeping systematic records of British Armed Service Specifications, and by providing facilities for scientific research and adequate Inspection[170].

The grand objective was the achievement of self sufficiency in munitions production in Australia. All the MSB's objectives were steps along the way towards this end, including a corollary activity — the development of Australian secondary industry. Unless the latter could reach an advanced stage of development, the processed raw materials on which the new MSB factories would rely, could not be supplied except from overseas. The MSB had various powers

168. MSB Agenda No.703 of 20 March 1923, *op.cit.*

169. *ibid.*

170. MSB First Report 24 August 1923, *op.cit.*, p.4.

which enabled it to play a role in developing Australian secondary industry (see Chapter 3).

The Armed Services did not have representation on the MSB. This was because the MSB was seen as the servant of the defence forces and not as their rival. The Armed Services specified their munitions requirements and it was up to the MSB to devise the best way to acquire them. It was not thought that the respective Services had anything to offer in the senior technical and financial administration of Leighton's empire; but they retained representation on the Contracts and Supply Board, at which administrative level Armed Service experience in supply matters was deemed to be relevant. The three Armed Services did not entirely accept this argument and attempted to gain representation on the MSB[171]. Leighton thrust all such attempts aside. The Services were not pleased when Leighton succeeded in also securing the position of Chairman of the Contracts and Supply Board for his own nominee when hitherto it had been held by a Serviceman[172]. The conflict went on for the next twenty years and is recounted in Chapter 4.

During the period 1914-21, there was never any certainty that the organisation, formulated by Leighton, would be the end product of all the disputes

171. AA MP598 S30, Box 9, Request by Military Board for representation on the Factory Board of Administration 27 April 1921. MP730, S8, Box 6, MSB Agenda No.311 of 6 October 1921, Request by Air Board for Representation on the MSB. MP730, S8, Box 6, MSB Agenda No.598 of 12 October 1922, Request by Naval Board for representation on MSB. The MSB had the power to invite members of the Armed Services to its meetings when it thought it was appropriate. See also J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.8, Vol.6, pp.21-4.

172. AA MP730, S8, Box 6, MSB Agenda Nos.548, 562 and 572 of 1922.

over munitions policy. Without Leighton's influence an arsenal would have been built in the FCT, away from all the industry which it was supposed to train. All raw materials would have had to be transported at least 200 miles, and there was little opportunity to do this cheaply by using normal commercial channels because the FCT was not a commercial centre. This isolation would also have hindered the arsenal staff from keeping in touch with the latest methods being used by commercial industry — something that was vital if the staff were to modify the manufacturing designs of munitions to accommodate Australian raw materials and industrial practice. Leighton could not be dismissed as easily as most critics of the arsenal, for he was an acknowledged expert; but this would not have been enough if the war had continued. The significance of the critics was not necessarily the quality of their criticisms but that they continually delayed Pearce. He overcame all opposition in the end but there was insufficient time left to get the arsenal construction well under way before the conclusion of the war. This gave Leighton and A.J.Gibson another chance to challenge the project, this time successfully. The whole arsenal project was an excellent example of how Government planning could go wrong on a massive scale, despite the admirable intentions of the planners. But from out of it came the organisation which was to be the nerve centre of the highly successful munitions production effort of World War II. We will now examine how the MSB developed during 1921-39.

CHAPTER 2

THE ROLE OF THE MSB WITHIN DEFENCE POLICY 1921-1939

The Imperial Relationship and the MSB

The allied victory in the First World War brought significant changes to the world balance of power. These changes had to be recognised in post war defence policy. The Australian Government sought to clarify the issues through a number of enquiries, which were conducted, on its behalf, by various committees, and prominent individuals. Amongst these were the Swinburne Committee of 1919[1], and the Senior Officers Conference of 1920[2]. The common view of both enquiries was that Australia might have to survive a period of isolation from British naval support, and that a large land force was essential, to maintain effective resistance against the Japanese, and to provide bases for the returning British Fleet. The Senior Officers Conference examined problems of supply in some detail, and concluded that self containment of munitions supply was an essential feature of their strategic view[3].

An alternative strategic view was propounded by the British Admiralty. This argued that an invasion of Australia by Japan was unlikely because of the long sea communications involved. Japan would have to first seize closer bases and neutralise places such as Hong Kong. By the time the Japanese were capable of launching an invasion, the British Fleet would have arrived[4]. All that Australia would have to contend with would be raids. While the Admiralty

1. AA CRS A2717, Volume 1, F4, 30 June 1919, *op.cit.*

2. Report on the military defence of Australia, *op.cit.*, NLA MS1827, S1, Vols 1 and 2.

3. *ibid.*, Volume 2, pp.5-10.

4. The Admiralty claimed that except in the most adverse circumstances of a two front war, the British Fleet could reinforce any part of the Empire within six to eight weeks. AA CRS A981 Item Defence 350 Part 1, 'Empire Naval Policy and Cooperation', Admiralty London, February 1921.

was prepared to admit that Britain could not support two major fleets (one in European waters, and the other in the Far East) it could prepare Singapore as a major naval base so that the main fleet from Britain could be supported in the Far East at short notice[5]. In June 1921, the Committee of Imperial Defence (CID) confirmed this Admiralty view, and suggested that with the removal of the German Navy, there was little prospect that the British Fleet would be tied up in Europe; and so in all conceivable situations would be available to counter Japanese actions. The CID thought that raids were far more likely to be made on Hong Kong and Singapore than Sydney[6].

This was the Blue Water strategy of Imperial Defence[7]. It saw sea power, as exercised by the British Navy, as the key to the protection of the Empire (in particular Australia and New Zealand) and its lines of communications. There was no point according to the logic of the strategy, in developing and maintaining large land and air forces, as envisaged by the Senior Officers Conference, because an enemy which gained control of Australia's communications with Britain had no need to invade the continent. Cut off from their main sources of support and supply, Australian land forces and industry would wither and die. Consequently, the best contribution to Imperial defence which Australia could make, was the provision of naval forces, and not the development of land and air forces larger than required to handle light raids[8]. These light raids

5. *ibid.*

6. AA CP103 S3 Item Volume 1B, 'Singapore Development as a Naval Base', Memo (No.501M) by Oversea Sub-committee of the CID.

7. The term is used by J.M.McCarthy in 'Air Power and Australian Defence ...', Ph.D. Thesis, ANU, 1971.

8. See J.M.McCarthy, *op.cit.*, Chapter 2.

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Table 2-1 DEFENCE EXPENDITURE BY MAJOR OPERATIONAL FUNCTION

YEAR	DEFENCE CENTRAL (£)	NAVY (£)	ARMY (£)	AIR FORCE (£)	MUNITIONS (£)
1933/34	20,307	1,735,215	1,496,841	794,811	251,208
1934/35	21,663	2,647,498	1,779,121	740,805	363,675
1935/36	24,891	3,177,346	2,418,497	1,054,410	332,897
1936/37	31,504	3,242,469	2,668,979	1,452,649	430,663
1937/38	35,163	3,484,773	2,836,275	2,445,457	625,792
1938/39	60,908	4,830,766	4,822,053	2,923,382	1,354,011
1939/40	237,430	11,528,767	26,447,431	11,621,642	4,408,628
1940/41	334,762	21,974,127	88,574,130	31,976,141	14,941,742
1941/42	362,574	22,496,477	186,573,147	57,749,801	27,870,939
1942/43	249,930	39,556,534	298,372,113	107,274,456	28,181,948
1943/44	232,346	38,606,582	215,766,326	128,189,198	19,259,103
1944/45	179,051	38,313,909	173,978,500	120,026,068	10,050,807

Sources

Budget Papers 1934-1946, Reports of the MSB to Parliament.

were defined in later years to be forces of not more than 200 men, landed from Japanese cruisers, and supported by naval gunfire[9].

The post 1921 Australian Government, of W.M. Hughes, accepted that the most important component of Australian defence and security would continue to be the protection given by Britain, and that this was most likely to be extended through sea power. Within this framework, the Government was compelled to accept the logic of supporting British sea power with a strong naval squadron - something the Admiralty and British Government were keen to receive as a contribution to joint defence. The Navy consequently became the most important element of the Armed Services, because British strategy, as accepted by Australia saw the Navy as the first line of defence for Australia against light raids. The Army was to be restricted to guarding major ports against light raids; and the Air Force was limited to supporting the Navy and Army. This division of operational responsibilities became labelled officially in 1932 as the *Defence Against Raids Contingency*, but it had an implicit existence well before this time. The Navy remained the most important element of the Armed Services until the beginning of the Second World War in 1939. The Army and Air Force received much less finance as their functional roles were not judged to be as important (see Table 2-1)[10].

9. See AA MP729, S2, File 1855/1/82.

10. This bias became more pronounced when Defence finance was reduced in the wake of the Quadruple Treaty of 13 December 1921, and the Washington Agreement of 6 February 1922. Australian Governments needed more finance for national development schemes, and war debts. The prospect of stability in the Pacific encouraged defence reductions, which left insufficient funds to do much more than maintain a reasonable naval squadron. See AA MP598, S30, Statement by Prime Minister on 'Defence Policy', May 1922, and Estimates of Expenditure 1922-23, PP-F14711, October 1922.

The Army did not accept this relegation passively. The Senior Officer's Report on the military defence of Australia[11], had recommended the development of a force, which could be mobilised quickly, to defend Australia from invasion. The Army subsequently struggled to develop the framework of this anti-invasion force of seven divisions; but during the 1920s was denied the finance to make any substantial progress; and in 1932, was directed, by the Government, to put its main effort into a nucleus for only three lightly armed divisions for defence against raids [12]. This brought the Army into line with British and Australian thinking on the Blue Water strategy. The seven division anti-invasion force-nucleus was continued, but at a very low priority.

A result of this Imperial strategy was the reduction of the Army's demand for munitions. The Army was unlikely to be engaged in heavy fighting, and would only be required to repel light raids. The production capability planned by Leighton and Pearce in the early 1920s, which could produce thousands of shells and rifles, and millions of bullets etc., was not required to defeat raiding parties of no more than 200 lightly armed men. The shortfall in demand was not made up by the more cherished Navy. RAN requirements for munitions from the MSB were insufficient to warrant production. The limited supplies required could be gained relatively easily, and at much less cost, from the Admiralty[13]. The Air Force also shared a minor role with the Army, and except for a small

11. Report on the military defence of Australia, *op.cit.*

12. AA MP598, S30, Box 9, 'Defence Policy and its Relation to the Figures to be Submitted for Limitation at the Disarmament Conference', Cabinet Submission by G.Pearce, 12 February 1932. Approved by Cabinet 15 February 1932.

13. See Joint Committee of Public Accounts — minutes of evidence 1924, *op.cit.*, pp.96-100. Testimony of Commander A.Stokes.

number of aircraft components and the production of a few airframes, also had little use for the MSB. Clearly Leighton's organisation was not required within the framework of post war Empire defence.

However, the Hughes Government and that of Bruce, all ignored this strategic consistency, and allowed the MSB to develop elaborate laboratories, factories and engineering establishments, on a scale which was clearly well beyond the contingency of defence against raids. The Scullin Labor Government did little to change this situation, and the Lyons Government encouraged it. More will be said of this inconsistency with the Blue Water strategy[14] later in this chapter; but it is sufficient to say at present, that Australian Governments did not entirely accept British promises of adequate protection by the British Fleet, and began to develop the MSB as a form of insurance against the prospect of future invasion[15].

Australia's Imperial connection with Britain had more influence on the MSB through technical and scientific links. The policy which governed this form of contact, we shall term the Uniformity of Armaments with Britain (UAB) Rule. This applied to the Armed Services, and was summed up succinctly by the Prime Minister, Bruce, in 1926:

'The guiding principle on which all our defence preparations are based

14. The strategic inconsistency was recognised explicitly by F.G.Shedden in 1928 when he attended the Imperial Defence College in Britain. The paper he wrote on the subject was circulated in 1929 around the Defence Department, and reached the Prime Minister Scullin. AA A5954, Box 39, F.G.Shedden to Brigadier Dill, 11 December 1928, 'Outline of the Principles of Imperial Defence', by F.G.Shedden, 20 December 1929.

15. AA MP598, S30, 'Defence Policy', Speech by Prime Minister, May 1922, p.2. A5954, Box 39, 'Notes on a Memorandum (Principles of Defence) ...' by A.E.Leighton, p.1.

whether for sea, the land or the Air Forces is uniformity in every respect — organisation, methods of training, equipment etc. with the fighting services of Great Britain in order that in time of emergency we may dovetail into any formation with which our forces may be needed to cooperate'[16].

It meant, in regard to munitions supply, that British and Australian Armed Services would have standard munitions with interchangeability of components and stores — so that logistic support problems could be minimised in joint operations. Since Australia was the junior partner in this arrangement, and had little experience in designing munitions, the munitions accepted as the standard were British.

Before 1918 there was no need to have an elaborate system for the transfer of developmental and manufacturing designs for British munitions, because only the Lee Enfield Rifle and its ammunition were made in Australia. With the beginning of the strategy of self containment, a method of transmitting from Britain, the much increased quantity of technical information had to be devised. The MSB had to gain the specifications, and developmental and manufacturing designs, for British munitions, and to keep them up to date with subsequent changes made in Britain. During 1923, and subsequently, the

16. AA CRS A664 File 437/401/21, Memo by the Military Board 1927 'Regarding Co-operation between Australia and Great Britain in Defence Matters' — quotes Bruce at the Imperial Conference, October 1926, London. See also 'Munitions Supply Organisation', statement by Minister of Defence Archdale Parkhill, 26 August 1936, pp.6-7, (PP-P819), and AA CP78 S22, File 1923/509, Secretary of Prime Minister's Department to Governor General, 6 September 1923, and Governor General to Secretary of State for Colonies, 19 September 1923. It is obvious that Australian Armed Services were adopting British munitions and following British Standards closely before the First World War; for example see AA CP78 S22 File 1915/80, CP78 S1 Bundle 45 File 1/1717, Bundle 43 File 1/1620.

MSB made arrangements with the Military Advisers office at Australia House, London, to maintain a close liaison with the respective inspection branches of the three British Armed Services for the despatch automatically of specifications of relevance to the Australian Armed Services[17]. At the same time the Equipment Officer Section of the Australian Inspection Branch would monitor British technical papers such as the Ordnance Committee's reports, to see what new specifications were emerging and ask the Military Adviser's office to gain full information[18]. All specifications for British munitions were gathered and indexed by the Equipment Officer Section, which examined old specifications to see if they were now superseded and distributed amended specifications to officers concerned with manufacture and inspection of munitions[19].

Possession of the appropriate British munitions specifications did not always guarantee successful production of interchangeable munitions and components, although it was a necessary start. British specifications often contained drawings which were nominal only; they were not exact. Such instances were related to situations where a manufacturer had worked closely with an experienced inspection officer who knew what allowances to make for the measurements in the drawing. This liaison could not be conducted between a manufacturer in Australia and an Inspector in Britain. It could only be overcome by the relevant specifications being elaborated, and/or certified copies of the controlling

17. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 8, Volume 8, p.474. Joint Committee of Public Accounts -minutes of evidence 1924, *op.cit.*, p.19, testimony of J.K.Jensen.

18. *ibid.*, p.75, testimony of the Chief Inspector Lieutenant Colonel Gipps.

19. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 8, Volume 8, pp.474-475.

or master gauges being sent to Australia from which working and inspecting gauges could be made[20].

A more subtle problem was that of the concept of measurement itself. The Australian concept of the length of one yard was slightly different from that of the Imperial yard on which the measurements in British specifications were based. Leighton solved this problem by creating the Metrology Section within the Physical Laboratory of the Munitions Supply Laboratories. This obtained a most exact copy of the Imperial yard, and calibrated all gauges in the MSB factories so that they corresponded to British measurements. This was the first time that Australian and British measurements were brought into line scientifically[21].

Such actions forged the most important technical link with Britain and ensured that Australian made munitions were interchangeable with their British counterparts including all components. The process was helped by the atmosphere of cooperation which permeated the Empire from the Imperial Economic Conference of October 1923. The Conference resolved to encourage the exchange of scientific and technical information between the various parts of the Empire, and the cooperation of the official and other organisations engaged in research for the solution of problems of common interest[22]. It was in the

20. *ibid.*, Chapter 8, Volume 8, pp.476–477.

21. Joint Committee of Public Accounts — minutes of evidence 1924, *op.cit.*, p.3, testimony of Leighton. D.P.Mellor, *The Role of Science and Industry*, *op.cit.*, pp.145–150. It was out of this Metrology Section that the National Standards Laboratory originated.

22. AA CP78 S22 File 1924/436, Dominions Office to Governor General, April 1924, (Dominion 171).

common defence interest that British authorities should see that Australia, and other Dominions, received all the technical information they required so that commonality of munitions could be maintained. Throughout the 1920's and 1930's the direction of the technical information flow was nearly all one way from Britain to Australia. Even when special training was required for some new form of production, Australian scientists and engineers were sent to the font of knowledge in Britain. This was inevitable if Australia were basing her munitions on those of Britain[23].

Strains were introduced into this relationship when Australia attempted to alter the specifications of British munitions; or worse still, wanted to change significantly British operational requirements. In the first case, it was a perfectly normal objective to want to change specifications so that for example, local materials could be substituted and/or manufacturing design changed to suit local industrial conditions. The MSB wished to do this for many munitions to enhance self containment and reduce dependence on overseas supplies[24]. But it had to be achieved while retaining the original operational performance of the British munition, and full commonality of components. As explained in Annex A, this was a demanding objective which involved modifying the developmental design and manufacturing design with some complex interactions

23. The Chairman of the MSB, A.E.Leighton, had a standing rule that members of his organisation were not permitted to visit America either on the way to England or on the way back. This story was related in an interview with the author by Mr J.Knight, personal assistant to Leighton 1946-1949, and separately in J.M.McCarthy, 'Air Power and Australian Defence ...', *op.cit.*, p.186.

24. 'Munitions Supply Organisation', statement by Minister of Defence, *op.cit.*, 26 August 1936, pp.6-7.

between the two. It was one of the main reasons for the Munition Supply Laboratories.

The second case, changing British operational requirements, rarely if ever occurred before the Second World War from actions of the Australian Armed Services. They were content to accept British operational requirements as being applicable to the geographic areas in which Australian forces expected to operate, and relevant also to the tactics and strategy they expected to use. This circumstance tended to reduce the impulse to carry self containment into the technical area of modifying proven munitions to fit operational conditions more suitable to the Australian environment. The problem arose that when Australian inventors provided significantly improved performances for particular munitions which were not called for by the existing British operational requirements, or when revolutionary new ideas for which no appropriate operational requirement existed at all were developed, inventors gained no practical support from the Defence Department.

Before the First World War, Australian inventors were encouraged to send their ideas to Britain, because Australia had no technical ability to pass even preliminary judgement on military inventions. Inventors bore all the costs of transporting themselves and their ideas to Britain without even the official reassurance they were producing something which was potentially useful. Many were not prepared to take the financial risk without more indication that the effort was worthwhile. L.E.De Mole for example sent the blue prints of his designs while staying in Australia. De Mole's 1912 design of a tank was judged by the postwar British Royal Commission on Awards to Inventors, to have

anticipated the major features of the officially adopted tank design of 1915 and surpassed many other features[25]. But, without his advocacy in Britain, his design had been quietly pigeon-holed in the War Office where it was forgotten. In 1912 the British had no operational requirement for a tank and were not persuaded they needed one until after 1915.

The problem of financial cost was partially overcome during the First World War because the Australian Federal Munitions Committee (FMC) was prepared to invest in promising ideas from Australian inventors as a patriotic gesture towards the Empire war effort. This led to the emergence of a number of practical inventions, the chief of which were the Australian Gas Mask and the Welshberry Handgrenade. The former was designed by Professors Masson, Laby and Osborne of Melbourne University. Sufficient funds were invested by the FMC to develop a proper design to prove the gas masks practicality and 10,000 were ordered from industry[26]. The Australian Gas mask appears to have been more scientifically designed and more comfortable than the standard British gas mask which appeared at about the same time. However, it was not adopted because Britain had committed herself to her own model and was anxious for the Australian experiment to be terminated; probably because it was creating a multiplicity of types[27]. The Welshberry grenade followed a

25. E.Scott, *Australia During the War* ..., *op.cit.*, pp.251-252.

26. AA MP598, S40, Federal Munitions Committee Minute, 18 August 1915.

27. *ibid.*, Federal Munitions Committee minute, 10 November 1915. E.Scott, *Australia During the War* ..., *op.cit.*, p.252. It is equally probable that British authorities were protecting British manufacturers in rejecting the Australian invention. Many munitions of similar purpose existed side by side during the War, as new technical innovations were made, without the authorities being unduly worried by multiplicity of types.

similar history. Welsh's idea was proven to be practical, and orders were placed for 10,000 grenades per month. The grenade was thrown like a cricket ball and could cover significantly greater distances than the British grenade[28]. As with the gask mask, the FMC work ensured that the Welshberry grenade came to the attention of British authorities in a well developed form. The British Ministry of Munitions replied:

'... regret unable to accept this type. It has been found absolutely essential adhere to one pattern which has now been standardised and troops trained in its use. Most unadvisable introduce another pattern to which troops are not accustomed ...'[29].

Australian authorities did not feel able to continue with either invention in the face of British opposition and the need for commonality of munitions. It was the fate of most Australian inventions[30]. The British attitude was perhaps understandable, but Australian ingenuity had little opportunity to have any impact on munitions design. It was part of the cost of a close defence and technical alliance with a major power.

The rise of the MSB after the war, provided greater technical scope to

28. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 4, Volume 2, pp.409-411. AA MP598, S40, Federal Munitions Committee meeting 19 November 1915, S41 *The Age* newspaper 25 November 1915.

29. *ibid.*, S40, Federal Munitions Committee minute 39, 20 July 1916.

30. Except those of the AIF in France, which were oriented towards modification of existing munitions and based on great practical experience in their use. The British Inventions Board received twice the number of valuable suggestions from the AIF than all the rest of the Empire forces. Significantly, a special AIF Inventions Research Section with an experimental ground of its own, was formed within the British Inventions Board and the Australian section head invited to sit on the Board. This avenue tended to lead to greater acceptance by the British bureaucracy of Australian inventions for the duration of the war. See E.Scott, *Australia During the War ...*, *op.cit.*, p.249.

influence British munitions design than had existed before. It was not utilised in this manner, partly because of lack of finance with the winding up of the FMC, and also because the Australian Armed Forces were not interested in developing munitions which they knew had little possibility of being adopted by Britain. This led to the demise of the McCrudden machine gun which had shown exceptional promise in improved machine gun design. As Jensen commented, it cost a large sum of money to manufacture one gun for trial, and until that was done no one really knew whether it would be a success or failure. Good Australian inventions were encouraged by the Australian Inventions Board to go to Britain where the authorities were judged to be in a much better position financially and in other aspects, to fully test ideas[31].

In effect the pre First World War situation had returned. The only influence that Australia had on British munitions design was the MSB modifying specifications to substitute materials and/or modify manufacturing design to aid local industry. These changes did not influence Britain at all as the operational performance of the munition and commonality of components was always preserved. Thus native ideas from official or private sources which might have reflected the realities of the Australian environment and other likely areas of operations such as New Guinea, had little opportunity to be adopted. The result of this was that many aspects of the British munitions used by Australian Armed Forces were found to be poorly designed for operations in Australia or the jungles of New Guinea. British munitions were designed to operate mainly

31. Joint Committee of Public Accounts — minutes of evidence 1924, *op.cit.*, p.115, testimony of J.K.Jensen.

in a European environment which Australia had knowingly accepted with the UAB rule. Australia was unable to exercise influence to reward native inventors, or to reflect the Australian environment. During the 1920's and 1930's none of these aims had seemed particularly important to the Australian Armed Services. This would change with the Second World War when operations in and around Australia seemed more likely. British munitions began to be modified according to *Australian* operational requirements which did not necessarily resemble those of the British (e.g. 25 pdr Pack Howitzer). But the Australian Army would still balk at anything which was entirely and originally Australian such as the Owen Gun. This attitude stemmed from the UAB Rule, to which the Armed Services adhered rigidly during 1921 to 1941. It is clear that this aspect of the Imperial connection prevented the MSB from developing new munitions with different operational performances to those of Britain. The MSB never did achieve this aspect of self containment, as it was abolished before restraints were relaxed during the Second World War. However, there was much that the MSB did achieve, and it is to the growth of its scientific and engineering capabilities between 1921 and 1939 that we now turn.

The First Development Programme

British attitudes towards attempts within the Empire to set up local munitions supply organisations had not always been supportive. In regard to Australia during 1901-1914, British authorities doubted that sufficient technical competence was present, and tended to favour reliance on the more economical British sources. If British suggestions were made to begin production in Australia, it was in conjunction with a British firm specialising in the area. Thus

British markets, one is tempted to say, were preserved for British firms. There was considerable British commercial dissatisfaction when Pratt and Whitney penetrated the Australian munitions market with its winning of the contract to build SAF at Lithgow[32]. These attitudes underwent a change in governmental circles in Britain in 1917. Pressures of war, and the fear of Japanese action in the Western Pacific, led Britain to support a resolution in April, at the Imperial Conference, which encouraged the dominions to develop their own munitions supply organisations. The resolution was accepted by the Conference[33].

This sense of danger from Japan was not alleviated until the beginning of 1922 with the Quadruple Treaty of 13 December 1921 and the Washington Agreement of 6 February 1922. The Australian Prime Minister, W.M. Hughes, was encouraged in May 1922 to cut the finance for the Armed Services, particularly the Army, on which the progress of the MSB depended. Leighton had only just, in late 1921, gained agreement for his organisation of munitions supply in Australia and the acceptance of a modest three year program of development for munitions production capabilities. In December 1921 having made his own judgement of the likely course of negotiations in Washington, Leighton began to protect the prospects of his organisation. He decided that economies in defence expenditure were inevitable, and that the future of his organisation would be best served if it did not attempt to directly oppose such reductions. Some concessions would have to be offered, but at the price of achieving what the

32. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 2, Volume 1, pp.111-113. See also Annex A to this thesis.

33. AA CRS A3934, SC15[30] 'Military Material, Production within the Empire', March-November 1917.

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Table 2-2 PRODUCTION OF SMALL ARMS AND AMMUNITION IN AUSTRALIA 1912-1940

	RIFLES (new)	RIFLES (convtd)	VICKERS MG MKI	VICKERS MG MKV	SAA (.303")
1912/13	40				?
1913/14	4760				?
1914/15	13786	-			31 MIL
1915/16	30460				49
1916/17	23960				72 "
1917/18	23251				93 "
1918/19	42129				60 "
1919/20	25570				40 "
1920/21	20420				40 "
1921/22	14440				40 "
1922/23	2700				3 "
1923/24	3320				?
1924/25	3140				?
1925/26	2760				?
1926/27	2500				8 "
1927/28	2500				8 "
1928/29	2500				9 "
1929/30	340		2		5 "
1930/31	-		56		4 "
1931/32	-		80		2 "
1932/33	-		80		?
1933/34	300		80	10	?
1934/35	500		82	40	15 "
1935/36	1141	2622	89	92	15 "
1936/37	900	3100	48	50	15 "
1937/38	421	3560	37	74	15 "
1938/39	860	2500	35	96	25 "
1939/40	1700	500	507	305	76 "
TOTAL	22398	12282	1096	667	625+ MIL

NOTES 1. Rifle production begins 1913.
2. 1922/23-Nucleus production begins.
3. 1929/30-Rifle Factory closed down.
4. 1933/34-Rifle Factory reopened.

SOURCES History of Ammunition Factory Footscray MHS39;
History of Small Arms Factory Lithgow MHS41;
Munitions Digest October 1940;
Director General of Munitions Report No15;
DC Comm. Minute No28/31 of 24 August 1931,Appendix D;

MSB most valued at this time — a development programme[34].

The MSB had planned to implement the development programme outlined in Leighton's May 1919 report on munitions supply. But apart from envisaging the establishment of new munitions technologies such as machine gun production, gun ammunition, aircraft and field gun manufacture, advanced explosives production etc., the May 1919 program was also based upon the assumption that the existing Army requirements would demand that the SAF, SAA and Cordite factories continue production at late 1914 output (see Table 2-2)[35]. The arrival of large quantities of military stores from Britain, and the impending defence reductions, persuaded Leighton that this part of the program, which made up two-thirds of the total annual cost of £1,200,000, would be difficult to justify[36]. He thought it was unwise to use up MSB funds in production of SAA and rifles just to build up large material reserves which were no longer of any particular value in Australia's defence. But the development of new munitions capabilities would contribute significantly in the future to Australian security. Leighton's plan, which he revealed to the MSB on 15 December 1921, was to reduce all production in existing factories to a nucleus basis (i.e. the lowest level of production compatible with maintaining knowledge of production technique, and with bringing a factory quickly back to full production in an emergency)[37] and thereby save about £800,000 annually. The balance of the funds which

34. Joint Committee of Public Accounts — minutes of evidence 1924, *op.cit.*, p.6, testimony of A.E.Leighton.

35. *ibid.*, p.114, testimony of J.K.Jensen.

36. *ibid.*, p.6, testimony of A.E.Leighton.

37. Munitions Supply Board — Second Report 1 July 1922, to 30 June 1923. PP-F8720 of 31 July 1924, p.16.

were to have been earmarked for the MSB (about £400,000 annually) would then, according to Leighton, be used to support a more modest development programme, spread over six years rather than three, and a much reduced factory maintenance bill[38]. As each new munitions capability was created, it would also be placed on a nucleus basis similar to the existing factories.

The MSB agreed to Leighton's scheme, and he set out to persuade the Military Board that it too should support him. Unless the Military Board concurred, the MSB could not reduce its existing factories to a nucleus basis, and would be compelled to keep on producing large quantities of rifles and SAA. However, the Military Board saw the problem in the same manner as the Senior Officers Conference of 1920. It placed great value on the development of new munitions capabilities, and accepted Leighton's proposal. Thus when Leighton was summoned to meet the new Minister of Defence, W.Massy-Greene, on 19 January 1922 to discuss new defence reductions, his position was already well prepared[39].

Massy-Greene accepted Leighton's scheme, for the Hughes Government was publicly committed to some form of munitions development, and had invested large sums of money in buying British surplus munitions factory plant. It was Leighton who provided the practical form to government policy in this area. The Nucleus scheme was approved, and formed the major part of the Prime Ministers public statement in May 1922 on the new defence policy. Hughes

38. Joint Committee of Public Accounts-minutes of evidence 1924', *op.cit.*, p.6, testimony of A.E.Leighton; pp.114-115, testimony of J.K.Jensen. AA MP730 S8 Box 6, Volume 3, MSB Agenda 352 Meeting 15 December 1921.

39. Munitions Supply Board — Second Report, *op.cit.*, p.16.

claimed that the reductions of the Armed Services, particularly the Army, were balanced by his governments policy of developing new munitions capabilities under the MSB which would:

‘... provide the maximum national insurance at the minimum cost’[40].

This was a genuine concern for Hughes; he was not just interested in a cynical cost cutting exercise to earn himself political support. While he admitted in his statement that the agreements flowing out of the Washington Conference were the cause of the defence reductions, privately Hughes retained a deep suspicion of Japan, and of the willingness of the USA to act in support of the Agreements[41]. The innermost thoughts of the Government had probably been summarised by Leighton at the end of 1920 in an address to the Advisory Council on Scientific and Industrial Research:

‘... when such nations as America, Britain and Japan talk about disarmament, it only means that it suits them at the moment to stop locking up money and effort in the non-productive shape of warships and guns. It does not mean that they are disarmed, for an industrially developed nation cannot be disarmed. Exact knowledge of munitions production, a nucleus of skilled workers, supplies, and then within a few months a nation is transformed.

... the power to retain a strong position in the world depends ultimately, not on the possession at any moment of the ships, engines, and munitions of war, but on the extent and variety of the nation’s industries and the possession of knowledge to apply the resources of the industries quickly and effectively to the problems of war.

... Australia is not in the fortunate position of those countries that can

40. AA MP598 S30 Defence Policy statement by Prime Minister ... May 1922, *op.cit.* AA MP730 S8 Volume 3, MSB Agenda 381 Meeting 28 February 1922.

41. T.J.O’Rourke, *op. cit.*, unpublished Ph.D. Thesis, Queensland University, 1979, pp.107-108.

afford to contemplate “disarmament”, for she is not yet a manufacturing country ...’[42].

Hughes had no intention of exposing Australia to that extent. Contrary to the continued dependence on Britain through the Blue Water Strategy, and the developments in Washington, the Government would develop the MSB research and engineering capabilities, and they would develop the technical knowledge of materials and industrial processes, which one day could be taught to industry when it had progressed further[43].

The military technologies selected for establishment under the development programme covered munitions which had very high usage and wastage rates during wartime, i.e. SAA, gun ammunition, field guns, machine guns and pistols. The development of these technologies was to be spread over six years with a total annual expenditure of just under £500,000, of which approximately £350,000* was for the maintenance of existing factories and facilities, and the balance for developmental purposes. The principal omission in the Nucleus developmental plan, as compared to the 1919 plan, was aeroplane and engine production[44]. This was forced by financial limitations, and the Governments

42. *Science and Industry* Volume 11, No.12, December 1920.

43. AA MP598, S30, Defence Policy statement by Prime Minister ... May 1922, *op.cit.*, p.3, and also AA CRS AA1971/216 Miscellaneous Papers, Memo by Massy-Greene to Secretary of Defence Department 17 January 1923: ‘I wish to leave on record that it is essential that this branch [the MSB] shall proceed on well considered and defined lines to make progressive provision for the foundation of munitions manufacture in Australia’.

* £100,000, of this sum was a grant by the Government to provide nucleus production in factories which had no current orders. Products from this were supplied free of charge to the Armed Services.

44. Joint Committee of Public Accounts-minutes of evidence 1924, *op.cit.*, p.115, testimony of J.K.Jensen. AA MP730, S8, Box 6, Volume 3, MSB Agenda 381 Meeting

belief that an aircraft industry would emerge within commercial industry if given tariff protection and subsidies. It will be argued in Chapter 3 that this was a grave error of judgement.

The Governments policy towards the MSB received general support from within the Defence Department and Parliament. In a secret report on the state of Australia defence in 1923, the CGS, Major General Sir C.B.B.White, Professor J.W.Edgeworth David (Sydney University) and Captain G.F.Hyde (RAN) outlined the strategic importance of the Governments development of the MSB[45]. This view was repeated by senior servicemen when testifying before an enquiry by the Joint Committee of Public Accounts into the MSB during 1923/24[46]. The Committee in its report supported Leighton's approach to self containment, and also the Governments policy in developing the MSB[47]. The Inspector General of the Australian Military Forces, Lieutenant General Sir H.G.Chauvel, agreed with this conclusion in his report of 31 May 1924. While he had plenty to criticise in the operational state of the Army he could still say that:

'... the progress in the development of the scheme of supply laid down by the MSB is gradually putting the country in a more satisfactory condition'[48].

28 February 1922, Table H.

45. AA CRS A664, File 435/401/33 'Report on RAN College Jervis Bay and RMC 1923', Appendix 1.

46. Joint Committee of Public Accounts-minutes of evidence 1924, *op.cit.*, see particularly the views of Sir John Monash and Sir C.B.B.White.

47. 'Report from the Joint Committee of Public Accounts upon the Expenditure on Munitions Supply' 9 July 1924, PP-F14497, pp.17-19.

48. AA CRS A3934 SC15[50] 'Reports of Lieutenant General Chauvel'.

The Labor Party parliamentary opposition did not, during the first years of the MSB, have a clearly articulated policy in regard to self containment. Many Labor MPs were probably still in favour of it as they had been in 1916; but since the Labor Party split over conscription, the issues were now confused by anti-military attitudes. The Labor Party was reluctant to concede a major role to the Army in defence policy. This did not mean that it supported the Blue Water Strategy of the Government. In 1923, the Labor leader, Charlton, had begun to develop a defence policy which emphasised defence of Australia ahead of Empire commitments, and favoured aerial and submarine forces as the basis of local defence[49]. By July 1924, Labor Party thoughts had crystallised to also accept the concept of the MSB. F.M.Forde echoed Charlton's emphasis on the Air Force and submarines, and added convertible (government) factories that could be used for the production of small arms and aeroplanes in times of war and of farming implements in times of peace, as well as bicycles and motor cars[50]. This probably was influenced by the Report of the Joint Committee of Public Accounts upon the Expenditure on Munitions Supply of July 1924 [51]. The MSB subsequently enjoyed bipartisan support in Parliament which compensated Jensen for the effort he had made to inform the Committee of all the facts and figures pertaining to the MSB. Much of the Report read as if Jensen had written it himself[52]. As will be shown, the Labor Party when it

49. G.Long, *To Benghazi*, AWM Canberra ,1961, p.7. There is a reason to doubt the commitment of the Labor Party to these objectives, see J.M.McCarthy, 'The ALP and the Armed Services ...' in *Labour History*, November 1973.

50. CPD 1924, Volume 107, p.2597. Cited in G.Long, *To Benghazi*, *op.cit.*, p.9.

51. 'Report of the Joint Committee of Public Accounts upon the Expenditure of Munitions Supply' 9 July 1924, PP-F14497.

52. *ibid.*, and Minutes of Evidence ..., *op.cit.* J.K.Jensen, 'Defence Production ...',

gained office in 1929 was to show considerable favour to the MSB.

The Bruce Government's large increase in defence expenditure foreshadowed in 1924, outlined an increased emphasis on the importance of naval forces and the Blue Water Strategy. Despite the more obvious relegation of the Army than during the Hughes years, the MSB's development was unaffected. Bruce, like Hughes, was content to ignore the inconsistency of developing an organisation, the objective of which seemed to be to supply eventually adequate munitions to support an anti-invasion force, while his Government supported the development of a naval policy which rejected implicitly the need for such a large land force. The Minister of Defence, Sir Neville Howse, in his major policy speech, could talk of the large increases in expenditure on Australian naval power, reaffirm the importance of the Blue Water Strategy, and then with no sense of contradiction, spend the second half of his speech outlining the Government's policy on the MSB[53]. It would seem from this that Bruce did not entirely trust British assurances of naval protection. Some evidence of this was shown in his speech to Parliament on the Defence Equipment Bill of 1924, in which he said that Britain had shown shortsightedness in defence, by retrenching on the one power naval standard and on air defence, without consideration for the farflung reaches of some parts of its Empire[54]. Bruce gave further signs of uneasiness at various Imperial Conferences where he questioned British assurances[55].

op.cit., Chapter 8, Volume 6, pp.17-18.

53. AA MP598, S30, 'Australian Defence', Ministerial Statement by Sir Neville Howse, 29 September 1925.

54. CPD Volume 107, pp1702-1707, 27 June 1924.

55. See J.M.McCarthy, 'Air Power and Australian Defence ...', *op.cit.*, pp.70-74.

The support of the Bruce Government for the MSB's development programme led to a relatively uneventful period for munitions supply during the 1920s. The programme was implemented steadily, leading to the following groupings of factories in the vicinity of the Munitions Supply Laboratories at Maribyrnong: High Explosives and Filling (three factories — propellant, high explosives and filling), Ordnance (three factories — gun carriage, gun and shell forging), Ammunition (two factories — cartridge case, and fuzes), SAA (one factory)[56]. SAF at Lithgow was developed as a fifth factory grouping (three factories — pistol, machine gun and rifle). Jensen, as the secretary of the MSB, began to consolidate the accounting for all factory groups in the central administration office, where he would oversee it for the MSB. He also wanted to control all book-keeping, store-keeping, purchase and payment for stores. He claimed that there was no intention of interfering with the efficient management of factories and that everything would be done gradually, in agreement with factory management[57]. Leighton agreed to his subordinate's plan as it fitted into his concept of organisation. The MSB approved the scheme, and by November 1923 it was being put into operation[58]. The Chief Inspector, Lieutenant Colonel Gipps, complained bitterly, less than two years later, of the peaceful penetration and takeover of his Inspection Branch by Jensen, and the Chief Chemical Engineer, Brodribb. The MSB evidently thought that Gipps

56. AA MP730, S8, Box 6, Volume 6, MSB Agenda 805 Meeting 24 August 1923. The SAA factory became part of the Gun Ammunition factory group in 1928. *ibid.*, Volume 15, MSB Agenda 370 Meeting 10 May 1928.

57. *ibid.*, Volume 6, MSB Agenda 805 Meeting 24 August 1923.

58. *ibid.*, MSB Agenda 845 Meeting 2 November 1923.

was over-reacting for it did not respond to his complaints[59].

A further development in central organisation was the creation in 1925 by Leighton of a Technical Board. This was to consider questions concerning manufacture, inspection, conditions of storage and transport of munitions to the point of delivery to the Armed Services. Leighton was the President of the Board and the members were the managers of the government factories, the Chief Inspector, and the Superintendent of Laboratories. Other members could be summoned as the President thought necessary. In effect, the Technical Board dealt with anything which concerned the technical administration of the MSB and its organs. The interested parties were brought together to carry out a discussion of a problem, drawing on their joint knowledge and experience in finding a solution[60].

By 1929, the development program was almost finished and prompted an euphoric summary of achievement for the Parliamentary Paper 'Summary of Defence Development 1924/25-1928/29' by Jensen and his subordinate A.V.Smith. They claimed that the MSB had now established the engineering capability to manufacture field guns, gun ammunition, machine guns, bombs, fuzes, high explosives, smoke floats and depth charges etc. The MSB R and D Capabilities had been expanded to include not only the Munition Supply Laboratories, but also experimental grounds, test ranges and a new Chemical Defence Laboratory. An organisation had been built up that could respond to the demands of

59. *ibid.*, Volume 9, MSB Agenda 266 Meeting 25 June 1925, MSB Agenda 276 Meeting 16 July 1925.

60. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 8, Volume 6, pp.60-61.

91A FIGURE 1: GROWTH IN THE CAPABILITIES OF THE MSB [INCLUDES ONLY CAPABILITIES APPROVED UP TO SEPTEMBER 1939]

1921	1929/30	1930/31	1931/32	1932/33	1933/34	1934/35	1935/36	1936/37	1937/38	1938/39	1939/40	1940/41	1941/42
CENTRAL ADMINISTRATION CONTRACT BOARD CENTRAL DRAWING OFFICE	CENTRAL ADMINISTRATION CONTRACT BOARD CENTRAL DRAWING OFFICE												
MUNITIONS SUPPLY LABORATORIES CHEMICAL DIVISION EXPLOSIVES DIVISION	GENERAL CHEMICAL DIV. EXPLOSIVES AND AMMO DIV. METALLURGICAL DIVISION PHYSICAL DIV. CHEMICAL WARFARE DIV. SCIENTIFIC INFO. DIV.		ORGANIC CHEMISTRY LABORATORY					METROLOGY DIVISION CALORIMETRIC DIVISION	NEW CHEMICAL WARFARE LABORATORY AND FACTORY	EXTENSIONS METALLURGY DIVISION EXTENSIONS METROLOGY DIVISION	OPTICAL LABORATORY AND FACTORY EXTENSIONS TO CHEMICAL WARFARE FACTORY AND LABORATORY	EXTENSIONS CHEMICAL DIVISION	
INSPECTION BRANCH CENTRAL SECTION SMALL ARMS SAA	AIRCRAFT SECT. STORES SECT. GUN AMMO SECT. EQUIPMENT SECT. GUN AND CARRIAGE SECT. SAA SECT. SMALL ARMS SECT. TESTING STATIONS NSW AND VIC PROOF AND RECOVERY RANGES SA						ENGINEERING AND SIGNAL STORES SECTION	EXTENSIONS GUN AMMO SECTION EXTENSIONS PROOF AND RECOVERY RANGE S.A.	EXTENSIONS GUN AMMO SECTION	PROOF RANGE VIC. EXTENSIONS PROOF AND RECOVERY RANGE S.A. EXTENSIONS SAA SECTION	EXTENSIONS TO TESTING STATIONS. VIC. EXTENSIONS GUN AMMO AND SAA SECTIONS	EXTENSIONS PROOF AND RECOVERY RANGE. S.A. NEW H.Q. BUILDING	
HIGH EXPLOSIVES AND FILLING GP. CORDITE FACTORY ACETATE OF LIME FACTORY LABORATORY	CORDITE FACTORY HIGH EXPLOSIVES FACTORY FILLING FACTORY LABORATORY ACETATE OF LIME FACTORY					ACETATE OF LIME FACTORY DISMANTLED		NAVAL S.C. FACTORY	EXTENSIONS NAVAL S.C. FACTORY	EXTENSIONS TMT FACTORY EXTENSIONS PROPELLANT FACTORY EXTENSIONS FILLING FACT.	EXTENSIONS TO FILLING FACTORY TOOL ROOM	NO.2 TNT FACTORY	PYROTECHNIC FACTORY
SMALL ARMS GROUP RIFLE FACTORY LABORATORY TOOL ROOM	RIFLE FACTORY MACHINE GUN FACTORY PISTOL FACTORY MACHINE TOOLS AND TOOL ROOM LABORATORY										NEW TOOL ROOM	BREN GUN FACTORY	
AMMUNITION GROUP NO.1 SAA FACTORY (OWNED BY CAC)	NO.1 SAA FACTORY (ACQUIRED BY MSB) CARTRIDGE CASE FACTORY FUZE AND PRIMER FACTORY CAP ROLLING MILLS AND GROUNDING LABORATORY							NEW TOOL ROOM	EXTENSIONS TO NEW TOOL ROOM EXTENSIONS TO CC FACTORY	FUZE AND PRIMER FACTORY EXTENSIONS NO.2 SAA FACTORY	NO.2 TOOL ROOM NO.2 FUZE AND PRIMER FACTORY NO.2 CC FACTORY	NO.3 CC FACTORY NO.2 CAP FACTORY	
ORDNANCE GROUP GUN AND CARRIAGE FACTORY GUN AND SHELL FORGE FACTORY TOOL ROOM WOODWORK SHOP			AIRCRAFT SHEET METAL SECTION			PROJECTILE FACTORY	PLATE SECTION SHEET METAL AND AIRCRAFT FACTORY	EXTENSIONS GUN AND CARRIAGE FACTORY NEW TOOL ROOM EXTENSIONS GUN AND SHELL FORGING FACTORY	EXTENSIONS GUN AND SHELL FORGING FACTORY EXTENSIONS TO TOOL ROOM	EXTENSIONS PROJECTILE FACTORY EXTENSIONS GUN AND CARRIAGE FACTORY	NEW SHEET METAL FACTORY EXTENSIONS GUN AND SHELL FORGING FACTORY	NO.2 GUN AND CARRIAGE FACTORY DEPTH CHARGE AND SMOKE FLOAT FACTORY NO.2 PROJECTILE FACTORY	NO.2 GUN AND SHELL FORGING FACTORY

war[61]. The new capabilities which existed in 1929 are listed in Figure 1, and employment within the MSB is indicated in Annex AA.

A great improvement had indeed been wrought over the situation which had existed in 1921, but the MSB was in no position to respond to the demands of war. The basis of the development program had been that as each new factory was completed, it would join the older ones, on a nucleus production basis. This meant that no experience in mass Production could be gained, or maintained as there was no effective production programme, and this was the price Leighton had had to pay to get his development program in 1922. Thus the strategy of self containment had only been implemented to Level 3 of Figure 3 of Annex A. In some cases, such as the ordnance factory, almost no experience was gained in even Tool Room production of guns, as no orders were forthcoming from the Military Board. The nucleus staff was kept busy doing odd jobs for the armed services for which their factory equipment was appropriate.

Surviving the Depression

Even as his two subordinates were congratulating themselves on the Nucleus development programme, Leighton knew he faced two problems which could destroy all the achievements of that programme. They both grew out of the economic recession of 1928, which in 1929 was worsening, with a consequential reduction of government funds for the MSB.

MSB funds came in two main categories: the Maintenance Vote, and the Capital Vote. The former financed the day to day operations of all instrumen-

61. AA MP598, S30, Box 9, Minute to MSB by A.V.Smith, 6 August 1929.

talities of the MSB, including salaries, cost of production and raw materials etc. The latter provided funds to build new buildings, and to acquire new plant and machinery.

Leighton's first problem was that by the financial year 1928/1929 it was clear that the Government's Capital Vote for the MSB was declining sharply and would shortly become insignificant. Any large industrial organisation which does not maintain a moderate capital investment programme to replace old buildings, plant and machinery, finds that it faces the problem of creeping obsolescence. It begins to find difficulty in manufacturing modern goods and keeping up with technological developments in industrial technique. Eventually, instead of the capital value of all buildings, plant and machinery, being maintained or increased, the capital value begins to decline sharply with increasing age and obsolescence. Significant parts of Leighton's empire were showing signs of creeping obsolescence in 1928/29. The Propellant factory (originally the Cordite factory) of the High Explosives and Filling group, had been operating since 1912 with comparatively little change to its buildings, plant or machinery. New technical developments in cordite now threatened to make its products outdated. The SAA factory of the Ammunition group dated from before 1900. It operated ageing plant from old and dilapidated buildings, which increased the ageing process of the plant. The Rifle factory from SAF had also started operations in 1912, when it was the most modern rifle factory in the world. Now there were newer techniques which needed to be absorbed, and more advanced machinery available. Without a significant Capital Vote of about £80,000 annually, the efficiency of one half of Leighton's organisation would collapse in a few

Table 2-3 CAPITAL ASSETS OF THE MSB 1921/22-1939/40

YEAR	BUILDINGS AND LAND		MACHINERY AND PLANT		CAPITAL ASSETS	
	CUMULATIVE VALUE (£)	ANNUAL INCREASE IN VALUE (£)	CUMULATIVE VALUE (£)	ANNUAL INCREASE IN VALUE (£)	CUMULATIVE VALUE (£)	ANNUAL INCREASE IN VALUE (£)
1921/22	297,381	--	358,393		655,774	
1922/23	238,003	-59,378	353,303	- 5,090	591,306	-64,468
1923/24	346,079	108,076	416,911	63,608	762,990	171,684
1924/25	489,192	143,113	687,015	270,104	1,176,207	413,217
1925/26	761,499	272,307	821,756	134,741	1,583,255	407,048
1926/27	929,577	168,078	1,081,968	260,212	2,011,545	428,290
1927/28	1,006,655	77,078	1,217,595	135,627	2,224,250	212,705
1928/29	1,035,218	28,563	1,299,743	82,148	2,334,961	110,711
1929/30	1,064,037	28,819	1,360,683	60,940	2,424,720	89,759
1930/31	1,065,747	1,710	1,401,514	40,831	2,467,261	42,541
1931/32	1,067,347	1,600	1,436,884	35,370	2,504,231	36,970
1932/33	1,082,998	15,651	1,429,363	- 7,521	2,512,361	8,130
1933/34	1,099,845	16,847	1,467,620	38,257	2,567,465	55,104
1934/35	1,154,447	54,602	1,513,997	46,377	2,668,444	100,979
1935/36	1,186,976	32,529	1,538,060	24,063	2,725,036	56,592
1936/37	1,232,577	45,601	1,642,356	104,296	2,874,933	149,897
1937/38	1,321,533	88,956	1,810,769	168,413	3,132,302	257,369
1938/39	1,706,063	384,530	2,323,399	512,630	4,029,462	897,160
1939/40	2,478,750	772,687	3,261,705	938,306	5,740,455	1,710,993

Sources

Annual Reports of the MSB to Parliament (Including Unpublished Report for 1938/39).

Note

1. Derived from Report of Department of Munitions, 'Organisation, Production Programme and Designed Capacity', 31 December 1940.

J.K. Jensen, 'Defence Production ...', op. cit., Chapter 10, Volume 10, pp. 44-45.

years — followed by the newer factories and the Munitions Supply Laboratories about 10 years later.

The solution to this problem rested on Leighton's ability to persuade the Australian Government to continue to invest capital in the MSB. Table 2-3 shows that he was not successful for some years. By 1932/33 annual capital investment in machinery and plant, and buildings and land, had declined to almost nothing. The halcyon years of high capital investment were 1924/25 to 1926/27, when the Nucleus development program was being funded. There were still some vestiges of this program in 1927/28; but by 1928/29 the slide had begun with no new capital investment projects being initiated, and very few old ones remaining to be finished.

Creeping obsolescence was a worrying problem, but it was not the most critical; this priority was reserved for Leighton's second problem, the Maintenance Vote for the MSB. As the economic crisis, known eventually as the Great Depression, continued to emerge, the Australian Government began to cut back the scale of the Maintenance Vote for the MSB. The size and efficiency of the organisation Leighton had created could not survive if government did not support the annual maintenance expenses of the MSB.

There were two potential solutions which could be applied. The Maintenance Vote was made up of two broad items, Expenditure and Credits. Expenditure was the total annual cost of operating expenses of the MSB, including wages, raw materials, electricity, etc. Credits was the annual value of products made by the MSB. Thus the Maintenance Vote was annual Expenditure minus

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Table 2-4 MAINTENANCE COST OF THE MSB 1921/22-1938/39

YEAR	EXPENDITURE (£)	CREDITS (£)	BALANCE OF GOVERNMENT EXPENDITURE (£)
1921/22			53,664
1922/23	229,498	16,409	213,089
1923/24	232,037	5,331	226,706
1924/25	327,915	108,982	218,933
1925/26	500,887	240,456	260,431
1926/27	567,762	308,280	259,482
1927/28	509,816	252,689	257,127
1928/29	485,978	235,764	250,214
1929/30	443,753	225,980	217,773
1930/31	451,526	254,363	197,163
1931/32	627,643	457,488	170,155
1932/33	686,877	517,192	169,685
1933/34	747,314	551,210	196,104
1934/35	973,499	710,803	262,696
1935/36	1,133,079	856,774	276,305
1936/37	1,383,502	1,102,736	280,766
1937/38	1,629,502	1,261,079	368,423
1938/39	2,236,385	1,779,534	456,851

Sources

Annual Reports of the MSB to Parliament (Including unpublished Report for 1938/39).

Budget Notes from Treasury Papers in Parliamentary Papers for 1922-25.

annual Credits. If Leighton could lift the annual Credits of his organisation, this would offset Expenditure to a greater amount, requiring a smaller Maintenance Vote from the Government. In this way the required Maintenance Vote was more likely to correspond to the actual sum granted by the Government. If Leighton failed to lift Credits sufficiently, the way to make up the difference would be to reduce Expenditure. Since his organisation was already operating on only a nucleus basis, such economy could only be achieved by closing down some factories in the hope that the rest could fit their Expenditure and Credits to the reduced Maintenance Vote the Government would grant. This solution was the more drastic as it involved sacrificing a part of the organisation built up since 1921, in order to save the rest of it.

The struggle to balance the books began during the financial year of 1928/29. The permanent Maintenance Vote envisaged at the conclusion of the Nucleus development programme was £392,200 yearly^[62], but as the programme drew to a close in 1929, the actual Maintenance Vote estimate sank well below this figure. Table 2-4 outlines the annual rate of MSB Expenditure and Credits between 1922/23 to 1938/39, and indicates the balance actually paid by the Government. It must be remembered that in effect the Government nominated how much it would advance at the start of each financial year for Expenditure, and Leighton and the MSB then had to adjust Expenditure and Credits to ensure that the balance (or Maintenance Vote) approached the final or corrected Maintenance Vote the Government wanted at the end of the financial year.

62. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 8, Volume 6, pp.45-46.

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Table 2-5 ORDERS RECEIVED FOR MUNITIONS BY THE MSB

YEAR	ARMY (£)	NAVY (£)	AIR FORCE (£)	OTHER GOVERNMENTS		
				TOTAL (£)	ORDERS FROM NEW ZEALAND (£)	INDIA (£)
1927/28	82,000	13,838	2,470	?	206	-
1928/29	89,939	3,660	3,653	?	3,343	-
1929/30	86,607	7,112	9,117	8,088	7,648	-
1930/31	77,409	22,811	7,471	4,301	3,744	-
1931/32	53,517	21,574	11,092	163	163	-
1932/33	45,399	33,879	21,693	9,244	9,150	-
1933/34	74,936	47,476	24,311	11,242	11,242	-
1934/35	240,612	63,200	12,348	62,953	62,953	-
1935/36	175,623	65,262	20,469	9,227	4,342	-
1936/37	331,242	181,887	31,342	41,017	13,149	?
1937/38	680,145	265,459	65,772	63,223	32,340	29,237
1938/39	1,757,539	137,708	82,619	39,689	16,080	22,049

Notes

1. New Zealand figures quoted in MP598, S30, Box 9, Jensen to MSB 22 March 1937, and Jensen, 'Defence Production ...', op. cit., Chapter 8, Volume 6, p. 73.
2. Figures from MSB Reports to Parliament.
3. The balance of orders from other governments were made up by small sales to British dependencies in the Pacific.

The first skirmish came in February 1928, when the Bruce Government realised that it could not complete its defence development programme in 1928/29 as planned, and ordered large cuts to the defence budget to help balance a fall in Government revenue. Leighton refused to accept the £40,000 portion which the Defence Committee assigned to the MSB[63]. His argument was that all factories were already operating on a nucleus basis, and the MSB could only make cuts by dismissing employees, thereby ending any form of production in certain factories. The Defence Committee overrode Leighton, so he appealed to the Minister of Defence, and the MSB's amount was reduced to £10,000[64], which Jensen was able to accommodate without too much disruption by adjusting factory balance sheets.

The Government would not accept Leighton's argument for the next financial year. The Government's advance for Expenditure for 1929/30 was £30,000 less than the previous year (i.e. £217,000)[65] ; and the Government expected the final Maintenance Vote at the end of the financial year to reflect this cut in funds. The only way this could be done without dismissing staff and closing factories was to increase Credits. However, orders from the Armed Services had been declining or stagnating, because of Government economies in defence (see Table 2-5) and the drastic reduction of the grant for nucleus production (hitherto used to ensure some limited production for factories holding no Armed Service orders). Work carried out for other government departments as well as for state governments was also declining (see Table 2-6). The MSB

63. AA Defence Committee Minute CRS A2031 of 15 February 1928.

64. *ibid.*, Defence Committee Minute of 11 July 1928.

65. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 8, Volume 6, p.44.

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Table 2-6 VALUE OF ORDERS RECEIVED BY MSB 1929-32 (Excluding the Clothing Factory)

FACTORY GROUP	DEFENCE (£)	OTHER FEDERAL DEPARTMENTS (£)	STATE GOVERNMENTS AND SEMI GOVERNMENT BODIES (£)	COMMERCIAL INDUSTRY (£)	TOTALS (£)	PERCENTAGE VALUE OF NON DEFENCE ORDERS TO TOTAL ORDERS
<u>1929/30</u>						
SAF	8,404	529	25	7,241	16,199	
Ammunition	56,505	445	-	2,144	59,094	
Explosives	27,491	301	3,245	2,669	33,706	
Ordnance	10,418	9,143	-	215	19,776	
TOTAL	102,818	10,418	3,270	12,269	128,775	20
<u>1930/31</u>						
SAF	18,893	1,405	16	32,707	53,021	
Ammunition	31,009	446	-	6,691	38,146	
Explosives	20,239	355	6,458	3,120	30,172	
Ordnance	37,550	6,487	98	2,212	46,347	
TOTAL	107,691	8,693	6,572	44,730	167,686	36
<u>1931/32</u>	(Approximate)					
SAF	23,340	850	10	21,800	46,000	
Ammunition	36,210	1,830	205	24,000	62,245	
Explosives	5,000	2,213	165	2,469	9,847	
Ordnance	20,000	1,000	250	12,470	33,720	
TOTAL	84,550	5,893	630	60,739	151,812	44

Source

AA CRS A664 File 474/401/452, Leighton Memo 23 February 1932 'Munitions Supply Factories etc.: A Statement Regarding Policy and Revenue of ...'.

did carry out a certain amount of work for commercial industry, and this was the only area of its activities which could be expanded to improve Credits. The problem here was that the Bruce Government, and that of Hughes before it, would not allow the MSB to compete directly with any section of commercial industry to supply an industrial demand. The policy was that the MSB could produce goods which were not manufactured anywhere else in Australia[66]. If the MSB developed a profitable line of production, it was usually grabbed eventually by a commercial firm which could see the potential market[67]. The effect of this Government policy was to limit the MSBs commercial ventures to many one or two-off jobs of an advanced technical nature, which it could complete more cheaply than an overseas firm. It was clear to Leighton that he could not expand this form of production enough to make up the shortfall in funds from the Government. This left one alternative; a part of the MSB organisation would have to be closed down, and its staff dismissed.

The MSB met on 20 June 1929 to decide where this action would be taken. The choice was the Rifle Factory at SAF. This had been operating on a nucleus basis since 1922 producing 3000 rifles per annum. The plan had been to preserve sufficient skill and capability so that within one year of an emergency, the Rifle Factory could attain an annual production rate of 50,000 rifles[68]. Now this had to be abandoned because of the economies forced on the MSB,

66. Report of the Munitions Supply Board 1929-1931, PP-F3474 of 26 May 1933, p.8. Government policy was established by a Cabinet Minute of 9 March 1920, see AA MP730, S8, Box 4, see CRS A2717, Volume 2, Meeting 10 February 1920, 9 March 1920.

67. AA MP730, S8, Box 4, MSB Agenda 1927/868.

68. AA MP730, S8, Box 8, Volume 17, MSB Agenda 367, Meeting 20 June 1929.

and the preference of the Minister of Defence and Leighton for continuity of nucleus production in the High Explosives and Filling group of factories, as this underpinned nucleus production in the Ammunition group and the development of gun ammunition[69]. The termination of production in either group vitally affected the other. Rifle production was the biggest activity in the SAF group, but it affected no other group. It could be terminated, and the reduced activities at SAF directed towards the development of nucleus machine gun production. This cushioned some of the effect at SAF, but the MSB realised that a force of very skilled workmen and a fund of practical skill of great value would be lost[70].

The Australian economic situation continued to deteriorate during the second half of 1929, with the prospect of more financial cuts being imposed on the MSB. The restricted number of options open to Leighton meant that more factories would probably have had to be placed on a care and maintenance basis. But Leighton and his organisation were saved partially by the advent of the Scullin Labor Government, which came to power on 22 October 1929. It removed the restrictions on commercial trading which had hitherto bound the MSB factories[71]. The Government's new policy of import restrictions also

69. *ibid.*

70. *ibid.* See also Agenda 369 and 370, Meeting 20 June 1929.

71. Report of the Munitions Supply Board 1929-1931, *op.cit.*, p.8. The Prime Minister (Scullin) directed that the MSB could now compete directly with private firms for all goods to state and Australian Government departments. Australian Government Departments were ordered to give preference to MSB factories. Scullin also approved the MSB accepting any orders which were *offered* even if they were in competition to commercial interests. The Labor Government later approved the employment by the MSB, in 1930, of commercial travellers. AA MP730, S8, Box 4, MSB Agendum 79, Meeting

promised new markets for the MSB as organisations would turn to its advanced engineering shops to supply complicated items of equipment which had come, previously, from overseas[72].

With the change in trading rules, the problem which confronted the MSB was how to get a financial advance to bankrole the production of commercial orders. Money was not available in early 1930, except from the Treasurer's advance, which had to be repaid by 30 June. This gave insufficient time; so Jensen borrowed the proceeds of an auction of surplus and obsolete MSB plant (which should have been used to buy replacement plant) and borrowed the profits of the Ammunition Factory group (which should have been used to purchase replacement materials). Showing the admirable disregard for regulations and political authority he revealed over plant and machine tool purchases in 1919, Jensen used this money to finance the other MSB factories for commercial orders — in total disregard of the Treasury regulations[73].

Within 18 months the MSB had boosted the level of its commercial trading by over twice the 1929/30 figure. Table 2-6 shows the Defence orders for 1929-1932, and those from other bodies accepted by the MSB for commercial reasons. The percentage value of such commercial orders, measured against the total value of *all* orders accepted was 20 per cent for 1929/30, 36 per cent for

12 November 1929.

72. C.B.Schedvin, *Australia and the Great Depression ...*, Sydney University Press, 1970, pp.140-143. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 8, Volume 6, pp.45-46. This generated great interest from importing firms seeking to supply their normal goods. Other firms wanted to compete with imports by using goods made by MSB factories. MP730, S8, Box 4.

73. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 8, Volume 8, pp.405-406.

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Table 2-7 VALUE OF PRODUCTION OF MSB FACTORIES (excluding Clothing Factory and Acetate of Lime Factory)

YEAR	TOTAL VALUE OF PRODUCTION (£)	APPROXIMATE VALUE OF COMMERCIAL PRODUCTION (£)	PERCENTAGE OF COMMERCIAL PRODUCTION TO TOTAL PRODUCTION	VALUE OF PRODUCTION FOR ARMED SERVICES AND NEW ZEALAND (£)
1922/23	94,076	7,784	8.3	86,292
1923/24	102,748	5,587	5.4	97,161
1924/25	117,214	5,077	4.3	112,137
1925/26	88,841	4,285	4.8	84,556
1926/27	117,476	7,268	6.2	110,208
1927/28	158,469	3,901	2.5	154,568
1928/29	153,313	4,922	3.2	148,391
1929/30	151,558	13,722	9.0	137,836
1930/31	154,223	37,243	24.1	116,980
1931/32	226,942	62,303	27.5	164,639
1932/33	243,067	72,944	30.0	170,123
1933/34	268,606	80,171	30.0	188,435
1934/35	398,447	87,730	27.5	310,717
1935/36	390,100	92,221	23.6	297,879
1936/37	507,774	135,626	26.7	372,148
1937/38	665,543	130,464	19.6	535,079
1938/39	1,088,938	45,760	4.2	1,043,178
1939/40	2,962,000	-	-	2,962,000

Note. This table is based on Annex B.

The 'Total Value of Production' is not comparable to 'Credits' in Table 2-4. The latter is a statement of what the whole MSB produced each year and includes all factories, excluding the Clothing Factory (but including the Acetate of Lime Factory); includes sales of factory products to other MSB factories; includes the value of free issues of munitions to the Armed Services under the nucleus production scheme; and finished product on hand. The 'Total Value of Production' seems to refer to a much simpler notion of credits, and is based on a different method of accounting. It cannot therefore be compared with 'Credits' in Table 2-4.

1930/31, and about 44 per cent for 1931/32. This is not as good a measure as the value of actual production. Table 2-7 gives the value of production at MSB major Factory Groups, and the approximate value of commercial trading operations, for 1922-1940. The value for commercial trading is certainly higher than stated, but Table 2-7 still reveals the steep rise from nine per cent in 1929/30, to 24 per cent in 1930/31, and to 27 per cent in 1931/32. It was still over 28 per cent in 1933/34. Detailed statistics are presented in Annex B on the value of production, by different Factory groups, of the MSB between 1922 and 1940.

Thus the MSB was able to absorb further cuts to its Maintenance Vote by the Government, and the consequences of the general stagnation in orders from the Defence Forces[74], without much difficulty for as long as it was given complete freedom to engage in commercial trading. Table 2-4 shows that Expenditure actually declined significantly in 1929/30, and stayed low in 1930/31. This was achieved through economies such as staff reductions, reductions of salaries, and deferral of regular maintenance of factory buildings and plant[75]. This would not have been enough to absorb the Governments reductions to the Maintenance Vote of the MSB, except that the MSB was able in 1930/31 to raise significantly the Credits of its organisation, despite the Great Depression's

74. Armed Service demands for clothing from the Clothing Factory were not declining, but since this factory had always been run as a separate trading venture with separate accounts from the rest of the MSB factories, it is inappropriate to include it here.

75. AA Defence Department CRS A664 File 646/401/709, Statement by Prime Minister showing savings affected in Defence Department since the Labor Government had been in office 17 March 1931. Refer also to the Financial Emergency Act which reduced all wages of Australian Government employees by 20 percent.

adverse effect on the Australian economy, and the Government's finances. In 1931/32, Expenditure increased steeply, but so did Credits even more sharply. The major part of this improvement was the great success in commercial trading.

The rest of the Defence Department did not fare so well. The Scullin Labor Government insisted on heavy curtailment of the activities of the Defence Forces, including the possible abolition of the Air Force as a separate service[76]. Despite rigorous protests by the Defence Committee, the 1930/31 Defence budget was reduced drastically from £4,513,500 in 1929/30, to £3,767,000[77]. The Defence Forces did not have the MSB's capability to absorb cuts without a collapse in operational efficiency.

The MSB was favoured initially by the Labor Government because it complemented Scullin's economic policy. Australia faced a chronic balance of payments problem, and the shortages of foreign exchange forced the Government to raise tariff barriers drastically to reduce imports. The MSB was seen to be capable of supplying many engineering and chemical products which had hitherto been imported. The technical versatility of Leighton's factories and laboratories made them important components of Scullin's import replacement scheme. An example of this policy is that up to 1931, the greater part of brass and nickel *sheet* and *strip* and allied non-ferrous products, had been imported. Following a suggestion from a commercial organisation, Leighton applied to

76. AA CRS A5954, Box 1012, see also J.M.McCarthy, PhD thesis, *op.cit.*

77. AA CRS A2031, Defence Committee Minute 15 of 7 April 1930, and 19 of 11 April 1930. CRS A664, File 646/401/709, Statement by the Prime Minister, 17 March 1931, *op.cit.*

Cabinet in November 1930 for a tariff of 25 per cent and 40 per cent on brass and nickel sheets respectively, to enable the rolling mills of the Ammunition Factory group to capture this market. Cabinet approved this scheme, and the MSB replaced foreign imports in this area by rolling Australian produced non-ferrous metals[78]. In other circumstances, where the Government had been more arbitrary in imposing new tariffs, manufacturers importuned the MSB to make components which had hitherto been imported but were now effectively denied to them. Thus GMH approached the MSB to make motor car axles, because the MSB was the only organisation with the technology and experience in Australia capable of doing the job properly[79]. The MSB made many similar complex items to aid other companies, and government bodies. Such items included electrical meters, sound projectors, universal joints, shock absorbers and car springs. Less complex components were sheep shearing combs and cutters, golf irons, refrigerator parts, gear blanks, paints and lacquers[80].

While the Scullin Government thought that it was wasteful to have the equipment and knowledge of the MSB unused[81], and had found a commercial use for it, the Government also valued the MSB's role for the defence of

78. Report of the Munitions Supply Board 1 July 1929 to 30 June 1931, PP-F3474, p.12. AA CRS A3264, Volume 1, Cabinet Meeting 26 November 1930. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 8, Volume 7, pp.196-204. See also Annex B, Ammunition Factory Group, Commercial Orders

79. D.P.Mellor, *The Role of Science and Industry ...*, *op. cit.*, p.25. AA CRS A664 File 474/401/452, Jensen, February 1932. See also AWM 74 Box3 Bundle1, Daley to Mellor 27 April 1954. This describes the project.

80. *ibid.*, pp.25-26. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 8, Volume 8, pp.384-441. CSIRO Archives S404, Esserman Tapes, Interview with Waldersee, No.1, Tape 3.

81. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 8, Volume 7, pp.263-264.

Australia. In May 1930, the Defence Minister, A.E.Green, approved Leighton's idea of making Naval Solventless Cordite; in effect initiating the development of a major new capability for the manufacture of big gun ammunition (6" Calibre and above) in Australia[82]. Green was told by Leighton that the scheme would initially cost £25,000 for changes to the propellant factory, but the Defence Minister ordered that preliminary investigations and work should proceed immediately[83]. This planning began despite the agreement of August 1930 by the Australian and State Governments, that approval was not to be given to the undertaking of any new public works which did not yield to the Treasury concerned, a revenue at least equal to the service of the debt interest and sinking fund[84]. In July 1931, the Government requested the MSB to outline a new development programme[85]. However, before any Cabinet decision could be taken, the Scullin Labor Government lost office.

A new Government was formed under J.A.Lyons in December 1931. The Great Depression was deepening, wreaking havoc on Australian Government finances. In the financial year 1930/31, the Government had run a deficit of

82. AA MP598, S30, Box 9, Leighton to Secretary of Defence, 29 May 1930.

83. *ibid.*, Green approved in note on Leighton's minute of 29 May 1930.

84. AA MP598, S30, Box 9, Secretary of Defence to Jensen, 18 September 1930. It is interesting to note from Table 5 that the Navy's renewed interest in big gun cordite production in Australia, coincides with a dramatic increase of naval orders on the MSB. Hitherto most naval munitions were obtained from the Admiralty as mentioned previously. This needed foreign exchange. Could it be that the Scullin import replacement scheme forced the Navy to redirect its interest towards the MSB as the Navy's major supplier? It seems quite plausible.

85. AA MP598, S30, Box 9, Secretary of Defence to Jensen, 16 July 1931, Jensen to Secretary of Defence, 30 July 1931.

nearly £11 million[86]. The Defence budget had declined from £5,403,840 in 1927/28 to £3,767,000[87]. The Defence Department expected that worse would follow in 1931/32. National income had fallen from £650 million in 1927/28 to £485 million in 1930/31, and was expected to be £450 million in the next financial year. Unemployment, which was approaching 30 per cent of the workforce, was costing the Australian Government £12 million annually in unemployment relief, and was expected to reach £15 million in the next year. The Defence Department concluded that the growing Government expenditure, coupled with further large deficits, was likely to threaten the Department's financial allotment even more[88].

This was correct, and during July 1932, the MSB was informed that its share of the £100,000 reductions was £25,000 for 1932/33[89]. If the MSB had still been free to boost actively its commercial sales, it might have been able to absorb this further cut to its Maintenance Vote. However, the Lyon's Government, under pressure from the Chambers of Manufacturers of Victoria and NSW, had restored the old restrictions on commercial trading by the MSB. The commercial travellers employed were now all dismissed[90]. But the Gov-

86. L.F.Giblin, *The Growth of a Central Bank*, Melbourne University Press, Melbourne 1951, p.250.

87. AA CRS A2031, Defence Committee Minutes 13 February 1928 and 11 April 1930.

88. AA CRS A5954, Box 971, 'Report on Budgetary Equilibrium in Australia 1931', 5 June 1931. L.F.Giblin, *Central Bank*, *op.cit.*, p.125, see also pp.83, 102, 124 for the deficits of the states and Australian Government.

89. AA MP598, S8, Box 1, Item 2, Box 2, Item 5.

90. Report of the Munitions Supply Board 1931-1933, PP-F5696 of 14 March 1935, p.9. AA Cabinet Records 1932-9 CRS A2694 Volume 2, Agendum 109 of 14 March 1932 (Memo to Cabinet by G.F.Pearce 11 March 1932). AA MP730, S8, Box 4, Commercial orders could be accepted provided the Defence Minister was satisfied that such work

ernment did not cancel the orders accepted by the MSB before December 1931, and new orders continued to arrive, despite the opposition of the Chambers of Manufacturers[91]. This was because tariffs had remained high and the MSB, in most of its commercial ventures, was not competing directly with Australian industry, but replacing imports[92]. The net result was that business continued to expand, but not at the rate to cover the Governments latest reductions of the MSBs Maintenance Vote. Leighton took a pessimistic view:

'It is evident ... that the Manufacturers as a body are opposed to the Munitions Factories continuing to make articles of a commercial nature; ... it is unnecessary to argue that we embarked on such work with good intent, or that we have played, and continue to play a useful part. The fact is that the public can be influenced against us and that those who now demand or distribute our products will probably be submitted to pressure that will be resisted at their peril.

... it appears to me that a situation is developing which spells the end of our commercial work, ...'[93].

This proved to be incorrect, as Table 2-7 indicates. Commercial work continued to be important until 1938/39. The Chambers of Manufacturers were unable to make an effective case of the MSBs 'competition'. Even when Australian manufacturing firms decided they wanted to take over areas of MSB commercial

could not be done in Australia satisfactorily either in quality or quantity. In cases of uncertainty the Tariff Board was to be consulted. The existing business agreements were to be continued as they were legally binding, but reviewed as opportunity offered.

91. AA MP730, S8, Box 4. See also Table 2-7; commercial production for the main Factory groups continued to increase, despite the restrictions.

92. Report of the Munitions Supply Board 1 July 1929 to 30 June 1931, p.8. See also J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 8, Volume 7, pp.196-204, 218-220, 261-266, 295-311. This shows in relation to the MSB's major commercial products that they were largely import replacements.

93. AA CRS A664, File 474/401/452, Leighton to the Secretary of Defence 18 April 1932.

work, the MSB withdrew from production rather than compete.

The Governments July reductions confronted the MSB with its gravest crisis yet. Leighton claimed that the savings required could not be achieved by cutting each factory groups Maintenance Vote. All factories were operating on inadequate finances and such action would drastically curtail operations everywhere. The only answer was to find the £25,000 by closing another Factory, so that the rest could continue in operation. The SAA Factory of the Ammunition Factory group was chosen, because demand for its product was very low, and its closure would not affect the rest of the factory groups[94].

The SAA Factory had been struggling for survival for many months. The Defence Forces had been unable to find the necessary orders to maintain production during 1931/32, although they had managed for the other Factory groups (excluding the Rifle Factory)[95]. The Defence Committee was anxious to keep SAA production going, and suggested that the necessary £10,000 could be transferred from the Trust Fund, Defence Stores London Liabilities Account. This Fund had over £150,000 which was for defence purchases in Britain, but was frozen because of the Scullin Governments ban on the use of Australia's dwindling supplies of foreign exchange. Cabinet approved the Defence Committee's idea, and the SAA Factory was able to keep going until July 1932[96]. The

94. AA MP730, S8, Box 1, MSB Agenda 8 of Meeting 27 July 1932.

95. AA CRS A664, File 474/401/452, Leighton to Secretary of Defence 13 August 1931, Defence Committee Minute No.28 of 24 August 1931.

96. AA CRS A664, File 474/401/452, Defence Committee Meeting of 24 August 1931 and Minute No.28. Cabinet approved the transfer on 21 September 1931. The Trust Fund had £153,056 — AA CRS A2031, Defence Committee Meeting 27 November 1931, Minute No.59.

obvious question in July 1932 was why could not further funds from the London Liabilities Account be transferred to the SAA Factory, or for that matter, to the other factories of the MSB. Leighton had warned on 23 February 1932 that the entire system of munitions factories was moving inevitably towards collapse on the existing level of funding[97]. The problem was equally well understood by the Defence Committee, which had suggested that the contents of the London Liabilities Account should be spent on a three year programme of orders for the MSB, to ensure that its factories did not close. The Treasury opposed successfully the idea as there were difficulties with the Audit Act[98].

Despite this disappointment, Leighton was not yet defeated over the SAA Factory. Paradoxically, by threatening to close the factory, he highlighted factors which were likely to force its reopening. The approved reserve of SAA for the Army was 150 million rounds. By July 1932, the reserve had fallen well below this figure, because usage was 13 million rounds annually, while SAA Factory production was less than three million. The closure of the SAA Factory, and the loss of 100 of its skilled staff, would mean that the Factory could not be restarted in less than one or two years. It would then take one or two years to work up to a high rate of production. In the meantime the Army's reserves of SAA would have been almost used up[99]. This problem had to be

97. AA CRS A664, File 474/401/452, Leighton Memo 23 February 1932 'Munitions Supply Board Factories Etc: A Statement Regarding Policy and Review of ...'.

98. AA CRS A664, File 474/401/452, Defence Committee Meeting 27 November 1931, Minute No.59. See also Finance Secretary, T.J.Thomas (also of the MSB) to Secretary of Defence 22 January 1932, and Leighton to Secretary of Defence 18 April 1932. Thomas to Secretary of Defence 14 June 1932.

99. AA MP730, S8, Box 1, MSB Agenda 9 of Meeting 27 July 1932.

faced eventually anyway, while the production of SAA remained at less than three million annually; but with an operational factory with a trained staff, production could be lifted rapidly at short notice, as soon as finance was made available.

The Minister for Defence under the Lyons Government was none other than George Pearce; and as could be expected, he appreciated Leighton's argument immediately. He confronted the Treasurer, (and Prime Minister) Lyons, with the result that the £100,000 cut in Defence Department funds was reduced to £47,000, and the £25,000 reduction to MSB funds was withdrawn. In its place another £25,000 was made available for further orders to MSB factories[100]. This apparent generosity might be partially explained by Jensen:

'... the Small Arms Ammunition factory was located within the electorate of one of the leading Cabinet Ministers, and of course we were well aware of the fact. Some of our departmental colleagues, jealous of the special consideration being granted to the Munitions Supply Board, regarded our manoeuvres as savouring of blackmail, ...'[101].

The reappearance of Pearce was timely, because Leighton knew that the MSB was reprieved only until the 1933/34 financial year, and he was anxious to gain more security for the future. Pearce had great prestige and influence in the Lyons Government, and the inclination to do something for the Defence Forces, and the MSB. For Leighton the long term problems were the same as at the beginning of the Depression. Firstly, there was the creeping obsolescence alluded

100. *ibid.*, Secretary of Defence to Jensen, 16 August 1932.

101. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 8, Volume 6, p.53. The member for the electorate of Maribyrnong was J E Fenton, who had defected from the Scullin Labor Government with Lyons.

to earlier. In August 1932, Leighton could see no relief until after 1936/37, when about £25,000 annually could become available, from reallocations within the MSBs Maintenance Vote, for development purposes and replacement of old buildings and plant. This was not enough, but it would provide a basis for planning and for the MSB to remain a forward-looking organisation, which Leighton felt was vital if the MSB was to remain flexible and responsive[102]. Pearce would solve this by 1933/34, with his rearmament programme, which is referred to later in this chapter.

The second problem concerned the small Maintenance Vote given by the Government. By 1932/33 it was only £169,685 (see Table 2-4) which was far below the sum promised originally to support the MSB in the early 1920s. The MSB had been able to struggle on by committing over 25 per cent of its production, by value, to commercial orders. The problem with commercial orders was that they did not exercise factories or employee's in the art of making munitions. Important skills were being lost, and being replaced by others of limited value to munitions production[103]. The problem with Service orders, which provided the rest of the MSB's work, was that they were spasmodic and led to a concentration first on one factory, then on another. They did not give each factory continuity of production. Instead production took place in a series of erratic jerks, which increased the costs of production, and provided

102. AA MP598, S30, Memo by Leighton 'Munitions Factories ...', 23 August 1932, pp.1-2.

103. AWM Pearce Papers 10027, File 419/80/2, B4, 48, Pearce to Treasurer (Lyons) undated but probably March 1932.

uneven experience to factory staff[104]. Service orders had always been spasmodic, but before 1929, a low level of continuous production in all factories had been guaranteed by the Nucleus production funding. This was provided by the Government to allow continuous uninterrupted production for experiment and practice, and was independent of Service orders. This system had been abandoned with the onset of the Depression.

In order to escape the reliance on commercial work, and the effect of spasmodic service orders, Leighton and the MSB felt that the Government had to return to the system of paying an adequate Maintenance Vote, or see the collapse of self containment in munitions supply[105]. Such finance would be more efficiently utilised if the Government also reformed the Treasury regulations which governed the financial relations of the MSB and the Services. Orders

104. *ibid.*, see also AA MP730, S8, Box 9, MSB Agenda 120, Meeting 18 March 1932, MSB Agenda 102, Meeting 10 March 1933.

105. AA MP730, S8, Box 9, MSB Agenda 120 Meeting 18 March 1932, Agenda 102 Meeting 10 March 1933. CRS A664, File 474/401/452, Leighton to Secretary of Defence 28 April 1930. Leighton had rated in 1930, the ability of his factories to expand from nucleus production to war time production, as low, i.e. Ammunition Factory group — SAA production was too low, and staff numbers too small — Gun Ammunition production had not reached a nucleus status. Explosives Factory group — Cordite production for SAA was good, but bad for gun ammunition giving a poor nucleus — TNT production provided a satisfactory nucleus. SA Factory Group - Rifle production had stopped, pistol production had not started, machine gun production had never been practised on a production line, SAF did not represent a good nucleus and would not expand properly to wartime production. Ordnance Factory group — no orders for guns and carriages ever received, factory had not reached nucleus status, shell production had not been practised continuously, so nucleus status was poor. By 1933 the situation was worse. There had been a decay in the production skill within the Explosives Factory group in that no nitroglycerine, gun cotton or SAA cordite had been ordered since mid 1931. The production skills in the Ammunition Factory group had also declined because of instability in orders.

could not be placed by the Services until they had the necessary funds actually in hand — and the MSB could not begin operations until it actually had an order. Leighton pointed out that these funds then were placed in a factory account, and lay untouched for many months, while production planning was completed[106]. Leighton claimed that this was unbusiness like as the MSB and the Services could make better use of such funds if they did not have to commit them to an inactive account. As well as this, few orders were completed within a year, which forced Service Boards to re-request the funds for the new financial year — artificially inflating their demands, and obliged the MSB factories to keep complicated sets of annual records for partially completed orders. The Service Boards had to maintain close touch with the progress of each order to see what balance of funds would have to be requested from the Treasury for the next year, creating more work[107].

Leighton wanted a special trust account, like the London Liabilities Account, into which all funds for orders could be placed, and from which MSB factories could draw funds as required to enable smooth production and planning, and a reduction in administration. Pearce expanded the idea to include the whole Defence Department and spoke to the Prime Minister[108]. Pearce

106. AA CRS A664, File 474/401/452, notes at end of file, in the handwriting of Leighton, undated. Production planning involved: assembling and checking specifications; preparing requirements of materials, tenders called by Contract Board; testing of materials received, preparation of designs for tools and gauges; production of tools and gauges — then production begins.

107. *ibid.*

108. AA CRS A664, File 474/401/452, Pearce to Lyons (Treasurer and Prime Minister) 15 May 1933. Pearce wanted a defence special account and that it should be devoted to the funds of all classes of material and equipment including arms, armament, ammu-

was not successful in alleviating the MSBs difficulties, as the Treasury was suspicious of the London Liabilities Account and its accumulated funds, and had no intention of creating a similar account in Australia[109]. Pearce did gain an important general concession with the creation of the Defence Equipment Trust Account, of which more will be said later; but the specific problem outlined by Leighton was to remain a serious problem until May 1940, when the Treasury was removed from all domination of financial affairs of munitions production.

But there were other ways to guarantee the future of the MSB. Leighton suggested to Pearce that he try and get them munitions orders from overseas, particularly from Britain for her forces in the Far East[110]. This had been a dream of Australian Governments since the early years of Federation[111]. The

nition, aircraft, clothing, ships etc. required for defence purposes. Pearce also wanted all unexpended balances of defence votes to go automatically into this special account at the end of each year. Pearce gained part of his objective with the creation in 1934 of the Defence Equipment Trust Account, although funds were transferred from it, by the Treasury, to the old multiplicity of smaller accounts. See later in this chapter.

109. *ibid.*, Assistant Secretary of the Treasury to Secretary of Defence 9 November 1932. The Treasury disliked the annual surpluses building up in the London Liabilities Account because it undermined their annual budget planning. Normally all funds had to be expended in the year they were granted, or they were lost to consolidated revenue and had to be applied for the next year, when they would be judged in relation to the Departments other proposed expenditure. This allowed the Treasury to keep control of Departmental expenditure for each new financial year. In 1932 the Treasury for this reason, tried to expropriate the funds in the London Liabilities Account, but backed off when informed of Australia's balance of trade problems and shortage of foreign currency preventing Defence purchases. It tried again in 1935, but the Treasurer, Casey, sided with the Defence Department against his own officers.

110. AA MP598, S30, Memorandum by Controller General 'Munitions Factories ...', *op.cit.*, 25 August 1932. Pearce and Leighton were thinking of this in early 1932 for Pearce spoke to S.M.Bruce before he left for London.

111. AA Governor Generals Office CP78/1, Bundle 25, 1/850, Prime Minister to Governor General, 8 June 1904, 18 July 1904.

first serious attempt had been made in 1916, when forged shell was supplied to aid Britain on the Western Front in France. It had been a failure because of lack of technical knowledge, and problems of communication between Britain and Australia[112]. The rise of the MSB in 1921 provided the capability to make basic munitions and the senior management had some experience in mass production. During his visit to Britain in 1923, one of Leighton's objectives was to persuade the Admiralty to purchase all of its requirements of ammunition for Singapore and Hong Kong from the MSB[113]. He found that while the Admiralty professed great enthusiasm for the developing MSB as a potential source of supply for fleet operations east of Suez, it was not forthcoming with any orders which could be accepted by the MSB[114].

In 1932 Pearce decided to open the question once more, and briefed S.M.Bruce, the next Minister resident in London[115]. The Australian plan was to improve the variety of manufactures made currently by the MSB[116], and to

112. E.Scott, *Australia During the War ...*, *op.cit.*, pp.241-248. See Chapter 1, Annex A, of this thesis.

113. Joint Committee of Public Accounts — minutes of evidence 1924, *op.cit.*, p.138, testimony of Jensen. See also AA CRS AA 1971/216, Item 13, Massy-Greene's ideas of Australia munitioning the British Pacific Fleet at Singapore 1923.

114. *ibid.*, p.138. The MSB noted from correspondence from the Admiralty that the latter wanted the Defence Department to develop local resources in everything which related to the maintenance of a fleet. MP730, S8, Box 6, MSB Agenda 1924/77. This was very unrealistic when the Admiralty had no intention to place orders or to defray some of the capital and maintenance cost. Australia could afford no such infrastructure on this scale. AA CRS A5954, Box 39, 'Notes on a Memorandum (Principles of Defence) 20 December 1929 ...', *op.cit.*, pp.2-3; Governor Generals Office CP78 S22, File 1925/249, Colonial Office to Governor General 25 July 1924 — Admiralty enclosure.

115. AA MP598, S30, Box 9, Pearce to S.M.Bruce 9 May 1932.

116. AA CRS A2694, Volume 5, Agenda 334 of 7 November 1932, p.2.

replace the Indian and British factories supplying British Forces in the Far East. It was thought the collective demand would enable the MSB factories to get out of their nucleus status. Indian factories were seen to be larger than those of the MSB, but Pearce thought they were less reliable and flexible because of political instability and other factors[117]. Munitions transhipped from Britain could be supplied more cheaply from Australia; and presumably, Pearce thought this would be agreeable to Britain on economic grounds, as well as helping to build up Empire munitions capabilities in the Far East. Cabinet agreed that Leighton would be sent to Britain to organise the revitalisation of MSB technology, and to advise S.M.Bruce when he began negotiations with the British[118].

Pearce was also alert to the possibility of selling munitions to other nations in the Far East. In April 1932, China had appealed for surplus military equipment, and Pearce pursued negotiations for many months in order to gain orders for the MSB factories, particularly SAF. However, British foreign policy towards Japan and China eventually persuaded the Australian Government not to continue for fear of antagonising Japan[119].

The negotiations with Britain were also unsuccessful. British authorities, always quick to commend the potential usefulness to Empire defence of the

117. AA MP598, S30, Box 9, Pearce to Bruce 9 May 1932.

118. AA CRS A2694, Volume 5, Agenda 334 of 7 November 1932, p.2. Cabinet approved.

119. See E.M.Andrews, 'The Manchurian Crisis 1931-33' in the *Australian Journal of Politics and History*, Volume XXIII, No.3, December 1977. This clandestine operation had as its main objective the reopening of the rifle factory at Lithgow. Old rifles excess to mobilisation requirements were to be sold to China, and the cash realised, used to fund the production for 33,000 new rifles at SAF. AA CRS A2031, Defence Committee 19 September 1932.

MSB, were vague on Far Eastern defence strategy when it came to committing themselves to any definite action, particularly orders[120]. Pearce subsequently missed no opportunity, even when he became Minister for External Affairs in late 1934, to emphasise that the mutual strategic interest of Australia, New Zealand, and Britain in the Pacific region required the support and development of the technical and engineering capabilities of the MSB[121]. The British Blue Water Strategy, of which Australia was an active participant, emphasised the concept of joint Empire defence; but when Pearce attempted to extend the principle to munitions supply, he found that the British followed more nationalistic impulses. British munitions factories were suffering as badly as those of the MSB during the Depression. Only a trickle of production passed through them, and many had switched to other activities, like the MSB[122]. Even Pearce admitted in March 1934, that British engineering firms — including the armament companies, were moribund[123]. Consequently, the British were anxious to see that what few munitions orders existed, were placed on their own factories. In any event, the Blue Water Strategy had never defined a significant role for the MSB. The latter had been developed primarily to support large land forces in the defence of Australia, which were not called for under the Blue Water

120. NLA Pearce Papers MS1827 S1, Bruce to Pearce 8 December 1933.

121. AWM Pearce Papers 10027 File 419/80/2 B4, 36, 'Report by the Right Honourable Sir G.F.Pearce KCVO, Minister for External Affairs on Conferences in New Zealand November 22-23, 1934', 4 December 1934. Pearce was still chasing British orders for munitions in July 1935, see AA CRS A1606 Pearce to Bruce 17 July 1935.

122. J.D. Scott and R. Hughes, *The Administration of War Production*, HMSO London 1955. See also R.Rhodes James, *Churchill a Study in Failure 1900-1939*, Penguin Melbourne, 1970, p.214.

123. AWM Pearce Papers Bundle 4, Item 47, Cabinet Submission of 26 March 1934.

Strategy. The MSB was basically an expression of distrust in British promises to maintain command of the Sea in the Far East. Thus Pearce was asking the British to support an organisation whose ultimate usefulness was premised on the possible flaws in British strategy. No significant British orders were placed on the MSB until the eve of the Second World War[124]. Table 2-5 indicates this fact, and also shows that Australia received orders from India before it received any from Britain.

Australia's attempts to gain support for the MSB were not rejected by New Zealand. Small quantities of munitions, including cordite and shell cases, had been ordered by New Zealand from Australia since 1915[125]. In October 1928 Leighton had visited New Zealand in an attempt to acquaint officials with the scope of MSB products. He was successful in generating much interest, gaining a number of substantial long term munitions orders. The Prime Minister of New Zealand promised to keep other products of the MSB in mind

124. AA CRS A5954, Box 1028, Minutes of Meeting at Admiralty 18 June 1937. The Admiralty offered substantial orders to Australia in 1937 for mines, depth charges and quick firing ammunition — and the British Army was thinking of also placing orders. However this was subject to British Treasury approval, and depended on the MSB completing deliveries within 12 to 18 months before the new British capacity came on line. Orders would not be extended beyond this time. British interest was based entirely on the temporary ineffectiveness of their own rearmament programmes, and there is no evidence that the British Treasury approved the orders anyway. J Knight recalled that just before the war, EFM completed a small order for the Admiralty for cordite for the 8 inch guns at Singapore. J Knight to writer 30 April 1986. The figures in Table 2-5 for 1937/1938 and 1938/1939, give some support for this view. The sum of New Zealand and Indian orders suggests Admiralty orders of about £1500 for each year.

125. AA Cabinet Records CRS A2718 Volume 2, 7 January 1926, report by Sir Neville Howse. Defence Department CRS A664 File 464/401/606 Estimates of Expenditure 1928-29. J.K.Jensen, 'Defence Production . . .', *op.cit.*, Chapter 8, Volume 6, pp.57-58.

for favourable consideration when opportunity offered[126]. Table 2-5 shows how important these orders were during the Depression, helping to keep MSB factories open; particularly the Cordite Factory, which would have ceased production except for a timely New Zealand order. The MSB and the Government were grateful, particularly because the same munitions could have been gained more cheaply from Britain, New Zealand's main supplier[127]. Leighton returned to New Zealand in February 1931 to develop the relationship further, and to advise on serious technical problems besetting the New Zealand SAA assembly factory[128]. In October 1933 Pearce received the news that the Prime Minister of New Zealand had written:

'... my Government appreciating the value of co-operation between both countries in matters of Defence particularly, proposed in future to give attention to the purchase in Australia as far as possible of as much of its military material as cannot be produced locally ...'[129].

The New Zealand Government was true to its word, as Table 2-5 shows, and Australia began to capture the New Zealand munitions market from British suppliers. The key to the Australian success was not low prices but rather the

126. AA CRS A458 V308/1 Prime Minister of New Zealand to Prime Minister of Australia December 1928. The New Zealand Prime Minister had commented in May 1928 that: '... this Dominion is fully alive to the advantage not only to Australia but also to New Zealand of the establishment of factories for the production of munitions in Australia'.

127. *ibid.*, Secretary of Defence to Prime Minister of Australia 12 February 1929; and Prime Minister of Australia to Prime Minister of New Zealand 11 December 1930.

128. *ibid.*, Prime Minister of New Zealand to Prime Minister of Australia 24 December 1930, see also Secretary of Defence to Prime Minister of Australia 1 December 1930. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 8, Volume 6, pp.58-59.

129. AA MP730, S8, Box 1, Item 2, Box 2, Item 5. Prime Minister of New Zealand to Prime Minister of Australia 12 October 1933.

New Zealand decision to encourage the close source of supply at the MSB, because of its value in an emergency[130]. It seems that, like Australia, New Zealand did not regard Britain as a reliable source of supply during a crisis. The Australian Government repaid this faith by making special provision for munitions supplies to New Zealand during World War Two; despite some attempts by the Army to shrug off this moral obligation[131].

By the end of 1933, it was obvious to Pearce, that despite the success with New Zealand, the attempt to rescue the MSB with large overseas orders had failed. They would be no substitute for a new production and development programme launched by the Australian Government itself. Yet this hardly seemed possible in the midst of the Depression. But Pearce seems to have never lost sight of this option from the time he returned to the Defence Department in

130. NANZ Army Department Box 1665 File 239/4/12 'Report on New Zealand Military Forces 1935' by Major General Sinclair Burgess.

131. See AA CRS A2031 Defence Committee Meeting 30 March 1939. The CGS (Lavarack) accused the MSB of being slow in completing orders for the Army and at the same time supplying munitions to New Zealand. Lavarack had been responsible for not giving enough orders to the MSB (see AA1971/216 Council of Defence Minutes 24 February 1938) and so was largely responsible for the slow deliveries. In regard to New Zealand, Leighton replied that he had solicited orders there, for the purpose of keeping MSB production facilities going, and had great success in securing New Zealand orders well above London prices. He pointed out that New Zealand was not interested in establishing her own munitions industry, and it had been decided at the Imperial Conference in 1937, at New Zealand's request, that her munitions supply should come from Australia. The present expanded munitions programme did not take into account the supply of munitions to New Zealand, but since Australia had been doing this for some time, there was a moral obligation to continue to do so in the present circumstances. The Defence Committee agreed. Later, the Australian Government agreed to supply 1/6 of its munitions production to New Zealand. AA CRS A1608, AC49/1/1, Prime Minister of Australia to Prime Minister of New Zealand, 5 May 1941.

December 1931[132]. The idea of sending Leighton to Britain, which emerged in August 1932, assumed that significant upgrading of the MSB's technology was necessary, and would take place shortly. As Pearce well knew, the cost of such changes would have to be born by the Australian Government before the new munitions could be sold to Britain. When the negotiations with Britain failed in early 1933, Pearce continued with the plans to upgrade MSB technology. The heart of the scheme was the project to build a new Naval Solventless Cordite (SC) Factory, which was known to be very expensive, and in fact cost over £100,000 in the end. The MSB approved the first stages of the construction in April 1933 as part of budget proposals, obviously with Pearces support[133]. This is probably sufficient indication that Pearce thought he could persuade the Government to increase finance to the MSB, despite the harsh financial conditions of the Depression. His plans to reopen the Rifle Factory at SAF were as detailed. In August 1932, Pearce informed Cabinet that in the last seven years nearly 24,000 Lee Enfield rifles and large quantities of ammunition had been imported. He persuaded Cabinet to prohibit such imports, creating a new market in Australia for MSB rifles and SAA[134]. This made no sense in regard to rifle production, unless the Rifle Factory was to be reopened. And yet there were no prospects financially for the MSB to achieve this in 1932 or 1933. However, Pearce ordered the MSB in May 1933, to begin planning for

132. See for example AWM Pearce Papers 10027, File 419/80/2 B4.48, Pearce to Treasurer (Lyons) *op.cit.*

133. AA MP730, S8, Box 9, MSB Agenda 117 Meeting 5 April 1933.

134. AA CRS A2694, Volume 4, Agenda 241, 23 August 1932. British firms had been undercutting MSB prices to sell to private citizens.

new production of rifles[135].

The source from which Pearce hoped to get his finance was from the budgetary surplus, which the Lyons Government had begun to accumulate each year, since it had been in office. This averaged £3 million annually for seven years[136]. The first two surpluses (for 1931/32 and 1932/33) were held cautiously in reserve by the Government, to help fund their subsequent budgets; but it became apparent in 1933 that the Federal Government at least, would have no difficulty in continuing to balance its budget — contrary to some of the states such as NSW. Pearce obviously gained the agreement of Cabinet in principle, to a substantial part of these accumulating funds being used for a new development programme for the Armed Services and MSB, because he made a detailed policy statement on such a scheme on 25 September 1933 at the 'Millions Club' in Sydney[137]. There were many things on which these funds could have been spent other than defence. Disarmament was still a very powerful influence, and unemployment was still very high — there were few votes to be won over defence issues[138]. And yet Pearce succeeded in cornering most

135. AA MP730, S8, Box 9, MSB Agenda 139 Meeting 23 May 1933. It was confirmed later that rifle production would restart at 1000 per year. MSB Agenda 51 Meeting 5 October 1933, MSB Agenda 1933/89 of 10 February 1933 reveals that Army and Navy orders for projectiles were building up beyond the capacity of the projectile factory of the Ordnance Factory group's ability to produce them. The increase in orders was probably caused by balance of payments problems which prevented purchase from Britain, and forced a greater reliance on the MSB. The expansion of the projectile factory was approved in September 1933 although planning had gone on from February. This seems to have been another aspect of Pearce's strategy.

136. L.F.Giblin, *The Central Bank*, *op.cit.*, p.250.

137. AA CRS A664, File 449/401/102.

138. See R S Gilbert *The Australian Loan Council in Federal Fiscal Adjustments, 1890-*

of the budgetary surplus to rebuild the Armed Services, and to secure the future development and production of munitions in the MSB. It has never been explained how he did this, nor has Pearce ever been given sufficient credit for his achievement. All that can be said is that it seems to have been the result of some deliberate planning extending over at least two years, and probably longer[139].

The Rearmament Programmes

There were four major rearmament programmes launched in Australia before the Second World War. The first was what shall be termed Pearce's Reconstruction Programme. It was announced by Pearce on 25 September 1933, and began with the financial year 1934/35, being scheduled to finish in 1936/37. Its purpose was to start the process of rebuilding the Armed Services from their decay and atrophy. The determining factor does not seem to have been any immediate sense of danger, but rather the realisation that there was no point in having defence forces unless they had some operational utility. Since Britain's initiative with disarmament had stalled, defence forces still looked as though they would have a role in international diplomacy[140].

1965, ANU Press, Canberra 1973 pp202-6. The states wanted the budgetary surplus to be spent on an expansionary economic policy to alleviate unemployment, while the Central Bank insisted that the surplus should be devoted to buying back treasury bills. Pearce's defence programme was a third option.

139. According to Peter Heydon in *Quiet Decision . . .*, *op.cit.*, p.64, Lyons had originally sent Pearce to the Defence Department to restore confidence — but this does not appear to have carried any financial commitment. Pearce sheds no light in his autobiography *From Carpenter to Cabinet*, *op.cit.* Pearce was recognised, however, as a careful planner, and so was quite capable of what is suggested. See for example J.Merritt in *University Studies in History*, J.I.W.Brash (ed.), University of WA, 1965.

140. AA CRS A664, File 449/401/102, Statement by G.Pearce, 25 September 1933,

Table 2-8 THE REARMAMENT PROGRAMMES - DEFENCE DEPARTMENT

YEAR	PEARCE'S RECONSTRUCTION PROGRAMME (£)	PARKHILL AND IMPERIAL CONFERENCE 1937 (£)	CASEY'S DEFENCE REVIEW (£)	MUNICH SEPTEMBER 1938 (£)	TOTAL (£)
1934/35	1,073,231				1,073,231
1935/36	2,712,014				2,712,014
1936/37	3,588,241	1,318,092			4,906,333
1937/38		4,433,954	355,980		4,789,934
1938/39		2,709,158	5,461,540	3,388,000	11,558,698
1939/40		1,563,031	6,674,550	8,405,000	16,642,581
1940/41			5,894,740	6,785,000	12,679,740
TOTAL	7,373,486	10,024,235	18,386,810	18,578,000	54,362,531

Notes

1. Figures for Pearce's programme represent actual expenditure.
2. Figures for other programmes are approximate only, and based on Departmental estimates. After Pearce's programme, actual expenditure became confused, as each new rearmament programme overlapped the last.
3. Figures are for capital expenditure, and maintenance of new capital items.

The financial structure of the programme is indicated in Table 2-8. The total annual defence cost was the annual cost of the defence forces (including the MSB) as they existed before the programme started (about £4 million), plus the cost of new capital items under the programme, and their maintenance. Predictably, Pearce's programme reflected the Blue Water strategy by apportioning the largest part of the finance to the Navy, which increased its number of cruisers and other vessels. The Army was to concentrate on anti-aircraft and coastal gun defence of some major ports, and to build up partially its reserves of SAA and gun ammunition. A small provision was made for a beginning of mechanisation for elements of the mobile forces required to repel light raids. The Air Force was to expand the number of its squadrons so that it could more effectively co-operate with and support the Army and Navy[141]. The MSB benefitted significantly, the Ordnance Factory group getting its first gun order to make the Army's small number of 3" AA guns, the Ammunition Factory group getting improved orders for SAA and gun ammunition. This involved, of course, the Explosives Factory group which had to make the necessary propellant. Pearce's programme also approved the construction of the Solventless Cordite [SC] Factory for big gun ammunition, and the refurbishment of munitions factories which were showing signs of obsolescence[142]. The Rifle

op.cit. The Manchurian Crisis was a consideration, but not the dominant one. Lyons was willing to see Japan involved in China as it reduced Japan's capability to threaten areas of more value to Australia — see C. Neuman, 'Australia's Citizen Soldiers 1919-1939 . . .', MA Thesis, University of NSW, Duntroon, 1978, p.48. See also E.M. Andrews, 'The Australian Government and the Manchurian Crisis 1931-4', *Australian Outlook*, Volume 35, No.3, December 1981.

141. AWM Pearce papers Bundle 4, Item 47, Cabinet Submission 26 March 1934.

142. AA CRS A664, File 449/401/102, Statement by Pearce, 25 September 1933, *op.cit.*

Factory at SAF was not forgotten. Operations had restarted in August 1933 and built up steadily to nucleus production on new orders made possible by the programme[143]. Pearce had given the MSB a new capital development programme worth about £405,000, and sufficient new orders to ensure at least nucleus production in all factories. Difficulties over the Maintenance Vote remained, necessitating the continuance of commercial production in some areas, but the pressure to close down factories had been removed.

Sir Archdale Parkhill succeeded Pearce as Minister for Defence in late 1934, and initiated another three year rearmament programme. This was to overlap the last year of Pearce's Reconstruction programme, because the latter had exceeded its planned cost and required a further £1 million, which Parkhill's programme would supply in its first year[144]. The last two years of Parkhill's scheme envisaged a moderate development scheme along the lines begun by Pearce. It was superseded quickly when, in July 1937, Parkhill and Lyons attended the Imperial Conference in London. They learnt that threats to British interests in Europe and the Far East were much more pressing than before. The next few years might prove dangerous for Britain until her rearmament had

143. Report of the Munitions Supply Board 1933-35, PP-F3732, p.14. This report warned that renewing rifle production had proved a difficult task because of the loss of expert knowledge caused by the original closure in 1929. The Manager of SAF observed: 'The experience indicates that it is unwise to suspend a steady progression of manufacturing where methods of mass production of small components are involved. It has become evident that there should be always even a small quantity going through the machines, and through the hands of employees, if ever a quick resumption of production should be deemed a matter of expectation'.

144. AA CRS AA 1971/216 Council of Defence meeting 24 August 1936, Agenda No.10. CPD Vol 151, p.75, 11 September 1936, Policy Statement on Defence by Sir Archdale Parkhill.

progressed sufficiently to give the Empire a satisfactory measure of security[145]. The conference decided that the Dominions should strengthen their Armed Services. It also concluded that there should be a reduction in the existing dependence of all parts of the Empire on munitions produced by Britain, and the corresponding development of munitions production in the Dominions[146]. The result of these conclusions was that Lyon's announced a revision of Parkhill's programme which was expanded financially, and, as Table 2-8 shows, was now to end in the financial year 1939/40[147].

Parkhill's Imperial Conference programme also followed the priorities of the Blue Water strategy in the apportioning of funds. The Navy gained most funds, to strengthen its oceangoing squadron. The Army came next with its first priority the manning of coastal guns and AA defences for major ports. Its second priority was to develop light mobile forces to support the coastal batteries and repel light raids. Only as a distant third priority was the Army allowed to retain its skeletal framework for a seven division anti-invasion force. The Air Force continued to expand modestly in line with its responsibilities to support the other two Services[148]. The capabilities of the MSB were again advanced significantly. The Army's new high performance 3.7" AA gun would be made at the Ordnance Factory group, requiring major additions to the existing engineering capabilities. The MSB would also make the 3.7" ammunition. A

145. J.M.McCarthy, 'Air Power and Australian Defence ...', *op.cit.*, p.107.

146. CPD Vol 154, Speech by the Prime Minister on 'The Commonwealth Government's Defence Policy in the Light of the Imperial Conference', 24 August 1937, PP-P1031.

147. *ibid.*

148. Archdale Parkhill, 'Defence Estimates 1937/38', 8 September 1937, PP-P1034.

third major project was the manufacture of the Bren light machine gun at SAF, which also required major re-equipping of the Factory group. Most of the MSBs new capital development of £1,400,000 was committed to these three projects. The balance was to further refurbish the older factories. The Navy and Air Force did not request any new munitions capabilities from the MSB[149]. The Government hoped to defray some of the MSBs capital expense and increased maintenance cost, by gaining orders from Britain[150]. These did not eventuate and the level of production in MSB factories remained at a little above the nucleus level. Capability was expanding, but not the ability to conduct mass production. Reference to Figure 1 will also reveal the interesting point that it took between two to four years before a new MSB capability became operational. The Bren gun factory, for example, was authorised in 1937, but began operations in 1941. This problem of lead time became a major issue in 1939, and is covered in Chapter 5.

The origin of what shall be termed Casey's Defence Review, was in the Council of Defence meeting 17 December 1937. The Parkhill Imperial Conference programme was meant to provide Armed Services capable of fulfilling most

149. *ibid.*

150. CPD Speech by the Prime Minister, 24 August 1937, *op.cit.*, Speech by Parkhill 8 September 1937, *op.cit.* The issue had been raised at the Imperial Conference where the Australians had emphasised the value to be gained to Empire defence in the Far East, by placing British orders with MSB factories. Parkhill had attempted to gain some indication of British preferences for future munitions requirements, but British representatives chose to encourage further self containment while not being specific about orders. The experience of the last 15 years did not stop the Australians from being optimistic. See AA CRS A5954, Box 1051, File E(MF)37, Munitions and Food Supply Committee, Memorandum prepared by the Australian Government, 'Australia as a Source of Supply'; and speeches of Parkhill to the Committee.

of their operational functions under the defence against raids contingency of the Blue Water strategy. But the Treasurer, Casey, distrusted the assurances of the Defence Department and asked for a review of what else the Armed Services needed to make them effective in their strategic roles. The results were presented at the Council meeting of 24 February 1938 and outlined massive gaps in Army and Air Force capability, principally in munitions[151]. This was at a time when MSB factories were running down munitions production because of declining orders from the Army. Casey had made emergency finance available in late 1937 to prevent the MSB from laying off workers. Now he wanted to know why the MSB factories were running at nowhere near full capacity, and making commercial articles, whilst there were huge deficiencies in munitions[152]. The point Casey sought to make was that by failing to outline needs in this area, during the last four years of rearmament, the Army and the Air Force had prevented the Treasury and Government from making any financial provision for these urgent requirements. Both Casey and the new Defence Minister, Thorby, accused the Army of putting up buildings and other non-vital works, while not concentrating on ordering the vital munitions. If an emergency had arisen, the Army would have had little to show in combat capability[153].

151. AA CRS AA1971/216, Council of Defence meetings of 17 December 1937 and 24 February 1938.

152. *ibid.*, minutes of meeting 24 February 1938.

153. *ibid.*, minutes. The Navy escaped much of the criticism as it pointed out that its munitions situation was satisfactory. The RAAF claimed that it could not satisfy its deficiencies in bombs through the MSB as it had not yet received the designs from Britain. Much less persuasively, the CGS claimed that in ignoring munitions deficiencies, the Army was following the Government's policy to complete coastal defences first. According to Shedden's remarks at the same meeting, the previous Defence Minister (Parkhill) had tried on a number of occasions to get the Army to place munitions orders

The result of these revelations was that Casey arranged the finance for yet another rearmament programme, the object of which was to improve, specifically, the effectiveness of frontline units of the Air Force and Army, so that if an emergency arose, there would be some fighting capability available in 1939/40. Casey's Defence Review was announced by Lyons on 24 March 1938[154]. Table 2-8 will show that it was far larger, in financial scope, than Parkhill's Imperial Conference programme, and appears to have outstripped the original criticisms of munitions shortages. The Navy gained the most once more, in financial terms, as the Government gave it two new cruisers. The Air Force was to double its frontline strength to 17 squadrons. The Army was to strengthen its port defences and was allowed to improve its mobile forces — within the parameters laid down by the Government for defence against raids [155].

Once again, the MSB gained substantially in increased capabilities. Of its new capital allotment of £700,000 part was to facilitate the expansion of production in the Ammunition and Explosives Factory groups. The rest went firstly to reduce munitions imports to the level where it was technically or economically impracticable to replace such imports by production in Australia; and secondly to provide in MSB factories the facilities which were necessary to complement the manufacturing resources of private industry in munitions production[156]. This last objective complemented the funding in Casey's programme of £1 mil-

with the MSB.

154. AA MP598, S30, Box 10, Broadcast Address by the Prime Minister 24 March 1938, 'The Governments New Programme of National Defence'.

155. CPD, Vol 155, Statement by Prime Minister on Defence Programme, 27 April 1938.

156. *ibid.* AA MP598, S30, Box 9, Secretary of MSB to Secretary of Defence, 28 February 1939.

lion to the Principal Supply Officer's Committee to develop the organisation of private industry for munitions production[157]. The MSB also received sufficient orders for munitions and was able to begin to escape its reliance on commercial work. Table 2-7 shows that the value of commercial production dropped sharply in the first full year of the Casey programme (1938/39). Correspondingly, the value of munitions production doubled. This did not mean however, that the MSB's factories were now swamped with orders, but merely that most types of munitions production capacity were now being used. The factories were capable of producing at many times their rate of 1938/39.

Casey's rearmament programme had only been in place for a few months when the Munich crisis of September 1938, forced the Government to add yet another programme. The Lyons Government now believed that war was a distinct possibility in Europe, and was uneasy about Japanese reactions should this happen[158]. After intense consultations during October and November, the Defence Minister, Street, announced the Government's new rearmament programme on 6 December 1938. As Table 2-8 will show, the Munich programme was in addition to the Casey and Parkhill plans. The total finance committed to rearmament (i.e. new capital acquisitions and maintenance of such new items) from 1934/35 to the end of 1940/41 was now £54,362,531.

The major purpose of the Munich programme was to adjust the Parkhill and Casey programmes. The Government had concluded that the lesson of Munich was that there might be little or no warning of future crises. It abandoned

157. CPD Statement by Prime Minister, 27 April 1938, *op.cit.*

158. CPD, Volume 158, pp2764, Defence Minister, G.A.Street, 6 December 1938.

the assumption, that there would be time to expand Armed Services' peace establishments to a war footing before the onset of war[159]. Much of what the Armed Services required to go immediately into action, to defend against raids, would now be supplied. This state of readiness would be reached by the end of 1940/41.

The MSB gained £1,646,000 in new capital expenditure for its new commitments under the Munich programme. Part of it was to establish a stockpile of critical raw materials which could only be obtained from outside of Australia. The MSB had requested repeatedly the creation of such a stockpile, and now it was allowed at the level of three months reserves of materials[160]. Another part of this capital went on expanding the Ammunition, Explosives and Ordnance Factory groups[161]. The impact of this peacetime capital expenditure can be seen in Table 2-3. The years of 1937/38 to 1939/40 brought a great surge in capital expenditure for the MSB. The MSB also began to build an optical instruments factory, and to expand the optical section at MSL into a laboratory. The main impetus behind the above developments was that the Government had realised that the fulfillment of orders, placed overseas, was unlikely as a consequence of Munich[162]. The record of the main supplier, Britain, had

159. *ibid.*

160. AA MP598, S30, Box 10, Secretary of MSB to Secretary of Defence Department, 6 October 1938. See also Controller General of Munitions Supply to Secretary of Defence Department, 30 September 1938, 'Munitions Supply in Relation to Prolonged War'. CPD Speech by Minister of Defence, *op.cit.*, 6 December 1938.

161. CPD, Vol 158, Speech by Defence Minister, 6 December 1938. See also Figure 1 of this thesis.

162. AA MP598, S30, Box 10, Special Meeting of the Council of Defence held with Minister of Defence, 30 September 1938.

been very poor, particularly in regard to frontline aircraft, coastal guns, and fire control instruments[163]. Several attempts by Lyons to speed up deliveries, many of which were already years overdue, were only marginally successful. The prospect that the British delivery record might become worse prompted the Air Force to place orders for frontline aircraft in the USA[164]. The Army turned more heavily to local production than it had already. The MSB received orders for optical equipment, an increased variety of heavy artillery shells, and many types of aircraft bombs and naval stores which had hitherto been supplied from overseas. The Principal Supply Officers Committee broadened its enquiries into private industry beyond shell components, to see if commercial firms could accept orders for items such as search lights, signal equipment, and engineering equipment[165].

The overall impact of these decisions on the MSBs production was that the quantity and variety of munitions required before 30 June 1941 had now greatly increased[166]. Projects such as AA guns, gun ammunition and explosives,

163. AA Council of Defence AA1971/216, meeting 24 February 1938, Agenda 1, Meeting 13 July 1938, Agenda 12 and minutes, meeting 26 August 1938, Agenda 19 and minutes.

164. AA Council of Defence AA1971/216, Meeting 25 January 1939, Agenda No.3.

165. AA MP598, S30, Principle Supply Officers Committee to Secretary of Defence Department, 28 September 1938, Secretary of MSB to Secretary of Defence Department, 6 October 1938; Cabinet Agenda 'Expansion of Defence Programme', 14 December 1938; minute by Minister for Defence, 21 December 1938 'Expanded Defence Programme'.

166. AA CRS AA1971/216, meeting 25 January 1939. CGS stated that orders for £1,120,000 worth of ammunition had been placed with the MSB, plus orders for 1500 Bren guns. The increase in orders is reflected in Table 2-5 of this thesis, particularly in regard to the Army. The Ammunition, Explosives and Ordnance Factory groups had been further expanded to cope with the quantity and variety of munitions now required. AA MP598, S30, 'Lessons from the Emergency', Secretary of MSB to Secretary

SAA, and chemical warfare respirators, depth charges, smoke floats and mines were consequently speeded up. The combined impact of the Casey and Munich programmes was sufficient in 1939/40 to remove completely the reliance of the MSB on commercial orders. Table 2-7 shows that the value of production also trebled to nearly £3 million. Yet even this rate of production did not extend the MSB factories to full capacity as will be shown in Chapter 5.

It is interesting to analyse the rearmament programmes collectively, for they conceal some important trends. First, the MSB was affected by the continued relegation of the Army to the defence against raids contingency. The Army was the biggest consumer by far, of the products of the MSB factories, as is shown clearly by Table 2-5. The Army's ability to place big orders on the MSB was linked directly to its strategic role, which until June 1940, was to remain as defence against raids. It has been stated that this contingency envisaged limited naval bombardment by Japanese cruisers, some light air attack from aircraft launched from such cruisers, with raiding parties of not more than 200 men being landed. These operations would not involve high expenditure of munitions. Consequently, the level of production required from MSB factories was low. By September 1939, the level had risen in all factory groups beyond nucleus production, but with the exception of SAA, had not reached mass production. Army and other orders, were insufficient to allow the factories to reach much more than batch production.

Secondly, while the MSB's rate of production was restricted, its assigned capacity was in excess of that required for the usage of munitions in the light of Defence, 6 October 1938. See Annex AA for employment.

Table 2-9 THE GROWTH IN THE PRODUCTION OF THE MSB

MUNITIONS	DESIGNED CAPACITY 1936-39 - ANNUAL	PRODUCTION 1935	PRODUCTION 1937	PRODUCTION JUNE 1939	TOTAL CAPACITY ANNUAL
SAA	30,000,000	15,000,000	15,000,000	22,000,000	100,000,000
GUN AMMUNITION (CC, PRIMERS, FUZES, EXPLOSIVES)	75,000	Small Quantity	22,000	75,000	200,000
PROJECTILES	50,000	Small Quantity	25,000	50,000	125,000
GUNS	38	-	5	11	48
RIFLES	35,000	1,000	1,000	1,000	50,000 ¹
VICKERS MG	250	120	120	150	625

Sources

Shedden to Minister, 24 October 1938, MP1217, Box 1092 (Cord).

Jensen to Shedden, 29 August 1935, MP1217, Box 1092 (Cord).

Note

1. Rifle capacity was deliberately reduced after September 1938 to 20,000 Designed Capacity in favour of Bren gun.

operations for defence against raids. Table 2-9 outlines the main munitions being produced between 1936 and 1939. Designed Annual Capacity was what a munitions factory could produce using one work shift for 48 hours per week, 48 weeks per year. However as Jensen observed in 1935:

'The actual capacity of a factory at any given time is difficult to determine because so many factors are involved. The buildings and plant may be rated as possessing a certain 'capacity', but unless trained labour and directing staff are available the actual capacity may be small. The only way to get 'capacity' and to depend on it is to give capacity orders year after year'[167].

The production of the various munitions listed in Table 2-9 rose steadily, in most cases, between 1935 and 1939 towards their Designed Annual Capacity. Production teams gained more skill and experience. It is difficult to envisage for the defence against raids contingency the wastage of millions of rounds of SAA, the use of thousands of shells, the use of scores of guns, and loss of thousands of rifles and hundreds of machine guns. Yet these were the wastage rates the Designed Annual Capacities of the MSB factories were capable of supporting. These wastage rates would seem more appropriate to a very intensive conflict involving the clash of large and heavily armed units much bigger than required to defeat lightly armed groups of commandos. One cannot ignore in making this claim, that some of the munitions would be needed for training purposes, and some to build up stocks, but a good margin remained. However, this was obviously not the entire explanation when one considers the Total Annual Capacity listed in Table 2-9. This was the level of production which could be

167. AA CRS A5954, Box 1092, Secretary of MSB to Secretary of Defence Department, 29 August 1935.

achieved in a munitions factory by continuous working with three work shifts of eight hours per day. It could generally be expected to lift production by about two to two and a half times the Designed Annual Capacity[168].

Continuous working was a much more complex form of production compared to one shift operation. It put great strain on subcontractors and major contractors alike, to maintain the flow of components and the required standard of quality in the product. However, with the release of funds by the Government for minor capital works and large orders, most of the MSB factories could reach their Total Annual Capacity within a few months from September 1939[169]. Thus the Government had completed the time consuming jobs of training munitions staff, and creating the Designed Annual Capacity, giving itself a huge potential capacity which could be gained quickly with the release of sufficient funds. The Total Annual Capacity listed in Table 2-9 is so large that it was more appropriate to the contingency of defence against invasion, which envisaged seven heavily armed Army divisions capable of large scale land operations in Australia[170]. In other words, the MSB factories looked as though they could take the first shock of war for a contingency much larger than defence against raids.

168. *ibid.*, Secretary of MSB to Secretary of Defence, 29 August 1935, Secretary of Defence to Minister of Defence, 24 October 1938.

169. Production by May 1940 had for nearly all munitions listed exceeded Total Annual Capacity. See Chapter 5 of this thesis.

170. The Army did have plans to send one division overseas to fight with British forces in the event of war, but the Army was not allowed to spend any funds on gaining the heavy equipment required to arm it properly. It was assumed that such munitions would be supplied by the British Army.

Of course, there were other munitions for which the rearmament programmes were establishing new capacity, but which had not gone into production by June 1939. These included the Bren gun, the Machine gun carrier, semi armour piercing bombs, the 3.7" AA gun, 3" mortar, pyrotechnic munitions, depth charges and naval mines. All of these had generous Designed Annual Capacities envisaged for them. For example, that for the Bren gun was 1000 and had a Total Annual Capacity eventually of about 3000[171]. Whereas these munitions can all be seen as being useful for the operations of the Armed Services within the contingency of defence against raids, there was an extravagance in the type and quantity of munitions which suggested that the real purpose behind the development of the MSBs factory capabilities and capacities, was to support military operations of a larger scale than defence against raids.

A final clue to the real intentions of the Government was the funding of the Principal Supply Officers Committee's (PSOC) organisation of commercial industry for the production of munitions. The Casey Review programme gave £1,000,000 for this task; and the potential capacity the PSOC sought to produce eventually for shell components, in commercial industry, was many times that which existed in the MSB factories. As is shown in Chapter 4, this was the policy accepted by the Government. Although (it) was meant to be within the context of the Blue Water strategy, and the defence against raids contingency, it went far beyond these, and was directed towards the contingency of defence against invasion or similar large scale operations.

171. AA MP891, S6, Box 2, MSB Agenda 124 of Meeting 1 September 1938. A.T.Ross, *Wartime Munitions Expansion* . . . , CSE Report 13, June 1978, Department of Defence, pp.131-133.

If the Government, between 1934–1939, was engaged in giving itself large excess production capacity for munitions over that required for the agreed strategy with Britain, it was only logical to conclude that the Government distrusted British promises to send the Fleet to the Far East. Indeed there is plenty of evidence that Lyons, and his successor Menzies, did doubt British reassurances of the British determination and capability to play their part in the Blue Water strategy[172]. The assertion, by this thesis, of the development of the large excess of potential production capacity for munitions, is one indication that Lyons and Menzies did something about their doubts. They took out some insurance against the uncertainty of the British Fleet not arriving when needed to protect Australia. In giving themselves much of the required potential industrial capacity to equip an anti-invasion force, Lyons and Menzies met the first two of three conditions for a powerful defence of Australia from invasion. The first condition was that no defence could be sustained without the local capability to manufacture munitions. The second condition was that the MSB or some similar body should be capable of organising the production of the *total* munitions required to equip a Defence Force large enough to repel an invasion.

172. See J.M.McCarthy, *op.cit.*, pp.101–107, 116–117 and B.N.Primrose, 'Australian Naval Policy 1919–1942', PhD., ANU, 1974. Lyons and Menzies were told in Britain 1935, that a fleet could not be sent to the Far East if war began with Germany. The British Treasurer, Neville Chamberlain, said that Britain was not strong enough to fight both Germany and Japan. The Foreign Office told the Australians that Japan was very opportunistic and would move when the major European powers were preoccupied. The 1937 Imperial Conference only strengthened doubts about British capabilities. Australian leaders were constantly asking for reaffirmation of British promises to send the Fleet, which is to say they doubted such promises. Lyons even tried to gain a pact with the USA, see J.M.McCarthy, *op.cit.*, pp.69, 111–112, and P.Hasluck, *The Government and the People 1939–1941*, AWM Canberra, 1952, p.70.

This objective was in sight in September 1939, provided sufficient funds were released[173]. The third condition was actually raising the necessary defence forces, and equipping and training them to repel an invasion.

Given that there was such distrust of the British ability to keep their promises under the Blue Water strategy, it is only natural to ask why the Government did not fulfill the third condition, as the Army demanded so insistently between 1932 and 1939. This was a question which also interested the official historians of the Second World War, and has puzzled many historians who have written after them. They have all noted that both Lyons and Menzies continually expressed great faith publically in the Blue Water strategy and in the British capability to implement it. Many of them have been openly critical of Lyons and Menzies failure to develop the Armed Services, the Army in particular, to repel an invasion[174]. Such views assume that the Government had the financial capacity to fulfill this third condition; but the next section will show that this was not the case, and that the rearmament programmes were all limited by difficulties over finance. The Government chose to over-develop munitions capacity because it was cheaper than developing any one of the Services to handle a higher level of contingency than defence against raids. Table 2-1

173. By this time the MSB had been subsumed by the Department of Supply and Development, which also had the responsibility for aircraft production. The Government in supporting Commonwealth Aircraft Corporation had taken similar measures to provide production capability and capacity for aircraft, as it had for guns, small arms and ammunition etc.

174. See G.Long, *To Benghazi*, *op.cit.*, pp.1-32. P.Hasluck, *The Government and the People*, *op.cit.*, Volume 1, pp.100-108. E.M.Andrews, 'The Broken Promise ...', *Australian Journal of Defence Studies*, Volume 2, No.2, November 1978. D.M.Horner, *High Command ...*, AWM, 1982, pp.13-15. J.J.Dedman, *Australian Journal of Politics and History*, Volume 13, No.3, December 1967, p.331.

shows the costs of the Armed Services and the MSB from 1933 to 1945. The MSBs factories and laboratories cost a fraction of the resources required for any one of the Armed Services. The MSB organisation represented a high rate of capital investment (see Table 2-3) with low maintenance costs. The latter stemmed partly from the laboratories and factories being run initially by nucleus staffs with production at a low level; but later from the sale of munitions, which paid for the costs of production.

The Economics of Rearmament

When Pearce's Reconstruction Programme began on 1 July 1934, Australia was still recovering from its worst depression on record. The dominant economic problem was how to get the Australian economy to move from the nadir of the Trade Cycle to an upswing. Conventional economic theory prescribed that business investment, and public consumption, had to be encouraged to grow once more. Business was assured of a minimum level of consumer demand, no matter how bad the slump, because all communities in an industrialised society still needed many basic necessities of life. Business began to expand its activities from this level, when interest rates had dropped far enough^[175], to make investment in new capital goods economical in the new economic environment. Similarly, falling wages^[176] reduced the businessman's costs of production, as

175. Interest rates fell because business had no further incentive to invest, having already created conditions of overproduction at the zenith of the Trade Cycle.

176. Wages fell when business began to reduce investment and production because of a decline in consumer demand. It needed fewer workers, and there would be more people seeking work than jobs available.

did falling prices^[177] for raw materials. As business investment developed once more, more people were employed, causing an improvement in consumption by the public. During a slump the natural reaction was for the public to save against hard times and possible unemployment. However, since interest rates were also falling, there was little financial reason for the public to save. As business began to employ more people once more, the public was encouraged to spend some of their savings, thus increasing consumption. A further incentive was that prices for goods would be low. An increase in consumption led to an increase in demand, and further encouragement for business to expand investment. This was the conventional economic view of the recovery of the Trade Cycle^[178].

Such theory argued that the Government could not lead an economic recovery; this was the role of business and consumers. But the Government could help to create the conditions which would help such a recovery to begin. Its first responsibility was to maintain a balanced national budget, which is to say the Government could spend no more than it received in revenue. If the Government ignored this and engaged in deficit funding, economists thought that the increased money supply would create artificial demand, tending to keep prices high when they needed to fall to encourage business activity. This inflation was to be avoided at all costs even if the Government had to raise taxes in order to cover its unavoidable expenditure. It was preferable that the Government cut its expenditure so that it could lower taxes, as this encour-

177. Prices fell as the demand by business for raw materials declined in line with the decline in consumer demand for its products.

178. M.Stewart, *Keynes and After*, Penguin, Victoria, 1969.

aged consumer spending and business activity. Conventional economic theory also discouraged the Government from taking out public loans as a means of balancing its budget, because this would eventually have the effect of raising or keeping interest rates high, when they needed to fall in order to encourage business investment[179].

It is not intended to examine the complicated events of the Great Depression in Australia, as this has been done in another source[180]. Our interest is in the general policy Australian Governments followed to vitiate the effects of the Great Depression, and its effect on the amount of finance available for defence. It is sufficient to note that Australia in 1930 faced a severe balance of payments problem, made worse by the need to pay back many foreign loans. The collapse of primary export prices led to a collapse in the domestic economy in Australia. Unemployment eventually reached 30 per cent of the work force. The Scullin Labor Government, whose misfortune it was to have inherited all these problems in late 1929, took drastic measures to contain the disaster. Imports were slashed by raising the protective tariff, and domestic recovery was encouraged by attempting to balance the federal budget. Government expenditure was restricted, and taxes raised significantly, to bring revenue up towards actual expenditure. In 1930/31 the Scullin Government had a deficit of £11 million, but a small budgetary surplus had been achieved in 1931/32 when

179. *ibid.* For a classic exposition of Australian Government economic policy for the period see AA CRS A1421 item2, 'Memorandum on the Present Monetary Position in Australia' Secret by R G Casey 10 October 1935.

180. C.B.Schedvin, *Australia and the Great Depression*, *op.cit.*

the Lyons Government succeeded to office[181].

Lyons continued this classical economic policy for many years, and continued to gain annual budgetary surpluses. Taxes were reduced every year until 1937/38[182]. The Government kept its loan requirements to a minimum. Until 1936/37, it had only claimed a small portion of the loan funds to which it was entitled, under the Financial Agreement with the States. Whereas state loan debts were increasing rapidly, the Governments debts were decreasing[183]. Later, this began to change when large scale rearmament started in 1938/39. The Government was equally careful about inflation. In its 1936/37 Budget it stated:

‘Artificial speeding up of activity in Australia through credit expansion

181. Giblin, *The central Bank* ... *op.cit.*, p.250.

182. AA CRS A461, File T344/2/1. In reducing taxation once more, in the 1936/37 Budget, the Government observed: ‘In reducing taxation to this extent the Government is adhering to a policy it has consistently adopted, namely that tax should be reduced to its fullest extent consistent with Commonwealth obligations’. In his budget speech of 27 August 1937 the Treasurer claimed that in reducing taxation every year since 1931/32, the Government had greatly eased the burden on the public and encouraged economic activity. See File U344/2/1. Of course Federal taxation was a small part of all taxation. The states levied the heaviest taxes.

183. AA CRS A461, File T344/2/1. The Australian Government was entitled to 20 per cent of loan funds raised on the behalf of the state and Australian Governments in Australia. In the period 1931 to 1936 these funds had totalled £83,546,000, but the Australian Government had only taken 11.3 per cent. In keeping its loan requirements to a minimum, the Australian Government was allowing the state governments as free access as possible to the local loan market, without raising loan interest rates. State governments were useful in stimulating business activity because they carried out large public works programmes in relation to transport, communications and power and water supply. Much of this was subcontracted to private business. The net increase in the aggregate Public Debt of Australia between 1932 and 1936 was £67,954,000 in which state debts increased by £75,599,000, and the Australian Governments debts decreased by £7,845,000.

might have had temporarily beneficial effects but would have introduced the probability of dangerous repercussions'[184].

This was a view with which the Central Bank agreed, and the Government continued to be very nervous about the effects of inflation until the end of the 1930s[185].

However, for reasons which are clear from today's economic theory[186], unemployment declined slowly, and primary export prices did not recover their pre-depression values until 1937[187]. In other words, despite balancing the budget, reducing taxes and loans, the Lyons Government continued to face serious economic problems during the first half of the 1930s. This was the economic context of Pearce's Reconstruction programme of 1934.

Pearce gained his programme because it was based entirely on the accumulating budgetary surpluses, which by 1933/34 totalled £6,162,000. Two million of this was appropriated for special grants to the states, and the balance was placed in the new Defence Equipment Trust Account for use, in the following years, by the Defence Department[188]. It was as far as the Govern-

184. AA CRS A461, File T344/2/1.

185. See for example AA CRS A571, File 39/1094, Commonwealth Bank to Treasurer 17 March 1939; and File 38/3620, which reveals the Government's persistent worry over inflation. Similarly Files 38/3177, Parts 1 and 2.

186. This is based largely on Keynes theories which were worked out expressly to explain why classical economic theory, as practiced by Lyons and most Western governments of the day, would not work to correct the slump. See M. Stewart, *op.cit.*

187. Giblin, *op.cit.*, p.250. Export prices in Australian currency had in 1931 fallen to 53 per cent of their pre-Depression level.

188. AA CRS A571, File 34/3170, J. Brophy to Secretary of the Treasury 12 June 1935. The Trust account was created by the Defence Equipment Act of 1934. Pearce's achieve-

ment was prepared to go. It considered that the balance of payments problem, and domestic economic recovery, were far more important than preparing the Armed Services for the contingency of defence against raids. Economic recovery was the basis on which a suitable defence force could be built eventually, but this reconstruction could not precede, or be allowed to hinder, the economic recovery:

‘Finance is the dominant factor that governs the possibility for objectives of the Services [and] that the latter should be strictly related to prospective capacity to provide for them’[189].

This meant the ability of the Government to get further budgetary surpluses. It had no intention of allowing the maintenance cost of the Armed Services to grow significantly within accepted Government expenditure, and thereby create difficulties in balancing the budget[190].

Between 1934 and 1937, progress in building up the Armed Services was slow, but there were no pointed indications of immediate danger to Australia either. Consequently, the Australian Government was not confronted with the

ment in getting this special account was that if money was not spent as scheduled, it would not be expropriated by the Treasury at the end of the current financial year, but would remain in the account until the Defence Department did spend it. However, the Treasury kept close control of the account, causing Parkhill to complain about its rigidity on 2 September 1937, see File 34/3170. £9.5 million had been placed in the account from budgetary surpluses by June 1938.

189. AA CRS AA1971/216, 19 June 1935, Agenda No.3. In this respect, the Australian Government saw the defence and economic problem in similar terms to the British Government. See R.P.Shay, *British Rearmament in the Thirties* . . . , Princeton University Press, New Jersey, 1977.

190. AA CRS AA1971/216, 19 June 1935, Agenda No 3. The Government directed that at the end of Pearce’s programme, an annual maintenance vote of £5,316,867 was not to be exceeded by the Defence Department, as this was the figure the Government could afford under the most favourable conditions.

need to respond to a defence emergency, at the same time as it attempted to encourage economic recovery. At the Imperial Conference in 1937, Lyons was informed that such an emergency now existed. Defence could no longer be restricted by the success or failure of the Government in gaining budgetary surpluses, but had to be expanded in answer to fast growing international dangers. The 1937/38 national budget did give greatly increased finance to defence, prompting the Treasurer, Casey, to comment:

‘It may be asked why the Government does not attempt to spread this largely increased provision for defence over a longer period of time than one financial year. The reason is that all the Government’s proposals for increased defence expenditure are essential — and time is the essence of the contract. ... Defence expenditure is not translated into actual armaments over night ... the Government is therefore convinced that the whole of its present programme should be undertaken now in the interests of the security of Australia’[191].

This shows how seriously the Government now saw the issue of defence, but it does not reveal the economic problem which this increased expenditure entailed. Australia had not recovered fully from the Great Depression, and still had unemployment of 9.5 per cent of the workforce[192]. On top of this, the prices for primary export commodities were beginning to decline, threatening a new economic recession in Australia[193]. The avenues open to the Lyons Government to raise extra money for defence were to raise taxes, and/or raise

191. AA CRS A461, U344//2/1, Statement by Treasurer, 27 August 1937.

192. *ibid.*

193. *ibid.* Casey stated that prices for primary exports were very good for 1936/37, but as early as February 1937 he knew that Government revenue was beginning to fall. By the time he gave his budget speech in August 1937, export prices had begun to decay badly. See CSIRO Archives S67, Vol.19, Rivett to Julius 16 February 1937 (Rivett relates a talk he had with Casey). See L.F.Giblin, *op.cit.*, pp.243, 247–250.

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Table 2-10 DEFENCE AND WARTIME EXPENDITURE 1933-45

YEAR	ACTUAL EXPENDITURE FOR WAR		ACTUAL INCOME SPENT ON WAR		AMOUNT OF REVENUE MADE UP BY EXPENDITURE FROM DEFENCE EQUIPMENT ACCOUNT (£)
	TOTAL NATIONAL BUDGET (£)	DEFENCE AND WAR EXPENDITURE (£)	REVENUE (£)	LOANS (£)	
1933/34	73,146,161	4,083,864	3,918,411	165,453	360,000
1934/35	77,835,163	5,683,552	5,552,711	130,841	933,899
1935/36	83,439,381	7,196,367	7,048,306	148,061	1,333,016
1936/37	84,451,220	8,019,917	8,026,572	Cr 6,655	1,076,187
1937/38	93,730,781	9,780,756	7,826,969	1,953,787	1,569,503
1938/39	98,658,504	14,395,091	12,482,807	1,912,284	3,245,749
1939/40	143,268,573	55,715,211	26,901,165	28,814,046	
1940/41	255,691,756	170,828,573	69,247,343	101,581,230	
1941/42	422,846,302	320,706,022	109,829,694	210,876,328	
1942/43	697,476,415	562,664,167	159,812,053	402,852,114	
1943/44	738,651,949	545,133,367	167,976,432	377,156,935	
1944/45	642,844,634	460,689,932	194,649,447	266,040,485	

Sources

Budget Papers 1934-45, Cost of Departments.

Budget Papers 1945/46, Table 18.

local loans, or to engage in deficit funding. But these actions would, according to prevailing economic theory, discourage economic recovery. This was the true dilemma of Government policy in the late 1930s. The Government could have strong defence forces to meet the contingency of defence against raids, but this would probably be achieved at the cost of another economic recession, or worse[194]. Alternatively, the Government could continue the nations economic recovery by keeping taxes, interest rates, and inflation low, if it was prepared to ignore international dangers and the demands of defence. *pressure*

The scope of defence expenditure for 1937/38, and the financial strain it threatened to create, is indicated by noting from Table 2-10, that since 1933/34 actual defence expenditure had risen by about £1.4 million annually until 1936/37, when the total had reached £8,019,917. The projected total for 1937/38 was £11,500,000[195]. The Government had to halt its policy of tax reductions, and raise a loan of £2.5 million for defence. It did this reluctantly because the loan put pressure on local interest rates, but the alternative would

194. A serious recession, or depression, would destroy the revenue base from which the Government could help to pay for defence. Economic collapse ultimately destroyed any defence effort.

195. AA CRS A461, File U344/2/1, Treasurers Speech 27 August 1937.

have been to raise taxes[196]. Much pressure was released when the Defence Department failed to expend its budget for 1937/38 by nearly £2 million[197]. The cause was the slowness of the works programme[198].

The financial problems of the Government became worse in 1938/39, under the impact of the Parkhill and Casey rearmament programmes. This is clear from Table 2-8. In preparation the Government had raised in May 1938 a public loan of £10.25 million, of which £4 million was earmarked for defence[199].

196. *ibid.* The Government had reason to be worried, for in 1935 the Australian and state governments had over-exploited the Australian loan market and interest rates rose. The Loan Council reduced its borrowings, but semi-government bodies (local government and statutory bodies) increased their share of the market. The total loans raised in 1937/38 was almost the same as in 1935. AA CRS A571, File 39/1094, Secretary of Commonwealth Bank to Secretary of Treasury 21 March 1939, Secretary of Commonwealth Bank to Treasurer 17 March 1939.

YEAR	GOVERNMENTS	SEMI-GOVERNMENT	TOTAL
1932/33	£16.5m	£ 3.5m	£20.0m
1933/34	£22.5m	£ 3.5m	£26.0m
1934/35	£27.5m	£ 3.4m	£30.9m
1935/36	£17.0m	£ 5.0m	£22.0m
1936/37	£15.4m	£ 8.9m	£24.3m
1937/38	£18.6m	£11.6m	£30.2m

197. See Table 2-10, see also AA CRS A571, File 40/2559, Treasurer's Financial Statement of 2 May 1940. It is noteworthy from Table 2-10 that only £1,953,787 of the loan of £2.5 million was spent. This was because the Treasury would generally insist that all funds in Revenue should be expended before Loan Funds. In the end the 1937/38 budgetary surplus was £3.49 million. AA CRS AA1968/391, Folder 55, Cabinet Submission of 24 August 1938.

198. AA CRS 3258, Volume 6, Cabinet Agenda 573 of 25 February 1939. In December 1937 Cabinet had ordered the Department of Works to give priority to Defence in works. However, the percentage of expenditure by the Works Department for defence projects had only risen from 33 per cent in December 1937, to 40 per cent in December 1938. Works claimed that while it recognised the Cabinet directive of 1937, other Departments had competed with Defence for Works Department resources for their own 'urgent' projects. Works wanted a clearer Cabinet directive.

199. L.F.Giblin, *op.cit.*, p.251, see Table at p.175.

But as early as 15 July 1938, Lyons had notified the Defence Minister that the preliminary Budget situation for 1938/39 indicated that taxation would not meet the Government's commitments. All Departments were exhorted to exercise the strictest restraint on expenditure[200]. The projected cost of defence was £16.8 million as compared to actual expenditure of £9,780,756 for 1937/38[201]. But as the Government's defence expenditure expanded, its revenue was shrinking. Prices for primary exports were still declining, and signs of an economic recession in Australia were becoming more obvious. The shortfall in revenue amounted to £3.2 million which the Government sought to make up with higher income and sales taxes, and stringent economies in all non-defence associated Departments. Further public loans were rejected temporarily as an alternative because of the needs for the states for loans, and because of a large conversion loan at the end of 1938[202].

It does not need to be emphasised that the Government was being forced into a policy which in conventional economic terms would aggravate the incipient recession. The addition of the Munich rearmament programme in late 1938, increased this trend[203]. The total public loans raised by the Australian and

200. AA CRS AA1971/216, Council of Defence Meeting 26 August 1938, Agendum No.21.

201. AA CRS A451, File G344/2/1, Treasurers Budget Speech for 1938/39.

202. AA CRS A451, File G344/2/1.

203. AA CRS A461, File H344/2/1, Acting Prime Minister, Page, to all ministers 13 October 1938: 'Since the Budget Speech was delivered the position has become accentuated by international developments and the need for extension of the Defence programme has become more evident and more urgent. We may have to increase the Defence expenditure substantially this year and devote all our available efforts and funds to the supreme national objective of obtaining the highest possible degree of security in the quickest possible time'.

state Governments by the end of 1938/39 was over £29 million[204]. When this was combined with the loans raised by semi government bodies, it amounted to great pressure on local interest rates. The Central Bank noted in March 1939 that in the previous 14 months, in addition to purchases on the open market, the Central Bank had subscribed £12 million to Government loans out of total cash raised of £35 million. Of the recent loan of £8.5 million raised in February 1939, subscriptions from the public totalled £3.9 million and the rest was provided by the underwriters, including a subscription from the Central Bank of £2.77 million[205]. This indicated clearly that interest rates would have risen if the Government loans had not been supported by the Central Bank.

The Bank was unhappy at having had to do this for it amounted to a policy of deficit funding. Small loans to the Government of about £5 million were appropriate to ameliorate recession conditions, but loans of £12 million increased the money supply faster than the production of consumer goods, threatening inflation:

‘General unemployment, or the threat of it, is one reason for increasing the supply (of money). General employment ... is one reason for decreasing it. The needs of defence have nothing to do with determining the proper supply of money. If a central bank loan is made for defence at a time when

204. L.F.Giblin, *op.cit.*, p.175.

205. AA CRS A571, File 39/1094, Commonwealth Bank to Treasurer 17 March 1939. The cause of the Governments loan difficulties, according to the Commonwealth Bank was firstly, the check to the increase in the National Income in the current year; secondly, the growth in the last two years of semi-government borrowing (local government and statutory bodies); thirdly, the expansion of building activity and the growth of the co-operative building society movement in NSW; fourthly, the investment policy of life assurance offices, banks, friendly societies and government superannuation funds, was being effected by building expansion and semi-government borrowing, and so were not available for loans to the Government.

the money supply does not require increasing then the country will pay for it through rising prices and general dislocation more heavily than if the money were raised by taxation ...'[206].

Yet the Government was under considerable public pressure, from even its own supporters, not to raise money by taxation increases, or by further public loans. Many people were in favour of paying for improved defence by interest free loans from the Central Bank[207].

By early 1939, the economic prospects for the Government were bleak. It seemed that as taxes had increased, and the pressure on public loans rose, the Government was aggravating the economic recession. Export prices had

206. AA CRS A571, File 39/1094, Commonwealth Bank to the Treasurer 17 March 1939 plus attachments. The Central Bank also pointed out that while a recession provided unused resources in men and capital equipment, for the Government to use for defence purposes, their loss from the civil economy would reduce the total number of consumer goods which could be made when the economy recovered, and would therefore lower the standard of living of the population. The Bank went on to sound the usual alarms about the consequences of raising taxation and/or interest rates to economic recovery.

207. AA CRS A571, File 38/3177, Parts 1 and 2. Support for these views came from campaign workers for the United Australia Party, the Wheat and Wool Growers Union, Returned Servicemen's League Branches, the Graziers Federal Council and the Douglas Credit pressure group. Many of these bodies wanted to stimulate the economy with large scale government spending, in the same way as the German Treasurer, Dr Schacht. The Australian Government and the Central Bank thought that this would fail because they could not emulate the rigid control of press and wages of the Nazis, which would prevent inflation. The connection between greatly increased credit and inflation was a difficult one for the Government to explain to the public, and despite the assistance of some prominent economists, the Lyons, Menzies and Fadden Governments never really succeeded. Professor Copland of Melbourne University wrote a detailed explanation and rebuttal of the Free Credit argument, for the Treasurer, Casey, but it does not seem to have been used. The Budget Statement of 8 September 1939 had a section which attempted to despatch the Free Credit argument; and the new Treasurer, Spender, published in 1940 a pamphlet entitled 'National Credit' which rather unsuccessfully attempted to explore the expanded credit-inflation nexus in simple terms. See AA CRS A571, Files 40/2432, 38/3177 Part 3, and Budget Statements of 1940 and 1941.

collapsed to 65 per cent of their pre-depression value by June 1939[208], revenue from taxes was declining, unemployment was rising and would reach 10.4 per cent in September 1939[209]. A budget deficit of £5.3 million for 1939/40 was forecast[210]. At about the same time the Government also learnt that its defence programme would still leave the Armed Services short of the desired capability to repel raids[211]. Despite this, it would not initiate any further defence rearmament to follow the Munich programme of December 1938. The Treasury had been complaining bitterly about the costs of the existing programme:

‘The problem of finance is going to be an exceedingly difficult one, and when the weight of taxation and increase in prices is felt, pressure by the press and public will be the reverse of what it is now, if war does not occur in the meantime’[212].

The new Prime Minister, Menzies, observed that:

‘He had been advised that any further great strain on the financial resources of the community may cause economic disaster. It had been stated that if war should come, money would be forthcoming to meet all requirements to wage a successful war. It had to be remembered, however, that war was by no means inevitable, and as war may not arise, the financial outlook was an important one’[213].

208. L.F.Giblin, *op.cit.*, p.250.

209. *ibid.*, p.272. However, the first census of the National Registration Act, carried out in July 1939, showed that of all males between 18 and 64 years old, 264,000 were unemployed, i.e. 12.5 per cent — J.J.Dedman in *The Australian Journal of Politics and History*, Volume 13, No.3, December 1967, p.335.

210. AA CRS A2694, Volume 18, Part 5, Cabinet Agenda 452 of 28 September 1938, CRS AA 1968/391, Folder 55, Assistant Treasurer 1 August 1939.

211. AA CRS AA1971/216, Council of Defence meeting 5 July 1939, Agenda No.9.

212. AA CRS A571, File 38/1815, Part 1, Secretary of Treasury to Treasurer, 8 May 1939.

213. AA CRS AA1971/216, Council of Defence Meeting 5–6 July 1939 Minutes.

Menzies also noted that any attempt to raise further large defence loans would result, with the states borrowing programmes, in the loans being under subscribed by the public, and the Central Bank would have to supply the balance. The resulting inflation of prices and reduction of living standards of the people was justified during a war, but unjustified as a precautionary measure against war[214].

The Government would not budge from this position, despite the deteriorating international situation, until war actually began in September 1939. Even though the Defence Department underspent its budget by £3 million for 1938/39, allowing a further budgetary surplus to be achieved[215], the Government found the economic strains too great to do anything more for defence.

The economic consequences of preparing for higher levels of contingency such as Defence against Invasion, as suggested by the Army, were laid bare in the Council of Defence meeting of 5 July 1939[216]. Here the Chiefs of Staff of the three Services outlined the additional requirements needed to prepare for the defence against raids contingency, and also what was needed to prepare for defence against heavy raids. This was the contingency which lay below defence against invasion, but above defence against raids. It envisaged raids of up to brigade strength, supported by Japanese cruisers, aircraft carriers, and perhaps

214. *ibid.*

215. CPD Vol161, pp319, Treasurer's Budget Speech 8 September 1939; CPD, Vol163, pp467, Treasurer's Budget Statement 2 May 1940. The Department spent £13.8 million out of £16.8 million. Works continued to be delayed. The Budgetary surplus was £627,309. AA CRS AA1968/391, Folder 59.

216. AA CRS AA1971/216, Council of Defence Meeting 5-6 July 1939.

one capital ship.

The Armed Services additional requirements for defence against raids were in excess of £20.5 million, a large proportion of which should have been included under the defence against heavy raids contingency. For example, the Navy included a battle ship and its destroyer escorts as additional requirements. Such heavy armament was not justified under the defence against raids contingency, although it would have been useful like many other things. The Army and Navy both knew that there was little prospect of the Government approving anything which was not associated with the defence against raids contingency, and so placed some of their more extravagant demands in the lower contingency. Yet the additional costs of preparing for the defence against heavy raids contingency, which the Services saw fit to indicate, totalled an additional £40 million[217]. Thus it would have cost the Government an additional £60 million approximately to complete preparations for the defence against raids and heavy raids contingencies. The much larger contingency of defence against invasion would presumably have cost much more again.

This data allows the Army's plans for an anti invasion force to be placed into economic perspective. If the Government was having such financial difficulty, as already indicated, in finding the sum of about £60 million for defence against raids, to which it had committed itself in December 1938[218], was it ever credible that the Government could also have afforded, in peacetime, the huge

217. *ibid.* The additional capital cost for the heavy raids (or Medium Scale) contingency for each of the Services was Navy — £18.5 million, Army — £15.0 million, Air Force — £6.5 million.

218. CPD Statement by Minister of Defence, 6 December 1938, *op.cit.*

additional costs of preparing for defence against invasion? The answer must be no, even in regard to the smaller defence against heavy raids contingency.

It is interesting to consider how much more the Government might have achieved if it had followed Keynesian economic advice — not that any was available to the Government — during most of the 1930s. For as long as unemployment remained high (i.e. above one or two per cent of the workforce) the Government could have run large deficit budgets, to utilise the unused industrial and financial resources for defence. The risk of inflation was much less than believed by the Lyons and Menzies Governments and the Central Bank. Continued large deficit budgets after the return to full employment (i.e. the full utilisation of industrial and financial resources) would have led to increasing inflation, as defence requirements and the civil economy began to compete for a finite number of resources. Such inflation could be controlled by the series of measures enacted during the Second World War, such as wage and price control, and rationing; but they were unlikely to have been acceptable to the Australian population before the onset of war[219]. Therefore Australian Governments would probably have had to stop financing defence through deficit budgets shortly after the return to full employment, or face an electoral backlash caused by rising inflation.

219. This was the Treasury view, AA CRS A571, File 38/1815, Part 1, Secretary of Treasury to Treasurer 8 May 1939. Essington Lewis — future Director General of Munitions, and J.J.Dedman — future Labor Minister for War Organisation of Industry and Minister of Defence, both thought that before June 1940, i.e. nine months of war, it was still impossible to get the Australian people to accept the necessity for such measures. See J.J.Dedman in *The Australian Journal of Politics and History*, Volume 13, No.3, December 1967. See Lewis address to luncheon given by the Editors of principal Australian newspapers 2 July 1940 quoted in Chapter 5.

Continued heavy expenditure on defence after the return to full employment would have had to be supported by the Governments[?] own revenue *possess* from increased taxes or public loans. Tax increases in peacetime caused more political backlash than inflation, and so were unlikely to be imposed beyond a limited extent. Public loans could only be pursued for as long as interest rates did not begin to rise significantly through competition with business for funds. If interest rates rose too much, business would be unable to get the funds needed for expansion of consumer products to meet the rising consumer demand stemming from the fully employed economy. This would force prices to rise creating inflation.

Keynesian economics would have allowed the Governments of the late 1930s to solve their economic and defence problems simultaneously, instead of presenting them as being mutually exclusive. This would have been possible to the stage when full employment was restored, when familiar problems of inflation and tax increases would have made further dramatic progress in defence difficult, if not impossible, in the face of public opposition to the lowering of peacetime living standards. Nevertheless, this increased flexibility would probably have allowed the Government to complete the preparations for the defence against raids contingency before the end of 1939. But sooner or later the problem of resources would have arisen. The defence against heavy raids, and invasion contingencies required so many resources to complete, that most of these could only have been obtained at the expence of the civil economy. The diversion of large resources from the civil economy could not be achieved without inflation, unless arbitrary and powerful economic measures were enacted

to control public consumption of consumer goods. It is unlikely that these intrusive and disruptive measures would have been tolerated by the population before the onset of war. The inescapable problem for the defence against heavy raids, and defence against invasion contingencies was that they required defence forces which were too large for Australia's small population and economy to support in peacetime. Such forces could be, and were, created during the war, because the population would accept great deprivations to support the war effort.

CHAPTER 3

THE MSB AND SECONDARY INDUSTRY 1921-39

Introduction

Self containment, as understood by the MSB, meant little if the munitions factories and laboratories were not supported by a growth in the capability of secondary industry. Firstly, the MSB required many processed raw materials to manufacture munitions. If these continued to be imported, the cause of self containment was not advanced very far, despite the creation of the technical superstructure under the MSB. Secondly, the factories of the MSB were not designed to produce the bulk of munitions required for a war. They were repositories of engineering knowledge and technique. Secondary industry was expected to make the major quantity of munitions required, after training and advice from the MSB factories and laboratories. This presupposed that secondary industry would reach a level of technical sophistication which would allow it to be trained for munitions production.

The development of secondary industry was monitored by the MSB, and in certain ways the MSB sought to influence and encourage the development of industries of direct significance to defence. This relationship is examined in the first part of this chapter. The second part considers the struggle between the MSB and the Council of Scientific and Industrial Research (CSIR) to control technical support for secondary industry, following the Lyon's Government initiatives in 1936.

Development of Australian Industry 1914-36

Before the First World War, Australia still had essentially a rural based economy. Such secondary industry as existed produced mainly consumable

items such as clothing, boots, beer etc., and machinery devoted to supporting rural activities such as farm machinery and refrigeration equipment. Some mining equipment was also made, but the refining of ores was not well established. An infant iron and steel industry struggled precariously for life at Lithgow producing about two per cent of the total demand for iron and steel. Australia was dependent heavily on imports of most major manufactured goods, and these were purchased largely with the earnings from the sale of rural products to Britain and other countries[1].

The First World War caused a decline of imports into Australia of refined metals and manufactured goods. Shortages in shipping space, and heavy demands by overseas governments, prevented overseas suppliers from continuing to meet Australian demands[2]. This caused considerable disruption to the Australian economy for much of the war, but it also provided a unique opportunity for local industries to spring up and to attempt to supply the demand for manufactured goods[3]. The decline in overseas competition encouraged many new secondary industries which included iron and steel making, ship-building, metal refining, glass making, chemicals, paints and varnishes. By the end of the war, these new industries had absorbed a significant amount of manpower, to some

1. See W.A. Sinclair, *The Process of Economic Development in Australia*, Cheshire, 1976, pp.164-172. C.Forster, 'Australian Manufacturing and the War of 1914-18', *Economic Record* Vol.29, November 1953, pp.211-230. C.Forster, *Industrial Development in Australia 1920-30*, Canberra, ANU, 1964, pp.15, 128. H.Hughes, *The Australian Iron and Steel Industry 1848-1962* Melbourne University Press, 1969, p.72. Australian Industries Development Association (AIDA), 'The Australian Iron and Steel Industry', *Industry Series No.2* 1969/70, p.10.

2. C.Forster, 'Australian Manufacturing ...', *op.cit.*, p.219.

3. *ibid.*

extent compensating for the disruption in employment in other industries. The iron and steel industry, for example, had expanded to 200,000 tons or 10 times its capacity of 1914, absorbing about 20 per cent of the total annual domestic market of approximately 1,000,000 tons[4]. The Australian Government was anxious to maintain the new industries, for with the imminent return of the AIF, there would be additional post war employment problems[5].

The new secondary industry sector soon needed help, because the 1920s *agreed* were a period of aggressive world trading. There was little international sympathy for newly industrialising nations such as India, Canada, South Africa and Australia. Overseas manufacturers set out to recapture lost markets by undercutting local Australian prices and/or dumping their products. The Australian competitive position was weak largely because of a cost structure which was at a much higher level than most overseas sources of manufactured goods, particularly Britain[6]. Many things contributed to this high cost structure, including higher wages, poor economies of scale, and long distances between the major Australian population centres. Other problems were related to the Australian population being grouped largely along the eastern seaboard which was reached readily by imports. The range of experience of the workforce was limited, and the Australian financial organisation was more appropriate to an agricultural-commercial economy, not industrialisation[7].

4. AIDA, 'The Australian Iron and Steel Industry', *op.cit.*, p.10. C.Forster, *Industrial Development ...*, *op.cit.*, pp.15, 128.

5. C.Forster, 'Australian Manufacturing ...', *op.cit.* F.G.Davidson, *The Industrialisation of Australia*, Melbourne University Press, 1969, p.4.

6. C.Forster, *Industrial Development ...*, *op.cit.*, p.5. H.Hughes, *op.cit.*, pp.85-6.

7. C.Forster, *Industrial Development ...*, *op.cit.*, p.5.

The best means available to the Australian Government for aiding the incipient industrialisation was through tariff protection. The idea of erecting tariff barriers to protect the new secondary industries was not original as it had been practiced to some degree by most Colonial Governments, particularly Victoria. Soon after Federation in 1901, the Australian Government had also imposed tariffs, but these were relatively low, and aimed principally at raising revenue[8]. In subsequent tariff increases before 1920, the main purpose remained revenue raising, although a further consideration was to protect secondary industry[9]. But there was little secondary industry before the First World War[10] ; and during the war, it needed little protection because there was minor overseas competition.

In March 1920, the Minister for Trade and Customs, Massy-Greene, announced the largest increases in tariffs since Federation, the major purpose of which was to protect existing secondary industries and to encourage their further growth. The British preferential tariff rate was raised to 35 per cent, and the general tariff to 45 per cent, which were well above what had operated during the war. At this time many Australian secondary industries were beginning to feel the effect of overseas competition. The fledgling iron and steel industry was particularly badly affected[11]. But the war had been an important experience

8. *ibid.*

9. Another objective was to preserve foreign exchange, and encourage savings (for war loans) by restricting luxury goods— see C.Forster, 'Australian Manufacturing ...', *op.cit.*, pp.219–222. W.A.Sinclair, *op.cit.*, pp.168, 179. The Manufacturing Industry remained less than 14% of the Gross Domestic Product until the First World War.

10. C.Forster, *Industrial Development ...*, *op.cit.*, pp.5, 17.

11. H.Hughes, *op.cit.*, pp.85–6. The industries mainly favoured by the new tariff were

for many Australian politicians for they had learnt the value of a high level of economic self sufficiency. They were not prepared to return to complete dependence on overseas suppliers. Massy-Greene stated that:

‘The Tariff will protect industries born during the war, will encourage others that are desirable, and will diversify and extend existing ones ...’

He added that the First World War had subjected Australian overseas trade to almost total disruption. Exports could not reach Europe, and imports on which Australia depended for many of the essentials of modern life could only be procured at exorbitant prices from overseas profiteers[12].

Massy-Greene’s actions did not signal that the Government now saw secondary industry as the main area for economic development. In fact between 1920 and 1929, Hughes and Bruce both saw the continued development of primary industry as the best means of increasing the population and standard of living in Australia. Their Governments gave vigorous support to the expansion of primary industry. Vast sums of capital were invested in the development of new farmlands and rural settlement, with further expenditure on complementary public works such as water supply, irrigation, transport and communications. Bruce’s Government extended subsidies to rural products, and did much work in improving marketing. This was matched by the creation of the Council of Scientific and Industrial Research (CSIR) in 1926, which the

chemicals, iron and steel, metal working. ‘Policies for Development of Manufacturing Industry’, Green Paper Vol.1: *Report to the Prime Minister by the Committee to Advise on Policies for Manufacturing Industry October 1975*, AGPS, pp.26-7.

12. CPD, Vol.XCL, 1920, p.700.

Government funded only for research into primary industry at this time[13]. This did not change until 1937[14].

Bruce felt that secondary industry existed on an artificial basis, because it needed high tariff protection, and such a sector could hardly provide the impetus for expansion and absorb large numbers of people. Bruce also believed in the economic unity of the Empire, with Britain providing the dominions a market for their foodstuffs and raw materials, and the dominions providing a market for British manufacturers and outlet for surplus population. A policy of development based on the intensive use of land and immigration thus seemed entirely logical[15]. Despite these prejudices, Bruce, like his predecessor Hughes, was not prepared to see secondary industry reduced, for the reasons already stated. They did not mind if secondary industry expanded because new industry helped to diminish Australia's persistent unemployment which throughout the 1920's never went below 7% of the total workforce[16]. But Hughes and Bruce were not prepared to go further than the imposition of protective tariffs and the development of administrative machinery which allowed swift adjustment in response to unfair overseas competition[17]. Tariffs could not be prohibitively

13. D.Pope, 'The Peopling of Australia: United Kingdom Immigration From Federation to the Great Depression', PhD, ANU, 1976, pp.171, 260-62. Such rural activities were encouraged by Britain which made an agreement in 1925 to lend £34 million to Australia, at low rates of interest, to encourage migration and stimulate land settlement and related public works. See also W.H. Richmond 'S.M. Bruce and Australian Economic Policy', *Australian Economic History Review* Vol.XXIII No.2, September 1983.

14. See later this Chapter.

15. W.H.Richmond, *op.cit.*, p.240.

16. W.A.Sinclair, *op.cit.*, p.191.

17. Some British manufacturers were importing from Europe, most of the components and/or materials of their products at very low prices, assembling them in Britain, and

high without increasing costs for primary production. Thus secondary industry could expand within this framework but it could expect no further assistance.

Other reasons why politicians were prepared to give tariff protection to secondary industry were because of defence. They did not believe that a small population of only a few million could defend the whole of the continent of Australia against the teeming hordes of Asia[18]. The First World War had been a bad shock because virtually the whole of the British naval shield in the Pacific had been withdrawn to Europe. Many people, including Hughes' Government, realised what Massy Greene summarized in 1920. Australia had lacked many

exporting them to Australia under the British Preferential tariff as goods manufactured in Britain. These were much cheaper than could be wholly manufactured in Britain, and gave de facto entrance into the Australian market, at low tariff rates, to European producers. See H.Hughes, *op.cit.*, pp.88-89. These and other overseas pressures led to the enactment of the Customs Tariff Act and the Industries Preservation Act of 1921, and the creation of the Tariff Board. Originally the Board was to assist the Minister for Trade and Customs to administer the antidumping provisions of the Industries Preservation Act but it also took over the duty of deciding correct tariff rates. C.Forster, *Industrial Development...*, *op.cit.*, p.17. G.J.Hall, 'The Australian Tariff Board 1922-1956', Master of Commerce Thesis, Melbourne University, April 1958, pp.5-8, 219. L.Glezer, *Tariff Politics—Australian Policy Making 1960-1980*, Melbourne University Press, 1982, p.9. The method for encouraging the growth of a new industry was through the use of bounties. A bounty was a government subsidy offered to Australian firms if they manufactured a particular new product. The use of a tariff in these circumstances was not always appropriate as it imposed a cost on society, through higher duty on the imported product, without any immediate benefit in increased employment (i.e. a non-existent industry employs no one). The bounty system encouraged the entry of Australian manufacturers into a new field and the general public did not bear the direct cost of the experiment. If a new industry did indeed succeed in emerging to supply a substantial part of the local demand for the product, it was then a practical measure to erect a tariff (and drop the bounty) with the expectation of preserving some significant number of new jobs, and perhaps increasing their number. In this way the additional cost to society became acceptable because industrial development and employment were enhanced. See H.Hughes, *op.cit.*, pp.38-39.

18. D.Pope, *op.cit.*, pp.251-254.

of the essentials vital for her defence and that the next war might be closer to Australia. The Government had a duty, through the development of secondary industry, to supply all the elements of a modern army's equipment[19]. Bruce held similar views[20].

In fact the protective tariff generally failed to keep pace with the falling price of imports, and was also restrained by the cost structure of rural producers whose financial returns declined each year with the fall in export prices[21]. Nevertheless, the Government was anxious to encourage some secondary industry and supported the protective tariff with a system of preferences for goods required by Government departments and instrumentalities. The Australian Government was not obliged to pay customs duty for anything it bought from overseas, and sometimes gave similar concessions to state governments. All governments when comparing local with overseas tenders, however, added to the overseas tender the amount of the tariff, plus some preference for Australian producers. The amount varied, but the Commonwealth Stores and Supply and Tender Board gave preference of 20 per cent over and above the tariff. The influence of this system was important because state and Australian governments absorbed large quantities of manufactured goods, particularly through their dominance in such fields as communications, power and water supply and large scale irrigation schemes[22].

19. CPD 1920, Vol.XCL, p.700, Massy-Greene statement.

20. W.H.Richmond, *op.cit.*, pp.239-240.

21. P.Cochrane, *Industrialisation and Dependence ...*, Queensland University Press, 1980, p.109.

22. C.Forster, *Industrial Development ...*, *op.cit.*, pp.18-19.

By 1929, the protective tariff policy appeared to have been successful in meeting Australian Government objectives for some industrial development. Australian secondary industry now supplied approximately 57 per cent of manufacture demand within Australia[23]. There had been a substantial growth in the value of capital equipment[24]. The population had risen between 1919 and 1929 from 5,304,000 to 6,414,000, and real income also appears to have risen, although this was also related to favourable world prices for wheat and wool[25]. In 1929 the Brigden committee seems to have confirmed the effectiveness of the protective tariff when it pointed out that the labour employed by industries which could not exist without protection, could not have produced the same income if employed in the export (primary) industries, because those industries were subject to pronounced decreasing returns. The committee said that the evidence available did not support the contention that Australia could have maintained its present population at a higher standard of living under free

23. C.B.Schedvin, *Australia and the Great Depression...*, *op.cit.*, p.55. Schedvin presents the following table:

SECONDARY	1907	1913	1919-1920	1924-1925	1928-1929
INDUSTRIES	%	%	%	%	%
INDUSTRIAL METALS	39.7	43.8	59.1	58.3	60.7
AND MACHINES					
TEXTILES	4.9	7.8	20.1	24.2	36.5
CLOTHING	63.7	69.4	84.1	80.5	84.7
PAPER	17.6	18.7	33.0	36.6	38.1
CHEMICALS	38.7	32.3	48.0	52.2	53.1
WEIGHTED					
AVERAGE	35.3	41.4	53.5	52.5	57.2

24. C.Forster, *Industrial Development ...*, *op.cit.*, p.11. Capital equipment included buildings, plant and machinery.

25. *ibid.*, pp.8-10. F.G.Davidson, *op.cit.*, p.4.

trade[26]. Thus it can be seen that between 1920 and 1929, Australian Governments were applying a broader policy of self containment than that being implemented by the MSB, and that this policy was reasonably successful.

But in economic terms, the protective tariff was not necessarily promoting efficient secondary industry. With the declining overseas demand for primary exports, Australia could not support such import substitution indefinitely unless it generated efficient industries, despite the demands for self containment. Australian Governments did not recognise this problem explicitly before the Great Depression. The Tariff Board was aware of it, and had sought to limit the scope of protection in the late 1920s, but had been largely ignored by the Bruce Government[27]. The Scullin Government was faced with mass unemployment and a balance of payments crisis, and consequently raised all tariffs greatly[28]. In 1931, the Tariff Board listed four reasons for not giving prohibitively high and indiscriminately broad tariffs[29]. The first was that the Board thought Australian secondary industry would get too sheltered and lack efficiency also tending towards undue profit. The second was competitive over-

26. G.J.Hall, *op.cit.*, pp.230-231. L.Glezer, *op.cit.*, pp.11-12. Green Paper Vol 1, *op.cit.*, pp.26-27. The success of the Protective tariff was also helped by:

- a. a well developed transport system in South East Australia, and after 1920 a good electric power system;
- b. a good resource base, particularly in iron ore and coking coal for heavy industry, and black and brown coal for power; and
- c. close cultural ties with Britain which helped to get skilled migrants for industry.

C.Forster, *Industrial Development . . .*, *op.cit.*, pp.5-6.

27. L.Glezer, *op.cit.*, pp.10-12.

28. *ibid.*, pp.16, 19.

29. G.J.Hall, *op.cit.*, pp.87-91. The Brigden Committee also made similar warnings in its report of 1929, when it said that the protective tariff had probably reached its limit and further increases might threaten the standard of living. L.Glezer, *op.cit.*, pp.10-12.

investment; too many local firms would be encouraged to compete for a new local market, causing high overhead costs for the community. The third reason was that industries supported by too higher tariff, produced at too great a cost, which was passed on to other industries not previously needing high protection. The last reason was that the imposition of a prohibitive duty could lead not only to the loss of duty previously collected from the imported article, but also to a serious disruption in trade resulting in unemployment in those industries manufacturing accessories and replacement parts as well as in the assembling and distributive services involved. In the same report the Tariff Board noted what it called the 'Tariff Habit', which was the tendency of manufacturers to ask for tariffs without first having tried to improve their production by other means available to them[30]. There was danger in too much tariff assistance, leading to an industrial dependence upon the Government, rather than the promotion of earnest effort towards self dependence and efficiency.

The comparative inefficiency of many parts of secondary industry with exports, and its high cost structure, contributed to the collapse in domestic consumer demand during the Great Depression. Although nominal wages declined by about 20 per cent between 1928/29 to 1932/33[31], tariffs were not reduced

30. Manufacturers were not encouraged to desist from this practice because of the ease with which unions could get wage increases. It was to everyones mutual advantage for manufacturers to ask for higher tariffs. When these were granted, the unions would go to the Arbitration Court for higher wages, which would be usually granted. This raised the cost structure of secondary industry decreasing its competitiveness with imports. G.J.Hall, *op.cit.*, pp.78-80. The *Sydney Morning Herald* thought that it was '... incontrovertible that the high tariff became a national objective in order to provide increased employment benefits to the Australian worker' quoted in C.R.Hall, *The Manufacturers* ..., Angus Robertson, 1971, p.434.

31. F.G.Davidson, *op.cit.*, p.5.

significantly. The Lyons Government did revoke the import prohibitions imposed by the previous Scullin Government, and the 50 per cent surcharge on most of the items on which it had been imposed[32], but it remained difficult to reduce tariffs because of continued fears of the political consequences of unemployment caused through such actions. Such tariff reductions as did take place were to aid primary industry and the restoration of export prices[33]. At the Ottawa trade conference in 1932, Australia promised increased preference to British manufacturers in return for increased entry for primary products into Britain. Lyons could only achieve this by increasing tariffs against non-Empire countries, thus widening the margin of preference in favour of Britain, but not exposing Australian secondary industry to increased competition from British industry[34]. His Government could not have withstood the political furore following significant tariff reductions on secondary industry. Nevertheless, the Lyons Government had realised, by the middle 1930s, the necessity for a more efficient secondary industry, if it were to become the major future employer of labour. The protective tariff could allow secondary industry to be created in Australia, but it could not enforce efficiency in manufacturing. If self containment were to continue to advance, what was needed was scientific research support for manufacturing industry, similar to that provided by the Government in 1926 for primary industry.

32. AA CP498, S1, Bundle 2, File 430/B/20d, 430/B/20f. W.T.Dobson, 'Associated Chambers of Manufacturers of Australia 1904-1977', MA, University of Melbourne, 1979, p.89.

33. C.B.Schedvin, *Australia in the Great Depression* ..., *op.cit.*, p.367.

34. P.Cochrane, *op.cit.*, pp.46-47. C.B.Schedvin, *op.cit.*, pp.368-370.

The MSB and the Development of Secondary Industry 1921-1936

The MSB was interested in the general development of industry within Australia. It knew that the elaborate edifice of research and engineering capabilities, which it was building during the 1920s, would not count for much if they remained dependent on overseas supplies of materials and articles. The self containment strategy had to be supported by supplies of materials and articles coming from Australian sources, if the strategy was to have any semblance of effectiveness, and if the problems of the First World War were to be avoided.

The MSB supported the use of the protective tariff as the Australian Governments main instrument for developing industry:

'... the problem of supply for defence is slowly but surely working to a solution through forces that are set in motion by the protective tariff, ... the net result being a great increase in sources of supply from a defence aspect. It is the emergence from the "raw material" stage to the "article" producing stage that proclaims a modern country to have reached military potency, and there is no doubt that during the last ten years Australia has vastly increased its capacity for producing "articles" essential to her defence. For many years now it has been the policy and the ambition of the Department [of Defence] to take full advantage of that improving position'[35].

This view was supported by Ministers of Defence throughout the decades of the 1920s and 1930s[36].

35. AA MP598, S30, 'Memorandum on Supply ...', by A.E.Leighton, 13 March 1928, p.8. This was approved by the MSB 15 March 1928.

36. e.g. Sir Neville Howse, 'Australian Defence', MP598, S30, 29 September 1925, p.7. Sir George Pearce, 'Statement of the Governments Policy Regarding the Defence of Australia', CRS A664, File 449/401/102, 25 September 1933, p.11. Sir Archdale Parkhill, 'Australian Defence: Munitions Supply Organisation', 26 August 1936, Parkhill Papers, NLA MS4742, p.1. G A Street, C.P.D. Vol158, p2764, 6 December 1938.

The MSB was not constrained to be a passive observer of the application of the protective tariff. It advised the Trade and Customs Department on how tariff policy could be used to aid industries of defence significance[37]. The MSB was concerned that tariffs should be imposed in a rational manner. In 1922-23 it cited the new metal working industry and argued that for example, a tariff on imported metal products would not always work to the advantage of the new industry if it included the vital machine tools needed by metal workers. Tariffs had to be applied with care if they were not to have negative as well as positive effects on new industries of defence significance[38].

The MSB does not appear to have sought to influence tariffs through the Tariff Board often, but preferred to work directly with Customs authorities where the confidentiality of MSB comments could be preserved. In the open arena of the Tariff Board enquiries, suggestions by the MSB were likely to be taken literally by commercial firms. Leighton was anxious that the MSB should not appear to be too effusive (even to the Trade and Customs Department) on proposals to establish new industries because:

‘Experience has shown that where a commercial concern, moved at some time by patriotic emotions, has subsequently failed to make profits, it feels that failure is to be ascribed to the sinking of capital to meet Defence demands, and there are cases on record where such concerns have even suggested compensation’[39].

37. MP598, S30, Box 13, ‘Notes on the Munitions Supply Work of the Defence Department and its Inter-Relationship with Trade and Customs Policy’.

38. *ibid.*

39. J.K.Jensen, ‘Defence Production ...’, *op.cit.*, Ch.9, Vol.9, p.18. However, when it chose to appear before the Tariff Board the MSB was usually unequivocal in its position; see for example AA A1731, Tariff Board Report 258 of 18 February 1929.

Jensen was also cautious:

‘A greater problem is the encouragement of new industries and the suggestion has been made that the Customs Tariff should be used in this connection but it requires much consideration and study of the peculiarities of an industry before any advice can be given that the Tariff should be directly applied for Defence purposes ...’[40].

The industries which the MSB most wished to see established were the chemical, iron and steel making, and metal working[41]. These were the most important for the beginning of industrialisation of an economy, and in fact, were the most favoured in the immediate post war protective tariffs[42]. It is doubtful whether Defence Department support was important in gaining such tariff protection, because there were many other government departments as

40. MP598, S30, Box 13, File 1, MSB Agenda 10, Meeting 17 July 1924. However, the MSB was quick to gain tariff protection for itself during the Great Depression. The Scullin Labor Government approved at the request of the MSB, a tariff of 25% and 40% on brass and nickel sheets respectively. AA CRS A3264 Cabinet Records 1929–1931, Volume 1, Cabinet Meeting 26 November 1930. The purpose of this was to enable the MSB’s Ammunition factory group to use its rolling mills to make metal sheets for commercial use, and so survive the drastic financial cuts of the Depression. See Chapter 2. Another area of similar activity was the prohibition in August 1932 of the importing of 0.303 rifles and ammunition, so that the MSBs Small Arms Factory and Ammunition Factory group would regain the domestic market against overseas competition. CRS A2694, Cabinet Records 1932–1939, Vol.4, 23 August 1932, Item 241. In February 1932 the MSB applied for a tariff on Oil of Mirbane which its explosives factory group was making commercially. Under normal trading conditions Oil of Mirbane could be imported at 5d./pound, whereas the MSB could make it for 7 d./pound. The explosives factory group was also making cotton wool commercially, and a tariff was applied to imported cotton wool at the insistence of the commercial buyers who had persuaded the MSB to engage in the experiment. AA CRS A664 File 474/401/452.

41. A.J.Gibson made this recommendation to the Defence Department in his report on the Tuggeranong Arsenal (see Chapter 1), 12 November 1918. MP598, S37, Item 23.

42. Green Paper Vol 1, *op.cit.*, pp.26–27.

well as commercial bodies who were also arguing the same proposition[43]. The Defence Department attitude merely indicated the general harmony of interest which existed during the 1920s, at the Federal level of government towards the protective tariff.

Defence Department advice was more important in gaining tariff protection for small specialised industries for which there were no large supportive interests. In May 1927 the MSB advised the Trade and Customs Department on a range of industries which needed to be established. Included in this range were many small industries, i.e. optical equipment (binoculars, cameras, glass triplex), special radio equipment, dental and surgical supplies, flax and flax goods, elastic webbing. More important industries cited were: chemical industry (dye stuffs), metal working (diecastings of alloy metals), electrical industry (electrical cables and wires), iron and steel (tool steel and aircraft steel, tinsplate), motor car industry, particularly in regard to engine manufacture, because of its importance to an aircraft industry and the development of mechanical transport[44].

However, protective tariffs and bounties were not a guarantee that a small industry would be established. Domestic demand was often too small to justify setting up production, even with the aid of a high tariff or bounty. This

43. These fundamental industries had potentially large domestic markets to capture. The prospect of such areas being preserved for local industry was a most attractive inducement for development from the perspective of increased employment, and commercial profits.

44. AA MP598, S30, Box 13, Defence Department to Private Secretary of the Minister for Trade and Customs, 5 May 1927.

was why, for example, the optical instruments industry never developed before the Second World War. The MSB understood this limitation to tariff policy. In 1918, Leighton had sent Mr N.Esserman, as part of the Technical Enquiry Staff in London[45], to study the theory and design of optical instruments at tertiary institutions in Britain[46]. Leighton's plan was to set up an optical instruments laboratory with the capability of making many of the optical instruments required by the Armed Services. His reasons were that commercial industry in Australia had no experience in making such instruments, and was unlikely to become interested because the domestic demand was small and more or less confined to the very specialised tastes and high standards of the Armed Services. However, the funds made available for the development of the MSB in the 1920s were insufficient to support Leighton's objective, and he had to be content to create a small optics section within the Physics Laboratory of the MSL. This section, in the charge of Esserman, mainly did repair work. The MSBs request in 1927 for a tariff for the optical equipment industry was not an example of its faith in the protective tariff, but a demonstration of its willingness to try anything to achieve the objectives it had set itself in regard to the development of industry[47].

45. See Chapter 1 of this thesis.

46. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 6, Volume 4, p.98.

47. Another example of the scale of domestic demand limiting the effectiveness of tariff protection was that of tinplate. The domestic market until after 1943 required less than 100,000 tons annually, this figure being the economic output for the large capital investment for modern plant. BHP was prepared to make the necessary investment in 1939, if the Government was prepared to give it high tariff protection for seven years. Despite the great importance of tinplate to national security, the Government judged that the tariff required was too high and would transgress The British Australia Trade Agreement of 1932. H.Hughes, *op.cit.*, p.128. A.Trengove, *Whats Good for Australia*

In some cases, where the Australian Government had a stated tariff policy in regard to a new but small industry, the MSB opposed the use of a tariff or bounty to establish the industry. An example of this attitude concerned the aircraft manufacturing industry in Australia. Before and during the First World War the industry was non-existent in Australia, which explains partly, why Leighton was training personnel on his Technical Enquiry Staff in airframe and aeroengine manufacture. By the end of the war, he and his officers had acquired most of the machinery and equipment for an aircraft factory[48]. As for the optical equipment laboratory, government finance was not made available for the aircraft factory within the 1922 development programme[49]. The reason for this was that the Defence Minister, Massy-Greene, believed that the industry would set itself up with the encouragement of a bounty:

‘The best means to encourage local manufacture appears to me to be the passage by Parliament of a Bill authorising the payment of a bounty to be based on the size, capacity and power of the machine’[50].

The MSB opposed the Minister, pointing out that the small scale domestic market showed no prospect for years of supporting any commercial firm with or without a bounty or tariff. If the Government wanted aircraft manufacture in Australia it could only be achieved by a government factory. The MSB thought that the Minister’s view was nonsense, but Massy-Greene replied in October 1922 that Cabinet had approved his proposal[51].

...! *The Story of BHP*, Cassell Australia, 1975, p.170.

48. Joint Committee of Public Accounts 1924, *op.cit.*, Minutes of Evidence, p.116. Minutes of the MSB, MP730, S8, Box 6, Agenda 703 Meeting 20 March 1923.

49. See Chapter 2 of this thesis.

50. Minutes of the MSB, MP730, S8, Box 9, Agenda 92 Meeting 22 February 1933.

51. Minutes of the MSB, MP730, S8, Box 6, Volume 4, Agenda 563 Meeting 14 Septem-

The MSB remained unreconciled to this policy and in 1930 was encouraged by the advent of the Labor Government to remark again on the prospects of aircraft manufacture. It noted that the bounty policy on aircraft had failed. Sufficient demand for aircraft had not materialised, and no bounty had ever been claimed or paid. The MSB pleaded that the problems of aircraft manufacture should be studied systematically in the manner of other munitions produced by the MSB, and the establishment of such manufacture was a matter of first class importance in any defensive war[52]. The Defence Minister, A.E.Green, showed some interest, but the proposal soon became impractical financially, as the Great Depression deepened in Australia. The original bounty/tariff policy for aircraft remained in place for much of the decade of the 1930s, and with no better result.

Government hopes for the protective tariff to encourage the development of key defence industries were not always disappointed, however. For example, the radio and communications industry, led by Amalgamated Wireless (Australasia) Ltd., proved capable of developing large commercial markets in Australia. This allowed much of the necessary infrastructure for defence requirements to be developed by the industry to satisfy commercial demand. Thus the Government was not burdened with a continuing capital and maintenance cost as with the MSB factories[53]. The MSB understood and welcomed this policy. Its complaint was that the Government was often too optimistic over the effect

ber 1922, Box 6, Volume 4, Agenda 591 Meeting 5 October 1922, Box 9, Volume 20, Agenda 77 Meeting 11 December 1930.

52. Minutes of the MSB, MP730, S8, Box 9, Vol.20 Agenda 77, *op.cit.*

53. D.P.Mellor, *op.cit.*, pp.481-485.

of the protective tariff in stimulating viable industries.

The area of the most productive attempts by the MSB to encourage and influence the development of secondary industry had little to do with the protective tariff. Technical assistance was extended on a very wide scale to commercial firms and organisations. The center of this effort was MSL. By the mid 1920's it had become the most important technical component of the entire network of organisations which made up the MSB[54]. A detailed description of its role and activities within the MSB including direct work for the Armed Services and other government departments, is given in Annex C. MSL was the biggest industrial research establishment in Australia, and became a focus of attention by commercial industry because few industrial research facilities were available in the 1920's.

not on
list of
industrial
research

One avenue of contact was through the Contracts Board which was responsible to the MSB for the purchase of all stores for the Armed Services. Commercial firms which won contracts were expected to reach the standards of quality defined by the Armed Services. These were often far higher standards than commercial industry was used to achieving, and MSL habitually extended technical advice with the Inspection Branch, to help firms in achieving production successfully. This educated such firms in the need for standards, but also introduced them to new technology[55]. In this way new indigenous sources of supply were created and knowledge disseminated. The Contracts Board encouraged this by extending significant margins of preference to Australian firms to

54. This had been Leighton's intention-see chapter 1 of this thesis.

55. See Annex C.

encourage tenders from local industry[56].

A second avenue of contact was through the Australian Standards Association which involved many senior executives from commercial industry. MSL supplied extensive technical support to the Association throughout the 1920's and 1930's, and MSB personnel took an active part in its deliberations[57]. MSL agreed to be the national authority on standards of length, and the major checking authority for testing-machines in relation to calibration with British standards. MSL and other MSB personnel were also involved in many other scientific bodies such as the Australian Association for the Advancement of Science, and the Chemical Institute of Australia, where they came into professional contact with industrialists and commercially employed engineers and chemists[58].

In another form of contact, MSL carried out much research directly in support of commercial industry. The MSB had received Cabinet approval for direct technical assistance provided a commercial firm could produce a certificate that the work desired from MSL could not be carried out elsewhere in Australian commercial industry[59]. MSL carried out routine analysis work for

56. AA CRSA5954 Box1092, Secretary of Defence 31 August 1937.

57. See Annex C.

58. AA MP598, S30, Box13, File1, Jensen to Shedden 29 May 1928. AA MP730, S8, Box6, MSB Minutes and Agenda 780 of 2 August 1923, Agenda 793 of 16 August 1923, Agenda 820 of 13 September 1923, Agenda 8 of 17 July 1924, Agenda 232 of 9 January 1928.

59. CSIRO Archives, Minutes of Council Meeting 12-14 December 1927- statement by Leighton. Leighton had originally proposed this policy in MSB Agenda 1921/305, and it was approved at the Meeting of 29 September 1921.

the smaller chemical firms, because the latter often could not afford adequate laboratory support from within their own organisations[60]. However many significant research projects were also undertaken some of which will now be mentioned.

The great interest of state and federal bodies in the work of the Timber Section has been mentioned in Annex C. In 1925, research by the section into the timbers for artillery wheel spokes, established the proper conditions for air seasoning of Australian hardwoods[61]. This was a matter of significant commercial interest, and the Hardwood Millers' Association began a close involvement with MSL[62]. Continuing research into preservation of Australian timber, and seasoning by kilns, was made available to commercial firms, and they often visited MSL to discuss technical problems and to observe the kiln based seasoning operations[63]. Later, research on glues and casein cements was also released[64]. During the 1920's and 1930's, the Timber section was the foremost authority in Australia on the preparation of Australian timbers.

The Metallurgy Laboratory was used often by metal working industries.

60. MSB reports to Parliament refer often to work for commercial interests, without specifying what it was. Much of it was routine chemical analysis- see report for 1929-31, PP 157 of 1933, pp4-5. See also CSIRO Archives S403, Esserman interview 28 May 1970. Esserman said much work was done in the 1920's in assisting industry. Fees were very small.

61. MSB reports to Parliament 1925-26, PP 123 of 1927, pp5.

62. MSB report to Parliament 1927-29, PP 377 of 1930, pp6. Not only did the Association and other members of the industry develop close contacts with the Timber section but MSL sent representatives to conferences run by the Hardwood Millers' Association.

63. *ibid.* See also MSB reports to Parliament for 1929-31 (PP 157 of 1933, pp5), 1931-33 (PP of 1935, pp5), 1933-35 (PP 82 of 1937, pp8), and 1937-38 (PP 160 of 1939, pp7-8).

64. *ibid.*

In 1924, it conducted a project into the pitting and corrosion of aircraft pump cylinders for commercial interests[65]. In 1926 it conducted research into the thermal properties of a series of copper cadmium alloys, for a large commercial firm[66]. During the Great Depression, the laboratory carried out extensive research on motor engines and chassis for car companies anxious to begin component production in Australia to avoid high protective tariffs on imports[67]. Work was undertaken later for the aircraft industry forming around Commonwealth Aircraft factory [CAC]. This included the production of magnesium, and determining the fire risk of machining magnesium alloys, and examination of airframe welds[68]. The laboratory also supervised the development of local production of battle helmet steel[69].

The most dramatic involvement with commercial industry by MSL was its participation with the factory groups in the creation of whole new industries during the Great Depression. The MSB factory groups had always been free to do sub contract work for secondary industry as long as it did not interfere with their defence work[70]. In 1929, Australia faced a chronic balance of payments

65. MSB report to Parliament 1924-25, PP 14 of 1926, pp5. The laboratory advised on prevention of pitting and corrosion, and how to repair them.

66. MSB reports to Parliament 1926-27 PP 234 of 1928, p5.

67. MSB report to Parliament 1929-31, *op.cit.*, p6. Other work included research into spark plug electrodes, linotype metal, valves and grids for gas meters- See report to Parliament 1933-35, *op.cit.*, p8.

68. MSB report to Parliament 1935-37, PP 57 of 1938, p9, and 1937-38, *op.cit.*, p8. The Physics Laboratory also gave metrology assistance in the production of aeroengine parts.

69. MSB reports to Parliament 1935-37, *op.cit.*, p9.

70. See Table 2-7. See also CSIRO Archives S403 Esserman interviews 4 August 1970. Esserman recalled that SAF did much subcontract work for commercial firms and taught

problem, and the shortages of foreign exchange forced the Scullin Government to raise tariff barriers drastically to reduce imports. The MSB was seen to be capable of supplying many engineering and chemical products which had hitherto been imported. The technical versatility of the MSB and its component organisations made it an important element in Scullin's import replacement scheme.

The more important industries created were non-ferrous metal sheet, advanced motor car components, dropforging, electrical meter manufacture, sound film projectors, nitro benzene, cotton wool production, sheep-shearing equipment, refrigerator parts, special paints and lacquers[71]. In the first case, the Ammunition factory group and MSL were able to specify the quality of non ferrous metals required, and to supervise their production by Australian industry[72]. The material was then roled into sheet at the Ammunition factory group's rolling mills. Advanced car components included axles, universal joints, engine connecting rods, crankshafts, shock absorbers and car springs. Most of these had been made before in Australia by commercial industry, but to a very indifferent standard of quality and sold as cheap replacement parts. The achievement of MSL and the Ordnance factory group was that they used proper

them how to make many difficult components themselves. He also noted that SAF was influential in training industry in mass production techniques. Many SAF staff were employed by industry 'sight unseen' because of the high reputation of SAF. Much the same could be said of other factory groups of the MSB. Esserman stated for example that the Explosives factory group was influential on the chemical industry.

71. MSB report to Parliament 1929-31, 1931-33, *op.cit.* J K Jensen 'Defence Production...' *op.cit.*, chapt 8 vol 7 pp196-220, 261-66, 295-309. See also D P Mellor *op.cit.*, p26.

72. Hitherto no materials for non ferrous sheetmetal had been supplied by Australian industry.

scientific methods of control, and made the components to the specifications and standard of quality desired by the original manufacturers in the USA[73]. Similar stories concerning the partnership between MSL and the MSB factory groups existed for the other new industries. Some of these did not require much change in existing arrangements, as for example, the MSB already made a wide variety of paints and lacquers for the Armed Services. Others required new research into materials and production techniques as for sheep-shearing equipment and sound film projectors.

As mentioned in chapter 2, the MSB handed over the technical information and practice for these industries when commercial industry was ready to exploit the new local markets. The exception was sheep-shearing equipment. The production by SAF forced British and American manufacturers to set up plants in Australia to pre-empt any Australian firm following SAF's example.

Thus it can be seen that the MSB, through its subordinate organisations (MSL, the Contracts Board, and the Inspection Branch) exerted an important influence on Australian secondary industry through technical assistance. The MSB saw such assistance as contributing to the defence objective of self containment. For this reason all MSB personnel were imbued with the need to assist industry in any way possible[74]. By the mid 1930's there was no other organisation in Australia which could match the training and experience of the MSB's technical staff in industrial research. Nor was there any organisation which

73. MSB reports to Parliament 1929-31, 1931-33, AA CRSA664 File 474/401/452, AWM 74, Box3, Bundle1, Daley to D P Mellor 27 April 1954.

74. CSIRO Archives S403, Esserman interview 4 August 1970.

had more experience in assisting secondary industry. The range of plant and machine tools held by the MSB equipped it to perform many classes of work which were more advanced than anything secondary industry could achieve. The MSB was the only Australian organisation with experience in mass production of complicated products[75]. This was the situation when the Lyons Government decided in May 1936 to initiate a major development of secondary industry.

This stemmed from the Lyons Government[76], realisation that the future for Australia lay not in the further development of primary industry, contrary to what Hughes and Bruce had thought. The employment offered by primary industry was declining relative to the growth of the population as a whole. The only sector capable of sufficient expansion to provide employment for a larger population was that of secondary industry. A more detailed exposition of these beliefs is given in Annex CA which also shows that there were many problems to be overcome before secondary industry could be developed further, including the prospect of a trade war with Britain over the loss of her exports of manufactured goods to Australia. The Australian Government went to elaborate lengths to placate Britain, including the diversion of trade from the USA and Japan towards British industry, and the encouragement of British firms to set up new industries in Australia. It was during this ferment of activity [77] that the Lyons Government sought to gain a comprehensive review of Australian

75. GMH was the only firm with broadly similar experience, see L J Hartnett, *Big Wheels and Little Wheels...*, *op.cit.*

76. Or more accurately, the United Australia Party component of the Government.

77. See Annex CA.

secondary industry to see what technical support would be required to allow the further development envisaged by the Government. The full establishment of the automobile industry, with the production of chassis gearboxes and engines, was seen as the key objective, because this industry supported a huge array of subsidiary industries.

The Lyons Government's initiatives in 1936 were of great interest to the MSB not only because of the improved supply of indigenous processed raw materials for its factories which would ensue, but because many of the initiatives were directed towards improving the technical capability of secondary industry. This was relevant to the MSB's plans for the organisation of secondary industry for the production of munitions in wartime. The Government directed the Council of Scientific and Industrial Research (CSIR) to form a committee to advise on the best means of extending technical assistance to secondary industry. The chairman of CSIR, Sir George Julius, formed the Secondary Industries Testing and Research (SITR) Committee.

CSIR had little experience of secondary industry, as its research activities had been restricted to primary industry. This was in contrast to the MSB which, as mentioned, had extensive experience in industrial research and in assisting secondary industry. However, the Government's interest in developing secondary industry was predominantly for economic and not defence reasons; and to demonstrate this it appointed the CSIR to conduct the enquiry^[78].

78. AA CRS A461, File H398/1/1, Part 1, Press statement issued by Lyons 8 July 1936. Lyons made no mention of defence when announcing the SITR enquiry, and emphasised economic aspects of the development of secondary industry. The activities of CSIR were to be extended to include secondary industry. Its first job was to prepare a survey of in-

The MSB was already conducting with the Armed Services, an official investigation into the defence potential of secondary industry, the Principal Supply Officers Committee (PSOC) enquiry, and was committed fully[79]. However, in recognition of the huge amount of knowledge and experience held by the MSB, Cabinet ordered Julius to consult with Leighton on gaining a Defence representative for the SITR committee[80].

The Struggle For Power In Industrial Science Policy

The combination of CSIR and MSB expertise on the SITR committee brought together explosive elements. Ever since the formation of the CSIR in 1926, Julius had dreamed of extending its research activities into secondary industry, but had been prevented because Australian Governments had refused to provide the funds for appropriate laboratories. This was despite the Act of Parliament outlining the functions of CSIR, which clearly envisaged CSIR involvement with secondary industry research. During the 1920's and early 1930's, Australian Governments saw primary industry as the most important sector, and could see no reason to extend CSIR activities beyond primary industry research. During the same period the MSB was, as mentioned, expanding its research involvement with secondary industry. This was clearly justified by the policy of self containment for defence self sufficiency and had been supported by all Federal Governments between 1921 and 1936. Even the CSIR had availed

dustly and to prepare a definite program of work and research involving the universities, state railways and MSL, amongst others.

79. See Chapter 4 of this thesis.

80. CSIRO Archives, Executive Committee Minutes Meeting 1 July 1936.

itself of the extensive industrial research capabilities of the MSB[81]. However, a state of tension began to emerge in the late 1920's between Julius and Leighton as Julius could see that the CSIR's future role in industrial research was likely to be pre-empted by the MSB[82]. He suspected that this was deliberate policy by Leighton.

These fears appeared to be confirmed in 1929, when the CSIR and the MSB clashed bitterly over the CSIR's plan to build a Forest Products laboratory. Annex D examines this dispute, and shows that Julius interpreted MSB opposition as an attempt to exclude CSIR involvement with industry while preserving MSB supremacy in the area. In fact, Leighton's opposition was not based on this at all, but related to the need not to duplicate existing scientific research capabilities at a time when the Government's revenue was contracting, and all finance for science was likely to collapse[83]. Some unfortunate events led Leighton to fail in his attempt to get the Executive Committee and the Council of the CSIR to appreciate economic and political realities. When the scheme was rejected by the Government on the basis predicted by Leighton, the CSIR held him responsible and evicted him from the Council of which he had been a member for some years[84].

The flames of mutual antagonism between Julius and Leighton over these

81. See earlier this chapter, and Annex D.

82. Julius's fellow members of the CSIR Executive Committee, Rivett and Richardson, were not particularly concerned as their main interest was primary industry research. Julius, who was an engineer and not a scientist, saw secondary industry as his special interest, and naturally was more involved.

83. See Annex D.

84. See Annex D.

events, had not been quenched by time when the Lyon's Government decided to form the SITR committee in 1936. Julius saw this as an opportunity to lead CSIR into secondary industry research, and to settle the issue with Leighton of who would control such research. Leighton did not wish to control secondary industry research, but wished to preserve the MSB's involvement with secondary industry so that the MSB could fulfill its responsibilities for self containment. He suspected Julius of wishing to exclude it, and of monopolising the research functions of MSL. Leighton knew that the MSB organisation could not function technically with a hamstrung MSL.

With the exception of the defence representative, Cabinet gave Julius a free choice on who else he wanted on the SITR committee. He chose 11 members who were either employees of the CSIR or worked closely with it, and seven prominent industrialists. All of these people were well qualified to sit on such a committee, but it would have been surprising if Julius had not selected a majority who supported his own ideas^[85]. These ideas were well thought out and provided an excellent starting point for the enquiry. But it was not in Julius's nature to allow any restriction in the scope of his enquiry, and this

85. Julius's correspondence seems to support this, see CSIRO Archives S67. Members of the SITR Committee were the entire Executive Committee including the Secretary (ie Rivett, Richardson and Lightfoot), Boas (head of the Division of Forest Products), Professor Barraclough (a founder of CSIR and still closely involved in its activities), W.E.Bassett (close friend of Julius and Rivett), A.J.Gibson (business partner of Julius), R.Grimwade (current member of the Council), W.R.Hebblewhite (Secretary of the Australian Standards Association of which Julius was President), Professor Madsen (member of several standing committees of the CSIR and closely involved with current projects), Professor O.V.Vonwiller (trusted associate of Julius and Rivett and consultant on CSIR affairs). The industrialists were: L.J.Hartnett, L.Bradford, F.Kneeshaw, M.Eady, A.Maughan, H.Tindale, J.Tivey.

once again began to cause friction with the Defence Department.

The first problem was that Julius and the SITR committee, showed little inclination to restrict their investigations to the economic aspects of the growth of secondary industry, but insisted they were also preparing industry for war. Initially the justification for this aspect of the enquiry was Julius's interpretation of a letter he received from the Secretary of Prime Minister's Department in early May 1936[86]. Strahan had suggested the establishment of an engine research laboratory, and Julius had thought he was referring to aircraft construction and aeroengines[87].

The first inkling the Defence Department had gained of the important emphasis on defence matters Julius was developing was when Leighton met Julius, as ordered by Cabinet, on 1 July 1936. Julius revealed that one of the terms of reference he was adopting was to examine the capabilities of secondary industry to produce a wide range of defence material[88]. When Leighton conferred with the Minister of Defence, he discovered that Parkhill had been given the impression by the secretary-presumptive of the SITR committee, Hebblewhite, that the defence aspects were a study on whether Australia had standards of measurement suitable for guiding commercial manufacturers of car and aero-engines[89]. But Julius had moved ahead of Hebblewhite, and despite being

86. CSIRO Archives, S67, Volume 18, Julius to Rivett 23 June 1936.

87. It was widely known in Government circles that an aircraft factory was to be built by Commonwealth Aircraft Corporation.

88. CSIRO Archives, S67, Volume 18, Julius to Rivett 14 July 1936.

89. AA MP392, S11, Bundle 11, File 709/501/5, Leighton to Secretary of Defence 3 July 1936. CSIRO Archives S67, Volume 18, Julius to Rivett 23 June 1936.

informed by Sir Henry Gullett that the Government's interest was essentially economic[90], had decided after all that:

'... the major urge behind all this move is the increasing pressure regarding the production of defence machinery'[91].

He was encouraged in this idea by the SITR committee members. At the first meeting every speaker:

'... stressed the importance of the Defence aspect. Each pointed out that at present secondary production was hopelessly unorganised, so far as the production of defence equipment is concerned. They further pointed out that they had for years suggested the installation of machines which would also meet the needs of the Defence Department, should such a need ever arise. They stated that nothing had been done ...'[92].

The Defence Department realised that Julius, the CSIR and the SITR committee were showing clear signs of demanding a powerful role in defining defence supply policy; and that this threatened to intrude into the areas of the PSOC and the MSB. Julius did little to dispell this idea. He was contemptuous of the Defence Department's efforts to organise secondary industry for munitions production[93], and was supported by industrialists on the SITR committee who criticised the Defence Department publicly[94]. On 8 October 1936, Parkhill

90. CSIRO Archives S67, Volume 18, Julius to Rivett 23 June 1936. The Minister for Trade Negotiations told Julius the main interest of the Government was the production of motor car engines and bodies in Australia. This was related primarily to the further development of secondary industry for the economic improvement of Australia. Defence was only a distant further consideration in that any improvement in the technical capability of secondary industry was bound to be of some use to defence. See this Chapter.

91. CSIRO Archives S67, Volume 18, Julius to Rivett 23 June 1936.

92. *ibid.*, Volume 21, Julius to Rivett 1 August 1936.

93. *ibid.*

94. AA CP576, S1, Bundle 5, Eady's Presidential address to the annual dinner of the

met a delegation of industrialists led by Kneeshaw and Eady of the SITR committee who emphasised that industrialists were not waiting for orders but for blueprints which they could study to get an impression of the tasks they might face if war came. They had no clue of what was required of them and favoured closer co-operation with the Defence Department through the SITR committee[95]. The resolution from the annual meeting of the Associated Chambers of Manufactures was that the SITR committee should be extended to include the co-ordination and development of secondary industry for defence purposes in times of emergency[96].

However, Julius was convinced that the Defence Department would obstruct the SITR committee in any way possible. Leighton was portrayed as a most committed opponent who had allowed his animosity towards Julius, Sir Henry Barraclough[97], and others on the committee to distort his judgement and attitude towards the objectives of the SITR enquiry:

‘The difficulty, of course, is Leighton’s personal attitude towards me, as he has consistently cut me ever since the old trouble when he had to give up his membership of the Council ...’[98].

Victorian Branch of the Chamber of Manufacturers, reported in *The Age* 14 August 1936.

95. AA CRS A5954, Box 1089, File ‘Principal Supply Officer’s Committee, Minutes of Meetings ...’, Kneeshaw was a close associate of Julius.

96. AA MP598, S7, Box 1. These views continued to be voiced throughout 1937. See also C.R.Hall, *The Manufacturers ...*, *op.cit.*, pp.544–555.

97. Barraclough, while serving as Leighton’s subordinate in Britain during and after the First World War, had with the assistance of the Royal Court, gained a knighthood for services to the war effort. Although Leighton received the most flattering testimonials from the British Government he received nothing. See Annex E.

98. CSIRO Archives S67, Volume 18, Julius to Rivett 23 June 1936: ‘... it may possibly be necessary for me to have a private talk with him or get perhaps Alec Gibson to do ...’. The latter was none other than Leighton’s old associate from the days of the

The Defence Minister according to Julius was believed to have refused in Cabinet any co-operation to the SITR enquiry, but had relented some weeks later when forced by public pressure[99]. In fact, there is no evidence that any personal animosities, however well justified, influenced Leighton on this matter. He met the CSIR Executive Committee on 1 July 1936, of which Julius wrote a particularly lurid account[100], and agreed to what they wanted. Contrary to claims by Julius, prompt action was taken within the Department to honour Leighton's promises of a representative[101]. There is no evidence of Parkhill's alleged attitude having any influence. Julius continued to interpret all Defence

arsenal (see Chapter 1). Gibson had gone back to Queensland University, but resigned his professorship to eventually join Julius to form the firm of engineering consultants Julius, Poole and Gibson, in 1922. Gibson was involved heavily with the Standards Association, and Julius often used him for advice on CSIR matters. Gibson helped Julius to write the SITR Committee Report.

99. CSIRO Archives S67, Volume 21, Julius to Rivett 1 August 1936: 'Quite recently also, and quite unexpectedly, we received the nomination of a representative of the Defence Department. The Minister of Defence I believe intimated to Cabinet that he did not propose to make any nomination, as he felt that the appointment of this Committee might be regarded by some as a reflection upon the Defence Department, in that it suggested that the Department has failed (as it undoubtedly has) in making the necessary contact and arrangements with the secondary producer for the manufacture of defence equipment. I suspect that the Minister for Defence was somewhat shocked and surprised at the support which the Committee received as soon as the matter was publically announced and felt that his Department had better be in it rather than out of it'.

100. CSIRO Archives S67, Volume 18, Julius to Rivett 14 July 1936. The highlighting of the more abrasive and bizarre elements of the discussions with Leighton, is probably a guide to Julius's psychological attitude to Leighton, rather than the reverse. The minutes of the meeting show that a useful and objective discussion was held (Executive Committee Minutes 1 July 1936). This is supported by Leighton's own unemotional account to the Secretary of Defence (AA MP392, S11, Bundle 11, File 709/501/5, Leighton to Shepherd 1 July 1936).

101. AA MP392, S11, Bundle 11, File 709/501/5. The formal request for a Defence representative was sent by CSIR on 3 July 1936, and the Department had processed the request and replied affirmatively by 14 July 1936.

Department actions in the worst possible way in regard to the interests of his committee.

The second problem in the relationship between the SITR committee and the Defence Department was the control of national standards. Julius and Rivett were determined to build a national standards laboratory and to end any influence exercised by the MSB over standards[102]. The SITR committee, not surprisingly, concurred[103]. However, it was not a widely held view in secondary industry as most industrialists had little use for standards and could not produce to specification[104].

It has been shown in Annex D that the MSB did not want to hold the responsibility for maintaining national standards of any sort. The fact that it was the reference centre nationally for length was at the behest of the Australian Standards Association of which Julius was the President, and Leighton a member. The desire to vacate this field completely was communicated to Julius

102. CSIRO Archives S67, Volume 18, Julius to Rivett 23 June 1936, 14 July 1936. See also Volume 17, Rivett to Julius 3 September 1936, 16 October 1936. The CSIR enlisted the support of the British National Physics Laboratory to restrict Defence Department influence on standards.

103. *ibid.*, Volume 21, Julius to Rivett 1 August 1936, Volume 18, Julius to Rivett 22 October 1936: 'I am quite sure of this—that there is not one member of the (SITR) Committee, except the Defence Department representative, who would be prepared to agree to leave the metrological work in the hands of Maribyrnong'.

104. *ibid.*, S403, S404, N.Esserman interview 4 August 1970 and Waldersee interview. Esserman was head of the MSB's metrology laboratory, and later Head of the National Standards Laboratory of CSIR. Julius had found it necessary to proselytise many industrialists to convince them of the need for standards and participation in the SITR Committee. He also sent three assistants to spread the gospel; S67, Volume 18, Julius to Rivett 14 July 1936, Volume 21, Julius to Rivett 25 August 1936.

by Leighton in September 1936[105]. The problem was the insistence of Julius and Rivett, that a national standards laboratory under their control, should be the final court of appeal for all standards[106]. The MSB had to maintain its standards laboratory for use by the Armed Services, because the latter would never submit to standards being set for them by Australian industry or any other civil authority[107]. Until he received reassurances of the continued independence of his standards laboratory, Leighton was prepared to be extremely suspicious of the intentions of Julius and the SITR committee in this area.

This matter should have been resolvable, but the clash of personalities exacerbated the conflict. Leighton's reticence heightened the paranoia of Julius and Rivett who became convinced that Leighton wished to control national standards for industry as well as defence[108]. The situation was well summed up by a close personal friend of all three men who was asked in 1969 whether Leighton was a difficult person with whom to work. Despite this lead-

105. CSIRO Archives S67, Volume 21, Julius to Rivett 29 September 1936. Sir Walter Bassett, who was a mutual friend of Julius and Leighton, and a member of the SITR Committee, was informed by Leighton during lunch that Maribyrnong could do nothing in metrological work for secondary industries during wartime. Since industry's need for metrological work would be even more important during this time, the inescapable conclusion was that a national standards laboratory had to be provided.

106. *ibid.*, S67, Volume 17, Rivett to Julius 3 September 1936, 16 October 1936. Rivett said of the Defence Department: 'If its officers take the sensible point of view there will be no occasion for any fighting. There is plenty of room for a civilian section as the ultimate court of appeal and also for the quasi independent Service Laboratories. It is just a case for sane collaboration ...'.

107. Much of this was based on the need to maintain uniformity of standards with Britain for defence purposes associated with interchangeability of defence stores and munitions.

108. CSIRO Archives S67, Volume 17, Rivett to Julius 3 September 1936, Volume 18, Julius to Rivett 22 October 1936.

ing question, inviting him to comment adversely he chose to make an equivocal statement critical of all:

‘... I found him a very pleasant man in many ways but found also that he could be difficult. I saw and talked with him over many years, both at the Naval and Military Club, and at the Melbourne Club, and was able to know most of his characteristics. His episodes, however, with CSIR were certainly painful and the word ‘Choleric’ certainly applied to both Julius and Rivett in this instance’[109].

The third problem in the relationship between the Defence Department and the SITR committee concerned the duplication of the laboratories at MSL. Julius had the ambition to take secondary industry research well beyond the area of standards as originally envisaged by the Government at the formation of the SITR enquiry[110]. He wanted laboratories covering industrial chemistry, metallurgy and physics, which would duplicate laboratories existing in MSL. Julius had been waiting for an opportunity since 1926, to commit the Government to extending CSIR activities into secondary industry research. Even Rivett’s caution was swept aside:

‘Sir David expresses the view that we should aim first at a standardising and testing department and for the present forget all about research. Apparently he has not fully grasped the situation here. We cannot adopt his view for two reasons. In the first place the present opportunity for CSIR to extend its activities to touch secondary industries has arisen from the desire of the Federal Cabinet to have provision made for the research

109. CSIRO Archives VM10/13, Sir Walter Bassett to Sir George Currie 6 October 1969. It must be added that at least some of the reasons as to why Leighton appeared ‘difficult’ could not be revealed to the CSIR or Walter Bassett because of security reasons. The CSIR worked in an atmosphere of total scientific freedom, where restraints on discussion and information were actively discouraged. Naturally enough, the CSIR found the Defence Department method of doing things stultifying, and was inclined to ascribe personal motives to the lack of communication.

110. CSIRO Archives S67, Volume 21, Julius to Rivett 25 August 1936.

necessary establishing the aircraft and motor vehicle engine industries in Australia, and the adoption of our proposals might be jeopardised if we relegated research to the background. In the second place CSIR in advising Cabinet of the need for a much more comprehensive treatment of the subject than was originally suggested, used as an argument the urgent need for research for the assistance of our secondary industries generally . . . We are, therefore, almost irrevocably committed to recommendations for the creation of adequate research facilities for secondary industries'[111].

Leighton realised that with her small population Australia always found difficulty in finding money for research laboratories. The economic recovery from the Great Depression was not complete, and in fact would reverse into a recession within a few months. These facts justified Leighton's view that the amount of finance Australian Governments were likely to make available for research was more or less fixed; at least for the next few years. If the CSIR succeeded in getting the laboratories it wanted, it was likely to be at the expense of necessary additions to MSL for the final stages of self containment of munitions production in Australia[112]. Since Leighton believed, like some other prominent Australians[113], that war was not far away, he felt justified in opposing in principle, the creation of new laboratories for CSIR which only duplicated those existing at MSL. This was wasteful of research funds, particularly when MSL could be expanded for less money than CSIR needed, and could

111. CSIRO Archives S67, Volume 21, on the invitation of Julius, Hebblewhite wrote this criticism of Rivett's letter of 29 July 1936, and Julius sent it to Rivett.

112. The expansion of MSL outlined in Chapter 2, Figure 1, gives a clue to the deficiencies which existed in 1936.

113. For example, Essington Lewis, with whom Leighton had some contact. The major motivation behind the creation of Commonwealth Aircraft Corporation was the belief of imminent war. Leighton had been active within the Department of Defence in encouraging Lewis, W.S. Robinson and Hartnett etc. to go ahead with their plan.

continue to extend its assistance to secondary industry as it had done before. The MSB's experience of industrial research was far more extensive than that of CSIR.

Ironically, Julius and Rivett saw this as an attempt at bureaucratic empire building by Leighton. For them the issue was put beyond dispute by claiming that industry had shown that it would never use laboratories which were controlled by the Defence Department:

'... but I am afraid that Industry will never be persuaded to entrust its enquiries to Maribyrnong. We have in the Standards Association for years past urged manufacturers to go to Maribyrnong to have gauges checked, etc. but none of them do so. The whole atmosphere is wrong, just as it was in the early days, when Leighton was trying to satisfy needs of the timber interests in regard to Forest Products research. He failed utterly ...'[114].

It was a dubious argument. Firstly MSL laboratories did significant amounts of industrial research for industry and other outside bodies[115]. Secondly, the more plausible explanation for the low use of the MSB's standards laboratory by industry was because industry had little interest in the value of standards, and could not produce to specification[116]. Even Julius had experienced this during the early months of the SITR committee. Secondary industry was largely ignorant and uninterested in the assistance that science could give to manufacturing. Julius and his assistants, Hebblewhite, Boas and

114. CSIRO Archives S67, Volume 18, Julius to Rivett 14 July 1936.

115. See this chapter and the Reports of the MSB to Parliament 1921-1937.

116. CSIRO Archives S403, S404, N.Esserman interview of 4 August 1970, and Waldersee interview. This was Essermans view, and he was the head of the MSB's metrology laboratory, and the first head of the CSIR's National Standards Laboratory.

Boyce, had had to speak to many gatherings of industrialists about the need for standards and secondary industry research, in order to get adequate support and understanding for the SITR committee:

'... just as we found in the case of Forest Products, it will be quite useless to approach a section representative of any particular industry with the request that they should tell us what their problems are. They will almost certainly not be aware that there are any. It will be necessary for someone to address them, to consider with them the nature of their work and of their industry, and to educate them more or less, just as Boas had to do with the timber industry'[117].

If the problem was, as Julius claimed, that the MSL laboratories were not used by industry, then it is obvious that an education programme on the uses of science, such as Julius himself had launched so successfully, would have been sufficient to gain greater industrial use of MSL. Certainly, industrialists showed no fear of involvement with the Defence Department during 1936 and 1937, because they criticised it for not involving them more deeply in defence planning. The Chambers of Manufactures persistently told the Government they were not looking for defence contracts but wished to know what would be expected of them in wartime[118].

The SITR commzztee report, when it was presented to the Government in February 1937, contained conclusions which in effect rejected all Leighton's objections. It stated its aim to be to present a plan for the development of sec-

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117. CSIRO Archives S67, Volume 21, Julius to Rivett 25 August 1936.

118. AA CP576, S1, Bundle 5, *op.cit.*, A5954, Box 1089, *op.cit.*, MP598, S7, Box 1, *op.cit.*, A1608, File C49/1/3, Petition presented to Prime Minister 3 December 1937, CRS AA 1971/216, Item 9, Council of Defence Meeting 17 December 1937. Many industrialists were prepared to engage in capital expenditure to equip themselves properly with no obligation on the Government to place orders of any kind.

ondary industry, which would also lessen the dependence of secondary industry upon supplies from overseas[119]. This was in accord with the Government's economic policy. But the SITR committee also claimed that many areas related to defence problems also fell within its realm of interest. It thought that CSIR should be given the responsibility for surveys of industry from the defence as well as the civilian and economic perspectives[120]. The report recommended a national standards laboratory and that it should be the *final* court of appeal in matters of measurement in Australia[121]. In recommending an industrial research service, the report was also recommending new laboratories for metallurgy, chemistry, physics and engineering[122]. Naturally, all these new laboratories, including those for aircraft and engine testing, were to be controlled by the CSIR. The objections of the Defence Department were not addressed.

The Counter Action by the Defence Department

Despite the accusations of Julius and Rivett, Leighton had not taken any steps to obstruct the SITR committee from its inception in July to the end of 1936. However, by December, he was well aware, through the Defence representative on the SITR committee, that no notice was being taken of the Department's view. Indeed the only gesture was that the CSIR suggested that a person familiar with defence supply matters should be appointed to the SITR

119. Report February 1937, 'Secondary Industry Testing and Research—Extension of the Activities of the Council for Scientific and Industrial Research', PP F2322 of 28 April 1938, pp.3, 9–13, 18–19.

120. *ibid.*, pp.10, 27.

121. *ibid.*, p.14.

122. *ibid.*, pp.18–21, 28.

committee to enhance co-ordination between the committee and the PSOC in their separate enquiries[123]. However, this proposal was not as innocuous and innocent as it appeared. Leighton was chairman of the PSOC, and he had been attempting for some years to stop it from becoming moribund because of faction fighting between the Armed Services, and the Army's determination to ignore Government policy in relation to the preparation of Army requirements from industry[124]. The centres of opposition were the Chief of General Staff, General Lavarack, and the executive officer of the PSOC, Lieutenant Colonel Beavis. Under the encouragement of Lavarack, Beavis had during 1936 established clandestine contact with the Executive Committee of the CSIR, and they found they had a common desire to reduce Leighton's influence. The person the CSIR wished to represent the PSOC on the SITR committee was Beavis[125].

This was a very clumsy move by Julius because it did not give the CSIR a powerful ally, but it did convince the Defence Department Secretariat, and the MSB, that the CSIR was malevolently intent in causing mischief. Leighton decided to begin active opposition to the ambitions of the CSIR. His first action was to accept the need, outlined by the CSIR, for better co-ordination between the PSOC and the SITR committee, and to persuade Parkhill that the best means of assuring this was to appoint him (Leighton) to the Executive Committee of the CSIR[126]. Parkhill wrote to the Prime Minister, Lyons, who

123. AA MP392, S11, File 709/501/5, Lightfoot to Secretary of Defence Department 9 December 1936.

124. See Chapter 4.

125. *ibid.*

126. AA MP392, S11, File 709/501/5, Leighton to the Secretary of Defence 17 December 1936.

supported the idea[127], but the CSIR Act only allowed for three Executive Committee members. It was decided that while consideration was given to changing the Act, Leighton would be appointed to the Council of the CSIR once more[128].

The idea of Leighton being on the Executive Committee of the CSIR was more reasonable than Julius and Rivett would allow. If the CSIR were involved in so much work of defence significance that it warranted close coordination between it and the Defence Department, how better to achieve this than to place the Defence Department's expert munitions planner and manager on the management committee of the CSIR. The grounds on which Julius and Rivett sought to reject Leighton's reappointment to the Council, and by implication his appointment to the Executive Committee, were entirely personal[129]. The CSIR refused to take action on Leighton's appointment.

The Defence Department was not deceived. It became the centre of the

127. *ibid.*, Parkhill to Prime Minister 7 January 1937. A.V.Smith note of 12 February 1937 states that Parkhill had told him that Lyons supported the appointment of Leighton to the Executive Committee.

128. *ibid.*, Lyons to Parkhill 15 February 1937, Parkhill to Lyons 6 March 1937.

129. CSIRO Archives, Council Minutes, Meeting 5-7 April 1937. Julius stated to the Council that the Executive Committee had rejected Leighton's appointment, and outlined the past relations with Leighton over the Forest Products Laboratory in 1929. As Annex D shows, Leighton had a case in this dispute and had not behaved as irresponsibly as Julius believed or represented. Julius also mentioned the slowness with which the Defence Department had become involved in the SITR Committee. This was largely a figment of Julius' imagination. Some members who were on the Council with Leighton in 1929, also got up and said it was impossible to work with Leighton. Not surprisingly, the Council supported its Executive Committee's decision. While the Council minutes are bland, they nevertheless hint that this aspect of the Council meeting had been choreographed by Julius and Rivett.

opposition to the CSIR ambitions over secondary industry and continued to press for Leighton's inclusion on the Executive Committee throughout 1937. As Leighton knew, the SITR report would mean nothing if it were not implemented. He took an active role in organising Departmental and political support in favour of placing the new CSIR functions within a government department. The strategy behind this was to delay action on the report and gain time for the emerging recession of 1937-38, and the rising defence emergency, to dry up government funds which might otherwise have been available to the CSIR. The Defence Department's allies were the Civil Aviation Board and the Department of Trade and Customs.

The Civil Aviation Board was seen by Julius as a problem as early as 19 February 1937. They had submitted plans of their own for the establishment of an aircraft research laboratory and Julius wondered if they resented the CSIR initiatives in this area[130]. A few months later, the CSIR Executive Committee had evidence that the Civil Aviation Board and the Minister for Trade and Customs, White, were all linked with Leighton in opposition to the CSIR's projected move into secondary industry. Rivett had been informed by Walter Bassett that Johnston, Chairman of the Civil Aviation Board was determined to block all CSIR activity in connection with aircraft, and Rivett thought that a showdown was necessary:

'Johnston, I hear, works hand-in-glove with Leighton and also, you may be interested to know, in view of certain recent suggestions of an unhealthy interest on the part of the Customs Department (sic) in the future of CSIR, that White and Leighton are, according to Bassett, in the habit of lunching together very regularly. I see some possibilities of great fun before very

130. CSIRO Archives S67, Vol. 20, Julius to Rivett, 19 February 1937.

long'[131].

Rivett had lost some of his good humour a few weeks later when he realised how powerful the opposition had become, and that it threatened not only to prevent Government funds being extended for CSIR secondary industry activities, but also to incorporate CSIR into the Government Departmental system – destroying its independence from direct political control:

'I entirely distrust the Defence and Customs Departments (sic) in their attitudes towards CSIR, and feel that a struggle is ahead of us to keep out of departmentalism and politics'[132].

'[The Minister] told me something of what had gone on in Cabinet, sufficient to indicate that Parkhill has been very much under Leighton's influence since his return and is more hostile than ever. His own personal antagonism towards Julius is, I imagine, fuel to the Leighton fire. Also he told me that White was making an effort to get CSIR placed under the Department of Trade and Customs; and, if so, I can only conclude that another politician has fallen victim to megalomania'[133].

By the middle of August, the CSIR Executive Committee was seriously alarmed. Rivett wrote:

'[The Minister] counted up heads in Cabinet and came to the conclusion that there would be no likelihood of their succeeding, at present at any rate ... He added that their efforts to get a finger in the CSIR pie were only associated with the proposal to extend our activities in secondary industries ...'[134].

Julius thought that:

'There is no doubt that Parkhill and [White] ... are fighting strenuously

131 *ibid.*, Vol. 19, Rivett to Richardson, 6 July 1937.

132. *ibid.*, Vol. 19, Rivett to Richardson, 24 July 1937.

133. *ibid.*, Vol. 19, Rivett to Richardson, 10 August 1937.

134. *ibid.*, Vol. 19, Rivett to Richardson, 19 August 1937.

against any monies being made available for work by CSIR in connection with secondary production. They are also opposing the establishment of any laboratory for fundamental standards, and urging that anything that may perhaps be necessary in that direction could be done at Maribyrnong'[135].

Rivett summed up the issue as they confronted the CSIR in August as follows:

'The situation in which we three as an Executive find ourselves at present is in some respects unique in our experience of the past eleven very happy years. We know that a majority in Cabinet (eight men: Lyons, Pearce, McLachlan, Page, Menzies, Casey, Paterson and Brennan) may be relied upon to oppose any action regarding CSIR against which we firmly set ourselves. A minority, including one with ethical standards beneath contempt and another of very weak character, is either hostile or indifferent ...

The advent of secondary industry into our field has aroused ambitions in Parkhill and White: each wants the power that will go with control of research activity. The two definite aims of which we know are (i) forcible addition of representatives of Departments to our Executive and (ii) transfer of the CSIR to the Department of Trade and Customs, where one of its [CSIR's] predecessors was placed in years gone by— with tragic results.

If I know you and Richardson as well as I think I do, any decision in either of these directions means your instant resignations: and I can assure you that I would not be one instant behind you with like action. CSIR as we picture it could not flourish in any other atmosphere than the one of perfect honesty and disinterestedness in seeking truth which we can

135. *ibid.*, Vol. 20, Julius to Richardson, 19 August 1937. The third member of the Executive Committee, Richardson, had a different perspective but came to the same general conclusion; Richardson to Rivett, 17 August 1937: 'One neither knows what the policy of the Government will be in its election campaign, nor the possible result of the election, but of two things we are reasonably certain. The first is that defence is to loom large in the policy programme (the people are going to get a first rate scare in defence so I am told), and the second is that if the Government is returned it will be by a much narrowed majority. Assuming that both these things eventuate, Parkhill's influence will probably be greater with the new than with the existing Cabinet, and he will certainly be more arrogant (if that is possible!) and dangerous than he is at present'.

properly feel we have fostered. Once departmental 'representation' came in on the Executive [the Council does not matter so much) there would simply be repetition of the struggle that darkened the birth of one of our liveliest offspring—the FP [Forest Products] Division'[136].

The CSIR Executive Committee was also worried at this time over the relative ineffectiveness of the Minister representing their interests in Cabinet [Senator McLachlan]. He was not forceful enough; and so Julius and Rivett had developed the habit of discussing important matters with Menzies and Casey, so that they could help McLachlan in Cabinet[137]. In February 1937, Casey had been confident that the Government would find the funds to implement the SITR Committee Report recommendations[138]. Since Casey was the Treasurer, the CSIR Executive Committee had good cause for optimism. But towards the end of the financial year 1936–37, there were signs of a decline in prices for primary exports, heralding a decline in Government revenue. The Cabinet refused in May to approve the allocation of £250,000 in a trust fund for the new CSIR activities in secondary industry[139]. A few months later the Government had committed itself to a greatly expanded defence programme, as a consequence of the Imperial Conference of 1937. Casey was unable to deflect economic pressure from CSIR, and in August it had to trim its existing

136. CSIRO Archives S67, Vol. 19, Rivett to Julius, 19 August 1937; Julius to Rivett, 23 August 1937: Julius did not think that Lyons was a potential supporter of CSIR, as Lyons had said the previous week that CSIR was too top heavy with men on high salaries. Julius thought that Lyons had always been in favour of the pick and shovel man and that CSIR had never employed any labourers.

137. CSIRO Archives S67, Vol. 19, Julius to Rivett, 15 September 1937; Vol.20, Julius to Richardson, 21 September 1937; Julius to Rivett, 22 September 1937.

138. *ibid.*, Vol. 19, Rivett to Julius, 16 February 1937.

139. *ibid.*, Vol. 19, Rivett to Richardson, 28 April 1937; Rivett to Julius, 6 May 1937; Rivett to Richardson, 1 June 1937.

^{Subject} budget and forgot about money for the expansion into secondary industry[140].

As Leighton well knew, the contracting economy and growing defence emergency made the expansion of CSIR into secondary industry unattractive to the Government, and the use of the increasing facilities at MSL, an attractive alternative.

Casey was alert to this danger and resolved that after the imminent general election, he would ensure CSIR's freedom from further political interference. He spoke to Rivett of issuing an ultimata to Cabinet that if it expected him to continue as Treasurer, he wanted the CSIR as *his* ministerial responsibility[141]. He would then be in a much better position to present arguments for the expansion of CSIR. After the election, Casey was appointed to represent CSIR in Cabinet on behalf of the Prime Minister, as well as remaining the Treasurer[142]. Parkhill lost his seat in Parliament[143], and Shepherd and Leighton retired from the Public Service. Their replacements lacked the interest and determination to continue to pursue the CSIR. In November, Rivett received a clandestine message from Jensen which said that before long a letter

140. CSIRO Archives S67, Vol. 19, Rivett to Richardson, 10 August 1937, 11 August 1937.

141. CSIRO Archives S67, , Vol. 19, Rivett to Richardson, 24 September 1937.

142. CSIRO Archives, , Executive Committee Minutes, Meeting 7 December 1937.

143. There is some evidence that CSIR played a role in the electoral defeat of Parkhill. Hebblewhite was the Secretary of the Australian Standards Association and of the SITR Committee, both of which Julius then headed. His association with Julius and the CSIR Executive Committee was very close. Hebblewhite was also a senior United Australia Party official in Parkhill's electorate and publically criticised Parkhill for his opposition to secondary industry research by CSIR. CSIRO Archives S67, Vol. 19, Julius to Rivett, 15 September 1937. Parkhill attempted to heal this break in his Party's ranks, but it must have contributed to his defeat by the independent United Australia Party candidate, Percy Spender.

would come from the Defence Department asking to what extent the CSIR was prepared to co-operate with the Department in work of common interest. The message said that the letter would be couched in formal terms but the people who were now taking charge of the Department[144] wanted the CSIR to understand that there was a great deal more behind it than was immediately apparent. They were prepared to welcome very close collaboration, hoping that Brodribb would be put onto the Council and that the past estrangement would now cease[145].

Rivett thought that Brodribb was:

‘... a thoroughly reasonable fellow and a clear thinker ... On metrological standards he agrees entirely that although the Defence Department must maintain its own, it is essential that the ultimate court of appeal should be in civil hands. He recognises that Defence has so much to do on its own lines that, in wartime, it could give no thought to outside industry’[146].

Julius noted that his business partner and confidant, Alec Gibson, also knew Brodribb well and thought he was ‘a good chap’[147]. For once he swallowed his suspicion of the Defence Department and Brodribb was co-opted to the Council[148]. This signalled the end of serious conflict between the MSB and the CSIR over the development of secondary industry. The MSB was now becoming totally absorbed with its own large scale expansion and the related

144. Shedden replaced Shepherd as Secretary of the Defence Department, and Brodribb replaced Leighton as Controller General of Munitions Supply.

145. CSIRO Archives S67, Vol. 19, Rivett to Richardson, 24 November 1937.

146. *ibid.*, Vol. 17, Rivett to Julius, 29 September 1936.

147. *ibid.*, Vol. 18, Julius to Rivett, 22 October 1936. Gibson had been Leighton's deputy in the Arsenal Branch in 1918. See Chapter 2 of this thesis.

148. CSIRO Archives Executive Committee Minutes meeting 18 January 1938.

problems of new defence production. It had most of what it wanted financially and felt no further need to fight over whatever financial crumbs were left over for the CSIR to implement the SITR Committee Report.

Australian Secondary Industry By 1939/1940

Leighton had been successful in his holding action and the significance of this was that the MSB continued to develop self containment without interference from the CSIR. This included not only planning for the organisation of industry for war production, but also the technical preparation of industry. Thus the ultimate success which accompanied Australian production of munitions owed little to the CSIR, and a great debt to the MSB. As Annex F shows, Julius had to exert great pressure on the Government to get funding in 1938 to build the aeronautical and engine testing laboratory and the the national standards laboratory. Laboratories for industrial chemistry and physics were not approved until the beginning of the war. All of these laboratories were to make valuable contributions to wartime activities.

Meanwhile, secondary industry did expand further in the late 1930's, partly as a consequence of the Government's policy in 1936, but more significantly because of the continued effect of the protective tariff. The process of import substitution, begun in the early 1930's, increased greatly. This is clear from data produced by M K Feil[149]. There had been a trend since 1930 in which foreign capital had begun to be invested increasingly in secondary industry,

149. M K Feil 'An Assessment of The Role of The Tariff Board in The Growth of Australian Industry 1921-1939', MEC thesis University of Sydney 1976.

rather than rural. The Government's unequivocal statement of policy in 1936 probably increased this trend, so that more and more firms set up in Australia, to pre-empt Australian or foreign rivals securing the market[150].

More specifically, the industries which most interested the MSB, i.e. iron and steel, chemical, machine tool and automobile production, all did well with perhaps one exception, in moving towards self-containment. The iron and steel industry, led by BHP, had succeeded in developing most of the missing subsidiary steel industries, and by late 1939 had captured virtually all of the domestic market of 1.5 million tons[151]. This process began in 1934, when BHP joined the British firm of Stewarts and Lloyds to make tubular products. By 1938, through its subsidiary Lysaghts, BHP had begun production of plates and sheets. During the same year, BHP succeeded in expanding the production of tubes and pipes with Stewarts and Lloyds, and British Tube Mills. The US firm of Rheem also joined BHP to make large steel containers[152]. In 1939, BHP began to make special steels of great importance to munitions production, i.e. high speed tool steels[153]. The result of all this endeavour was that by 1939/40 Australia was able to supply most of its own requirements of steel for the agricultural machinery, motor body building, aircraft, chemical, shipbuild-

150. P Cochrane *Industrialisation and Dependence...*, *op.cit.* pp49–50. See also R S Gilbert *The Australian Loan Council...*, *op.cit.* pp192–4.

151. H. Hughes, *op.cit.*, pp.129–131. With its monopoly, BHP was able to organise the iron and steel industry properly, and to gain full advantage of its attention during the 1920s to efficient production processes. The economies of scale which it gained resulted in cheaper steel than could be made in the USA or Britain by 1937, and remained cheaper for the entire war.

152. *ibid.*, pp.113, 127–130.

153. A. Trengove, *op.cit.* pp.169–170. H. Hughes, *op.cit.*, pp.129–133.

ing and heavy engineering industries[154].

Similarly, many of the gaps in the chemical industry of concern to the MSB in implementing self containment of raw materials to its factories, had been filled by 1939/40. Perhaps the most dynamic influence in this development was Imperial Chemical Industries of Britain, which decided in the late 1920s to develop a powerful subsidiary in Australia, Imperial Chemical Industries of Australia and New Zealand (ICIANZ). ICI realised that this would initially be more costly than exporting to Australia, but decided that in order to avoid the Australian Governments protectionist policies, it was better to develop production in Australia[155]. The most important chemical project during the 1930s was the construction of the ICIANZ Alkali plant at Osborne, South Australia, which took five years of planning, and began production in 1940[156]. Of more immediate concern to the MSB was the decision by ICI, at the end of 1936, to manufacture synthetic ammonia[157]. Production started in early 1940, removing to some extent, the reliance on imported nitrates for nitric acid in explosives production. In 1938 and 1939, such raw materials which were not produced already in Australia, began to be stockpiled by the MSB to safe-

154. D.P.Mellor, *The Role of Science and Industry*, *op.cit.*, p.72. See also pp.66-90 for Mellors detailed account of the developments in the steel industry up to and including the Second World War.

155. P.Cochrane, *op.cit.*, p.50. A.Hunter (ed.), *The Economics of Australian Industry*, *op.cit.*, p.291.

156. A.Hunter (ed.), *ibid.*, p.292.

157. D.P.Mellor, *op.cit.*, pp.118-119. EFM had set up a pilot plant to make nitric acid by oxidation of ammonia. ICIANZ introduced this or a similar process in 1940 in what seems to have been yet another example of the close association between the MSB and commercial industry. J Knight to the writer 5 May 1986.

guard munitions production, if supplies should be cut off. The official historian, D.P.Mellor, concluded that by 1939 the Australian heavy chemical industry had developed to a stage where it could be expected to provide a sound foundation for the manufacture of the intermediate chemicals needed for making explosives, plastics and drugs[158].

The production of machine tools had not advanced much as a commercial industry by 1939. The main reason for this was that machine tools and other capital goods were a major export from Britain to Australia, and in most cases, local production was too costly to compete even with tariff protection. It was Government strategy to allow the cheap entry of British capital goods, as this helped to keep down the production costs of secondary industry. Between 1932 and 1938 over 300 items, predominantly capital goods, were admitted steadily from Britain at lower tariff rates[159]. However there existed around Australia a number of well equipped tool rooms, backing particular industries. These included the four tool rooms of the MSB, i.e. the Factory groups of Small Arms, Ammunition, Explosives and Ordnance; the BHP tool room at Newcastle, the GMH tool room at Adelaide, the tool room being built for the South Australian Railways, and probably the Ford tool room at Geelong, Victoria. The commercial machine tool manufacturers had small capacity and included such companies such as McPhersons, E.P.Bevan, Nuttall Engineering and W.G.Goetz[160]. However, when combined with the expertise of the tool

158. *ibid.*, p.121. See also Mellor's chapters on the Chemical Industry, and Ammunition and Explosives for more detail on pre-war, and wartime developments.

159. P.Cochrane, *op.cit.*, pp.47-48.

160. D.P.Mellor, *op.cit.*, pp.162-163. See also The Munition Digest 1943 of the Ministry

rooms already mentioned, these firms represented a useful nucleus from which to expand machine tool production.

The Governments' ambitions for the complete manufacture of automobiles in Australia were not realised before the war. The Tariff Board in September 1937 reported against the Governments idea because of the excessive tariff protection which would be required to ensure engine and chassis production. At that time Australian labour and materials accounted for about 50 per cent of the value of cars assembled in Australia, and more than half of all replacement parts were also made locally. This resulted in cars which cost twice as much as US made cars, and 50 per cent more than the cost to make cars in Canada. The Tariff Board calculated that engine production in Australia would require a tariff rate of 175 per cent, which would impose great costs on Australian industry and the public[161]. GMH, which in June 1936 had been examining with the Government the prospects of complete local production, had by now rejected the Governments proposals. The Managing Director, L.J.Hartnett, stated that the Government was moving too fast, and there were still too many new and immature subsidiary industries which needed time to develop[162]. The underlying problem was in fact that the economies of scale offered by the Australian market were not large enough to justify the huge capital cost of setting up engine and chassis production. Such cost could only be offset by a high volume of production[163], and the domestic market was not capable of

of Munitions, pp.188-189.

161. Tariff Board Report of 6 September 1937, PP 1937-40, Volume II, pp.1763-1818.

162. P.Stubbs, *The Australian Motor Industry . . .*, *op.cit.*, p.18.

163. See G.Maxcy in A.Hunter (ed.), *op.cit.*, pp.497-498. The impact on the motor

absorbing such production[164].

Although the Government was virtually told this by the Tariff Board, it refused to follow the Board's advice of a gradual approach to the problem. The Government's reasons were the importance of the complete automobile industry for the rising defence emergency, the assistance it would give to increased employment and immigration, the general promotion of industrial expansion, and the savings on foreign exchange[165]. The last reason referred to the £4 million annually which would be saved from car related imports from the USA[166], and less obviously to the displacement of British exports of the same. Given the economic problems it faced in relation to defence preparation, unemployment, the adverse balance of trade with Britain and the USA, and the need to develop secondary industry for Australia's future growth, the Government obviously felt that the costs of automobile production were well worth accepting. In December 1939 the Government brought in the Motor Vehicle Engine Bounty Act,

industry was very important. The economies of scale worked out for the British motor industry in 1950 demonstrate the effect of volume on lowering costs to an economical level. As production rose from 1000 units to 50,000 per year, a 40 per cent reduction in costs was achieved. 100,000 units lowered costs by another 15 per cent. 200,000 units per year achieved another 10 per cent in savings. The jump to 400,000 units yielded another 5 per cent, and expansion after this resulted in progressively smaller savings for each extra 100,000 units, the gains tapering off at a level of about 1,000,000 units per year.

164. Small domestic markets and hence the inability to gain economies of scale in major industries remained an important factor as late as the 1960s in Australia—see C. Forster (ed.), *Australian Economic Development in the Twentieth Century*, Australasian Publishing Company, pp.134–137, 150–154, 166–168.

165. See CPD, Vol159, pp418, R.G.Menzies, 17 May 1939.

166. AA CRS A2694, Volume 17, Part 2, Cabinet Agenda 2117 of 14 July 1937. The annual balance of trade between the USA and Australia was £9,415,000 in favour of the USA, and the car related imports of £4 million were the largest single component.

which provided for a payment of a bounty on engine units produced in Australia, on condition that the units were manufactured by companies controlled by British subjects resident in Australia. Australian Consolidated Industries (ACI) accepted the Governments invitation and were given complete protection from all foreign competition by the Motor Vehicles Agreement Act of 1940. The war intervened before any engines and chassis could be made by ACI.

CHAPTER 4

THE MSB AND THE PLAN TO ORGANISE INDUSTRY FOR WAR

1921-39

The Politics of Preparing a Survey

As we have seen, it was not enough for secondary industry to be the source of processed raw materials for the factories of the MSB; secondary industry had also to make the vast majority of munitions during wartime[1]. In this regard Leighton's factories were only designed to take the first shock of war, during which it was hoped commercial industry could be organised to satisfy the anticipated demand from the Armed Services[2]. Hence the MSB factories were designed as much to be centres of knowledge and tuition, as manufacturing centres[3]. The ease with which secondary industry could be integrated into munitions production depended mostly on its level of technical experience, because munitions work was far more exacting in standards of measurement and machining than almost anything else produced for the civil population. The problem confronting the MSB was to determine the level of technical skill and then develop a detailed plan for the organisation and training of secondary industry for wartime production[4].

1. British experience during the First World War had shown that government factories and established armament firms had been unable to supply the demand for munitions after the first months of war, and that subsequently the commercial industry had made almost 90% of all munitions. This was the example on which the MSB planned.

2. AA MP598 S30, Box 13, File 1, A.E. Leighton to Minister of Defence, 10 October 1925.

3. See Chapter 1 of this thesis.

4. The charter which the MSB received at its creation in 1921, did not give it clearly the responsibility for organising secondary industry for munitions production. However, it was implied strongly (see PP F12, 828 of 24 August 1923. MSB First Report, 13 August 1921 – 30 June 1922, p.4) and had received further support from the Prime Minister's speech of May 1922 (AA MP598 S30,, Prime Minister's Statement on Defence Policy, *op.cit.*, p.3). No less a body than the Conference of Senior Offices of the Australian Military Forces had said: 'It must further be the business of the Munitions

The MSB already had in 1921, a broad plan for the organisation of secondary industry. Leighton proposed to employ the annexe system developed by Britain during the First World War[5]. This envisaged the selection of commercial or state government organisations, on the appropriateness of their particular technical skills and managerial experience, for the manufacture of a particular munition or associated component. The Government would supply the machine tools and build a factory adjacent to the selected organisation's main factory or workshop. After training, the selected firm would then run the new factory on behalf of the Government, with its own personnel and managerial staff. This approach was favoured by Leighton because he doubted that secondary industry had the correct machine tools to make munitions, and it was unreasonable for the Government to expect commercial firms to buy them, as such machinery was not always useful for civil production[6]. The advantage of this system for

Supply Board thoroughly to organise private industry to undertake the manufacture of ammunition in all its branches.' (Report, February 1920, *op.cit.*, Vol.2, p.2). No other organisation other than the MSB was associated with this function.

5. Leighton naturally was familiar with the annexe system after spending much of the War in the British Ministry of Munitions. He sent for J.K. Jensen in 1918 who among things had to study the annexe system before he returned to Australia. (J.K. Jensen, 'Defence Production...', *op. cit.*, Chapter 6, Volume 4, pp.124-26). Meanwhile, A.J. Gibson had written in 1916 a report 'Rapid Production of Munitions and Equipment on the Outbreak of War' which raised many of the important elements of the annexe scheme (AA MP598 S37 Box 2, Item 23). Gibson's report was brought before the Council of Defence by George Pearce, 9 April 1918 (A1917/216 Miscellaneous Papers) where it was referred to a special sub-committee (Council of Defence No. 2, Standing Committee on Resources and Manufacturing, 17 December 1918, CRS A3934 SC17(17)). In MSB Agenda 857, Meeting 22 November 1923 Jensen noted that the MSB had already completed its investigation of the organisation of British industry for the production of munitions during the last war (AA MP730 S8, Box 6, Volume 6).

6. Leighton's view was based on the British experience during 1914-18, which had shown in 1915 that despite its advanced industrial status, British industry used machine tools and plant which were not readily turned to munitions production. The standards and

the Government was that such annexes did not displace, in peace, the normal production of the commercial factories or state workshops with which they were associated. Annexes could be run at a low level of production until needed, when they could then enjoy first priority.

This was the broad plan only, for the MSB had no clear idea of the level of technical skill of particular commercial or state government organisations, and so did not know how much technical equipment and training it might have to supply; nor did it know what the demands of the Armed Services were likely to be[7]. Leighton thought that such enquiries were generally, at this time, a waste of energy because the MSB had not even completed building its factories and laboratories. Without some experience, for example, in the manufacture of guns and shells, the MSB was in no position to investigate the technical capabilities of secondary industry to produce these items[8]. There was also the problem of the protective tariff which was promoting a rapid development of secondary industry in Australia[9]. Information collected on technical capabilities of com-

techniques required for civil production were in many cases quite different. Leighton soon learnt that the same situation existed in Australia, where secondary industry was generally even less technically advanced than in Britain.

7. This had not stopped Leighton from initiating some enquiries. The Council of Defence Meeting of 24 April 1919 had approved A.J.Gibson's recommendation for a survey of industry from his report 'Rapid Production of Munitions and Equipment on the Outbreak of War' (AA CRS A1606 File D15/1). Leighton had attempted to implement it but the tremendous size of the task and the little manpower available made it impossible (J.K.Jensen, 'Defence Production...', op. cit., Chapter 9, Volume 9, pp. 5-6. Leighton to Council of Defence, February 1921).

8. AA MP730 S8, Volume 5, MSB Agendum 703/1923. Report from the MSB to the Minister of Defence, E.K. Bowden, 20 March 1923.

9. AA MP598 S30, item 18, 'Memorandum on Supply...', by A.E. Leighton, 13 March 1928.

mercial firms, for example, was likely to be out of date within a relatively short period of time. All of these considerations pointed to the conclusion that the 1920's were not the time to begin detailed investigations into the technical capabilities of secondary industry. The minimum requirement was for the MSB factories to become operational, but this was not scheduled until 1928-29 with the completion of the MSB's development programme. This did not include the inevitable problems over the high costs of such an investigation.

The Army did not agree with this approach. Outwardly its reasons were plausible. It wanted secondary industry investigated to see what assistance the Army could expect immediately on mobilisation in an emergency[10]. But, as Leighton informed the Minister of Defence in 1925, there was no immediate prospect of early assistance from secondary industry in the event of an emergency. Munitions production required a special arrangement of plant and machine tools so that large quantities of articles could be produced. These emergency arrangements took time to set up. Commercial and state government organisations would be making normal commercial products until the emergency occurred[11]. One did not need an investigation to determine this fact, and yet the Army persisted with its request throughout the 1920's and was critical of the MSB's alleged lack of action[12].

There were two purposes behind the Army's behaviour. The first concerned its attempts to persuade the Government that it needed to be fully equipped for

10. AA MP730 S8, Box 6, Volume 6, MSB Agenda 857, Meeting 22 November 1923. See also J.K. Jensen, 'Defence Production...', op. cit., Chapter 9, Volume 9, pp.12-3.

11. AA MP598 S30, Box 13, File 1, Leighton to the Minister of Defence 10 October 1925.

12. AA MP730 S8, Box 7, MSB Agenda 200/1925. AA MP598 S30, Box 13, File 1.

the mobilisation of five infantry divisions and two cavalry divisions. It looked to an MSB investigation of the technical capability of secondary industry to prove beyond doubt that no support would be forthcoming from this sector for many months after an emergency had begun. The results of such a study would put great pressure on the Government to equip properly the Army's field force before an emergency began. The second purpose was to demonstrate to the Minister of Defence that the Army's interests were being overlooked in the area of munitions supply and would continue to be ignored by the MSB until the Army had some sort of representation on, or control of, the Board.

The latter purpose was shared by the other Armed Services, both of which had tried to get representation on the MSB. They had been rejected by the various Ministers of Defence, principally because they could not show that their inclusion on the MSB would in any way increase its efficiency and effectiveness[13]. In 1925 the Armed Services launched a joint attack. Their main arguments were:

'Nothing can alter the fact that success or failure in war is primarily a responsibility of the Services and that they may very well depend on nothing so much as the production of munitions... Success or failure in war, the safety of ships and personnel in peace and war and the confidence of the Services in their supplies all depend on the means taken to provide munitions and are responsibilities which are inseparable from the Services;

It is contrary to the experience and practice of the Home Authorities

13. AA MP730 S8, Box 6, MSB Agenda 311, Meeting of 6 October 1921, MSB Agenda 598 Meeting of 12 October 1922. There is evidence that Armed Service resentment was also generated by the MSB taking over the Contracts Board and inserting its own chairman, J.K. Jensen. Previously the Board had been run by the Services, but the Minister of Defence favoured its control by the MSB. MP730 S8, Box 6, MSB Agenda 548, 562 and 572. See also J.K. Jensen, 'Defence Production...', Chapter 8, Volume 6, pp. 16-7.

[Britain] to leave control entirely in the hands of the civilians;

Necessary touch between the administration of production and supply, and officers serving afloat and ashore and in various depots, cannot be maintained except through a Service Committee;

The Services as the "customers" must be in a definite position of authority over their "suppliers" whether the latter be Government factories or private firms.'[14].

The object of these arguments was to create a Service Committee to control all the activities of the MSB[15]. They were a good example of the arguments which were to be raised constantly throughout the 1920's and 1930's by the Services, and reached fulfillment with the Department of Supply and the Principal Supply Offices Board in 1939[16]. If the Service arguments were to be taken literally, the Services were claiming the right to involve themselves in areas outside their immediate control and experience, in order to protect

14. AA MP730 S8, Box 1, item 2, First Naval Member to First Military and First Air Board Members, 12 February 1925. The Military and Air Board agreed with these arguments on 9 June 1925 and 23 June 1925 respectively.

15. AA MP730 S8, Box 1, item 2. This committee was to advise the Minister on:

- a. The nature of the stores to be produced in Government Factories and the program for progressive development of manufacture of each nature;
- b. The steps to be taken to ensure that the capabilities of commercial industry are made full use of;
- c. The nature and extent of experimental and research work to be done;
- d. The erection of new works in Government Factories;
- e. The arrangements to secure the supply of munitions in wartime;
- f. The formation of a connecting link between the Services to ensure cooperation in development; and
- g. For reference of opinion in connection with munitions production.

The committee was to have two members from each Armed Service and one from the MSB. The Secretary was to come from the Services as well. Joint submission from Army, Navy and Air Force of 17 September 1925. .

16. See Chapter 5 of this thesis.

Service interests in time of war. In the case of the MSB, the Services had no experience in manufacturing, factory administration and scientific research programmes but they felt they were still justified in controlling the MSB, despite their complete power to place whatever orders they liked on the MSB or elsewhere. Other aspects of the Armed Services position were related to having the same control over supply as the British Armed Services[17]. The Minister of Defence, Neville Howse, was not impressed with any of these arguments[18]. He appears to have accepted the need for better coordination between the Services themselves and formed the Defence Committee, which could consider general questions of supply, among other things, but could not overrule the powers of the MSB without the Minister's support[19].

In 1927, the Army continued its campaign for detailed investigation of secondary industry and control of the MSB. On 30 March 1927, the Dominions Office in Britain suggested that Australia should adopt the Principal Supply Offices Committee (PSOC) organisation approved by the Committee of Imperial Defence and set up in May 1924[20]. The PSOC was controlled by the British

17. The British Ministry of Munitions had been abolished after the War, despite its great success, in favour of returning to the Services their factories and research establishments. The Australian Government preferred to keep the unified supply structure pioneered by the Ministry of Munitions. It was helped in this decision by the fact that Australian munitions production facilities and laboratories were too small to be divided up between the three Australian Services.

18. AA MP730 S8, Box 1, item 2.

19. Leighton, as CGMS, had to be present at any Defence Committee meeting which discussed matters of supply. Defence Ministers seem to have nearly always supported the MSB in any dispute with the Defence Committee until 1939 and the creation of the Department of Supply.

20. AA MP598 S30, Box 13, File 1, Dominion's Office to Governor General, 30 March

Armed Services and its objectives, among other things, were the preparation of plans for the industrial organisation of the resources of the Empire for munitions production in time of emergency or war[21]. The Services took up the issue of an Australian PSOC and helped to persuade the Council of Defence to call for a special report from Leighton[22]. Meanwhile the Army launched a direct attack on the MSB through a paper called 'Mobilisation of the Army'[23]. This discussed various difficulties in mobilisation, particularly those associated with the procurement of the large body of stores and munitions required. The paper considered two solutions, the first with procurement through a single agency such as the MSB; the second with each Service arranging its own sources of supply. The familiar issue was also raised of the need to have a detailed investigation of secondary industry, so that time could be saved, during mobilisation, in the procurement of supplies from commercial industry.

This was a complicated situation for the MSB. It had to fend off a direct and clever assault on its role within supply, and also reject the idea of

1927; 'The Supply of War Material and Other Essential Requirements', by the British PSOC, 19 May 1926.

21. The PSOC was created as a result of the Worthington-Evans Committee Report on the organisation of supply for the British Armed Services. The latter had realised by 1923 that many questions of supply could not be contained within single Service functional areas and that some form of central coordination was required. The Services were not prepared to return to the Ministry of Munitions solution as they still wished to control their own factories and laboratories. The PSOC was a compromise worked out by the Worthington-Evans Committee and had no control over factories or laboratories. See 'Memorandum on Supply...', by A.E. Leighton, 13 March 1928, AA MP598 S30, item 18, pp. 3-6.

22. AA MP598 S30, Box 13, File 1, Council of Defence Decision, 23 June 1927.

23. AA MP598 S30, Box 13, File 1, Commonwealth War Book, paper 15. The paper was written by Colonel Wynter and was issued in September 1927.

a detailed survey and an Australian PSOC, when the last was supported by Britain and appeared perfect to carry out such a survey. It seemed that at the very least, the MSB would lose its function to investigate and organise secondary industry for war. A joint Departmental Committee was formed to consider the Army's paper[24]. It found in favour of a single supply agency but the Service representatives claimed that they should be on the MSB. The Minister of Defence, Major General Glasgow, rejected this claim[25]. The committee also recommended that the MSB should complete a detailed survey of industry as soon as possible, and that such plans as eventuated from it should be submitted to the Military Board for approval[26]. Leighton decided not to resist this in his report to the Council of Defence[27]. His main target was the suggested PSOC. He claimed it was superfluous given the organisation of the MSB, which far more accurately reflected the realities of the organisation of the British Ministry of Munitions than did British supply organisations which had been created on the

24. This consisted of representatives of the three Armed Services, Prime Ministers Department, Attorney Generals Department, Works and Railways, and M.M. Maguire and A.V. Smith from the MSB. The Committee met on 21-22 October 1927. J.K.Jensen, 'Defence Production...', *op.cit.*, Chapter 9, Volume 9, pp.20-1.

25. AA MP598 S30, Box 13, File 1, Secretary of Defence Department to Secretary of the MSB, 18 February 1928.

26. *ibid.*, 'Report of the Joint Departmental Committee upon Commonwealth War Book Paper Number 15'.

27. AA MP598 S30, item 18, 'Memorandum on Supply...', *op.cit.*

abolition of the Ministry[28]. The Minister agreed[29].

All three Services were invited to submit their requirements for mobilisation so that the MSB could then see how many could be met from within Australia. Only the Army had significant demands[30]. The investigation was completed in October 1928 and reported on the Army's 950 items in terms of articles which were not procurable in Australia (Category A) and articles which could eventually be made by the MSB factories if finance and time were available (Category B). The balance of the 950 items were expected to be procurable from secondary industry. Both categories listed about 50 articles each, confirming Leighton's contention that the growth of secondary industry through the influence of the protective tariff was leading steadily to self containment for the requirements of the Army. However, most of the 100 articles divided between Category A and B were the more important articles, particularly munitions such

28. *ibid.*, pp.3-8. Leighton pointed out that the protective tariff was encouraging the growth of secondary industry on a very wide basis. The effect of this was to increase steadily in the community the reserve of general stores and supplies available for use in war. There was little value in conducting a survey in these areas as secondary industry was changing so quickly. It was sufficient to recognise that the general stores position was getting stronger all the time through the forces set in motion by the protective tariff. This of course was not good enough for the Army, so Leighton made some practical suggestions in his Report on how such a survey could be made. See also MP598 S30, Box 13, File 1, Jensen to the Secretary of Defence, 9 June 1927.

29. AA MP598 S30, Box 13, File 1, Secretary of Defence to Secretary of Prime Ministers Department, 14 August 1928.

30. The Navy replied that its mobilisation requirements of all armament stores were complete and so it had no requirements to submit. The RAAF did not bother to reply. The Army submitted a list of 950 different items. AA MP598 S30, Box 13 File 1, Secretary of Defence to MSB, 13 June 1928, Military Board to MSB, 4 May 1928, Naval Board to Secretary of Defence, 19 July 1928, MP730 S8, Box 8, Volume 16, MSB Agendum 17 Meeting, 12 July 1928.

as shells, SAA, machineguns, optical equipment and gas masks. Most of these fell into Category B which the MSB believed it could supply if given sufficient money and time to complete the production planning cycle. In many cases the cycle could not be completed in less than 12 months. It was estimated that if the production planning cycle could be completed in peace, two months would still be needed before substantial deliveries could commence[31].

The Military Board professed to be shocked at this result and pointed out that the 5 infantry and 2 cavalry divisions could all reach their places of mobilisation by 10 days, at which time a full issue of equipment needed to be made[32]. The Military Board concluded that there was only one solution to this problem; the Army had to hold, in peacetime, its complete war outfit. It also claimed that the Minister, by giving the responsibility to the MSB for investigation of Army mobilisation requirements, made the MSB responsible financially for supplying the Army's deficiencies. This amazing piece of logic was dismissed by the Secretary of the Defence Department, who pointed out

31. AA MP598 S30, Box13 File 1, Secretary of MSB to Secretary of the Military Board, 2 October 1928. The Production Planning Cycle was:

- a. Drafting of a plan for manufacture, with working drawings and description of operations, tools and gauges;
- b. Making or obtaining tools and gauges;
- c. Designing and installing plant where necessary;
- d. Obtaining raw materials; and
- e. The manufacture and testing of a trial batch of articles.

32. This was to enable training to begin immediately as the Army was inadequately trained for immediate military operations. The Army planned to use the weeks preceding the actual attack by enemy forces for much needed training of the militia. The Military Board did not like the idea of gradual mobilisation as equipment became available, because this risked defeat in detail and much disorder as partially trained forces were engaged with the enemy. AA MP598 S30, Box 13, File 1, Military Board to MSB, 16 November 1928.

that the MSB was a provider, not a user and that the Army had to find the funds required[33]. He and the Minister attempted to get the Army the necessary funds but the Depression intervened before anything definite had been achieved[34].

They need not have bothered because the survey had been carried out on a biased assumption. The Army wished to prepare for the defence against invasion contingency, which was only one of several possible contingencies and was the least likely and most costly for which to prepare[35]. The defence against raids contingency was more probable and did not require the size of force the Army was determined to prepare (i.e. seven divisions). Yet the survey was carried out on the assumption that the mobilisation requirements needed by the Army were those to repel invasion. Within the invasion contingency, the Army had placed a very narrow assessment of the time to respond to the enemy threat — 10 days — which was queried by the MSB[36]. It was in fact reasonable to assume that the prospect of invasion would have been recognisable many months before the threat was imminent (the traditional time to mobilise). This would have provided the MSB with a good opportunity to supply the Army's mobilisation

33. *ibid.*, Shepherd to Minister of Defence, Major General Glasgow, 15 March 1929.

34. *ibid.*, Secretary of Defence to the Military Board, 15 March 1929; The Military Board to Secretary of Defence, 17 April 1929. See Chapter 2 of this thesis.

35. The invasion of Australia was only considered a possibility from Japan, and a very distant possibility at that during 1928. Japan was thought to need at least 3 to 4 divisions, which required an enormous amount of shipping to transport from their nearest bases to Australia many hundreds of miles away. This convoy, and its subsequent lines of communication, were vulnerable to interdiction, making the whole operation very risky while the British were free to deploy their main fleet to the Far East.

36. AA MP598 S30, Box 13, File 1, Secretary of the MSB to the Military Board, 2 October 1928, paragraph 4.

deficiencies, as the Government could have been expected to increase finance to the MSB, as international tension rose gradually.

The above considerations showed that the Army's survey was a waste of the MSB's time. It was soon to be irrelevant as secondary industry continued to change quickly under the influence of the protective tariff. The Army's attitudes towards the organisation of secondary industry were coloured by its desire to rob the MSB of its functions. During the 1930's the Army, and to a lesser extent the Airforce and Navy, were far more interested in the tactics of diminishing the MSB's power over supply than in studying the problems associated with secondary industry. The investigation of the technical capability of secondary industry and the preparation of plans for its organisation for wartime production were to provide the opportunity.

The Principal Supply Officers Committee

During the Great Depression, the British Government and the Australian Armed Services continued to exert pressure for an Australian PSOC[37]. By 1933 they had worn down Leighton and he agreed that such an organisation

37. AA MP598 S30, Box 13, File 1, CNS 20 February 1930, CGS 27 March 1930, CAS 4 April 1930. Following the circulation of the sixth annual report of the British PSOC in early 1930, the CNS suggested to his colleagues of the Defence Committee that an Australian PSOC should now be formed. CGS and CAS agreed. The MSB rejected this demand with its familiar arguments and was supported by the Defence Minister, A.E.Green, who confirmed the MSB as the equivalent of the British PSOC. British authorities were reluctant to accept this decision and raised it again during the 1930 Imperial Conference. The Australian Delegation did not change its view. MP598 S30, Box 13, File 1, MSB to Secretary of Defence Department, July 1930, Minister of Defence, 21 July 1930. A5954, Box 10, Minute of Defence Department for Imperial Conference 1930. J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.9, Vol.9, pp.35-6.

should be given a trial[38]. In surrendering MSB control of this function, he took pains to ensure that the MSB controlled largely the new committee. The Defence Committee agreed that Leighton would be the Chairman and that the rest of the PSOC would be made up of one representative from each Service and the two other members of the MSB. The executive organ of the PSOC, the Supply Board, was to be chaired by a member of the MSB, while the Secretary of the Contracts Board, A.V.Smith, was to be Secretary of the PSOC and the Supply Board as well. The CGS, Major General Bruche, had submitted a different proposal which reduced greatly MSB control, but the Defence Committee rejected it, probably because without Leighton's support no proposal would have been approved by the Minister of Defence, George Pearce[39].

38. AA MP598 S30, Box 13, File 1, MSB Agenda 71 Meeting 19 January 1933, British PSOC to Secretary of MSB, 9 July 1931. Leighton's main reasons were that with the financial restrictions of the Depression, the MSB could make no progress at all with plans for the organisation of secondary industry; a task, which for various reasons, was becoming more difficult and complex. If any progress was to be made, the MSB had to have the cooperation of the Armed Services and the PSOC might achieve this end. Service support could be beneficial in persuading the Minister and Government to release more funds for the project, which would then allow worthwhile progress.

39. *ibid.*, Defence Committee Agenda No.2/1933, 'Formation of a Principal Supply Officers Committee and Subsidiary Organisations in Australia', 3 February 1933; Defence Committee Minute No.6/1933. Ministerial approval, 14 March 1933. CGS to Secretary of the Defence Committee, 'Essential Supplies in Time of War', 25 January 1933, MP598 S7, Box 1, CGS to QMG, 28 November 1932. The terms of reference of the PSOC were:

- a. Ascertaining and maintaining a watch upon the National stocks of raw materials required in the manufacture of articles required by the three Armed Services;
- b. Preparation of a list of articles, the total supply of which might be required in wartime;
- c. Maintaining liaison with PSOC in Britain;
- d. Furnishing periodical reports to the Defence Committee;
- e. To advise with regard to plans for increasing supplies in an emergency; and

The new organisation quickly became moribund as the Army and the Airforce attempted to supplant the Government's strategic contingency of defence against raids, with the defence against invasion contingency. This started in mid 1933 when the Defence Committee decided that PSOC investigations would be based on the supply of munitions for the contingency of 12 months sustained conflict in Australia with overseas communications having been rendered difficult. Pearce directed that there was to be no variation to Government policy as laid down in 1932[40]. For the next two years the PSOC lay almost inactive waiting for the Defence Committee to determine how Pearce's directions affected the basis of investigation[41].

There should have been no difficulty in settling this as the Govern-

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- f. To maintain in the Contracts Office of the MSB, a list of contractors who could be called upon during an emergency.

Chairman of PSOC to Minister of Defence, 10 June 1935, MP598 S30, Box 13, File 1.

40. AA MP598 S30, Box 13, File 1, Shepherd to Jensen, 25 July 1933, A.V.Smith to Shedden (Secretary to the Defence Committee), 29 August 1934 plus attachment dated 20 August 1934; MP598 S30, Box 9, 'Defence Policy and its Relation to the Figures to be Submitted for Limitation at the Disarmament Conference', Cabinet submission by the Ministers of Defence and External Affairs, 12 February 1932; approved by Cabinet 15 February 1932. Pearce's directions defined a contingency which envisaged light raids on Australia and therefore only about half the forces required for the Defence Committee contingency.

41. AA MP598 S30, Box 13, File 1, Leighton to Shepherd, 10 June 1935. Leighton complained to the Minister of Defence that: '...the past year has been one of inactivity which has been due to the non-supply of ...the new basis of enquiry and the Principal Supply Officers Committee has therefore decided not to issue Annual Reports this year ...as there is nothing of importance for inclusion in such reports.

The lack of activity during the year is deplored and the Committee urges that particulars of the new basis of enquiry should be furnished as early as possible so that the work of the Supply Organisation may proceed along more satisfactory lines than is possible under existing conditions'. See also A.V.Smith, 'Principal Supply Officers Committee', 30 October 1934, and minutes of meeting of PSOC, 27 March 1935.

ment's position was made clear by Pearce in his speech to the Millions Club on 25 September 1933[42]. The Hankey Report of 1934 confirmed the Government's preference for the defence against raids contingency. This prompted the Navy to write in February 1935 to Parkhill, the new Defence Minister, about the 'Invasion Bogey', pointing out that no more than a three division army was needed because British naval defence would prevent an invasion[43]. The Army wanted a 7 Division force to defend against invasion. Parkhill tried to resolve the dispute by referring it to the Council of Defence. It approved something of a compromise, which basically supported the Navy and the Government but did not reject the Army's aspirations totally[44]. The ambiguousness of this conclusion prompted the Defence Committee to approve unanimously the defence against invasion contingency as the basis of investigation of industry by the PSOC[45]. Thus the PSOC was to examine secondary industry for its capability to supply an anti invasion force, which was at least twice the size of the forces being prepared according to the Government's defence against raids

42. See Chapter 1 of this thesis.

43. AA CRS A5954, Box 1018, File 'Defence Policy Strategical Aspect, February 1935', CNS memo: 'The Invasion Bogey'. This naval defence assumed the presence of the British Fleet.

44. AA CRS A2031, Defence Committee Agenda 20/1935, 16 July 1935. At its meeting on 19 June 1935 the Council recommended that the existing organisation of seven Army divisions be maintained, but that in the use of additional funds the Army should concentrate on three cavalry brigades, two divisions and four mixed brigades, i.e. an anti-raids organisation.

45. AA MP598 S30, item 18, Defence Committee Minute 36/1935, 19 July 1935. The person responsible for this confusion was Parkhill himself. He suggested the form of words used by the Council of Defence. He appears to have been confused about the issues — see *ibid.*, Parkhill to Secretary of Defence, 'Principal Supply Officers Committee', 12 June 1935 and A.E.Leighton's reply: 'Australian PSO Committee, Note prepared for Minister in view of his Meeting the Committee on 18 June 1935.'

rearmament programmes. Parkhill does not seem to have thought there was any conflict in objectives; but there would be when the PSOC began to ask for funds to develop capacity in secondary industry. The Government was unlikely to extend finance to support a contingency which was not its own.

The PSOC was the one administrative body which allowed the Army and the Airforce to continue work on their favoured contingency — defence against invasion. The new CGS, Lavarack, was a trenchant critic of the Government's defence policy and was determined to do what he could to see that the Army was equipped properly to defend against invasion. He pursued several strategies[46], but gave most importance to the PSOC. His unshakable belief was that if a properly detailed investigation were implemented of secondary industry, an industrial mobilisation plan could be developed which allowed the early

46. One of these, which began in early 1936, was to reverse the internal priority of the Government's rearmament plan. So instead of making the completion of fixed defences for ports the first priority, as demanded under the defence against raids contingency, Lavarack sought to make completion of mobile forces the first priority and to create larger mobile forces than the Government's contingency allowed. He hoped to achieve this disguising of the true purpose of annual expenditure under cryptic headings which implied that the Government's wishes were being followed. Mobile forces, of course, were the most important element of an anti invasion force. The Defence Secretary, Shepherd, and Parkhill, were alert and caught the Army out. When challenged, the Military Board claimed that the planned defences against raids were unbalanced and they needed mobile forces to protect the fixed defences. AA CRS 5954, Box 887, File 'Defence Committee Agendum No.32/1936 and Defence Committee Minute No.48/1936 of 27 October 1936'. See Shepherd to Parkhill, 10 March 1936 and 13 March 1936 and Military Board, Parkhill comments. See also Box 1028 for Minute from Parkhill on the Army's antics, 21 May 1936. Another strategy which Lavarack followed appears to have been to encourage the public dissemination of the Army's criticisms of the Government's defence policy. Lieutenant Colonel H.D. Wynter seems to have been the chosen intermediary. It seems very unlikely that Wynter would have leaked anything to the Press unless he knew he had Lavarack's tacit approval. See AA CRS A1606, item AQ25/1.

production, after the declaration of an emergency, of the vast quantities of munitions required by the Army under its contingency of defence against invasion. The MSB could be expected to produce less than 10% of what was required[47]. Thus, detailed paper planning would give the Army some of what it was denied by the Government's refusal to allow it funds for preparations other than for defence against raids [48].

The MSB had made clear its distrust of complicated and detailed investigational methods during the 1920's[49], and so it was natural that Lavarack should move to reduce MSB opposition to his plans during 1935. In addressing his colleagues of the Defence Committee, Lavarack claimed that he was concerned that there was little time left to pursue the necessary investigations of secondary industry and therefore, it was vital to appoint permanent staff to support PSOC activities[50]. The real purpose was to remove M.M.Maguire

47. AA MP598 S30, item 18, Lavarack to Secretary of the Defence Committee, 27 August 1935.

48. The Army proposed to follow the Analytical Method of investigation. This entailed the reduction of all munitions into their simplest components. From there, careful and laborious research was conducted of secondary industry to determine which materials and manufacturing processes it was capable of completing, and how many machine tools, plants and buildings were required to allow production of all components. AA MP598 S30, item 18, 'Memorandum of Supply ...', 13 March 1928 by A.E.Leighton, pp.2-6.

49. See earlier in this chapter. The method of investigation preferred by the MSB was the Business Method. This entailed making direct enquiries of secondary industry as to whether it could make particular components or articles as nominated by the Army. This method was used by the Contracts Board of the MSB and could not only identify commercial firms with new capabilities but also gaps in the supply chain, which could be corrected by Defence Department representations to the Department of Trade and Customs for new protective tariffs. The Business Method was less thorough than the Analytical Method but was far quicker and cheaper. AA MP598 S30, item 18, 'Memorandum on Supply ...', 13 March 1928 by A.E.Leighton, pp.2-3.

50. AA MP598 S30, item 18, Lavarack to Secretary of Defence Committee, 27 Au-

of the MSB from the Chairmanship of the Supply Board, placing that Board under Service control[51]. Lavarack admitted openly that he wished to see the PSOC organisation removed from MSB influence otherwise:

‘...there would be the tendency for thought to be devoted to the Munitions establishments whereas the great bulk of our requirements in war must be found from other sources’[52].

Leighton made no objection to these proposals as he had long accepted that the PSOC must have full time staff and develop more independence[53]. The PSOC was now created as an independent branch within the Defence De-

gust 1935. Lavarack thought that the international situation looked menacing and therefore supply planning should be sped up.

51. *ibid.*, M.M.Maguire was a part time chairman, being also Assistant Secretary of the Defence Department. Lavarack hoped to see a Serviceman appointed to the position, and in fact had one of his own officers in mind in L.E.Beavis. Urgency was not the real purpose behind this move as was demonstrated by the following. Because of the alleged urgency, Leighton, as chairman of the PSOC, requested £3000 from the Defence Committee to speed up the appointment of permanent officers, which otherwise would have to wait until the financial year 1936-37. At this time the Defence Committee had just been given £200,000 by the Government which was additional to approved funds for the Services. The Committee refused to allocate any of this to the PSOC. AA CRS A5954, Box 1028, Leighton to the Defence Committee, 27 June 1935, Defence Committee Meeting 27 June 1935, Minute No.33/1935. See AA MP598 S30, Box 13, File 1, Defence Committee Minute No.52/1935 of 31 October 1935. This approved the permanent appointment of three military staff and three technical assistants etc. but provided no finance. The Defence Committee did not believe that investigations needed to be sped up despite the international situation. The three technical assistants, without which the Service's list of requirements could not be completed within the six months requested by Lavarack, had still not been appointed by October 1936. The Chiefs of Staff were unanimous in their voting on these matters. See also Leighton to Defence Committee, 13 November 1935.

52. AA MP598 S30, item 18, Lavarack to Secretary of Defence Committee, 27 August 1935.

53. *ibid.*, MSB Agenda 71 Meeting 19 January 1933, Minutes of the Council of Defence, 19 June 1935; see also Secretary of PSOC (A.V.Smith) to Defence Committee, 10 July 1935; and Leighton's Notes on Lavarack's proposals, 5 September 1935.

partment and Lavarack's nominee, Lieutenant Colonel Beavis, was appointed as Chairman of the Supply Board[54]. A.V.Smith was made the Deputy Chairman[55]. The Services now controlled the executive organ of the PSOC and all its subcommittees, while they also controlled the PSOC through the appointment of Beavis to it; a gesture made by Leighton because it would improve coordination between the Supply Board and the PSOC.

Leighton might have hoped that his conciliatory attitude would be reciprocated by the Army and Airforce; but they chose to pursue their own ideas throughout 1936, on the preparation of secondary industry for defence production, with the ultimate objective of excluding the MSB completely. The focal point of this campaign was Beavis.

The terms of reference of the Defence Resources Board (previously the Supply Board) indicated clearly that enquiries of industry were to be made through the Contract Board, but Beavis refused to use it[56]. This was despite the fact that the Contract Board had a huge store of experience and information on commercial firms which had attempted to fulfill defence contracts since 1919.

54. This appointment was a foregone conclusion as the huge bulk of required munitions were needed by the Army, and Beavis was the best trained technical officer in the Army in 1935.

55. AA MP598 S30, Box 13, File 1, Defence Committee Minute No.23/1936 of 15 June 1936. A.V.Smith was appointed Deputy Chairman of the Supply Board on the votes of the CNS, the Finance Secretary of Defence and Leighton. His appointment was opposed by Lavarack and CAS who wanted a Serviceman appointed.

56. AA MP598 S30, item 19, Memo 'Reorganisation of the Principal Supply Organisation', by the Secretary of the Defence Resources Board, M.Connolly, 4 May 1937, reference notes, pp.3-4. It is worthy of note that Beavis' Deputy Chairman was A.V.Smith, Secretary and Chief Executive Officer of the Contract Board. He was ignored.

It was, of course, part of the MSB organisation. Predictably, embarrassing problems of coordination began to occur. Beavis and his assistants investigated firms which had already been examined by the Inspection Branch of the MSB, or had already completed defence contracts successfully[57].

Beavis also persistently expanded the investigational and functional scope of his organisation. The investigational subcommittees under the Defence Resources Board were encouraged to go far beyond their terms of reference, supposedly to broaden investigations, but also to compete with functions of the various branches of the MSB, e.g. the Contract Board, Inspection Branch and the Factory Branch in the supply of gauges and machine tools[58]. Beavis conducted his investigations on the requirements of the Services for the defence against invasion contingency, which had been approved by the Defence Committee. However, as the chief executive officer to the PSOC, it was his responsibility to point out at an early stage that this contingency was generating a list of requirements which cost over £40 million; a sum which dwarfed the existing rearmament programme of the Government. There was no chance that the Government would approve that level of expenditure when it was not even related to the approved defence contingency, i.e. defence against raids. Beavis

57. *ibid.*, The duplication of effort was apparent to secondary industry, and helped to give the Department of Defence a reputation for being disorganised in its preparations. Not even the Service Boards were allowed to become involved in any way with commercial contractors unless in coordination with the Contracts Board or the Inspection Branch. This was a standing order from a previous Defence Minister, Sir Thomas Glasgow — see J.K.Jensen, 'Defence Production . . .', *op.cit.*, Ch.8, Vol.6, pp.29–31.

58. See AA MP598 S30, item 19, Connolly memo, *op.cit.*, p.3. The subcommittees were usually led and always dominated by Service personnel. The MSB had little influence on their activities. See Australian Supply Board Paper No.3 of June 1936 by Beavis.

persisted with his vast and complicated investigations based on the defence against invasion contingency, ignoring the Government's contingency[59]. He also wanted an inter-Service Supply Board, responsible only to the Minister for policy in regard to supply and for executive action in accordance with that policy. The entire MSB organisation was to be under this Service Board[60].

Beavis was quick to make contact with other organisations which were enemies of the MSB. General Lavarack had been visited by the Secretary of the SITR Committee, Hebblewhite, and had informed the Executive Committee of the CSIR that:

'...Leighton was a menace to the Defence Department... the secondary industries in Australia were totally unprepared for the manufacture of any defence material, and that although he and his colleagues had done their utmost to press Leighton to do something on the matter, they could do nothing, and that probably nothing would be done until Leighton left the Department.

...he and his Council had appointed Colonel Beavis, because they recognised the extreme danger of the present position, Beavis having previously been the representative of the Defence Department at Australia House, and whilst there acting as liaison officer between the producers of defence equipment and the Department. They had therefore appointed him on his return to Australia to undertake the same work in the Commonwealth, which he was trying to do, despite Leighton's opposition.'[61].

59. AA MP598 S30, item 19, Defence Committee Minute No.55/1936 of 21 December 1936. The Defence Committee directed in December that the Government contingency should have first priority, but there is no evidence that Beavis took any notice. It is probable that he was not expected to, at least from the Army's point of view. While the Navy became increasingly restive in the following months, the Army and Airforce were content to do nothing beyond lipservice to the Government's contingency.

60. AA MP598 S30, Box 13, File 2, 'Australian Principal Supply Officers Organisation — Supply of Service Requirements in War', by Lieutenant-Colonel L.F.Beavis, particularly Appendix K.

61. CSIRO Archives, S67, Vol.18, Julius to Rivett, 14 July 1936. Since Leighton was

It is obvious from CSIR correspondence, that Beavis was exchanging information with CSIR from as early as the first half of July 1936[62]. It is difficult to believe he would have done this without Lavarack's approval. The contact went on through 1936, and culminated in the suggestion from CSIR, in December 1936, that the Defence Resources Board should be represented on the SITR Committee[63]. Leighton was aware of Beavis' proclivity by this time and was not prepared to allow this union of his declared enemies[64].

only Chairman of the PSOC, and the PSOC had never refused to do anything the Supply Board requested (see MP598 S36, Box 1 and S7, Box 1), Lavarack's statement was a distortion of the facts. With the advent of the Defence Resources Board, Beavis was made a member of the PSOC, so the Services now had control here as well. Plainly Leighton was not in a position to obstruct the existing organisation. However, he was in a position to offer considerable opposition to the Army's plans to exclude the MSB from most supply matters, and it was to this that Lavarack really referred, if his remark is to be intelligible. Army interests were identified with the national interests and Leighton's views associated with wilful obstruction.

62. CSIRO Archives S67, Vol.18, Julius to Rivett, 14 July 1936; S3, MV 10/13. CSIR was engaged in getting secret information from Britain on the manufacture of gauges for Beavis, which he should have obtained from the MSB.

63. CSIRO Archives S67, Vol.17, Lightfoot to Julius, 16 November 1936. Executive Committee Minutes, Meeting 8 and 11 December 1936. Beavis had been discussing many details of the Defence Resources Board activities with Lightfoot of CSIR. These included Beavis' plan of organisation for supply. Beavis had no authority to do this without having had permission from the PSOC and the Defence Committee. The CSIR suggestion was really a joint submission from them and Beavis — see AA MP598 S36, Box 1, Defence Resources Board Meeting, 17 December 1936.

64. It has been related that Leighton had good reason to fear the intentions of the CSIR through the SITR Committee. Whatever doubts he might have had about Beavis' intentions were removed in October 1936, when Beavis made a clumsy attempt to discredit the MSB in the eyes of the Minister, Parkhill. He wrote to the Secretary of Defence requesting that the Minister should explain his speech of 26 August 1936 on the MSB. His purpose was to show that the information the MSB had given Parkhill was misleading and that it was mismanaging the supply situation; AA MP598 S30, Box 13, File 2, Beavis to Secretary of Defence, 13 October 1936, 'Organisation of Industry to Provide War Requirements' and attachment, 'The Development of Nucleus Government Factories and the Necessity for taking the Second Step of Educating Civil Industry in Peace

The Financial and Technical Limits to Industrial Preparation

Even though the Army, at least, was using the PSOC investigations of secondary industry, to reduce the influence on supply of the MSB, the investigations themselves had a purpose beyond developing an industrial mobilisation plan. The effectiveness of such a plan was enhanced greatly if commercial firms were given some preparation and training. This of course, would cost huge sums of money if it was implemented fully, and for this reason alone, was not a likely Government action unless war was imminent or had actually started. However, the PSOC investigations could provide the basis for a modest financial implementation. The prospects of such financial assistance looked good in 1936 because the Government was extending significant assistance to secondary industry, as mentioned in Chapter 3, and defence aspects were part of the overall scheme of economic self containment. The ensuing battle between the MSB and the Army and the Airforce among other things, was about how such financial assistance, if it were approved, should be expended.

The dispute began to emerge in July 1936 when the Defence Resources Board, working under the defence against invasion contingency, established that the Army required massive quantities of ammunition. It was also certain that the Army and other Services The view taken by the Defence Resources Board,

Before an Emergency Arises Since Beavis' criticisms were based on information placed out of context from informal talks he had conducted with some MSB factory staff, they were easily discredited. Leighton ordered all MSB staff to have nothing more to do with Beavis unless he went through the Secretary of the MSB, Jensen.

65. AA MP598 S30 Box 13, File 2, Minutes of the 12th Meeting of the PSOC, 11 August 1936 and accompanying minute from the Secretary of the PSOC to the Secretary of the Defence Committee of 17 August 1936. See also MP598 S30, Box 13, 'Memorandum

context
Beavis
Jensen
secretary

and particularly by Beavis, was that since the MSB factories could not make the quantity of ammunition required, the Defence Department should give educational orders to secondary industry[66]. The Board recommended that the Service votes should be supplemented by £250 000 so that they could place some appropriate orders. The MSB was to supply the necessary jigs, gauges and machine tools[67].

The fallacy in this logic was that the huge deficiency in ammunition was based on the defence against invasion contingency and was not the Government's contingency of defence against raids. There was no suggestion, internationally, that Australia could face anything except raids. Leighton did not raise this

to Accompany Minutes of the Twelfth Meeting of the Australian PSOC, held on the 11th August 1936', by A.E.Leighton, 7 October 1936.

66. Beavis wrote Defence Resources Board Paper No.16 which was the basis of the Board's recommendations: see MP728 S3. His views had been disseminated in earlier papers, e.g. MP598 S30, item 19, Australian Supply Board Paper No.3 by Beavis, of June 1936. In May 1936 Beavis attended a conference at Victoria Barracks on fuze and gaine production. From the minutes, Beavis said that commercial firms should help in the production of fuses. He claimed that in Britain firms were given an order equivalent to 20 weeks work for one shift in the part of the factory intended to be taken over. An outfit of tools, jigs and factory gauges was usually supplied to the firm by the Government. The representatives of the MSB at the conference were reported as saying that fuses had to be made first in Australia at the MSB to perfect and learn the difficult technique of manufacture, which could then be passed on to commercial industry. They also said that the real bottleneck in fuse manufacture was the limited capacity in Australia for tool and gauge making. The demands of the MSB factories alone for tools and gauges etc., could not be met in reasonable time and thus the production of fuses would not be accelerated at present by calling on outside firms to machine components. See AA MP729 S6, File 3/401/160, Conference of 7 May 1936, Report by H.L.Nurse, 11 May 1936. Beavis's claims in regard to British practice with commercial industry appear to have been exaggerated. See M M Postan in *British War Production*, HMSO London 1952 pp41-44.

67. AA MP598 S30, Box 13, File 2, *ibid.*; S36, Box 1, Defence Resources Board Meeting, 1 June 1936, 14 July 1936.

point because it had to be assumed that the Defence Committee understood the latest foreign intelligence from Britain, and was aware of the Government's policy. Instead, he restated the view the MSB had been espousing since the 1920's:

'The popular idea that factories which in time of peace have been devoted to ordinary commercial production can be rapidly converted when war comes for manufacture of munitions, is an error so far as it may concern weapons and their accessories'.[68].

The significance of this observation was that the production lines. of secondary industry were not appropriate for the manufacture of munitions. Separate production lines had to be constructed, for which the Government had to supply many of the jigs, gauges and machine tools. Such production required additional factory space because the production of normal commercial articles could not, in most circumstances, be stopped as they supplied the needs of the civil population. The Government's financial commitment did not stop here because private firms had to be given significant orders so that it would be worth their while to attempt production. Should such firms succeed, the Government was more or less compelled to give further periodic orders so that the experience gained by staff was not lost through lack of practice[69]. Leighton concluded:

'...the policy of enlisting civil industry in support of defence presents certain problems, and although I believe the problems to be soluble if time and money are on our side, it is clear to me that their solution will require

68. AA MP598 S30, Box 13, Memo by A.E.Leighton, 7 October 1936, *op.cit.*

69. *ibid.*, Leighton's view was supported by British experience — J.L.Knight — Personal Papers, 'Extract from CID Paper No.1240-13 War Office Production', June 1936. This was in the possession of Leighton in 1936.

much of both.'[70].

The hint Leighton was giving to the Defence Committee was that even with a modest programme of munitions production by secondary industry, the cost to the Government was going to be high; and that the Committee had better check the costs of the huge requirements for gun ammunition generated under the defence against invasion contingency. The Defence Committee did, and discovered that the costs were in excess of £40 million, which did not include capital costs for factory space and jigs, machine tools and gauges etc.. The Committee recognised, belatedly, the difficulty of gaining significant financial support from the Government for this costly defence contingency and ordered that the Government's defence against raids contingency be resurrected in PSOC investigations[71].

The idea of using secondary industry for defence production, even on a modest scale, was ultimately dependent on the well-being of the MSB. Secondary industry could not begin the mass production of munitions until it had been given adequate training by the MSB's research and specialised engineering facilities. This presupposed that the MSB itself had performed the mass production and modification for Australian conditions etc.[72], of the munitions which were to be manufactured. As Leighton argued, this meant that the MSB

70. AA MP598 S30, Box 13, Memo by Leighton, 7 October 1936, *op.cit.*

71. AA MP598 S30, Box 13, File 2, Defence Committee Minute No.46/1936 of 26 October 1936; No.55/1936 of 21 December 1936. The Defence Committee had strengthened the importance of the defence against invasion contingency only in August in regard to PSOC investigations, now it had to change its mind: see Defence Committee Minute No.33/1936 of 7 August 1936.

72. See Chapter 1 of this thesis.

factories and laboratories had to be properly equipped before secondary industry. If the scheme proposed by Beavis and the Defence Resources Board merely resulted in the diversion to secondary industry of funds which would normally have been spent in the MSB factories and laboratories, the latter would fall into disuse. Leighton pointed out that this was happening already. The Services had placed no new orders for shells and the OFM would close down after February 1937 which would:

‘...seriously impair the efficiency of the one source of shell which is available in Australia today.’[73].

This appears to have been the intention. If the Government made more funds available, the Army intended to build up certain commercial firms into nucleus factories duplicating the MSB. When this was achieved, the Army could direct its orders to the nucleus factories at the expense of the MSB, unless the latter became acquiescent to Army objectives. In effect the Army, and the other Services, would get defacto control of the MSB through the creation of their own munitions production organisation. Esserman, who had been one of Leighton’s senior scientists since 1918, summed up the situation as follows:

‘The outlook of the Services was always in conflict with that of the Munitions Supply Board whose factories were the *only* sources of precision interchangeable production. In the eyes of the MSB it would be better to have completely equipped factories than to spread the pitifully inadequate money so thinly over industry inadequately equipped and staffed. Had we been brought into the argument, I am sure that all MSB staff would have been as bitter as Leighton. We knew industry’s weaknesses ...’[74].

73. AA MP598 S30, Box 13, Memo by Leighton, 7 October 1936, *op.cit.*

74. CSIRO Archives, S3 VM 10/13, Esserman to Curry, 5 May 1969. ‘In the middle thirties a serious conflict arose between Leighton and the Services. The latter wanted industry developed as speedily as possible for the supply of munitions in the forthcoming

Leighton's criticisms exposed the technical as well as the financial weaknesses of the Defence Resources Board argument. Beavis and Lavarack stubbornly ignored the financial impracticability of their scheme for secondary industry. Although the Defence Committee had resurrected the Government's contingency, Lavarack wished it to give priority to defence against invasion[75]. In order to meet Leighton's technical point that to correct the Services deficiencies under even the Government's contingency of defence against raids, would require that MSB factories had to be developed further and given sufficient orders, Lavarack developed the concept of the 'War Potential' of secondary industry[76]. This envisaged the placement of educational orders with secondary industry, simply to give some firms experience in munitions production and not as part of fulfilling any deficiency programme, which would require the use of the MSB. The purpose of this gambit was obvious, and gained the support of the Air Force. Its result was to increase the confusion over what the PSOC and the Defence Resources Board were meant to be doing[77]. Leighton attempted to resolve the confusion by suggesting to the Defence Committee that it should drop the defence against invasion contingency and pursue investigations in re-

war, Leighton wanted the Government factories developed to as high a pitch as possible to serve as a centre for dissemination of knowledge and experience to serve the whole country. There was not enough money for both'. Esserman to Curry, 10 April 1969.

75. AA MP598 S30, item 19, Lavarack to the Secretary of the Defence Committee, 19 January 1937; A.V.Smith to the Secretary of Defence, 2 March 1937. A.V.Smith had been appointed Second Assistant Secretary of Defence in November 1936 but remained Deputy Chairman of the Defence Resources Board and Special Adviser to the Secretary of Defence on PSOC matters.

76. *ibid.*, Lavarack to the Secretary of the Defence Committee, 19 January 1937. This concept seems to have come from Beavis.

77. *ibid.*, A.V.Smith to the Secretary of Defence, 2 March 1937.

lation to defence against raids, for which the Government might be expected to find funds. He derided Lavarack's attempts to side step the technical realities of munitions production in Australia. The MSB laboratories and factories were central to any attempt to involve secondary industry and until they were properly equipped and had sufficient orders, nothing could be done for secondary industry in defence production[78]. The Defence Committee split with CNS and A.V.Smith supporting Leighton, but with CGS and CAS continuing to support the full investigation of secondary industry as envisaged under the defence against invasion contingency[79].

Leighton now resolved to exercise his power of appeal to the Minister, to whom he wrote, via the Secretary of Defence, on 26 February 1937, requesting the delimitation of the PSOC's burgeoning investigations to only that of the Government's contingency. He also requested the abolition of the Defence Resources Board and all its subcommittees and their replacement with an executive panel[80]. A.V.Smith agreed with Leighton, claiming the old system was too elaborate and in effect incapable of producing results which could be acted on practically. The proposed system was simpler, did not slavishly follow Britain's PSOC organisation, and promised better coordination between

78. AA MP598 S30, item 19, Leighton to the Secretary of the Defence Committee, 18 February 1937; J L Knight- personal papers, 'Memorandum Referring to Supply Preparations — D.C.Minute 55/1936 — And Departmental Estimates 1937-38 — Submitted by Controller General of Munitions Supply at Meeting of Defence Committee, 24 February 1937', by A.E.Leighton, 24 February 1937.

79. AA CRS A2031, Defence Committee Minute No.3/1937 of 24 February 1937.

80. J L Knight- personal papers, Leighton to the Secretary of Defence, 26 February 1937, covering 'Memorandum on Supply Problem — with Reference to Certain Aspects of the — By Controller General of Munitions Supply ...', 26 February 1937.

the PSOC executive staff and the organs of the MSB[81]. Parkhill supported Leighton, and reformed the PSOC Branch, in the process destroying the predominant Service control, and replacing Beavis with the more tractable Major G.C.Rowe[82].

Beavis was very upset over his dismissal and gained revenge on Leighton in a curious way many years later- See Annex G[83]. However, in 1937 his departure was welcomed by the senior civilian staff of the Department of Defence. Smith wrote to Shedden, soon to be the new Secretary of Defence, that:

‘...the position is that it was impossible for anyone to work with Colonel Beavis unless they agreed with and accepted his point of view in all cases. To put forward any other point of view or to question any of his suggestions was immediately interpreted as opposition to getting on with the job. Rowe has taken over, as you will see, and really the position is much more happy and certainly more healthy. At the moment, anyhow, there is complete

81. AA MP598 S30, item 19, A.V.Smith to the Secretary of Defence, 2 March 1937. Smith said: ‘Mr.Leighton has endeavoured to clarify the position, but as previously mentioned, this does not seem possible through the Defence Committee, which seems to deal with the highly theoretical aspects of the position which may be interesting but which do not contribute much to the practical solution of our difficulties’.

82. AA MP598 S30, item 19, Minute by Minister: ‘Defence Committee Minute No.3/1937 — Supply Preparations — Acceleration of Progress — Financial Provision’, 16 March 1937. Parkhill had been considering replacing Beavis since December 1936 — Secretary of the Military Board to Secretary of Defence, 22 January 1937 — probably because of Beavis’ memo entitled ‘Australian Principal Supply Officers Organisation — Supply of Service Requirements in War’, which was a series of accusations of MSB obstruction; MP598 S30, Box 13, File 2. Much of the 47 page memo was irrational and inaccurate: see Jensen, ‘Defence Production ...’, *op.cit.*, Vol.9, Ch.9, pp.81–91.

83. The *The Age* newspaper began, in May 1937, a sustained programme of criticism of the Government’s lack of use of commercial industry for defence. Beavis left the Defence Resources Board in April 1937 and many of the arguments used by the *The Age* were similar to those he advanced. See the *The Age* article on the abolition of the Defence Resources Board, 12 August 1937 [AA CRS A5954, Box 1092]. The Defence Department thought that Beavis had talked to the *The Age*’s correspondent and was behind at least one of the stories which went on until August. AA MP598 S30, Box 13, item 19.

harmony in the camp, and we do hope that this will continue ...'[84].

The Secretary of Defence, Shepherd, agreed with Smith[85].

Lavarack was reluctant to accept the Minister's decisions in favour of the defence against raids contingency. He continued in April to pursue his concept of war potential in secondary industry, but without regard to the availability of funds. He was reminded by Leighton that depending on how much was to be made available, the MSB's factories and laboratories had first priority. Further funds would allow educational orders to be placed with certain firms in secondary industry. If they succeeded in the tool room manufacture of munitions, the Government could then erect annexes and give further orders, but all this was dependent on finance from the Government. 'War Potential' did not exist naturally in industry, but had to be created as above[86]. Smith's comment to the Secretary of Defence on Lavarack's ideas was terse:

'CGMS has replied to this. It is immaterial and merely raises theoretical issues without regard to the requirement of creating productive capacity within our means.'[87].

The MSB and Service rivalry now subsided from the PSOC but Jensen

84. AA CRS A5954, Box 1089, File 'Australian PSO's Committee Reorganisation in 1937', A.V.Smith to Shedden, 14 May 1937. Smith went on to say: 'The trouble with the old Committee was that endeavours were made to cover too many spheres and we had neither the skilled personnel nor the money to do so thoroughly . . .endeavours will be made to use the existing departmental machinery, e.g. Inspector of Stores, Contracts office, Victualling Store Officer etc.'.

85. *ibid.*, Shepherd to Parkhill, 13 May 1937.

86. AA MP598 S30, Box 13, item 19, Defence Committee Minute No.19/1937; and Leighton's reply to CGS.

87. *ibid.*

observed subsequently that:

‘...nothing could shake [the Services] idea that we had some sinister design to concentrate everything in our hands and prefer the Government factories over the utilisation of commercial industry.’[88].

The Support of the Industrialists

The Services still retained sinister ambitions which they realised with the creation of the Department of Supply and Development in 1939[89]. In the meantime, the PSOC succeeded in 1937 in completing a plan for the organisation of secondary industry which was in conformity with Government defence strategy. It was similar, in general terms, to MSB ideas as stated during the 1920’s. Specifically, two stages were envisaged. The first was that while the MSB factories made the more difficult munitions required to make up the Services deficiencies for defence against raids, £250 000 would be requested especially to place educational orders in secondary industry[90]. Stage two was to create annexes within those commercial firms which completed their educational orders successfully. The total capacity of these annexes was to be equivalent to the expected annual war wastage of munitions. The cost of the necessary equipment and factory space was estimated to be £1 187 000 for the 28 annexes required[91]. Further funds would be required for periodic orders

88. J.K.Jensen, ‘Defence Production ...’, *op.cit.*, Ch.9, Vol.9, pp.98–9.

89. See Chapter 5 of this thesis.

90. The total deficiencies in war material of first importance to the Armed Services as calculated for the contingency of defence against raids was £16 524 845. AA MP598 S7, Box 1, Meeting of the PSOC 29 June 1937.

91. AA MP598 S30, PSOC Agenda 98, ‘Interim Report by Australian Principal Supply Officers Committee — Investigation of Industry as a Source of Ammunition Com-

once the Annexes were built. The Defence Committee approved the plan and this was sufficient to gain the £250 000 for stage one[92]. The first £100 000 became available in 1937–38 despite the Governments economic difficulties[93]. The CSIR had also asked for £250 000 to implement the SITR Committee Report, but failed in 1937 to get anything. By the end of 1938 CSIR had only gained half of what it wanted[94].

The Government was hesitant to approve stage two of the PSOC plan because of the high cost and doubts as to whether this was the best way to approach munitions production by commercial industry. Brodribb, soon to replace Leighton when he retired as CGMS, had anticipated this problem and decided to copy some of the tactics Julius had used so successfully. Brodribb decided that the PSOC should get the support of the major industrialists for their plan:

‘It is quite possible, indeed probable, that if the right type of industrialist be obtained for an Advisory Panel, more could be accomplished and that a considerable amount of assistance might be forthcoming through the personal factor of such representation.’[95].

Brodribb accepted that defence preparations were modest but did not think they should wait until orders were really large before approaching business.

ponents’, 9 September 1937, by A.E.Leighton and A.V.Smith. G.C.Rowe contributed significantly to this Report; see Rowe’s report to the PSOC of 27 July 1937.

92. AA CRS A2031, Vol.4, Defence Committee Minute No.36/1937 of 13 September 1937; Minutes No.2–4/1938 of 3 February 1938.

93. See Chapter 2 of this thesis.

94. CSIRO Archives S67, Vol.19, Rivett to Julius, 6 May 1937; Rivett to Richardson, 21 May 1937, 1 June 1937. S30, Rivett to Mcdougall, 15 September 1938.

95. AA MP598 S7, Box 1, Brodribb, 4 August 1937.

Here he disagreed with Leighton and MSB policy. Leighton gave way, and an Advisory Panel of businessmen was recommended in the PSOC plan for the organisation of secondary industry[96]. The Government took comfort from this suggestion and approved the appointment of Essington Lewis, Managing Director of BHP, Sir Colin Fraser of Electrolyte Zinc and M.Eady, President of the Associated Chambers of Manufactures of Australia, to an Advisory Panel on munitions production[97].

Australian industrialists had already had a major impact on the Government through their support for the SITR Committee and its recommendations[98]. Now their representatives would do the same for the Defence Department and the PSOC, despite long standing enmity. What had irked industrialists was the refusal of the Government to involve them in its planning for an emergency. They repeatedly informed the Government that they were not interested in orders but in blue prints, which they could study to get an impression of the tasks they might face if war came[99]. They also warned that modern war would

96. AA MP598 S30, PSOC Agenda 98, 'Interim Report . . .', *op.cit.*, of 9 September 1937.

97. When the Minister of Defence (Thorby) had taken this idea to Cabinet in November 1937, he had argued that the Advisory Panel could give an authoritative opinion to the Government; it would increase Government contact with commercial industry; it would engender confidence in secondary industry for Departmental action and minimise the ill-informed criticism that was current in the newspapers. Thorby concluded that there was no way of avoiding these industrialists as they were either the best or the only ones available to the Government, and it had to trust their goodwill as there was no other way. AA CRS2694, Vol.17, pt.3, Cabinet Agendum 2255, 26 November 1937. Lyons announced the Advisory Panel on 9 March 1938; see J.K.Jensen 'Defence Production . . .', *op.cit.*, Ch.9, Vol.9, pp.139-40.

98. See Chapter 3 and Annex F of this thesis.

99. AA CRS A5954, Box 1089, File 'Principal Supply Officers Committee Minutes of Meetings, Agenda 1936-37', transcript of deputation of Associated Chambers of Manu-

not provide a period of time to organise industry after war had been declared:

‘We trust steps will be taken immediately and if necessary further money made available to ensure the drawing up and putting into operation of a comprehensive plan of wartime industrial organisation.’[100].

The Government was preparing such a plan but it lacked strong support and the industrialists knew little about it. Archdale Parkhill was informed at the Associated Chambers of Manufactures conference for 1937 that:

‘Manufacturers’ concern was they feared that their assistance might not be used in any national emergency ... Manufacturers found it difficult to visualise any article that was not entirely necessary to Australia in case of emergency. They wanted to help in making the Defence Department as efficient as possible, and their State Chambers of Manufactures were all well equipped in that direction.’[101].

The genuine patriotism behind these views is revealed, to some extent, by Essington Lewis in 1934:

‘...I do feel that if our relations with the Defence Department were closer, that there are lots of valuable things we could do and at least we could work intelligently towards a common goal ... We spend about £500 000 annually on extending and enlarging [BHP] and I feel sure that if the Defence Department would visit us and place some confidence in us, a lot of work now being done could be so erected to become readily available for munitions if and when it was wanted. This would cost nobody any-

facturers with the Minister of Defence, Parkhill, 8 October 1936. AA CP576 S1, Bundle 5, President of the Victorian Chamber of Manufactures (M.Eady) address to the annual dinner reported on *The Age* 14 August 1936. AA MP598 S7, Box 1, Resolutions of annual conference 1936 of the Associated Chambers of Manufactures. AA CRS A1608, File C49/1/3, Petition to augment the Munitions Industry by the Associated Chambers of Manufactures, presented to the Prime Minister on 3 December 1937.

100. AA CRS A1608, File C49/1/3, Petition to Prime Minister, *op.cit.*, 3 December 1937.

101. Statement made by the Managing Director of GMH, L.J.Hartnett on behalf of the Associated Chambers of Manufactures quoted in *The Manufacturers*, C.R.Hall, *op.cit.*, pp.544-45.

thing.’[102].

Lyons was forced to admit the existence of this patriotism in 1937 and informed the Council of Defence that the industrialists:

‘...were even prepared to add at their expense to their establishments and to install equipment and machinery so that they might be in a position in the event of an emergency to throw in their weight to add to the present sources of supply for Defence requirements.’[103].

Other powerful groups such as the Council of Employers followed the industrialists example[104], and no doubt encouraged the Government to proceed with the creation of the Advisory Panel[105].

On being invited to review the proposed measures for industrial mobilisation, the Advisory Panel supported the PSOC’s Interim Report of 9 September 1937. It added that it was not practical to manufacture anything like shells, bombs etc. in existing commercial engineering shops. The annex system was

102 AA MP730 S9, Box 1, Letters of Essington Lewis, 14 May-August 1934. Leighton did visit BHP in April 1935 and suggested to Lewis that he should build a shell annex. BHP men were sent to the MSB factories for training, and in 1938 the annex began production, being the first annex in operation. AA CRS A5954, Box 873, Leighton to Minister of Defence, 2 March 1939. G.Blainey, *The Steel Master* ..., MacMillan, 1971, p.133. The Joseph Fisher Lecture, 10 June 1948, University of Adelaide, p.16.

103. AA CRS AA1971/216, item 9, Council of Defence Meeting, 17 December 1937.

104. AA CRS A1608, File C49/1/3, Secretary of Council of Employers to Lyons, 21 December 1937: ‘There are other industrial activities outside of the sphere of manufacturing that could usefully be placed at the disposal of the Government in times of emergency and steps should be taken to have other employers organs brought into the [Defence] scheme’.

105. Lyons did not regret his decision. At the Council of Defence Meeting of 13 July 1938 he was laudatory of the role of the Advisory Panel which had gained a high level of co-operation from industry, and Lewis pointed out that this had nothing to do with commercial profits. AA CRS AA 1971/216, item 9.

vital to the success of the scheme to organise industry, and the MSB factories should be brought up to full capacity as soon as possible[106]. Having recognised the importance of the industrialists on the Advisory Panel to any future co-operative effort with commercial industry in wartime, Lyons was probably bound to act on this advice or risk offending them. His decision was made much easier by the German seizure of Austria on 12 March 1938. On 24 March Lyons broadcast to the nation about the new defence programme he had just approved. Included in it was over £1 000 000 for the development of the annexe scheme suggested by the PSOC[107].

The Advisory Panel aided the PSOC in other ways. It suggested commercial firms which looked, from the Panel's knowledge and experience, capable of managing an ammunition annexe. These were then checked by the investigating staff of the PSOC to see what technical or other support the nominated firms would require[108]. In this way the PSOC came into contact with the most capable firms immediately, without going through an elaborate survey as practiced by the defunct Defence Resources Board. The PSOC was also encouraged to drop the practice of writing detailed reports on particular industries, in favour of getting manufacturing associations to write these reports themselves, e.g. the Chambers of Manufactures, the Associated Woollen and Worsted Textile Manufacturers of Australia, the Institution of Engineers and

106. AA MP598 S30, Advisory Panel to Secretary of Defence, 17 March 1938.

107. AA MP598 S30, Box 10, Broadcast address by the Prime Minister, 24 March 1938 on 'The Government's New Programme of National Defence'. See also CPD, Vol.155, Statement on Defence Programme by the Prime Minister, 27 April 1938.

108. AA MP598 S30, Advisory Panel to Secretary of Defence, 17 March 1938.

the Australian Chemical Institute. Many of these bodies kept a card index of members and skills for use by the Defence Department[109]. This was another departure from the analytically elegant but impractical methods of the Defence Resources Board. Ironically, this new approach had been pioneered by the SITR Committee[110].

The Advisory Panel continued to support the PSOC in many of its plans and was instrumental in persuading the Government and the Council of Defence to accept the PSOC's advice[111]. The Secretary of the Defence Department, Shedden, was so pleased with the role of the Panel that he brought it more deeply into all aspects of Departmental munitions planning. In February 1939 the Panel's role was extended further to include examination of the works programmes of the three Armed Services and the MSB[112]. The Defence Department had been slow to realise the powerful influence the industrialists wielded with the Government, but it learnt its lesson well.

Despite the help and support of the Advisory Panel, the PSOC was

109. AA CRS AA1971/216, Meeting of 13 July 1938, Agenda 11. In a last attempt to make the Defence Resources Board methodology work, the PSOC launched in February 1939, a questionnaire to all manufacturing businesses, to survey the resources of Australian manufacturers. It was too complicated, and required a large staff to collate and maintain such data as was received. Jensen was not aware of it being of any use to anyone, although the survey was revised later, with little better result. The problem was familiar in that the data collected was incomplete and soon out of date. See J K Jensen 'Defence Production...' *op.cit.*, Ch 9, Vol 9, pp150-53.

110. CSIRO Archives, File P1/2, P1/3, P1/5/1.

111. For example, the PSOC plan to involve State Railway workshops in the annexe scheme. AA MP598 S30, Advisory Panel to Secretary of Defence, 29 June 1938. The Panel also increased the staff of the PSOC from 19 in 1937-38 to 38 in 1938-39.

112. J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.9, Vol.9, pp.148-49, 155-56.

not able to move quickly into the creation of annexes. Prolonged Parliamentary discussions took place about the possibilities of profiteering by commercial industry involved in the annexe scheme. The elapse of time led to many manufacturers being considerably less enthusiastic than when first approached by the Advisory Panel and the Defence Department. In response to Parliamentary pressure, the Department attempted to use rigid and severe contracts to reduce the possibility of profiteering, but found that commercial firms were reluctant to accept them, and negotiations were protracted[113]. Where agreements were reached, the Department of Works was very slow in completing the necessary buildings. This was in the face of a Cabinet decision in December 1937 that the Works Department should give priority to the Defence Departments building programme, which in December 1937 occupied 33 per cent of the Works Department's effort. By December 1938 the proportion had only risen to 40 per cent. In January 1939 the Works Department claimed that the Cabinet decision was vague and that other Departments competed with Defence for resources to complete their own building programmes[114]. The Cabinet decided to ask the Advisory Panel what percentage of the Works Department's effort should be devoted to the Defence Department. It recommended 80 per cent. The Defence Minister, G.A.Street, accepted this advice and recommended to Cabinet that other Departments be directed to put forward only very urgent works demands and that the Works Department should only accept those which left 80 per cent

113. AA MP598 S30, Notes of Meeting of the National Planning Council, 8 August 1939. See also J K Jensen 'Defence Production ...', *op.cit.*, Ch.7, Vol 5, pp.55,66-7; Ch.9, Vol.9, pp.172-73.

114. AA CRS A3258, Vol.6, Cabinet Agendum 573 of 25 February 1939.

of its capacity for Defence[115].

By the beginning of 1939, educational orders (the first part of the plan to organise industry) had been completed by only one firm, with deliveries under-way from two others. The former had not originally been part of the PSOC's Annexe scheme. BHP had built at its own expense at Newcastle, a complete plant to produce 18 pdr shell bodies. Twenty armament annexes for shell bodies and mortar bombs, grenades, aircraft bombs, fuses, primers and gaines, naval mines, tools and gauges, were expected to be built and in production by December 1939[116]. But by April 1940 only 10 were in production, although nine more were scheduled to commence production within about four to six weeks. However, the number of planned annexes had grown by then to 24 [117].

In May 1940 the PSOC organisation went out of existence with the creation of the Ministry of Munitions, where the organisation was absorbed into the Directorate of Gun Ammunition Production. Prior to this in September 1939 the PSOC had been transferred to the new Department of Supply and renamed the Defence Supply Planning Committee, but the organisation had remained intact[118].

This was the end of the legacy of the pre-war attempts to develop a plan for the organisation of commercial industry. The scale of the operations of the Ministry of Munitions dwarfed the modest plans of the PSOC which had never

115. *ibid.*

116. J.K.Jensen, 'Defence Production ...', *op.cit.*, Ch.9, Vol.9, pp.168-72.

117. *ibid.*, pp.175-77.

118. *ibid.*, pp.174-75, 177.

been based on the contingency of defence against heavy raids and total war. Annexes proliferated and were to cover many areas other than the components of gun ammunition, which had been the original starting point. At least the PSOC had pioneered the method of organisation, and with Leighton's reforms of 1937, had made greatly improved progress under the Executive Panel. Yet it is difficult not to conclude that faster progress might have been made if the responsibility had been left with the MSB, as originally intended. The first four years of PSOC activity were entirely wasted as the Army used the Committee first as a means of fighting the Government's policy of defence against raids, and secondly as a forum to attack the MSB because of the lack of Service representation on it. Like their counterparts in Britain, the Services were slow to appreciate the advantages of a unified supply system, as run by the MSB. This trapped Leighton because without Service co-operation it was impossible to develop a plan for the organisation of industry. This led him to gamble on the success of a PSOC, despite his better judgement. It eventually succeeded, but only after much waste of time and effort. Leighton's difficulties were also increased by his slowness in realising that the industrialists were powerful allies in his cause. Having experienced years of complaints by secondary industry over the commercial activities of his factories, Leighton did not realise that the leaders of industry were motivated by a strong sense of patriotism, and not commercial greed, when it came to defence issues. When the approach was finally made to involve key industrialists, their influence opened doors to Government finance which the MSB was not capable of breaking down by itself. The industrialists were to do the same again in the far more critical days of

*Anderson's
Panel?
See p. 250*

May 1940.

CHAPTER 5

THE EVOLUTION OF WARTIME PRODUCTION STRATEGY

1937-40

The Destruction of the MSB

While the MSB had been absorbed in its expansion of capabilities in the late 1930s, it had not ignored the problem of the higher departmental organisation for wartime production. The lynchpin of such planning was the continued membership ^{IN} of the MSB of experienced personnel. The entire MSB was due ^{IN} to retire from the public service by the end of 1937[1]. Leighton took special steps to ensure that experienced personnel continued to dominate the MSB. He turned to his two long time subordinates, N.K.S.Brodribb (Chief Chemical Engineer) and J.K.Jensen (Secretary of the MSB and Chairman of the Contracts Board).

Brodribb was an affable extrovert, with an encyclopedic memory for technical detail[2]. He had been the assistant manager under Leighton of the Cordite Factory, before the First World War, and continued to be Leighton's most trusted technical assistant 25 years later, rising to be the manager of all the factory groups in Victoria. This was well merited, for Brodribb had a reputation for being able to solve problems, and to improvise in a crisis[3]. He had acted for long periods for Leighton when the latter had been overseas. In August 1935, Leighton decided to extend Brodribb's experience, so that he would become the next Controller General of Munitions Supply and Chairman of the MSB.

1. Colonel T.J.Thomas was to retire in July 1936 followed by M.M.Maguire in November, and A.E.Leighton in November 1937. AA MP891, S6, MSB Agenda 126, Vol.27, meeting 28 October 1937; J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 8, Volume 6, pp.62-64, 72.

2. Interview with J.Knight *op.cit.*

3. *ibid.*

Brodribb was to be despatched overseas to study new technical practices and to develop personal contacts with key scientists and engineers in Britain[4].

Jensen's characteristics of being an introvert and relatively humourless stamped him as a contrast to Brodribb[5]. But they concealed the skills of a great administrator and a courageous public servant, who was quite capable of breaking any regulation or administrative rule if he thought it was in the national interest[6]. In February 1936, Leighton announced his intention to increase the numbers of members of the MSB from three to four, and that he would recommend the appointment of Jensen to the new position[7]. When Leighton finally retired in November 1937, the MSB was made up of, Brodribb (Chairman), F.G.Shedden (in place of Thomas), A.V.Smith (in place of M.M.Maguire)[8] and J.K.Jensen. Leighton was retained as a consultative member, available for duty two days per week[9].

Jensen soon took the initiative, as was his responsibility as the Controller for administration, to prepare plans for wartime organisation. Leighton had sent him overseas in 1918, among other things, to study the organisation of the British Ministry of Munitions. Jensen had a realistic grasp of what could be

4. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 8, Volume 6, pp.61-62.

5. Interview with J.Knight, *op.cit.*

6. For example, the purchase of equipment and machine tools in Britain after the First World War without Cabinet authority, described in Chapter 1 of this thesis..

7. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 8, Volume 6, pp.62-63.

8. Smith had been appointed the Second Assistant Secretary to the Department of Defence sometime earlier; and gained appointment to the MSB in this new capacity, being on an equal basis with his former boss Jensen. However, in 1938 Leighton had returned from retirement, and appointed Jensen as the Deputy Chairman of the MSB.

9. AA MP891, S6, Vol.27, MSB Agenda 126, meeting 28 October 1937.

expected in wartime[10], and in 1938 produced a detailed plan for an Australian Ministry of Munitions, including the draft legislation which would be required for special wartime powers of supply[11]. The MSB sent the essence of Jensen's plan to the Council of Defence[12] and encouraged him to continue his work. In March 1939, Jensen submitted his more or less completed plan[13]. It was based closely on the old British Ministry of Munitions, which had had complete control over the entire process of armaments production, including research and development, procurement of raw materials and machinery, supervision of commercial and government factories, and the provision of finished articles such as guns, shells and other warlike stores[14]. Responsibility and power were vested in the one department, and not shared with the Armed Services or any central coordinating department. The Ministry of Munitions had been extremely successful; and it was Jensen's intention that the MSB would form the basis of a similar powerful wartime organisation in Australia. The MSB took other initiatives to prepare its existing organisation for the increasing rate of production foreshadowed by possible war[15].

10. AA MP891,S6, MSB Agenda 1937/243 meeting of 11 May 1937.

11. AA MP891, S6, Vol.27, MSB Agenda 368 meetings 19 May 1938 and 2 June 1938.

12. AA, AA1971/216 Council of Defence meeting 26 August 1938, Agenda 18C.

13. AA MP730, S9, Box 1, MSB Agenda 1939/587 of 6 March 1939.

14. R.J.Q.Adams, *Arms and the Wizard: Lloyd George and the Ministry of Munitions 1915-1916*, Cassell, London, 1978, p.43.

15. Jensen and Leighton (who had been reappointed CGMS in June 1938 to replace Brodribb temporarily) set up a central stores section to take delivery of the growing quantity of components and articles from the factories, and to reissue them as necessary — thus keeping track of all components. They also created a planning and statistical section to allow the MSB to have a statistical profile of the increasingly complex web of production in the MSB factories, so that problem areas could be identified readily, and remedial action taken. AA MP891, S6, Box 2, MSB Agenda 51, meeting 28 July 1938,

Other parts of the Defence Department were also preparing their organisations for wartime. The primary planning vehicle for this was the Commonwealth War Book, and its main proponent was Shedden, who had been appointed the new Secretary of Defence in November 1937[16]. Shedden was energetically pushing the completion of the War Book when he received in June 1938 the first draft of the MSB's plan for a Ministry of Munitions. He wrote back noting the lack of progress the MSB had made in preparing plans for the War Book, in particular the lack of preparation to supply the mobilisation requirements of the Armed Services. Shedden also invited attention to his plan for a Ministry of Munitions which he had placed into the War Book without any apparent reference to the MSB[17].

The MSB tended to see the War Book as a collection of pious generalisations which had little practical value in so far as its interests were concerned. It had not developed plans to supply mobilisation requirements because the Armed Services had persistently failed to give proper information. Jensen commented years later:

'To my mind it would have been a waste of time to be considering any scheme for a large scale production and procurement of processed and manufactured goods until —

- a. the descriptions and quantities of the goods required had been stated; and
- b. the machinery for procurement and production had been established.

Agenda 436, meeting 23 June 1938, Agenda 215, meeting 11 October 1938, Agenda 247, meeting 31 October 1938, Agenda 764, meeting 5 May 1939.

16. AA A3258, Vol.3, Cabinet Agenda No.2263, 25 November 1937. Shedden then resigned his position on the MSB.

17. AA MP730, S9, Box 1, Shedden to Secretary of MSB, 9 September 1938, pp.6-7.

[Shedden's] memorandum ... of 9th September 1938 contained nothing that could contribute to the attainment of those objectives. Consequently we pursued a course designed out of our own assessments as best likely to attain the objectives prescribed in the Munitions Supply Regulations ...'[18].

Shedden should have known of the difficulty in getting precise information from the Armed Services, particularly the Army, as he had been the Secretary of the Defence Committee in 1936 and 1937, and had observed the great difficulties of the PSOC over precisely the same matter. Either he had not understood what it had all been about, or what he had really wanted for his War Book was a set of generalisations. Whatever Shedden's ulterior motives, the MSB would not cooperate, and the supply part of the Commonwealth War Book (along with that of manpower) was one of the two sections to remain uncompleted at the beginning of the War[19].

The apparent intransigence of the MSB over Shedden's favourite planning scheme, might have been one reason why its own plans for a Munitions Ministry

18. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 10, Volume 10, pp.6-7. The MSB was still waiting for statements from the Services of their requirements as of 25 August 1939, see AA MP730, S9, Box 1, minutes of meeting 25 August 1939.

19. S.J.Butlin, *War Economy 1939-1942*, AWM, Canberra, 1961, pp.23-27. Further conflict took place over the Commonwealth War Book. Shedden's War Book Officer, Cmdr A.M.Ramsay, claimed he could not complete the Supply Section and also decided that the Contract Board and its system of state boards, was inappropriate for war. He called upon the MSB to carry out various reforms (AA A816, File 2/301/2 Ramsay to Shedden 26 May 1938 and 24 February 1939). The MSB refused, regarding Ramsay's claims as sweeping generalisations and pointing out among other things that the Board system was to stop corruption and to prevent the Department from being accused of bias. It claimed the system would work efficiently (AA A5954, Box 1093, MSB Agendum 710, meeting 18 April 1939). See also AA MP730, S9, Box 1. Ramsay allegedly had the support of senior Service Supply Officers and the objective seems to have been to have the Contract Board broken up with individual pieces going to each Service.

were ignored by Shedden, when the Government decided in May 1939 to create the Department of Supply and Development. The Treasurer, R.G. Casey, seems to have been the key politician in moving the Government on this development, but Shedden was the key public servant, as the new department was to be established on the initiative of and under the control of the Department of Defence.

Shedden used his influence to encourage the demise of the MSB as the dominant body in developing research and production policy for defence strategy. Hitherto, the statutory regulations of the MSB gave it administrative control over all major aspects of munitions supply in Australia, and also gave it the power to develop munitions policy. The MSB exercised this power in close consultation with the Armed Services, but it always succeeded in ensuring that the scientific and engineering aspects of defence strategy were considered properly along with the international and military aspects. If the Defence Committee considered any subject relating to research, engineering or munitions production, the CGMS (Leighton) had to be present.

Shedden did not realise that without an organisation like the MSB with unfettered responsibility and power, engineering and production issues would fail to be presented properly in the councils of defence, and would not form a discrete part of defence strategy. Shedden believed in 'coordination' which was essentially the closer integration of the autonomous Boards of the Defence Department with the Secretariat, controlled by Shedden:

'The MSB and PSO Committee have recently been under review from the aspects of establishing even closer relations between the Military and

Munitions Boards, the more unified direction of Government Factories and the planning of civil industry, and the closer coordination of Service and civil needs'[20].

In seeking to achieve this objective, Shedden was emulating the Secretary of the CID and British Cabinet, Sir Maurice Hankey, under whom he had worked some years before in Britain. This improved coordination of policy could only be achieved with wider use of joint committees on which all interested parties (including the Armed Services) were represented. The complete dominance of supply policy by the MSB alone, was at variance to this principle and the objective of improved policy coordination. Perhaps it was not surprising that Shedden was uninterested in the MSB's plans for a powerful Ministry of Munitions.

The Australian Armed Services were in favour of Shedden's plan to integrate supply policy more closely with Defence Strategy. Chapter 4 has outlined why they wanted to control all aspects of munitions supply. Each British Armed Service ran its own munitions research and production establishments. The Australian supply organisation (i.e. the MSB) was unified, and was too small to be broken up between the Armed Services. The latter therefore wanted representation on the MSB itself. This was consistent with Shedden's plans for joint committees and greater 'coordination' of policy in regard to supply matters.

The Statutory Rules which were eventually agreed to by Shedden, and the Defence Committee, were based closely on ideas originally put forward by Lieu-

20. AA A5954, Box 1093, 'Higher Defence Organisation', 21 April 1939 by F.G.Shedden.

tenant Colonel L.E.Beavis in 1936 (see Chapter 4), when he was attacking the MSB[21]. The MSB was placed under four levels of control, whereas before the advent of the Department of Supply and Development, there had been one. Immediately above the MSB there was now a supervisory body called the Principal Supply Officer's Board, on which the Armed Services had gained representation, and had the numbers to control or deadlock the Board[22]. Above the Principal Supply Officer's Board, was the new Secretary of Supply and Development (D.McVey), and above him the new Minister (R.G.Casey). However, the Department of Supply and Development was subordinate to the Defence Department for all major policy decisions[23].

Originally, the MSB had had direct access to the Minister of Defence on matters of policy; but now it was renamed the Factory Board, and relegated to day to day administration of the government factories and laboratories[24].

21. AA MP598, S30, Box 13, File 2, 'Australian Principal Supply Officers Organisation — Supply of Service Requirements in War', L.E.Beavis (see particularly Appendix K). This report is to be found in Shedden's Papers, A5954, Box 1093, with Shedden's notes on the subject.

22. AA A571 40/2276, Statutory Rules for the Department of Supply and Development. The Services each had one representative on the Principal Supply Officers Board, while the Department had the CGMS, Chairman of the Contracts Board and the Finance Officer. The Minister was the (neutral) Chairman. The Principal Supply Officers Board was to advise the Minister on policy on procuring supplies etc. for the Services and all planning associated with it. It was to also decide the priority of supply and production, and works for new factories. It was the means of liaison with the Defence Department and was to co-ordinate the operations of the MSB, the Contract Board and the PSOC.

23. AA A664, File 450/401/28, Prime Minister (Menzies) to Minister of Defence 7 August 1939, Menzies listed Defence Committee functions to include the co-ordination of MSB operations in relation to the requirements of the Armed Services. The Principal Supply Officers Board was seen to be subordinate to the Defence Committee, and through it, the Defence Committee 'co-ordinated' MSB operations.

24. AA A571 40/2276, *op.cit.*

Some of Shedden's reasons for this arrangement were revealed in a letter to the new Secretary of Supply and Development:

'There is a conflict between the scope of functions of the MSB and the PSOC, which becomes more emphasised with the creation of a Department of Supply. The designation of the former under the new Department would be better described as Factory Board, and a higher body representative of both this Board and the PSOC should be constituted to bring the whole of the machinery for supplies for the Services into closer relation and to control production policy, resources and priorities, both in respect to Government Factories, annexes and industries. There is much to be said for this change from the aspect of internal administration of the Department of Supply and that of relation to the Department of Defence'[25].

The Services Pound of Flesh

While these changes satisfied Shedden's desire for 'co-ordination', they did not satisfy the Armed Services' desire to further emasculate the old MSB power structure. Early in the negotiations for the new Department, the Defence Minister, Brigadier Street, invited the comments of the Defence Committee on the Inspector General of the Army's report of December 1938[26]. Among other things this had suggested Army representation on the MSB (achieved effectively with the Principal Supply Officers Board) and the transfer of Inspection from the MSB to the Army.

From its inception in 1921, Defence Ministers had consistently supported the MSBs control of Inspection of all supplies obtained in Australia[27]. The Navy, supported initially by the Admiralty, constantly refused to obey ministerial

25. AA A5954, Box 1096, Shedden to McVey, 27 May 1939.

26. AA A5954, Box 1094, Shedden to Naval, Air and Military Boards, 5 May 1939.

27. See J.K.Jensen, 'Defence Production . . .', *op.cit.*, Chapter 8, Volume 8. See AA A571 39/2367, Defence Committee view of the Supply and Development Bill, 22 May 1937.

directions on this matter, and organised its own inspection service[28]. The issue became dormant, because the Navy ordered comparatively small quantities of munitions in Australia. In the late 1930s this had changed because Naval orders were now substantial; and the Inspector General, Lieutenant General Squires, wanted the Army to copy the Navy[29]. The MSB regarded Squire's arguments as tendentious, and easily discredited them[30], but the Defence Committee picked up the issue with more skill. In a rare example of unanimity, the three Armed Services decided that Inspection should return to the Army

28. AA MP730, S8, Box 6, Vol.8, MSB Agenda 77, meeting 6 November 1924. The Admiralty reached a satisfactory agreement with the MSB after Leighton's trip to Britain in 1923; but the Australian Navy continued its resistance. See AA CRS B197, File 1810/1/77 and J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 8, Volume 8.

29. AA A5954, Box 846, AA MP891, S6, Box 2, Vol.29, MSB Agenda 774, meeting 5 May 1939.

30. Squires thought there was inadequate liaison and cooperation between the Inspection Branch and the Military Board. The latter could not get fully detailed information in regard to progress in meeting Army demands, or as to plans for, and forecasts of future production. Squires thought that Military authorities alone could lay down the relative priority of these demands. The ultimate criterion in deciding the relative priority, claimed Squires, was Military necessity which had to take precedence over convenience in manufacture. Consequently he recommended the transfer of Inspection to the Army, and that a representative of the Military Board should be a member of the MSB. Leighton observed that Squires could give no evidence of the supposed failure in liaison and co-operation; and Jensen added that Squires' idea of priority was exaggerated. It was for the Service to state priority and for the MSB to try and fulfill it. The supposed lack of information from the MSB had never been raised before by the Military Board. Squires now contended that he had a foreshadow of failure. He was a British officer, and was judging the Australian system from the point of view of the Armed Services controlling their own Inspection services. See MSB Agenda 774, meeting 5 May 1939, and J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 10, Volume 10, pp.196-197.

and Airforce[31], as well as control of Design and Specification[32]. The Defence Committee based its case on the principle of the British Ordnance organisation that Inspection staff should be responsible to the users of the munitions, and not to the supplier. The Committee cited Inspection of Naval munitions in Australia as an example of Service control working well; and that the Admiralty had stated it could not agree to Australian made munitions being placed in ships of the Royal Navy, unless such munitions had been inspected in accordance to the principle above[33]. Instead of implementing these changes by altering the draft regulations of the Department of Supply and Development, the Defence Committee wanted them enshrined in the new Act, presumably to prevent any further changes in the future[34].

The Service desire to exert authority over the MSB, was further advanced in relation to the PSOC (now renamed the Defence Supply Planning Committee). The Defence Committee had formed a sub-committee to advise it on policy towards the formation of the Department of Supply and Develop-

31. The Navy carried out its own inspection for all items, the Airforce for aircraft only (Directorate of Aircraft Inspection) not including stores and clothing etc., the Army had all its inspection carried out by the MSB. AA A571, 39/2367, Defence Committees view of the Supply and Development Bill, 22 May 1939.

32. AA CRS A664 450/401/27, Defence Committee Agendum No.30/1939 of 17 May 1939, Defence Committee Minute No.41/1939.

33. Before the Second World War, the Admiralty never attempted to purchase any significant quantity of munitions from Australia (see Chapter 2 of this thesis) so this condition was of little importance to Australia. Furthermore it has been mentioned that the Admiralty was not adamant on the role of Naval inspection.

34. AA A5954, Box 1093, The Defence Committees desire in this respect was drawn to the attention of the Prime Minister, 24 May 1939. See Sinclair to Shedden 18 May 1939.

ment[35]. This sub-committee included the ubiquitous Beavis. Among other things, the sub-committee recommended the retention of full Service representation on the PSOC, and the recreation of the Defence Resources Board sub-committees which had been abolished in 1937 when Leighton had reformed the PSOC and had had Beavis sacked [36]. The Defence Committee endorsed the sub-committee's unregenerate views[37]. Apparently the success of the PSOC since 1937 counted for nothing, because the Armed Services intended to recreate the system which had proved to be moribund when under their control.

It might well be asked what Casey was doing while his new Department was being made the creature of the Armed Services and the Defence Department under Shedden? It seems that Casey was taking a very flexible attitude to the structure and power of his Department, because he thought that whatever changes might be necessary, would be achieved in the light of operating experience[38]. He seems to have believed that the Services and the Defence Department would be his allies in gaining such changes when the time came; and so he sought to compromise with them over any issue on which the Defence Committee expressed a firm opinion. Leighton, Brodribb and Jensen would have advised him differently, for they had witnessed for years the Service desire to dominate supply for no better reason than bureaucratic ambition. They had also seen how joint organisations such as the PSOC, could be reduced to

35. AA A5954, Box 1093, Defence Committee Minute No.60/1939 of 26 July 1939.

36. *ibid.*, Defence Committee Agenda No.53/1939 of 16 August 1939. See chapter 4 of this thesis.

37. *ibid.*, Defence Committee Minute No.69/1939 of 22 August 1939.

38. AA CRS A664 450/401/27, Secretary of Defence to Secretaries of Service Boards, 17 July 1939.

chaos because of Service faction fighting over defence contingencies and finance. Casey, in all probability, carried with him a far greater suspicion of the members of the MSB than for the Armed Services. He was an ex-serviceman, and his very close association with the CSIR had exposed him to the prejudiced views of Rivett and Julius about the obstruction of the MSB in secondary industry research [39].

Leighton, who had resumed the position of CGMS temporarily, had objected to the Defence Department's plans for a Principal Supply Officers Board[40]. The Secretary of Supply and Development supported him[41], but the Defence Committee would not back down[42]. McVey gave in, and tried to get Jensen and Rowe appointed to the Board, but the Defence Committee again successfully rejected this attempt to threaten Service control[43]. McVey did not pursue the matter of the recreation of the sub-committees of the old Defence Resources Board of the PSOC. He took no action in the hope that the problem would be forgotten. In this he was successful[44].

Despite the lack of support from Casey, Leighton fought a determined

39. See chapter 3 of this thesis. AA MP380, S1, in setting up the Department of Supply Casey did not consult the MSB, but referred to other less expert people such as A.C.Smith.

40. AA A5954, Box 1093, The CGMS objected to most of Defence Committee Minute No.69/1939 of 22 August 1939.

41. *ibid.*, McVey to Shedden, 29 August 1939.

42. *ibid.*, Defence Committee Minute No.79/1939 of 1 September 1939.

43. *ibid.*, Defence Committee Minute No.97/1939 of 13 October 1939. When McVey suggested dropping direct service representation on the PSOC because of the PSO Board, this too was rejected by the Services. AA MP730, S9, Box 1, McVey to Shedden, 10 July 1939, Defence Committee Minute No.69 of 22 August 1939.

44. *ibid.*, see Box 1093.

rearguard action in the last weeks of his career, to save the Inspection Branch. He reminded the Defence Committee that Major General Sir Brudenell White had said in 1923 that the Army's interests were adequately protected by the practice of nominating inspectors from the Army to staff the key positions in the Inspection Branch. These men could report to the Military Board on any aspect of inspection procedure in which they thought the Army's interests were threatened[45]. The purpose of keeping executive control of the Inspection Branch in MSB hands was, according to Leighton, because Inspection formed a valuable and necessary internal constituent of the defence supply system. Not only did the Branch train the other parts of the system in the standards required, the other parts of the system trained inspectors on the need to assist local contractors. For Leighton the problem was how to use the natural materials and relatively untrained labour of Australia, for the production of articles of special function and quality which could conform to certain test and evaluation standards. The best solution was to provide a form of inspection which was inspired in the art of encouraging a contractor to overcome the innumerable difficulties which occurred. This was achieved by assisting him at each stage, by affording actual help from the testing and scientific services of the MSB, and by applying the knowledge possessed by a staff of technical men expert in modern munition factory practice. Leighton thought an inspector was more likely to be fully acquainted with the ways and means of rendering help if he were part of the organisation which comprised the various forms of help (i.e. the MSB organisation) and was able to call upon them without circumlocution[46].

45. AA MP891, S6, Box 2, MSB Agendum 774/1939, meeting 5 May 1939.

46. AA MP891, S6, Box 2, MSB Agendum 774/1939, meeting 5 May 1939.

While Leighton was refuting the Defence Committee's arguments, Brodribb had discovered that British practice no longer placed Inspection with the Army, but gave it, along with research and design, to the new Ministry of Supply. When he was told, Shedden claimed he had an open mind on the matter, but thought it was best left to agreement between the Ministers of Defence, and Supply and Development[47]. Brodribb challenged the Services in the Defence Committee on the validity of their arguments[48], but it made no difference as Casey and Street settled the matter themselves. The Inspection Branch went to the Armed Services with Casey's hope that:

'... in the interests of both Departments I trust there will be maintained the same close co-operation and collaboration between the Inspection Branch and the other activities with which they were associated in the Defence Department and which have been transferred to the Department of Supply and Development, that existed prior to the separation'[49].

McVey attempted to implement Casey's wish, by suggesting to Shedden that sections of the Department of Supply and Development would continue to deal direct with sections such as Inspection, which were now in the Defence Department. Shedden would have nothing to do with this, and insisted that all important communications go via his secretariat on a secretary to secretary basis[50].

47. AA A5954, Box 1093. This reveals that Shedden had known for some time that the War Office had transferred all branches concerned with research, design, production and inspection of warlike stores to the new Ministry of Supply. There is reason to suspect the Military Board had also held the same information, but had not, in the spirit of proper co-ordination, passed it on to the MSB. *should be inserted*

48. AA A5954, Box 1096 amendment of Defence Committee Minute No.41/1939 of 7 June 1939.

49. AA A5954, Box 1094, Casey to Street, 12 July 1939.

50. AA A5954, Box 1093, McVey to Shedden 21 July 1939, Shedden to McVey 30 Au-

The passing of the Inspection Branch to the Armed Services signalled the end of the MSB which had now lost two of its original four branches[51], and had its ability to formulate production policy removed. It is interesting to note that Leighton's prediction over Inspection behaviour seems to have been supported. Contractors were often harassed by over zealous Service inspectors who rejected munitions on trivial grounds. Such inspectors in many instances were more interested in punishing contractors for not reaching the required standards of quality, rather than in assisting them[52]. This problem is examined in chapter 6, in the section entitled *The Problems of Design*.

Leighton retired with the collapse of his organisation. Despite his age, he should have been made the Secretary of the Department of Supply and Devel-

gust 1939. McVey wrote back 13 September 1939 pointing out the waste of time this would involve, and that his Secretariat dealt with several hundred letters weekly which made Shedden's suggestion of a weekly exchange of all correspondence impractical. Shedden would not alter his position and insisted that the various Boards of the Defence Department had never been allowed to communicate on matters of policy directly with other branches of Defence, except through the Secretariat. He did not propose to let them communicate, except on this basis, with the remaining Branches and Boards of his Department.

51. These were the Factories Branch, the Munitions Supply Laboratories, Inspection Branch, and the Contracts Board. Under the new arrangements of the Department of Supply and Development, the Contracts Board was split off from the MSB, although it remained within the Department. The Armed Services controlled the Contracts Board, see AA A571 40/2276, Statutory Rules for Department of Supply and Development. A new branch was added to the Department called the Aircraft Production Branch, which under the Statutory Regulations for the Factory Board should have been administered by this Board, like all other government factories. The General Manager (H.W.Clapp) was able to insist on his independence, further fragmenting the power structure of the old MSB. Clapp was employed on contract. See J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 10, Volume 10, pp.36-37.

52. History of the Board of Area Management NSW, MHS 107. The histories of the other BAMs are missing.

opment, because his experience was unrivalled, and his health remained good. Politics prevented this sensible arrangement because the Services resented his authority, Shedden feared his intellectual grasp of defence policy, and Casey had absorbed the adverse views of Julius and Rivett. Leighton's mantle now fell on the shoulders of his two hand-picked subordinates, Jensen and Brodribb, who in a curious way, possessed one each of the two major aspects of Leightons personal ability. Brodribb with his mastery of technical detail and crisis management had little inclination to plan for future policy. Jensen was not a technical man, but could appreciate the policy issues that often arose from technical questions. He had Leighton's skill at bureaucratic manoeuvring and manipulation, and also a persistence which stemmed from his grasp of long term planning issues. Jensen and Brodribb complemented each other well; but in the nine months that would follow, it would be Jensen's talents which would be most required, and consequently it would be Jensen who would give the drive and purpose to supply policy.

The Struggle to Establish Production Policy

The most urgent issues in munitions production policy after the formation of the Department of Supply and Development in June 1939 were firstly the long lead time which elapsed before an order could be turned into a factory product; and secondly the insufficiency of orders to allow all government factories to attain mass production.

In relation to the first issue, the Department of Supply and Development could not anticipate or initiate orders for munitions on its own authority. It

had to wait until the Defence Department had formally placed an order, and the Treasury had declared that funds were available for the particular order[53]. This usually took a few weeks, after which the Department of Supply could then start expending funds on planning, acquisition of tools and materials etc. The earliest time in which a finished product could emerge was nine to 12 months after the receipt of the order[54]. The significance of this fact was that for munitions to be available to the Armed Services for use in some defence contingency, the appropriate orders had to have been raised at least nine to 12 months before the contingency arose.

This problem of lead time had an influence on the *quantity* of munitions required. A significant quantity of munitions could only be made in a short time by the technique of mass production. Mass production could not in most circumstances be established until after tool room or batch production had been achieved. Tool room or batch production could only be transformed into mass production if the number of orders allowed a steady build up in production rate. The technique of mass production required considerable training of junior technical staff, workers and subcontractors[55]. Even though the senior technical management of the MSB understood the technique very well through training in Britain, mass production had only been practiced at SAF and the Ammu-

53. AA MP598, S30, Box 10, McVey to Casey 25 September 1939. Added to this was the irritant of only being able to fund orders on an annual basis, see Chapter 2 of this thesis.

54. *ibid.*, McVey to Casey 25 September 1939, assuming that the munition was already in production, i.e. a stock item. If not, the lead time was even longer.

55. *ibid.*, McVey to Casey 18 September 1939. The mass production of an item had to be specially learnt by workers and subcontractors, and if for any reason such mass production was interrupted, the technique and skill was quickly lost.

nition Factory Group intermittently, and in few other places in Australia. In 1939, the government factories already had a significant range of munitions in tool room or batch production, but in many cases they could not reach mass production because the orders extended under the existing Defence Development programme were insufficient[56]. The orders had to spread over the next few years to ensure that the government factories could maintain production at their current levels.

The Defence Development programme was designed to prepare the Armed Services for the contingency of defence against raids (the Minor Scale of Attack), and it was not scheduled for completion before June 1941. The weakness of the programme was that it made no provision for the early commencement of war. If this event were to occur, the Armed Services would not be equipped properly. If orders were then increased significantly, the Armed Services would have to wait for long lead times before mass production could be established, and also for batch production if new production was desired to be established.

The fact that the Department of Supply and Development had no financial discretion of its own, and had to remain entirely dependent on Defence Department orders given within the Defence Development programme, meant that little or no provision could be made for the above problems. Jensen's plan for a powerful Ministry of Munitions had intended to escape this dependence, so that the issues could be addressed in terms of policy and special financial

56. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 10, Volume 10, pp.26-27. In May 1939, the Treasury claimed that the MSB factories were working at full capacity — therefore a smaller maintenance vote was required. Jensen pointed out that some parts were, but many were not fully employed — some had little production at all.

provision[57].

Despite his naivete over the ambition of the Department of Defence and the Armed Services to control all aspects of munitions supply, Casey did understand the main issues of production policy more clearly than perhaps any other member of the Government. No doubt his training as an engineer helped in this. He raised in Cabinet in June 1939 the problem of early war and the completion of the Defence Development programme, suggesting that in order to give the Armed Services some sharp weapons at an early stage, the government factories should concentrate their efforts on a limited number of important munitions[58]. The Cabinet, and the Chiefs of Staff ignored the idea, although they were quick to adopt it three months later when war actually began[59].

Thwarted in this direction, Casey decided to speed up all production at government factories, so that the munitions supply part of the Defence Development programme would be finished by December 1940 instead of June 1941[60]. This was another way of solving the need for early delivery of key armaments,

57. It might be argued that the Governments financial difficulties in 1939 were such that there was no likelihood of any financial provision for more orders for the government factories. In fact, the MSB costs were a small fraction of the costs of each Armed Service, and it was well within the Governments financial capability to find the few hundred thousand pounds required, if the Government had been motivated properly.

58. AA MP380, S1, Casey to Cabinet 23 June 1939 — see MP598, S30 and J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 7, Volume 5, pp.67–68. Casey had raised this idea before in the Council of Defence, and alluded to it in his Second Reading speech on the Supply and Development Bill, CPD House of Representatives 11 May 1939.

59. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 7, Volume 5, pp.55–58. Report by Brodribb and Rowe 28 September 1939, endorsed by Conference held with Armed Services and Defence Minister 30 September 1939, MP598, S30.

60. AA MP598, S30, Box 10, McVey to Casey 28 July 1939.

but it also addressed the issue of generating mass production. By shortening the timescale for the completion of the munitions programme, Casey in effect increased the number of munitions required by December 1940. The increased production now required meant that some of the government factories would have sufficient orders to initiate mass production to replace the prevalent batch production.

In little more than a month, the Department of Supply and Development began to be embarrassed by its own efficiency. The fuze and cartridge case factories began to run out of orders and would have to lay off 140 men within two months, unless new orders appeared from the Armed Services[61]. Casey was informed that the situation would get worse in other areas as the production programme speeded up, with the result that by the second half of 1940, thousands of men would have been laid off from the munitions factories, if no further orders were found[62].

The Defence Department was unable to assist with more orders, and so Casey decided to seek orders from Britain and the other dominions[63]. However, this initiative was stopped, not by British lack of interest as in the past, but because the Australian Government had not decided on the requirements for the Services outlined in the Expanded Defence Development programme

61. AA MP598, S30, Box 10, Jensen to McVey 25 July 1939.

62. *ibid.*, McVey to Casey 28 July 1939. Brodribb calculated that 2000 men would have been dismissed by June 1940, Brodribb to McVey 28 July 1939.

63. AA MP598, S30, Box 10, as a consequence of McVey's and Brodribb's minutes of 28 July 1939, Casey ordered enquiries in Britain and the Dominions for munitions orders, 31 July 1939.

submitted by the Chiefs of Staff to the Council of Defence in June 1939[64]. The Government still had not decided when the War began in September 1939.

One of the few Defence Department recommendations for the War Book on munitions supply, indicated that the Department of Supply and Development should, during the period of imminent conflict, step up all factory production without waiting for formal orders. The Defence Committee recommended action on 24 August 1939[65]. Casey obliged, but his Department quickly received a Treasury reprimand because it had acted without receiving any orders, in defiance of Treasury regulations[66]. What was worse was that the Defence Department was not forthcoming with large orders. In the first days of the war, the Defence Minister had approved of £4,169,000 in expenditure for the Armed Services in immediate requirements out of £10,000,000 in the War Loan Bill[67]. Very little of this went on munitions orders. Casey called a meeting with the Chiefs of Staff and the Defence Minister on 16 September to discuss the predicament of the government factories and annexes, which were rapidly exhausting all orders under the pressure of the Armed Services for an accelerated production effort. Casey expected that in less than three months, many hundreds of workers would be dismissed from munitions factories unless more

64. AA AA1971/216 Council of Defence meeting 5 July 1939, Agenda No.9, see Chapter 2. MP598, S30, Box 10, Brodribb to Casey 31 July 1939.

65. AA CRS A2031, Defence Committee Minute No.75 of 24 August 1939.

66. AA MP730, S9, Box 2, Brigden to McFarlane 23 May 1940. AA MP598, S30, Box 10, McVey to Casey 8 September 1939, 25 September 1939.

67. AA A571 1939/1815 Part 1, Assistant Secretary (Joyce) of Treasury to Shedden 29 September 1939.

orders were forthcoming[68]. Casey was informed by the Armed Services that they required nothing more from the Department of Supply and Development after the existing orders were fulfilled[69]. The Defence Minister, Street, asked Casey why his Department had developed so much capacity excess to immediate needs[70].

The Defence Department's attitude betrayed an ignorance of the problems of lead time for munitions production[71], and that the munitions organisation was really the fourth arm of the defence forces, and as such needed preparation and training. Large orders were investments in training for mass production for factory staffs and subcontractors. It is easy to believe that the Defence Department could have got the funds the Department of Supply and Development required (only £375,000)[72] if it had felt like supporting its case to the Government. Jensen noted the air of disinterest:

'... the onlooker could not help observing an atmosphere on the part of the Chiefs of Staff of awaiting instructions from the Government, rather than an attitude that as advisers of the Government they were of the opinion that Finance should be provided for such purposes as they advised'[73].

68. AA MP598, S30, Box 10, Notes of meeting 16 September 1939 at Victoria Barracks.

69. *ibid.*, see also MP598, S30, Box 10, McVey to Casey 8 September 1939.

70. Notes of meeting at Victoria Barracks, *op.cit.*, See also MP598, S30, Box 10, McVey to Casey 18 September 1939.

71. See for example D.P.Mellor, *op.cit.*, p.34.

72. AA MP598, S30, Box 10, McVey to Casey 13 September 1939. McVey pointed out that it would cost the Defence Department £375,000 in orders to keep the government factories working at their current rate for the rest of the financial year (nine months). The factories were capable of working at a much higher rate. The cost in orders to keep the annexes going for the same time was £600,000.

73. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 7, Volume 5, pp.79–80. It is a matter of speculation that the Defence Departments attitude at this time was the

And so with the war well under way the Department of Supply and Development was forced to sit idle until such time as the Government approved further expansions to the Armed Services according to the raids or heavy raids contingencies. A halt was called to the acceleration of output[74]. In the circumstances it was probably not surprising that the Department decided to revive the plan to sell munitions to Britain and other Dominions. McVey and Jensen *in consultation* had been thinking of this in early September in order to escape from complete dependence for financial provision on orders from the Defence Department. The vision they put forward to Casey was of an Australian Empire agency for munitions, working directly under the Cabinet, for the production and procuring of munitions and supplies for Dominions in the southern hemisphere and Britain herself. McVey concluded:

‘... if this policy were adopted, it is clear that our establishments in such circumstances would prove an enormous asset to our own forces if the war were brought closer home because we should then have, fully developed, capacity to meet whatever requirements our own Defence forces might need. As you realise, it takes time to develop momentum in the production of the highly intricate mechanism used in modern warfare’[75].

McVey and Jensen were thinking of using *existing* munitions production capacity which had not been committed to Australian orders. The capacity of

main reason why Casey never used the Principal Supply Officers Board, which does not seem to have held even one meeting (see Jensen, Chapter 10, Volume 10, pp.61–63). Its promise was the joint support and understanding of munitions problems it could have extended through the two Departments. It had little value to Casey if the Defence Department was uninterested in munitions problems. Indeed it tended to infringe on the ministerial and secretarial authority of Casey and McVey, both of whom were responsible to Parliament for the operations of the Department of Supply and Development.

74. AA MP598, S30, Box 10, McVey to Casey 25 September 1939.

75. AA MP598, S30, Box 10, McVey to Casey 8 September 1939. See J.K.Jensen, ‘Defence Production ...’, *op.cit.*, Chapter 7, Volume 5, pp.73–74.

government factories and annexes was rated at about £10,000,000 in annual production value, but only £3,500,000 worth of Australian orders had been received or were in sight[76]. Orders from Britain and other parts of the Empire would raise the rate of production, removing the fear of factory closures, and allow many elements of the munitions organisation to attain higher rates of production.

However, within a few days, Jensen and McVey had developed their idea to include a capital development programme to create *new* capacity. New capital expenditure was needed within the existing Defence development programme to balance the capacity being established by the PSOC for the Army's future War Wastage requirements. The Army had not been allowed to proceed with orders for these, even though war had begun. Outside of the development programme was the requirement to duplicate certain vital factories as a precaution against enemy attack or sabotage[77]. Factories which fell within this circumstance were the High Explosives and Propellant factories, and the SAA factory, which if destroyed had no replacement in Australia. The most powerful reason for Jensen and McVey seeking new capital expenditure was that if there was any prospect of the heavy raids contingency occurring, the preparations for establishing new munitions capabilities had to be begun at least 12 months before the contingency occurred[78]. Jensen and McVey hoped, with Casey's support, to persuade the War Cabinet to allow orders from Britain, and then to introduce the new

76. AA MP598, S30, Box 10, McVey to Casey 18 September 1939.

77. *ibid.*

78. *ibid.*, McVey to Casey 18 September 1939, Jensen to McVey 20 September 1939, McVey to Casey 25 September 1939.

capital development programme as a necessary adjunct to aiding Britain with munitions. The Government having accepted the first bait, would then be drawn to the other, and morally committed to assisting Britain in this way. British and Dominion orders would then enable full use and development of Australian munitions factories and annexes, without the full cost of maintenance falling on Australia. If the operational circumstances should arise where the Australian Armed Services should require a wider range and higher quantity of munitions than at present, the munitions factories and annexes would be fully prepared for immediate deliveries[79].

Casey persuaded Menzies to send a cablegram to London offering Australian productive capacity. This was sent on 19 September, and it passed a cable from the Ministry of Supply in London to the Australian Government enquiring about the same subject[80]. Concurrently Casey requested War Cabinet approval for capital expenditure of £2,750,000[81]. This was almost 3/5 of the entire capital value of the government factories and laboratories as they then existed[82]. The War Cabinet on 29 September 1939 approved all of the capital expenditure, excepting that most closely associated with preparations for the heavy raids

79. AA MP598, S30, Box 10, McVey to Casey 18 September 1939, 25 September 1939.

80. AA MP598, S30, Box 10, Cable by Menzies 19 September 1939, Cable by Ministry of Supply London 19 September 1939. A further cable answering the London enquiries was sent by Menzies on 22 September 1939.

81. AA MP598, S30, Box 10, War Cabinet Agenda of 6 September 1939. 'Statement of Requirements of Capital Expenditure to bring Munitions Production up to a condition whereby the War may be prosecuted effectively'. This proposal was in effect exactly the same as that put forward by the MSB during May 1939 in conjunction with the Chiefs of Staff Review of the Defence Development programme.

82. See table 2-3, in Chapter 2, for capital value of MSB.

contingency — i.e. £855,000 for the provision of 25 pdr Field guns and their ammunition[83].

The critical issue of orders for the government factories and annexes now looked as though it would be solved. Negotiations with Britain proceeded smoothly[84], and the Defence Department began to support the scheme actively, provided all Australian Armed Service orders had priority[85]. The British Ministry of Supply offered orders in November covering the full range of munitions manufacture in Australia, and also for 25 pdr Field guns and ammunition[86]. The latter encouraged the Department of Supply and Development to request approval of the British orders and to resubmit its proposal for capital expenditure (£1,025,000) to remove production bottlenecks and to produce the 25 pdr Field Gun. From the lead time point of view the capital needed to be spent now if the extra facilities were to be available in 12 to 18 months time. The British orders would help to defray costs, increasing the attractiveness of the combined proposals to a financially cautious War Cabinet[87]. The War

83. AA MP598, S30, Box 10, War Cabinet Decision of 29 September 1939.

84. See AA MP598, S30, Box 10. This holds all relevant correspondence on British orders.

85. *ibid.*, McVey to Principal Supply Officers Board 23 October 1939. This had been endorsed by the Defence Minister. See also J.K.Jensen, 'Defence Production . . .', *op.cit.*, Chapter 7, Volume 5, pp.97-99.

86. AA MP598,S30,Box10, Cable from Casey (London) to Menzies 9 November 1939, Ministry of Supply (Britain) to High Commissioners Office 8 November 1939. British orders were worth £3,000,000, with the promise of more — War Cabinet Agenda No.277 of 15 November 1939. AA MP598, Box 10. Perhaps Casey had persuaded the British to ask for 25 pdr Guns and their ammunition, to exert pressure on the Australian Government to begin production.

87. AA CRS A5954, Box 496, McVey to Sheddén 20 November 1939, Acting Secretary of Defence Committee 22 November 1939.

Cabinet referred the submission to the Defence Committee[88], but the latter supported the Departments' proposals noting firstly that they would achieve a most valuable increase of the sources of supply available to meet Empire requirements; secondly they would materially increase the capacity and accelerate the supply of munitions to meet the requirements of the Australian Armed Services; and lastly they would tend to reduce the cost of munitions supplies to Australian forces[89]. /p.

Treasury Obfuscation

This decision showed that with World War II now in progress the Services were beginning to identify their interests with the fortunes of the Department of Supply and Development. It was not enough, because now the Treasury stepped in, to prevent further progress with the British orders and the capital expenditure for the 25 pdr project. The Treasury had worried about extravagance and wasteful expenditure by the Armed Services, since defence preparations had been accelerated in 1938. It was very anxious to keep a tight control of defence expenditure because of the acute economic problems Australia faced [90]. The Treasury viewed the Defence Minister's approval of £4,169,000 at the beginning of the war with consternation. It had not been properly scrutinised, and the Treasury suspected a tendency by the Armed Services to equip

88. AA MP598, Box 10, War Cabinet Agenda No.227 of 15 November 1939 - endorsed 'referred to Defence Committee'.

89. AA MP598, Box 10, Defence Committee Minute No.106/1939 of 24 November 1939.

90. See Chapter 2 of this thesis. AA A571 39/1815, Part 1, Cabinet Agenda of 28 September 1939 by Minister assisting the Treasurer (Spender).

themselves more generously than was strictly necessary[91]. Cabinet approved the creation of the Treasury Finance Committee on 3 October 1939, to vet all defence proposals. Subsequently Sir Walter Massy-Greene, a former Defence Minister and prominent accountant, was appointed chairman[92]. The Defence Department and Supply and Development, were opposed to the interference of the Treasury Finance Committee. Shedden summed up the objections when he pointed out that the Defence Department already had a detailed finance checking system, the Business Board of Administration, and that once a Cabinet decision had been made, the Warrant Authority should be issued without the approved proposals being subjected to further detailed examinations before any departmental action could be taken[93]. Shedden lost this argument[94] and in

91. See AA A571 39/1815, Part 1, particularly Joyce to Shedden 29 September 1939, and Cabinet Agenda of 28 September 1939,

92. See AA A571 39/1815, Part 1. Massy-Greene thought that the Government should put a limit to the assistance it would give to the Empire and settle the limits of the Australian defence programme, otherwise the whole economy of the nation might become seriously dislocated (see Chapter 2). This view was an accurate reflection of Treasury opinion. Massy-Greene also thought that the Department of Supply and Development scheme to sell munitions to Britain resulted in a programme which was based on another contingency than the defence preparations of the Armed Services. (Letter by Massy-Greene 30 November 1939).

93. AA A571 39/1815, Part 1, War Cabinet Agenda No.25/1939 'Control of Defence Expenditure'. See also conversation between Treasury Liaison Officer (Sprange) and Shedden 30 October 1939. Shedden's claims for an efficient finance checking system were confirmed by the Assistant Secretary of the Treasury (Joyce), but instead of drawing Shedden's conclusion, Joyce thought this justified adding a member of the Defence Secretariat to the Finance Committee (Joyce to Spender 9 October 1939).

94. The Treasury was able to point out that most War Cabinet approvals were not itemised and very broad, requiring detailed examination by Treasury later, to prevent open ended financial commitments. At this early stage of the war, the war effort was still being constrained by what the economy could afford for defence, and not governed by the definition and achievement of certain strategic objectives regardless of financial cost.

early December the Treasury Finance Committee was ready to take action.

One of the first casualties of the Finance Committee was the Supply submission to War Cabinet. Its major weakness was that the 25 pdr Field gun was not apparently required for the defence against raids contingency; the Army only needed its 18 pdr guns to repel the enemy and Jensen and McVey were ahead of Government policy[95]. The submission also implied that the removal of production bottlenecks was to assist in the production of British orders, and raised some difficulties on charges for exports. Shedden had realised most of this, but instead of advising McVey, he chose to inform the Treasury so that the submission could be stopped[96]. Apparently the need to acquire vital capabilities for defence was less important than attempting to save money for the Treasury. The latter informed Massy-Greene who interrogated Jensen. In his report to War Cabinet, Massy-Greene accused the Department of Supply of attempting to expand British orders so as to justify further capital expenditure on the 25 pdr Field gun and other projects. Greene doubted whether Britain had really asked Australia to increase its production and capacity further, but had responded to a commendable piece of salesmanship. He did not think that it followed that Cabinet was now obliged in spending more money, when it was uncertain that Britain would require all the new production[97].

95. AA A5954, Box 496, Report by Massy-Greene 5 December 1939, Sinclair to Shedden 17 January 1940. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 7, Volume 5, pp.94-96, 108-117.

96. AA A5954, Box 496, Sinclair to Shedden 27 November 1939, 30 November 1939. Shedden sent these views to Joyce 28 November 1939 and 1 December 1939, who sent them to Massy-Greene.

97. AA A5954, Box 496, Report by Massy-Greene 5 December 1939, copy also in

On the basis of Massy-Greene's report, War Cabinet rejected the Defence Committee's decision, and sent back the proposals for further consideration[98]. Acceptance of the British orders was also held up. After further weeks of delay, Brodribb and Jensen succeeded in bringing the matter back to the War Cabinet. With Defence Committee support, they pointed out that the capital expenditure to reduce production bottlenecks was required so that the Australian Armed Services could be supplied promptly. The production of 25 pdr Field Guns was necessary to supply war wastage reserves for the Army's artillery. Obviously, the obsolete 18 pdr Guns could not be replaced except by a more modern gun[99]. The Prime Minister, Menzies, still opposed these propositions. Having been supplied with information from Shedden, he pointed out that the claim that the 25 pdr project now fell within the defence against raids contingency was contradicted by previous statements made by the Army and the Department of Supply[100]. Fortunately, Menzies War Cabinet recognised that this was no longer relevant and approved the Department's submission on 18 January 1940. The next day it approved the acceptance of large British

MP598, S30, Box 10. Greene appears to have implied that Casey had organised the British response from London. As an experienced former minister Greene knew all the tricks.

98. AA MP598, S30, Box 10, Shedden to McVey 28 December 1939. War Cabinet Agendum No.37/1939 of 27 November 1939 'Supply of Munitions to the United Kingdom Government - Proposed Expansion of Government Factories' was considered by War Cabinet 21 December 1939 in Minute No.96.

99. AA A5954, Box 496, File: Supply of Munitions to the UK Government. AA MP598, S30, Box 10, Defence Committee Minute No.2/1940 of 3-4 January 1940. War Cabinet Agendum No.37/1939, 17 January 1940.

100. AA A5954, Box 496, Sinclair to Shedden 17 January 1940, Supplement No.2 to War Cabinet Agendum No.37/1939 of 17 January 1940.

orders for munitions[101]. The capital expenditure for 25 pdr ammunition was not approved until April 1940 after a similarly tortuous battle[102].

Thus in the name of good accounting, Massy-Greene and the Treasury had succeeded only in delaying vital capital expenditure for the development of new munitions capability[103], and also the acceptance of British orders. Together with the Defence Department's original disinterest, Massy-Green and the Treasury ensured that over three months had been lost, and the munitions factories were still not operating at full capacity. This situation had occurred because the Department of Supply and Development did not have the financial and executive authority to get on with implementing its responsibilities. It had to refer to far too many agencies all of which had the power of veto. The new Secretary of the Department of Supply and Development J.B. Brigden, complained:

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'My Department can act only upon the demands from the Services. It has no authority to build up stocks, and the demands of the Services have to be approved by various controlling or checking authorities'[104].

101. *ibid.*, War Cabinet Decision 17 and 18 January 1940.

102. AA MP598, S30, Box 10, see War Cabinet Decision No.186/1940 on Agendum No.43/1940 of 28 February 1940, Defence Committee Minute No.19/1940 of 28 March 1940 and War Cabinet Minute of 29 April 1940 on War Cabinet Agendum No.88/1940. See also A5954, Box 496, File: Supply of Munitions to UK Government.

103. The Treasury did not succeed with delaying the 25 pdr Field gun project significantly. Late in 1939, Jensen told the Manager of the Ordnance Factory Group (M.O'Loughlin) to build the new 25 pdr gun shop under the guise of the vote and building for No.2 Machine Shop. Jensen was prepared to take this risk because he was convinced of the need for the 25 Pdrs, and was frustrated by the prevarication of the Government. This was not the first time he took courageous decisions (see Chapter 1) — and the new Director General of Munitions (Essington Lewis) in effect approved Jensen's action in May 1940 when he had learnt what Jensen had done. See 'Defence Production ...', *op.cit.*, Chapter 7, Volume 5, pp.103–106.

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104. AA MP730, S9, Box 2, Brigden to McFarlane 23 May 1940.

This was only half of the story. Brigden and Brodribb could not act until the Service proposal had passed through the system of co-ordination constructed by Shedden and the Treasury. This entailed the Defence Committee, the Business Board of Management[105], the Treasury Finance Committee, the War Cabinet; after which Shedden would write to inform the Secretary of Supply and Development of the new decisions. This then allowed Brigden and Brodribb to develop appropriate proposals of their own to fulfill the Service requirement[106]. These went back to the Defence Committee, the Business Board of Management, and the Treasury Finance Committee could interfere as it thought proper and appropriate. If the proposals survived this experience, they went to the War Cabinet, where hopefully, they were approved. In the case of the 25 pdr Field gun they were not, and went through this process once more. There were many other delays[107].

105. This was the Defence Departments financial checking authority, and was run by prominent businessmen (Chairman Essington Lewis). It held sway over the new Departments of Navy, Army and Air when they were created in November 1939, even though the Board remained with the Department of Defence Co-ordination.

106. These proposals themselves had to be presented in great detail so that the Defence Committee, Business Board, Treasury Finance Committee, etc., could understand and scrutinise them. This occupied an inordinate amount of time for the senior officers of the Department of Supply, who were already overworked. Apart from the technical assessments of Service proposals, the preparation of documents in the correct form usually took two weeks. See AA MP598, S30, Box 10, Brodribb, Jensen, Smith, Gillan to the Minister 13 May 1940, Jensen to Minister 13 May 1940.

107. For example, delays by Defence Co-ordination over the new Filling Factory (AA CRS A816 3/301/36 Shedden to Sinclair 13 May 1940). The Department of Supply was not the only body becoming critical of Shedden's system of co-ordination. The CNS, Admiral Colvin, wrote to Essington Lewis 2 January 1940 and said: 'You will remember that at Shedden's dinner party the other day I made bold to refer to the time factor in war and expressed a doubt whether the machinery, however excellent from many points of view, might not cause undue delay at times'. AA CP111 M280.

The process created considerable uncertainty in the Department of Supply's planning until the process was completed. When proposals had been approved, the Department was not free to go and spend the money in the most efficacious manner possible, but had to obey rigid Treasury rules. Brigden's comments to McFarlane Secretary of the Treasury were terse:

'The goods themselves must be obtained within procedures laid down, and it appears that your Minister desires to treat us as though we were a sub-branch of his own Department for which he can make adequate rules. We have broken many rules and we are bound to be wrong whether we supply the equipment or we fail to do so'[108].

'... Treasury policy and the circumlocution of Defence Co-ordination have imposed large costs upon the Government. Delays have forced us to break rules we need not otherwise have broken, because goods had to be obtained in a frantic haste. even the (Minister) is subjected to limitations by his colleague, the Treasurer. Incredibly naive attempts are made to make rules to suit our conditions, in utter ignorance of those conditions'[109].

The Ministry of Munitions

The apparent inability of the Department of Supply to get on with the job of fulfilling Service demands began to produce a decline of confidence in its performance. The first criticisms were made by the Army. The CGS complained to the War Cabinet about the poor deliveries of gun ammunition for the week ended 24 February 1940. The War Cabinet was worried, particularly in relation to the munitions programme as a whole, and referred the matter to the Department of Supply for immediate comment[110]. The delay had

108. AA MP730, S9, Box 2, Brigden to McFarlane 23 May 1940.

109. *ibid.*

110. AA CRS A2671 War Cabinet Agendum 127/1940 'Deliveries of Ammunition from the Department of Supply and Development' - War Cabinet Minute No.174 of 27 Febru-

occurred because no proof tests had been held by the Inspection Branch, which was under the control of the Army itself. The Department of Supply was able to show that other anomalies in the programme were from factors outside its control such as deliveries of raw materials and machine tools from Britain[111]. However, the Department of Supply view did not reach the War Cabinet until 6 June 1940[112], by which time the major events emanating from the fall of France had overtaken it. In the short term, the Army's criticisms remained unanswered, and in Jensen's opinion contributed to the atmosphere of declining confidence in the performance of the Department[113].

Of course this was just another attempt by the Army to discredit the Supply authorities. It followed the pattern set over the Squires Report of December 1938. Squires had complained of poor liaison and cooperation with the MSB, and said the Army could not get information in regard to progress on Army orders and future production[114]. The MSB had challenged this on 31 January 1939, and Squires admitted he could give no instances, but that he had a foreshadowing of failure[115]. Shortly afterwards the Military Board

ary 1940.

111. AA MP730, S9, Box 2, Brigden to Shedden, 21 March 1940.

112. The Departments reply was referred by Shedden to the Army, which did not reply until 31 May 1940. The Army this time had reduced its criticisms to trivial points of detail; and was ordered in future to refer all matters raised on munitions in the CGS weekly report, to the Department of Supply for comment before release to the War Cabinet. AA A2671, *op.cit.*, Secretary of Department of Army to Shedden 31 May 1940, War Cabinet Agendum 127/1940 of 6 June 1940, Brigden to Shedden 14 June 1940, Shedden to CGS 16 May 1940. See also J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 7, Volume 5, pp.123-127.

113. J.K.Jensen, *ibid.*, pp.127-129.

114. AA A5954, Box 896, Squires Report.

115. See AA MP891, S6, Box 2, MSB Agenda 774 meeting 5 May 1939. Agenda 774

obligingly made a series of complaints of late deliveries of gun ammunition and raised questions of the MSBs capability to live up to forecasts. The Military Board claimed, among other things, that the MSB set its own priorities and ignored the Armys. The MSB answered that all deliveries would have been made on time except that the Inspection Branch had not completed proof tests because of the tides at its test ground at Port Wakefield[116]. The similarity with the incident of February 1940 was obvious, and suggested strongly the political motives of the Army vis a vis Supply Authorities.

However, in early May 1940, the Factory Board, under Jensen's inspiration decided to strike back against its critics and the stifling system of co-ordination under which they tried to work. It wrote to the Minister of Supply and Development, Stewart, complaining bitterly of the delays inherent in the existing system of approvals run by the Departments of the Treasury and Defence Co-ordination:

'... the machinery which has been set up for dealing with proposals for capital expenditure, however admirable in principle, is causing delays. In June 1939, the [Factory] Board submitted proposals to the Council of Defence which in the opinion of the Board were essential in preparation for war. In September 1939 war commenced, and ever since then there has been what can only be described as a struggle to obtain authority to proceed with the essentials of three months earlier. Even now, eight months after the commencement of the war, the whole of those essentials have not been approved. Later submissions seem doomed to a similar deliberation, as witness: on 23 April 1940, a most important paper in relation to Filling Factories was forwarded to the Department of Defence Co-ordination; three weeks have elapsed and nothing has been heard of it.

refers to the MSB reply to the Military Board on 31 January 1939.

116. AA MP729, S6, File 3/401/160, see A.V.Smith memo 'Brief Summary Regarding Ammunition Deliveries MSB' 10 March 1939.

If it is the will of the Government that so much of what the [Factory] Board can do is to be delayed by deliberative investigations by Committees and other authorities, then it is the duty of the Board to comply, even though the bodies referred to must in the main be guided by the expert and intimate knowledge possessed by the Board. If, on the other hand, expedition is desired by the Government, then the Board urges that it should be granted authority to take immediate action'[117].

Stewart read this minute to the War Cabinet on 13 May when Menzies was reviewing the war effort in the light of the debacle in France. Shedden was defensive, claiming that delays had only been caused because the Department of Supply had not used the Defence Committee in the first place — in other words, the system was not wrong, only those who tried to use it[118]. The Department of Supply did not see why it had to go through the system of 'co-ordination' when it was seeking to implement Service requests which themselves had gone through the system. The system lacked the technical expertise of the Factory Board anyway[119]. Shedden had been warned of the weaknesses of his system by Brigden in January:

'The academic elegance of your document describing the Functions, Machinery, and Procedure, of the Department of Defence Co-ordination, moves me also to spare time from the pressing urgency of the day, and to offer comments equally inspired by first principles ...

Of course, I realize that your instructions are directed mainly to your three subordinate Departments, and that you are naturally liable to

117. AA MP598, S30, Box 10, Brodribb, Jensen, Smith and Gillan to Stewart 13 May 1940. This was passed to the Minister with Brigden's support.

118. AA CRS A816 File 3/301/36, Shedden to Sinclair 13 May 1940. A5954, Box 695, File 'Department of Supply and Development — Notes Re Co-operation ...' 1940. This amplifies Sheddens comments in Cabinet and lists a series of trivial misdemeanors by the Department of Supply, which Shedden thought proved that Supply had never tried seriously to work within his system.

119. AA MP730, S9, Box 1, Jensen to Stewart 21 March 1940.

identify your Department with the War Cabinet. You have described the functions of the Department of Defence Control, rather than one of Co-ordination, and the shorter word would really be more appropriate. If I may really go into metaphor, you have not only, like some great Sun, shot off a series of planets, but you have set up on paper a solar system to include other planets too.

I will not specify any particular criticisms. As a body of working rules I dare say yours are as good as could be devised. They are a kind of supplement to the War Book, which because the War did not go by the book became obsolete the day War began. I do urge, however, that all such rules should be treated as servants and not as masters. The point is quite important because if a rule is laid down it is apt to become an exclusive way of doing things. We know that any large administrative machine can be intentionally sabotaged merely by keeping to its rules; we know also (and we are liable to experience this day by day) that such a machine can be unintentionally hampered by too much insistence on formal procedures.

My Department is, of course, much more concerned with substance than with form, otherwise the Second AIF would not have been ready for despatch ...'[120].

The Prime Minister, Menzies, was at first inclined to favour Shedden's view, and insisted that the Department of Supply had to work within the system of 'co-ordination'[121]. However, Menzies was under considerable political pressure to demonstrate to the public that his Government was capable of responding to the new crisis in Europe. Hitherto public interest had been casual towards Australia's part in the War[122] ; but now many groups were demanding action. With an election due in only six months, Menzies realised that the

120. MP1038, S2, 3rd Drawer 44A, 'Breen Papers', Bridgen to Shedden 6 January 1940.

121. AA CRS A5954, Box 695, Menzies 18 May 1940, Menzies pointed out that the Departments of Navy, Army, Air and Supply had to submit their draft estimates to the Department of Defence Co-ordination, which had the job of financial co-ordination and review of defence policy. There, he would consider them before they went on to the Treasury. Menzies criticised the Minister for Supply, Stewart, for not doing this.

122. P.Hasluck, *The Government and the People 1939-1941*, *op.cit.*, pp.198-201.

political, as well as the strategic realities[123] needed a dramatic gesture. The Factory Board minute showed the way. Menzies took the first step to relieve the administrative restrictions besetting the Department of Supply by abolishing the Treasury Finance Committee. He did this with the support of the Armed Services and the Department of Defence Co-ordination, which had always represented the Committee[124]. Shedden's system of co-ordination was the next to be reformed.

*The introduction of the new
manpower structure was
not to the advantage of those
style to experience important points.*

The new strategic position had pushed the Government's defence contingency from raids to that of heavy raids on Australia. Apart from the greatly increased scale of munitions which would be required for the defence of Australia, there was also a desperate need to supply vast quantities of munitions to Britain and other members of the Empire such as India and New Zealand[125]. Contrary to Shedden's advice[126], Menzies moved to recreate and strengthen the power structure run by A.E. Leighton and the MSB. The old powers of the

123. The strategic realities had been understood since Lyons, but were confirmed by Britain on 13 June 1940 when the Australian Government was informed of the possibility of Japan taking advantage of British and French defeats in Europe, and the improbability that Britain could send a fleet to the Far East. (D.M. Horner, *High Command*, op.cit., pp.35-36). The Japanese began to make demands on Britain in mid-June in regard to the withdrawal of the Shanghai garrison, and the halting of aid to China. Britain felt obliged to accede in July.

Document

word missing?

124. AA A571 39/1815, Part 1, War Cabinet Minute No.266 of 13 May 1940. The Treasury Finance Committee in fact survived its 'abolition' by the War Cabinet, but was greatly restricted in its operations. See War Cabinet Minute No.338 of 12 June 1940.

125. AA MP598, S30, Box 10, War Cabinet Agendum No.108/1940, War Cabinet Minute No.277 of 14 May 1940.

126. AA CRS A5954, Box 695, Shedden wrote to Menzies 21 May 1940 that: 'The essential requirement appears to be the introduction of an intensive drive into the administrative organisation that already exists, rather than the creation of any new machinery'.

Board were now largely embodied in a new position called the Director General of Munitions (DGM), and a new Ministry of Munitions was created to carry out the directives of the DGM[127].

The DGM was given the status of a Chief of Staff and full membership of the Defence Committee[128]. Leighton, and Brodribb after him, had enjoyed only associate membership, being called when matters of munition supply were discussed. Leighton had been able to use this membership successfully before 1938 to influence defence policy and strategy, but this connection had become less effective in 1939 and 1940 because the Service Chiefs and Defence Department began to ignore the munitions engineering perspective of defence policy, particularly in regard to the planning for future munitions capability. The DGM could not be ignored by the Defence Committee as the former had direct access to the War Cabinet, and his minister was the Prime Minister[129].

Menzies ordered the Defence Committee to co-operate with the DGM and formulate the future munitions supply objectives which had to be achieved in the new strategic circumstances[130]. Leighton had enjoyed direct access to the Minister of Defence which allowed him to win some important battles for the

127. Leighton had argued in May 1939 against the concept of the Department of Supply and Development as it covered too much ground being responsible for civilian as well as Service supply. Leighton wanted a single Ministry of Munitions concerned only with Service supply as this would be better able to get on with the job. (AA MP891, S6, Box 2, Volume 29, MSB Agenda 778, meeting 5 May 1939).

128. AA A571 40/2276, War Cabinet Minute No.282 of 21 May 1940 and Prime Minister (Menzies) to Attorney General 6 June 1940. See also Statutory Rules of Ministry of Munitions 15 June 1940.

129. *ibid.*

130. *ibid.*

MSB, but he had never had access to Cabinet. He did have access to the Council of Defence, but during Shedden's system of co-ordination from September 1939 to May 1940, the access had not been transferred to the War Cabinet when it had replaced the Council.

The most revolutionary powers of the DGM were those associated with finance. Once the War Cabinet had approved a *general* objective and the associated *preliminary* estimate of cost, the DGM was free to achieve the objective in any way he chose[131]. He did not have to refer each project to the system of committee's set up by Shedden, and nor could the Treasury attempt to delay progress in the cause of maintaining stable budget expenditure. The exigencies of the War now dictated that the objectives set down by the War Cabinet had to be achieved regardless of the budget difficulties they might cause. The DGM had the power to authorise expenditure on any particular item of up to £250,000. A.E.Leighton and the MSB had only enjoyed the authority to expend up to £2000 without immediate reference to the Treasury[132]. The DGM could also authorise purchases of any goods without recourse to tenders or circumlocution if he chose. In this respect he was largely free from the powers of the Auditor General. The need to conform to the correct procedures of finance and purchase had added materially to the lead time for starting new projects

131. *ibid.*

132. AA A467, Bundle 21, Special File 7, No.6, MSB Regulations 1936. A571 40/2276, Prime Minister to Attorney General 6 June 1940. The Treasury resented the DGMs power to incur up to £250,000 expenditure and considered cancelling it. However, assistant secretary Yandell concluded that they would not succeed because the DGM would take great offence and hostility, and the War Cabinet would support the DGM in a contest with Treasury (Yandell 16 July 1940).

during the period of the Department of Supply and Development.

The selection for the position of DGM was a foregone conclusion. The outstanding industrialist in Australia was Essington Lewis, the Managing Director of BHP. Lewis had gained the respect of commercial industry through his development of the steel industry in Australia, but he had also gained the respect of the Government through his involvement on the Advisory Panel of Businessmen of the Defence Department in 1938, and his Chairmanship of the Business Board of Administration in 1939. In fact, Lewis's achievements in defence extended beyond this to include a dominating role in the development of the aircraft manufacturing industry, and the creation of the first operational Armament Annexe[133]. Lewis had been critical of the Defence Departments slowness in copying his own example of action[134]. However, his patriotism was probably also complemented by an acute sense of the economic opportunities which would arise for completing the development of the steel industry[135].

133. The Joseph Fisher Lecture for 1948 given by E Lewis, University of Adelaide and Hassell Press 1948, p.16. In 1936, Lewis considered it advisable that BHP should secure experience in shell production and to have a plant ready in the event of emergencies. On Leightons advice, BHP equipped, at its own expense, a machine shop at Newcastle for machining 18 pdr shells. This began operations in 1938, and was incorporated into the Defence Departments Armament Annexe scheme which was run by the PSOC. Lewis was probably influenced by his experience during the First World War, when he managed BHP's munitions company which machined 18 pdr shells for the British Government.

134. See Chapter 3. Lewis had an ingrained expectation of future war. It gained point in 1934 when he visited Japan. In contrast to the rest of the worlds steel works which Lewis had visited, the Japanese were secretive. Lewis learnt from his own technical deductions and from conversations with Japanese businessmen, that the Japanese steel industry was gearing up for massive armaments production. See G.Blainey, *The Steel Master: A Life of Essington Lewis*, Macmillan, 1971, pp.120-127.

135. See Chapter 3 of this thesis.

The senior personnel of the Department of Supply and Development had, with few exceptions, been key figures in the MSB organisation, and consequently had been the targets of Lewis's private criticism in the 1930's. The appointment of Lewis in May as DGM seemed to confirm the Government's lack of confidence in the Department of Supply. This was the view taken by the public newspapers, which unleashed a wave of criticism of the Department and its supposed lack of progress. A popular conclusion was that prominent business executives were being brought into the new Ministry of Munitions to sort out the tangle of inefficiency[136]. The business community accepted this interpretation as much of it was exasperated, for patriotic reasons, at not yet being utilised in the war effort, despite having offered their services in June 1939 or earlier[137]. However, the majority of Australian engineering shops, were not set up for mass production of articles of fine precision such as guns and shells. Nor were the machine tools and gauges available to rectify the situation[138]. There had never been enough finance released by the Government, during the tenure of the Department of Supply and Development, to give capital support and orders to anyone except the government factories and a very limited number of armament

136. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 10, Volume 10, pp.80-81, see also Brigden's thoughts, 28 May 1940, AA MP730, S9, Box 2.

137. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 10, Volume 10, pp.81-86. See also Chapter 3 of this thesis for businessmen's reactions to CSIR proposals and preparations for war. Menzies had issued a statement on 6 July 1939 which said: 'I desire to express my great appreciation of the widespread readiness of industrial leaders and others to help in the work of defence. The Department of Supply was constituted to facilitate such cooperation. No opportunity will be neglected to obtain all possible assistance in carrying out the vastly expanded Defence Programme'. A5954, Box 1040. Little had in fact happened by June 1940 to involve commercial industry in Defence. *part in text*

138. AA MP730, S9, Box 2, Jensen to Brigden, 29 May 1940.

annexes. Brigden complained:

‘... the whole policy is one where the Government has been fearful of having too much equipment, but to all appearances it is my Department which has failed in its job’[139].

Lewis had the power to employ or dismiss whomever he wanted for his new Department[140], and so it was with some trepidation that the key figures of the Factory Board waited on the DGM in late May 1940, to see if he had been influenced by the public criticism[141]. Jensen wrote of this meeting:

‘Mr Lewis’s attitude was very friendly, but to me it was obvious that he knew he had a job to do and intended to do it. His opening words answered unspoken questions in our minds; he knew what we were thinking, and very nicely he told us that it was not the first time he had taken over “ready made” organisations, ... but he always carried on with the existing executives as long as they wished to work with him. He said that he relied upon our help, and to me gave the impression that we had no cause for concern about our place in the organisation if we gave that help, but I also got the impression that if we did not wish to help it was immaterial to him. I left the meeting feeling that I would like to work with Mr Lewis ...’[142].

Brodrigg was made the Deputy DGM; and after a power struggle with his old understudy, A.V.Smith, Jensen became Lewis’s chief policy adviser on the Government factories[143]. Brigden became permanent head of both the

139. *ibid.*, Brigden to McFarlane, 23 May 1940.

140. AA A571, 40/2275, Prime Minister to Attorney-General, 6 June 1940.

141. J.K.Jensen, ‘Defence Production ...’, *op.cit.*, Chapter 10, Volume 10, pp.93–96.

142. J.K.Jensen, ‘Defence Production ...’, *op.cit.*, Chapter 10, Volume 10, pp.94–96. The diplomacy and tact of Lewis is all the more apparent when the following admission of Jensen is considered: ‘... I was rather prejudiced against him; feeling that people were given to toadying to him on his status as a head of the steel industry rather than on his personal ability and merit ... this was an erroneous viewpoint’.

143. J.K.Jensen, ‘Defence Production ...’, *op.cit.*, Chapter 10, Volume 10, pp.38–41,

Department of Supply and the Ministry of Munitions, to allow close cooperation between the Departments. A.E.Leighton was recalled from retirement and put in technical charge of all explosives production, with the right of direct access to Lewis himself. He also oversaw MSL, chemical defence and co-ordination with the chemical industry. When the question arose of placing businessmen in charge of the original MSB factories and laboratories, Lewis refused saying:

'I consider that the organisation which now exists to run these factories is adequate for any expansion that we may wish'[144].

The reason for this apparent modification of attitude since the late 1930s

104-112. A.V.Smith had served for many years under Jensen as the Assistant Secretary to the MSB, and the Executive Officer of the Contracts Board of which Jensen had been the Chairman. In the mid-1930s Smith had elected to leave the MSB organisation and become the second Assistant Secretary of the Defence Department, which was a more senior position than Secretary of the MSB which Jensen held. With the formation of the Department of Supply, Jensen had become an Assistant Secretary, but Smith had also joined the Department and successfully challenged the Permanent Head, D.McVey, intention to make Jensen his Chief Officer, in that he, Smith, had seniority over Jensen. Jensen did not forgive Smith as the latter had, in Jensen's opinion, learnt his departmental knowledge from Jensen. Jensen considered that he had far more relevant experience and seniority than Smith in munitions production and organisation. With the formation of the Ministry of Munitions, both Smith and Jensen began to manoeuvre to gain the position of Permanent Head. Jensen claimed that he was motivated by his desire to avoid being superseded by his long time subordinate. On 13 June 1940 he saw Lewis and threatened to stay with the Department of Supply, if Smith were appointed. Jensen obviously thought that the fact that he was withdrawn and quiet was a handicap vis-a-vis the more outward A.V.Smith, for he told Lewis not to be deceived by his (Jensen's) manner. Jensen claimed to Lewis that 90 per cent of the ideas of the present munitions organisation were built up by him, and that he would serve under Brigden, Brodribb or Lewis as Permanent Head, but not Smith. The conflict between Smith and Jensen was resolved when Brigden was appointed, and Smith elected to stay with the Department of Supply. Despite Jensens claims, Smith was a man with considerable ability, and became the Permanent Head of the Department of Supply. Jensen became the Head of the Munitions Ministry some months after Smith's promotion.

144. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 10, Volume 10, p.128.

was that Lewis had now realised that the munitions organisation had always been restricted by finance in its plans for industry, and not by lack of ideas. His time on the Advisory Panel of Industrialists assisting the PSOC in 1938 had helped in this. On 2 July 1940 he summed up the situation to the editors of Australian newspapers:

‘The foundations of munitions production in Australia were well laid — for the needs of the time. Today the needs are infinitely greater. We require a vastly expanded system. In comparison with what was done in other Dominions, our pre-war system was good. We need not deceive ourselves that in past years a majority of the public would have appreciated a very heavy expenditure on munitions ...’[145].

Nevertheless, businessmen were to play a prominent role in the new Ministry of Munitions. The vastly increased demand for munitions meant that the Government factories and the existing armament annexes, could not supply the quantities required, even if operating at full production. Commercial industry now had to become directly involved. The Government realised that the cooperation of commercial industry would be best achieved by involving prominent industrialists directly in the munitions effort. This also served to give confidence to the Press and the general public. The appointment of Lewis was the first step in this direction, and the Government understood that Lewis would proceed to select more industrialists to assist him.

Jensen had anticipated this general development in his 1938/39 plan for a Ministry of Munitions. His reasons for enlisting businessmen were slightly different:

145. AA MP730, S9, Box 2.

'... experience has taught me that while the services they render may or may not be important in the war effort, those men who speak for the people: Members of Parliament, the Government of the day and the newspapers; are always on the side of the business executive and against the public employee when it comes to management of an expenditure of money in what may be described as business operations'[146].

In fact there were better reasons for involving businessmen than any of these. The Australian engineering industry by June 1940, was scattered across the inhabited part of the continent, in small units, with a few exceptions. The problem was how to integrate all of these units into munitions production, when few could produce anything more than one or two components of a shell or a gun etc. even with assistance. Some of the larger firms in Australia had come up with the answer through their own work for civil production. Subcontracting had reached probably its highest level of development at General Motors Holden (GMH) which made bodies for 21 brands of cars and trucks, totalling 75 models. GMH had mastered the complexities of co-ordinating the manufacture of components from dozens of outside firms, funnelling them into the many assembly lines, to become complete cars or trucks[147]. This was the method by which all the comparatively small units of engineering skill could be integrated into the munitions production effort; and the detailed knowledge of its implementation lay almost entirely within commercial industry. Companies such as GMH, which had thus become skilled as central co-ordinators, also gained extensive experience in planning and running complex production and assembly lines; something of great value to munitions production, and of which

146. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 10, Volume 10, pp.100-101.

147. L.Hartnett, *Big Wheels and Little Wheels*, Lansdowne Press, Melbourne 1964, pp.73-74, 118.

even the government munitions factories had only had selective and intermittent experience up to June 1940.

The role which Lewis defined for businessmen within his Department followed closely the organisation which Jensen had developed in 1939, but which had been ignored by Shedden[148]. Jensen had resurrected his plan on 3 June 1940, but soon found himself in competition for Lewis's attention with A.V.Smith who had ideas of his own[149]. Lewis accepted Jensen's scheme on 14 June[150] and it was implemented throughout the next few weeks. The Ministry of Munitions was divided into two halves, one being the government munitions organisation under Brodribb, the other being the organisation for the development of munitions production within commercial industry. The organisation was made up initially of seven directorates, each led by a prominent businessman, usually with a senior public servant as his deputy (or Controller). The following table lists these directorates, their directors and controllers:

148. *ibid.*, pp.103–104, 128–137.

149. AA MP730, S9, Box 2. See also J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 10, Volume 10, pp.131–136, 163–167 for the consequences of the Smith/Jensen struggle.

150. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 10, Volume 10, pp.131–136. The detailed statement of the organisation, 'The Code of Procedure' was written by Jensen in the ensuing weeks and approved by Lewis and his Directors on 13 August 1940. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 10, Volume 10, pp.181–182.

DIRECTORATE	DIRECTOR	CONTROLLER
Ordnance Production Directorate	L.J. Hartnett, Managing Director of GMH	F.S. Daley of GMH, but formerly Assistant Manager of Government Ordnance Factory Maribyrnong
Explosives Supply Directorate	T. Donaldson, Technical Adviser to ICI of Australia and New Zealand	A.A. Topp, Manager of Explosives Factory, Maribyrnong
Gun Ammunition Production Directorate	W.J. Smith, Managing Director of Australian Consolidated Industries	G.C. Rowe, Executive Officer of the PSOC, and Defence Supply Planning Committee
Aircraft Production Directorate	H.W. Clapp, Chairman of the Victorian Railway Commission	Aircraft Production Commission which was inherited from the Department of Supply
Machine Tools and Gauges Directorate	F.G. Thorpe, Director of McPhersons Limited and Associated Machine Tools Australia Pty Ltd	T.A. Witten of the Department of Supply
Materials Supply Directorate	Sir C. Fraser, Director Broken Hill Mining Companies	H.C. Green, Assistant Secretary, Department of Supply, and Assistant Commonwealth Statistician

Labour Directorate	Hon. J.B. Chifley,	R.J. Murphy (Supply),
	former Member of House of Representatives and the MSB and Department of Defence in of Supply	
	the Scullin Labour Government	E.P. Eltham (Technical Training), Victorian Dept. of Education
Finance Directorate	E.V. Nixon, CMG,	G.J. Gillan, Chief
	Accountant and Company Director	Accountant, Department of Supply, and Member of the MSB

It is interesting to note that three of the seven controllers listed above had been members of A.E.Leighton's Technical Enquiry Staff in Britain during the First World War[151]. Most of the Directors and Controllers had been suggested by Jensen, and accepted by Lewis[152]. Later, other directorates were added such as Armoured Fighting Vehicles Production, Radio and Signal

151. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 6, Volume 4, pp.98-99. These were F.S.Daley, who investigated the manufacture of gun carriages and mountings; A.A.Topp, who investigated Explosives manufacture and Filling Factories; and E.P.Eltham, who examined machine gun manufacture. The Production Orders and Statistics Branch which worked directly to the DGM, was headed by R.H.Doyle, who had investigated rifles and pistols while on the Technical Enquiry Staff.

152. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 10, Volume 10, pp.132-142. Many of these choices were obvious because of the outstanding nature of the businessmen concerned, and in many cases, their close involvement with the Defence Department and Department of Supply. Hartnett was placed in charge of the most important production directorate because of his great experience in mass production techniques and subcontracting; Thorpe was a leading figure in the Australian Machine Tools industry and had been helping the Department of Supply for some time; Nixon was a publically respected accountant, and had been helping the Business Board of Management in the Department of Defence etc. Therefore, Jensen was not necessarily suggesting anything to Lewis which Lewis would not have done himself.

Supplies, Small Craft Construction, and Locomotive and Rolling Stock. The Directors were concerned with interpreting the requirements of the Armed Services and developing appropriate production units throughout Australia[153]. The supervision of the units of production and the co-ordination of the local interests of each directorate, was under a Board of Area Management (BAM) for each State. These were also part of Jensen's original scheme, and were made up of prominent local businessmen, assisted by State or Commonwealth public servants, knowledgeable in public finance and accounting. The BAMs were also expected to assist the Directors with information and advice as to local industrial capabilities. The Directors were situated in Melbourne, and were rarely able to visit the States[154].

153. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 10, Volume 10, pp.176-177.

154. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 10, Volume 10, pp.132-148, 152, 156-157, 177.

CHAPTER 6

*THE NEW MUNITIONS PROGRAMMES, AND RELATIONS WITH
THE ARMED SERVICES 1940-45*

The Wartime Munitions Programmes

As indicated in the last chapter, the dramatic events of June 1940 led to a greatly increased demand for munitions by the Armed Services of Australia. Although it was not formally stated for some time, in effect the three Armed Services began to prepare for the Medium Scale of attack (ie. heavy raids) which had been defined in prewar defence planning[1]. This did not lead to much immediate change in the size of the Navy as the only source of further ships was now Australia, and there was no prospect of rapid acquisition from shipyards[2]. The Air Force remained at 32 squadrons[3], which had been its prewar target. The difference now was that the level of operational preparedness was to be lifted so that all necessary airbases and logistic support were in place. The quality of the RAAF's frontline aircraft was also to be improved, and six months war wastage reserves were to be established. The Army's basic home defence force of seven divisions of militia was not increased in size, but its scale of preparation and equipment was to be improved greatly so that it could more effectively combat the heavier raids expected under the Medium Scale of attack. The Government had also been raising divisions for service overseas, the

1. There seems to have been no formal decision made by War Cabinet to move to the Medium Scale of Attack as the basis of preparation for the Armed Services; but it seems to have been understood implicitly by all major parties. Jensen was in no doubt that the scale of munitions now being demanded meant that the Minor Scale of Attack had been superseded. See J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 10, Volume 10, pp.160-162. War Cabinet Agendum No.169/1941 of 13 May 1941 shows that the Army and Air Force were preparing for the Medium Scale of Attack, AA A5954, Box 478. See also A816 File 3/301/152, Draft War Cabinet Agendum, November 1941.

2. AA A5954, Box482-83, Ministry of Munitions, 'Munitions Digest', December 1940, pp.17-18.

3. *ibid.*

Table 6-1: THE MAJOR INCREASES IN THE PLANNED MUNITIONS PROGRAMME - FEBRUARY 1940-DECEMBER 1942

	PLANNED ANNUAL CAPACITY AT FEBRUARY 1940	PLANNED ANNUAL CAPACITY AT EARLY JUNE 1940	PLANNED ANNUAL CAPACITY AT JULY 1940	PLANNED ANNUAL CAPACITY AT MARCH 1941	PLANNED ANNUAL CAPACITY AT FEBRUARY 1942	PLANNED ANNUAL CAPACITY AT DECEMBER 1942
<u>GUNS</u>						
AA Guns	100 (includes 3" or 4.5" field guns)	104	300	400	360	360
Bofors	-	-	121	121	500	1,000
Field Guns	See AA Guns	104 (25 Pdr Field Gun)	840 (25 Pdr Field Gun)	840 (25 Pdr Field Gun)	1,160 (includes 5.5" Howitzer)	840
AT Guns	40 (includes 3" mortars)	40 (includes 3" mortars)	1,500	1,900	2,400	2,400
Naval Guns	-	-	24	24	650	650
Mortars	See AT Guns	See AT Guns	2,000	2,000	2,500	2,500
<u>SMALL ARMS</u>						
Bren	1,800	1,800	6,000	6,000	6,000	6,000
Vickers Mk 1	1,250	1,250	2,500	2,500	2,500	2,500
Rifles	50,000	50,000	100,000	200,000	200,000	200,000
Pistols	-	-	50,000 (includes Signal Pistols)	50,000 (includes Signal Pistols)	50,000 (includes Signal Pistols)	50,000 (includes Signal Pistols)
Submachine Guns	-	-	-	-	12,000	40,000
<u>AMMUNITION</u>						
Gun Ammunition	1,500,000 (includes mortar and aircraft bombs)	1,500,000 (includes mortar and aircraft bombs)	9,500,000	10,500,000	12,800,000	12,300,000
Mortar Bombs	See Gun Ammunition	See Gun Ammunition	1,600,000	1,950,000	4,400,000	4,000,000
Aircraft Bombs	See Gun Ammunition	See Gun Ammunition	240,000	240,000	135,000	135,000
SAA	270,000,000	320,000,000	630,000,000	730,000,000	850,000,000	850,000,000
<u>APV</u>						
Carriers Machine Gun	-	-	-	2,000	3,000	3,000
Tanks	-	-	-	1,000 (Light Tanks)	500 (Medium and Heavy Tanks)	750 (Medium and Heavy Tanks)
<u>MISCELLANEOUS</u>						
Depth Charges	-	3,000	10,000	10,000	10,000	10,000
Naval Mines	-	3,000	3,000	3,000	4,500	6,000
AT Mines	-	-	260,000	260,000	260,000	260,000
Grenades	?	?	1,000,000	1,000,000	1,500,000	1,500,000
Gas Masks	220,000	220,000	220,000	220,000	500,000	600,000
Torpedoes	-	-	-	-	520	520

Sources

AA MP598, S30, Box 10
AA MP730, S10, Box 2
AA CRS A5954, Box 482-483, Munitions Digest, December 1940.
AA MP1217, Box 488.
AA MP956, S2, Box 10, Item 47.

Australian Imperial Forces (AIF), but by December 1940, this had been fixed at four divisions, plus one armoured division[4]. The Government endorsed the principle of giving maximum material support to AIF divisions, rather than relying on Britain any longer[5].

Table 6-1, 'The Major Increases in the Planned Munitions Programme February 1940-December 1942', shows among other things, how the demands of the Armed Services were broken down into annual production capacities. In February 1940, the Designed Annual Capacity, which the Government *sought* to establish was quite modest. It had increased incrementally by early June 1940, as the result of a large number of separate War Cabinet decisions. By July 1940, the Armed Services, particularly the Army, had calculated their new munitions requirements as a consequence of the collapse of France. When translated into Designed Annual Capacity, they represented a very large expansion in the munitions programme, as is clear from Table 6-1. This was the total capacity which the new Ministry of Munitions had now to attempt to create by whatever means were available. By March 1941, the total munitions programme had increased again, largely as a response to Eastern Supply Group Council requests for expansion[6]. With the beginning of war in the Pacific, the Designed Annual

4. *ibid.*

5. War Cabinet Decision of 13 May 1940 (cited in Supplement No.1 to War Cabinet Agendum No.358/41 of January 1942 — A5954, Box 478, File Army and Munitions Coordination Committee).

6. AA A571, File 41/795 Part 1. War Cabinet Agendum No.63/1941 suggested that Australia should create capacity to supply Eastern Group responsibilities placed on Australia at the recent Conference in New Delhi. War Cabinet Minute No.777 of 12 February 1941 agreed, subject to Britain supplying the necessary 4 million capital expenditure. The Eastern Group was the Empire munitions supply organisation the creation of which

Table 6-2 : ANNUAL CAPITAL EXPENDITURE BY THE DEPARTMENT OF
MUNITIONS 1939/40-1944/45

FINANCIAL YEAR	PLANT AND MACHINE TOOLS ETC.	BUILDINGS AND WORKS	TOTAL
1939/40	1,390,908	737,917	2,128,825
1940/41	7,045,471	3,934,068	10,979,539
1941/42	12,136,156	9,716,728	21,852,884
1942/43	16,671,127	8,262,837	24,933,964
1943/44	12,613,704	4,304,570	16,918,274
1944/45	7,082,221	688,054	7,770,275
TOTAL £	56,939,587	27,644,174	84,583,761

Source

AA MP956,S2 Box14 item87

Capacity was further expanded in early 1942, to correspond to the requirements of the contingency of Major Scale of attack — the envisaged invasion of Australia[7]. New capacities had to be created to accommodate this new level of threat to Australia. This total programme was a big increase on even the vast programme which had been outlined in July 1940. However, it was the last major increase. The last column of Table 6-1 shows that by December 1942, the programme had changed little.

As could be expected, the creation of the capacity to produce the annual output envisaged in July 1940, and subsequently, would cost millions of pounds. Some idea of the actual capital expenditure can be gained from Table 6-2, 'Annual Capital Expenditure by the Ministry of Munitions'. By June 1942 over £34 million had been spent since 1 July 1939, and £21 million in 1941/42 alone. The next financial year was even higher. Of course, this was not the only cost to the Government. Expected Armed Service orders for munitions were in excess of £98 million by July 1940[8]. By April 1941 the value of orders was in excess of £183 million[9]. These figures were far larger than the total expenditure on defence for 1939/40 — £55,715,211[10]. As the new Director of Finance in the Ministry of Munitions, E.Nixon, observed, the Treasury had lost all control of

Australian Governments had sought since the 1930's.

7. See speech by the Prime Minister J.Curtin to Parliament CPD, Vol 169, 16 December 1941.

8. AA A5954, Box 695, Menzies to Lewis, 15 July 1940.

9. AA MP730, S10, Box 2, War Cabinet Agenda No.63/1941, Supplement No.1 of 23 April 1941. See also MP956, S2, Box 8, Item 38, Jensen to Makin 1 November 1941. The orders for the Eastern Group were not included in the figure of £183 million. Jensen said the total was actually close to £200 million.

10. See Table 2-10, Defence and Wartime Expenditure 1933-45, Chapter 2.

Departmental budgeting:

'In the emergency of a great war, contingencies which defy all forecast make it impossible for the War Departments to frame any reasonably close estimates of their probable expenditure. The fundamental principle of appropriation is sacrificed, and with it goes all Parliamentary control, in so far as this is applicable before the money is spent. Expenditure, in fact, is no longer determined by the amount Voted in Parliament; on the contrary, the amount voted is determined by the expenditure. Parliament dispenses for the time with its power of control and grants a 'Vote of Credit' without the usual limitations to the Treasury, to which it leaves the responsibility of distributing the money in the manner best calculated to meet the emergency'.

'The demands made upon the Munitions Department are not governed by the fixed amount of money available, but by the needs of the fighting services ...'[11].

What was true for the Ministry of Munitions, was also true for the Department of Supply, and the three Armed Service Departments. If the Prime Minister Menzies could say of the less malignant economic conditions of mid-1939 that they represented a first class problem[12], what would he say of the circumstances of the second half of 1940? To some extent his, and the Treasury's position, was not quite as bad as in 1939. With the coming of war, people were a little more willing to pay higher taxes, and to subscribe to large defence

11. AA MP730, S10, Box 1, Nixon to Lewis, 8 July 1940.

12. AA, AA1971/216, Council of Defence Meeting 5 and 6 July 1939. Menzies stated to the Chiefs of Staff that the great increases they desired in the Defence budget presented a first class problem. The necessity to raise a huge Defence loan, together with the States borrowing problem, would lead to the result that the public could not provide the whole amount and it would be necessary to call on the reserves of Central Bank credit drastically. If war came, the need for increased use of Central Bank credit would result in inflation of prices and a reduction in the living standard of the people. Such action was only justified in war; the Government was not justified in doing this as a precautionary measure against war.

loans. These developments offered some hope to the Treasury, of balancing the budget. It was to be a long and complicated path, which was made more steep and dangerous by the Government's political weakness, after the national elections of September 1940. It is sufficient to say that the money for the Ministry of Munitions, and other war Departments, was found, and finance for the rest of the war was not a serious problem for them. It was a major financial problem for the Treasury and the Government, which has been covered to some extent by the Official Histories[13].

The Method of Implementing the Wartime Munitions Programmes

When Essington Lewis became the DGM, he acquired the largest manufacturing task Australia had ever attempted. But he also inherited the experience of the MSB. The key personnel for the MSB had been the driving force behind the PSOC, which had determined the best way in which to integrate commercial industry into the war effort. The principles had been outlined in September 1937 by A.E.Leighton and A.V.Smith[14]. The munitions or components, for which there were no comparable products in industry, would be made in factories created and controlled by the Government. This involved mainly explosives and their filling into ammunition. Commercial industry possessed for example some of the more important machine tools required for making metal ammunition components and so was familiar with useful machining techniques

13. S.J.Butlin, *War Economy 1939-42*, *op.cit.* S.J.Butlin, C.B.Schedvin, *War Economy 1942-45*, *op.cit.*

14. AA MP598, S30, Item 19, 'Interim Report by Australian Principal Supply Officers Committee — Investigation into Industry as a Source of Ammunition Components', 9 September 1937. See Chapter 4 of this thesis.

for ammunition. It would concentrate on the types for which there would be the greatest demand. This ensured that commercial organisations would have sufficient orders to make it worth their while to undertake the work. The MSB factories would make the miscellaneous types of shell components for which there was small demand.

These principles covered the division of work between the MSB factories and commercial industry. The actual method of carrying out the work of production was also addressed by Leighton and Smith in 1937. The MSB's factories were considered to be well equipped to mass produce guns, small arms and ammunition, although their output was small compared to the demand expected from war. Leighton and Smith pointed out that the MSB factories and MSL were there to teach commercial industry the techniques of production for these munitions. Commercial industry was not well placed to conduct mass production as it lacked complete sets of machine tools, jigs, fixtures and gauges for the munitions produced by the MSB. Mass production as a technique was not widely known in the commercial engineering industry anyway[15]. The solution was, according to Leighton and Smith, for the Government to supply sufficient machine tools and jigs etc. to particular commercial firms so that they might be capable of mass producing *whole* components (sub-assemblies) and not just batch production of single parts. The concentration of such resources in one location made it easier to train commercial executives and workers in mass pro-

15. The demand raised by a small population did not, in most cases in the engineering industry, necessitate the cost of mass production. Batch production was practiced widely and produced a large variety of equipment. MHS No.107, BAM-NSW, Copy No.1 pp116-17.

duction and the standards of quality required by the Armed Services, which generally were much higher than those normally employed by commercial industry[16]. It also made Inspection easier, as inspection stations did not have to be created in several different firms. The special production line would be created in separate buildings to those of the commercial firm, and called an armament annex[17]. This would be controlled by the Government, and managed on its behalf by the commercial firm involved.

see the
difference
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D.P. 238, p. 13
p. 107

The annex method was first applied to the production of metal ammunition components and the PSOC had created 19 annexes by June 1940[18]. Under Lewis, it was to be applied more generally and also included such fields as chemicals, tank gear boxes, optical munitions and machine tools and gauge production[19]. 243 Armament Annexes had been created by the end of the war[20].

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Government annexes would not be used when a commercial firm, or a

16. D.P.Mellor, *op.cit.*

17. Mellor says that the intention of the annex idea was to avoid the growth of a large private munitions industry and to avoid building huge factories that would be useless after the war (p.30). The first point seems improbable if the inter-war experience of the MSB is remembered from Chapter 2. Australian orders were not sufficient to make the MSB self-supporting, and overseas orders were small. The post-war prospects of the munitions industry in Australia hardly looked any better; and so it is difficult to believe that munitions production presented a worthwhile long term business proposition to commercial industry. Mellor's second point can only have been of secondary importance to the reasons stated by Leighton and Smith.

18. See Chapter 4 of this thesis.

19. See D.P.Mellor, *op.cit.*, pp.50-56 for a list of the armament annexes created for the war.

20. See Annex H 'Vital Statistics on the Annexes'.

state government railway workshop, had most of the manufacturing capability to produce a munition or its major components. This assumed it held most of the necessary machine tools and gauges or could make them, that its staff were capable of sound production planning, shop inspection, and cost accounting, and that its workforce had sufficient skilled tradesmen. In these cases the Government could supplement the existing organisation helping to create what might be termed a commercial armament annex^[21].

As Leighton and Smith had realised in 1937, sometimes the Government would have insufficient machine tools and jigs etc. to set up a government annex, for a particular munition, and no commercial firm or state railway workshop would be capable of creating a commercial annex. Here they envisaged there would be no alternative to appointing a major contractor, who would then break down the munition into its smallest parts, and subcontract them out to whichever commercial firms thought they could make them. It was recognised that this method created major problems of inspection and training, as the subcontractors would be spread widely in different locations. It was also likely that the major contractor would have to accept that many of his subcontractors would be too small to engage in mass production of parts, and would only be capable of tool room (or jobbing) methods of production. This increased costs, and sometimes the time for production, because assembly in the major contractor's factory could be held up by the slow supply of one part by a

21. The commercial armament annex might subcontract some of the components of the munitions, but it would make most of them in its own factory, and complete the major assembly.

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subcontractor[22]. However, what might be termed the detailed subcontracting approach was the method of production which could be tried when all else had failed, and while it was not likely to be very efficient, it was a good way of involving many small commercial engineering firms, which otherwise would have been too small to contribute to munitions production. As the war progressed, and all resources became more scarce, detailed subcontracting became very important. The only people who had had any prewar experience in practising it were a handful of large commercial firms of which the most outstanding was probably General Motors Holden (GMH). This gives at least one reason why the General Manager of GMH, L.J.Hartnett, was made the head of the Ministry of Munitions Directorate with the most complicated production task ahead of it[23].

Table 6-3, 'The Division of Responsibility and Method of Production of Munitions 1940-45', indicates what areas of work were dominated by commercial industry or the government factories, and which of the four methods of production tended to be used most frequently. The table is a general indication only, and exceptions existed in most categories of munitions. One method of production was rarely used alone, and in some cases two or three methods were used together. The 25 Pdr Field gun project, for example, employed three methods: government factories made many of the initial ordnance pieces, but this was later taken over by the major contractors themselves in their commercial annexes. The carriage was produced by detailed subcontracting.

22. MHS 107, BAM-NSW, Copy No.1, p.117.

23. See L J Hartnett, *Big Wheels And Little Wheels op.cit.*

Thus when Lewis confronted the huge production task of July 1940, he at least knew what methods and principles were to be applied to develop munitions mass production in Australia. He had contributed in some way to the development of these principles as he had been the chairman of the Advisory Panel of Industrialists which had assisted the PSOC in its work before the war. The organisation which he created was well designed for applying these principles and methods realistically. The Directorates understood the technical difficulties associated with the production of particular munitions, and the general limitations of Australian industry; and so could decide which method of production should be used. The BAMs knew the capabilities of local firms and state government enterprises, and so could advise the Directorates on who might be able to carry out different types of production. The Government factories and MSL were there to tender detailed technical advice and training to whoever needed it. The Ministry of Munitions did not, of course, settle down to work without teething problems in administration and co ordination. Some of these are examined in Annex HA, and also some of the factors which helped to ameliorate the impact of such problems.

Relations with the Armed Services

It has been indicated that co-ordination between Department of Supply and the Armed Services was not always satisfactory. The strain which was to be introduced with the huge new munitions programme under Lewis, caused a further deterioration in co-ordination, particularly with the technical branches of the Army, and the production directorates of the Ministry of Munitions [24].

24. Interestingly, Jensen claimed that the problem of coordinating the Armys technical

Since the Army was responsible for the compilation of about 90 per cent of the munitions requirements placed on the Department, this was a serious problem.

The initial manifestation of the problem concerned the placement of orders. Although Lewis had been informed in July of a programme already exceeding £98 million, very little of it had been translated by the Services into firm orders. Most of this total represented 'possible requirements', and by early August Hartnett and Lewis were becoming uneasy at the Army's inability to give them a firm programme[25]. If the Munitions Ministry embarked on production planning and the creation of appropriate capacity, and then began production; all this effort and expense could be wasted if no firm order eventuated. Unless the Army could be induced to give a confirmed general forecast of requirements, such as Lewis had thought he had got in July, all the Munitions Ministry's planning would be thrown into chaos, and much time lost. The Army claimed that firm orders had been delayed by action to simplify the Army's needs in relation to the manufacturing capability of Australia[26]. This was a complicated question, and could only be solved with the knowledge and assistance of the Ministry of Munitions. The Army had no business to be attempting to solve it alone, as it held up the despatch of the general requirements for munitions, the receipt of which could then allow the Ministry of Munitions to

requirements to production authorities was not a new one and had been solved in the past by the Inspection Branch of the MSB. This branch was lost to the Armed Services with the creation of the Department of Supply in 1939. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 10, Volume 10, pp.185-186.

25. AA MP730, S9, Box 2, Hartnett to Lewis, 12 August 1940, Lewis to Hartnett, 14 August 1940.

26. S.J.Butlin, *War Economy 1939-1942*, *op.cit.*, p.319.

determine whether Australian industry could make all the items. The Branch of the Master General of the Ordnance (MGO) which held the responsibility for the despatch of orders, was still operating along peace time procedures, and could not cope with the avalanche of new requirements which became relevant after June 1940. Its instinct was to work through each requirement carefully, having checked all aspects, rather than to respond in the spirit of the crisis and make a general forecast, accepting that there would be some mistakes, and many revisions. Lewis went to the Prime Minister, who arranged a major conference for 27 August 1940 to discuss this and other related problems.

The conference, which included representatives of the Army, Munitions, the Prime Minister and several other Ministers[27], decided that:

'There is ... no obstacle from the Government or Treasury point of view ... for the immediate placing of demands with the Department of Munitions to ensure the attainment of the maximum productive capacity in the shortest possible time. Any delay in their preparation should not hold up the establishment and organisation of productive capacity by the Department of Munitions, but the important consideration was to give it a firm basis of Service requirements, both in respect of quantity and type, on which to proceed'[28].

The War Cabinet affirmed this, and other decisions of the conference to establish an Army and Munitions Co-ordination Committee. The War Cabinet directed that the Army would present each month an 'Army Forecast' listing

27. Ministers present were Menzies (Prime Minister), Spender (Treasurer), Stewart (Supply and Development), MacBride (Army). Army representation was Major-General T.R. Williams (MGO), Colonel H.B.L. Gipps (Chief Inspector of Munitions). Lewis, Hartnett, Brodribb and Brigden represented the Munitions Ministry.

28. AA A5954, Box 478, File 'Conference on Munitions Production', 27 August 1940, at Victoria Barracks, Melbourne.

all items passed to the Ministry of Munitions and containing newly revealed and likely Army requirements, including priorities for production. Ordnance Production Directorate (OPD) was to present production notes[29]. The Committee was, among other things, required to consider the capacity of Australian industry to meet the forecasted requirements and to approve the conversion of such requirements into munitions orders. It could endorse items contained in the Army Forecast as approved items of requirements, and the Ministry of Munitions could then immediately proceed with the necessary investigations, production planning and preparation, ending with production if quantities were defined of particular approved items. In this event, Army had to promptly follow up such production with a firm order.

These actions gave the Ministry of Munitions the confidence to proceed on the Committee's approval of items with all aspects of preparation for production, without the delay inherent in waiting for a formal order from the Army. But the new system did not necessarily allow the initiation of early production. For the Committee to approve production, the Army Forecasts had to specify *quantities* of particular items, and this they did not always do. This meant that in some cases the Ministry of Munitions finished all its production planning and created the production capacity for a particular item, only to find such capacity frozen into inactivity because of the lack of an order. Hartnett in his reports to Lewis during the last months of 1940 often complained of this problem:

‘We are still having difficulty in obtaining orders from the Army, and the

29. AA A5954, Box 478, File ‘Army Munitions Coordination Committee’, War Cabinet Minute No.535 of 24 September 1940 and Agendum 208/1940. Army and Munitions had equal membership of the Committee, with Army providing the Chairman.

time lag between our agreement to accept, ... up to the point of receiving them from the Army, is far too long'[30].

Whereas it can be said that such delays did not disrupt the whole munitions programme, they should not have occurred. Evidently the War Cabinet thought that the procedure needed further change, for in April 1941 it directed the Munitions Ministry to work at maximum capacity on munitions for which it was known that requirements existed or were planned, without waiting for quantities to be specified. The only restriction was that the Department had to adhere to the production priorities laid down by the Defence Committee. In instances where the Department took this initiative, the Service Departments were still required to place covering orders as quickly as they could[31].

Such measures seem to have resolved the problems over orders, until they arose again, towards the end of 1941. The cause was the approaching conclusion, in many areas of munitions production, of the production programme formulated in July 1940. The Services had not been forthcoming with new orders, or given any indication of what their requirements would be for the next 12 or 18 months. Yet, as Hartnett had learnt from senior Army officers, most munitions in production, were still needed. He went on to observe to Lewis that:

30. MHS 120, Director of OPD's Weekly Reports to the DGM, Report of 1 November 1940, see also Reports of 8 November 1940 and 15 November 1940. Two good examples were the delays in going into production for Barblock wire and Field Telephone wire, both of which were urgently required by the Army. Several weeks were lost because the Army was slow in placing orders after the capacity had been created.

31. AA A5954, Box 478, File 'Army and Munitions Coordination Committee', War Cabinet Minute No.996 of 29 April 1941.

'Such a method of working is very disturbing to industry and discounts the effectiveness of the munitions programme... If success is to attend our efforts, it is important that when production has commenced it should continue, rather than cease and recommence depending on the non-receipt or receipt of additional firm orders'[32].

Hartnett returned to this point a few days later:

'Attention is again directed to the increasing number of Projects completed or almost completed, for which further orders from the Army have not been forthcoming in time to ensure a continuity of production. As a direct result considerable capacity is progressively becoming idle, and this Directorate has not been able to indicate in answer to the many enquiries received, whether or not such capacity may be similarly employed in the future. ... the weakness in the system as a whole is again revealed'[33].

There were plenty of examples Hartnett could cite such as the 3" mortar project which had been producing at 250 per month, but would soon drop to only six, the machine gun carrier project whose production rate would also drop dramatically because the Army was late with new orders, and the imminent cessation of many lines of Army signal equipment by the PMG. In this case the failure to place new orders had resulted in many subcontractors completing their schedules of components, and then disassembling their production establishments to go onto completely different work. Delays of between three to 12 months were expected in the re-establishment of production for further orders[34]. Hartnett wanted a full schedule of Service requirements for the next 18 months, which would include the preferred rate of monthly production, and

32. AA MP956, S2, Box 11, Item 62, Hartnett to Lewis, 16 October 1941.

33. Weekly Reports of the Director of OPD, *op.cit.*, Report of 20 October 1941.

34. *ibid.*, Reports of 29 August 1941, 4 October 1941, 20 October 1941, 29 November 1941, 10 January 1942. AA MP956, S2, Box 11, Item 62, Hartnett to Lewis, 16 October 1941.

be followed up by regular reviews. He also wanted approval by finance authority for continuity of production in accordance with rates established without strict limitation to individual approved orders[35].

Hartnett's exasperation can be appreciated, as the Army had been shown to be incapable once more. It was its interest to ensure that orders were kept up to the Ministry of Munitions so that production would continue to flow and the chronic shortages in the equipment of the Home forces were made good[36]. Given that the Western Allies had cut off oil supplies to Japan in July 1941, it was known that the situation in the Pacific was getting more dangerous each week. Yet this had not stirred the development of a forecast of further requirements. The embarrassing nature of the Army's lack of interest in forecasting was eventually recognised by the Chief Military Adviser to the Ministry of Munitions Major General T.R. Williams, who was not an admirer of Hartnett[37] :

'It is obviously more economical and satisfactory to keep these firms in production if further orders are to be forthcoming. Similarly in connection with the obtaining of materials and components within the Commonwealth, such as for instance, steel, it is desirable that forward orders for as long a period as possible be placed by the Department. For instance,

35. AA MP956, S2, Box 11, Item 62, Hartnett to Lewis, 16 October 1941, 17 November 1941.

36. AA A816, File 3/301/152, Minister of the Army to Acting Prime Minister, 21 April 1941. '... I am most gravely concerned (particularly in the light of the recent developments of the war) in relation to our power: (a) to defend Australia, and (b) to supply and reinforce our military forces overseas.' Among other things, Spender then related that in Eastern Command, the most important in Australia, the Australian Military Forces had 20 to 95 per cent deficiencies. Principal deficiencies were in machine gun carriers, anti-tank guns, AA guns, Bren guns, 25 Pdr field guns and signal equipment.

37. See text further on in this Chapter.

if steel companies are to roll certain kinds of steel in November next, it is preferable that they roll the requirements for orders say for a period of 18 months, rather than for a period of six months.

The questions, therefore, are of economy on the one hand, certainty of delivery and continuity in manufacture, on the other. The Army Munitions Committee (sic) therefore agrees that it is highly desirable that the Department of Army submit to the abovementioned committee, a reliable schedule of requirements of the Ministry of Munitions for the period ending June 1943, and such schedule to be supported by firm orders as soon as practicable. Upon acceptance of the schedule, the Ministry of Munitions should then take action to provide for manufacture within the delivery period, and place orders for materials or components in short supply or which need to be imported from overseas'[38].

The CGS, Lieutenant General Sturdee, in a gesture which was all too familiar to the Ministry of Munitions, refused to hold the Army completely responsible for the critical situation in orders, although he did not dispute the need for action. Sturdee implied generally that Hartnett was exaggerating and did not heed the Army's pleas for more spare parts for the equipments already made[39]. Hartnett replied to Lewis that he could not get any orders for spare parts[40].

The new Minister of Munitions, N.Makin, took the issue to the War Cabinet[41] which decided that each Service was to formulate a schedule covering all its munitions for which orders had not been placed to the full extent of requirements on a mobilisation basis. The schedule was to state each items /p total requirements, the basis of the calculation, the quantity on order with

38. AA MP956, S2, Box 11, Item 62, Williams to Lewis, 15 October 1941.

39. *ibid.*, Sturdee to Lewis, 23 October 1941.

40. *ibid.*, Hartnett to Lewis, 17 November 1941.

41. AA A5954, Box 478, *op.cit.*, War Cabinet Agendum 358/1941 of 28 October 1941.

Munitions, or elsewhere, and what would be required from the Department ultimately in monthly rate of production. The schedules had to be submitted and reviewed quarterly by the War Cabinet[42]. The Production Executive also became interested, as it could see that the Department of Supply was having identical problems with Service Orders. The Executive decided that Service Departments would be required, when placing an order, to order requirements for at least 12 months[43]. When the War Cabinet in February 1942, gave Makin^{understandable} the power to continue production of munitions for which further requirements were anticipated[44], Hartnett had finally won his battle with the Armed Services on this point at least. Problems with orders declined significantly[45]. In April 1942 the Army and Munitions Co-ordination Committee was expanded to include the other Services and became the Services Munitions Co-ordinating Committee[46].

Another problem in relations with the Armed Services was that of priority. Priority was the level of importance in regard to machine tools, materials, and manpower given to a production project in comparison to all others. The assignment of priority began with an individual Armed Service. Thus, for ex-

42. *ibid.*, War Cabinet Minute No.1477 of 6 November 1941.

43. AA MP956, S2, Box 8, Item 38, Production Executive Agenda No.5/41 of 2 December 1941. Production Executive Decision of 8 December 1941. See also S.J.Butlin, *op.cit.*, p.467.

44. AA A5954, Box 478, *op.cit.*, War Cabinet Minute No.1904 of 18 February 1942.

45. AA MP730, S11, Box 6, The Army procedure was not entirely satisfactory as Lewis was still complaining to the MGO in December 1942 about erratic Army ordering and cancelling.

46. AA A5954, Box 478, *op.cit.*, War Cabinet Agendum 189/1942 of 2 April 1942, War Cabinet Decision 2086A.

ample, the Navy would decide which of the production projects concerned with its equipment were of first priority, and which were of second priority, and so on. This was of considerable assistance as a guide to the Ministry of Munitions after July 1940, because if there was a clash between two or more naval projects for the same set of machine tools, or something else, there was a means of deciding which project got assistance first.

Initially, each Service when setting its internal priorities, used the first priority category sparingly. Between June 1940 and February 1941 the Navy only placed three projects in first priority, the Army only four, and the Air Force three[47]. By May 1941, the Services had expanded the number of projects they placed individually in first priority; Navy now had four, Army seven, and Air Force six[48]. By June 1942, the Navy had 25 projects in first priority, Army 13, and Air Force eight[49]. First priority was now the biggest single category. The phenomenon of 'priority creep' has been noted for other countries in World War Two[50], and it is obvious that this is what was happening in Australia. The first priority category became overused, and consequently of declining value to the Ministry of Munitions in implementing internal priorities for individual

47. AA A5954, Box 478, War Cabinet Agenda 191/1940, Supplement No.1, 23 September 1940. A571 1941/880 War Cabinet Minute 813 on Agendum No.72/1941 of 17 February 1941. These projects were: Navy - 2 Pdr ammo, smoke floats, mines, Army - Bren guns, SAA, 2 Pdr AT gun, 3.7" AA gun ammo, Air Force - SAA, SAP bombs, pyrotechnics.

48. AA A5954, Box 478, File Priority of production of Naval Armament Stores, Defence Committee Minute No.45 of 6 May 1941.

49. AA A5954, Box 484, Munitions Digest, June 1942.

50. See B A Carroll *Design for Total War: Arms and Economics in the Third Reich*, Mouton, the Hague 1968 pp193-202.

Services. By 1943 a new category was invented, 'Absolute Priority', to sit over first priority[51]. By 1944, this new category had also expanded beyond the point of usefulness and had more production projects listed than any other category[52].

Part of the reason as to why the Services were pushing so many projects into the highest possible category of priority, was that early in 1941 competition began between the projects of one Service with those of another[53], because resources of all kinds were becoming scarce. The inter-Service priority problem was recognised implicitly by the Acting Prime Minister, Fadden, in May 1941:

'There is competition in the demands for manpower. There is great danger of attempting too much and not getting the best out of our total resources. We cannot meet unlimited enlistments and unlimited demands for munitions and war supplies'[54].

The Defence Committee determined inter-Service priorities[55], but was never able to take a strong lead because of inter-Service rivalry on the Committee itself. For example, in May 1941, it *suggested* that the Navy and the

51. AA A5954, Box 485-486, Munitions Digest 1943.

52. *ibid.*, Munitions Digest 1944.

53. *ibid.*, Box 478, File Priority of Production of Naval Armament Stores, War Cabinet Agendum 72/41. The point of this was that the Navy wanted its Mine and Depth Charge projects to have equal priority in the Ministry of Munitions to the Army's Bren gun. War Cabinet Minute 813 of 18 January 1941 ordered the Defence Committee to ensure coordination on laid down priorities in order that due balance existed between measures taken by the Services and the Munitions Ministry to fulfill their material needs.

54. AA MP730, S10, Box 2, War Cabinet Agendum No.63/1941, Supplement No.3 by Fadden 7 May 1941. Faddens statement was based on Supplement No.1 of 23 April 1941 which was the Pearce Committee Report on consolidation of the Munitions Programme.

55. Assisted after April 1941 by a subcommittee of the principal Armed Service supply officers and the Ministry of Munitions. AA A5954, Box 478, War Cabinet Minute 1006 of 30 April 1941.

Air Force might be first priority because they would engage the enemy first, and contrary to the Army, their munitions stocks were low[56]. The Army did not accept this, and generally, such problems remained unresolved. This meant that in effect the DGM decided inter-Service priority. His policy was to give equal priority whenever possible and this practice was able to be followed throughout 1940[57]. In the more difficult circumstances of 1941, individual Services sought to gain special priority by going direct to commercial contractors and placing orders on them for important munitions. This activity had gone on before 1941, partly as a carry over from the days before the Ministry of Munitions. When he became the DGM in June 1940, Lewis had declined to stop this activity although it was within his power as DGM to do so. Jensen wanted him to complain to the Prime Minister, but Lewis preferred not to force a dispute with the Armed Services at this time[58], and he perhaps foresaw that eventually shortages of resources would force the Services to conform and place their orders through the Ministry of Munitions.

The first serious clashes occurred in late 1940. Two Services would find that they had both made special contract arrangements with the same commercial organisation, probably because no other firm could take their orders. A battle then ensued over which Service's project would have priority over the other. The contractor would be caught in an impossible situation as first one Service, and then the other, would send officers to order him to concentrate on their

56. AA A5954, Box 478 File Priority of Production of Naval Armament Stores, Defence Committee Meeting of 23 April 1941, Minute No.51, Agendum No.48.

57. AA A571 File 41/4677, Lewis to Prime Minister, 17 September 1940.

58. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 11, Volume 11, pp.79-80.

projects[59]. The usual result was that neither project progressed. Where a contest of this nature occurred between two Services, one of which had placed its orders through the Ministry of Munitions, the latter would win because the DGM had the power to insist on his Departments orders receiving priority over all others. The Army had placed the overwhelming majority of its orders through the Department since July 1940, so it consistently won these contests with its rivals. By late December 1940, the Navy had decided that it would accept co-ordination of contracts by the Ministry of Munitions[60]. One of its reasons was that orders it had placed directly with industry for anti-submarine gear and other equipment, were proving difficult to manage properly, and the contractors concerned were proving to be slow in deliveries[61]. The Ministry of Munitions was expected to do a better job. The reason was that the Navy planned to claim equal priority with the Army for munitions, and it knew it could not do this while still having substantial direct contracts with commercial industry[62].

The situation with the Air Force was more complicated. In December 1940 the CAS, Burnett, complained to Lewis that Munitions Directorates were interfering with the progress of Air Force projects by insisting that contractors give

59. AA MP730, S9, Box 2, Minute of Army Munitions Coordinating Committee 4 November 1940. Service representatives were quite capable of doing this even when all orders had gone through the Ministry of Munitions.

60. AA A816, File 3/301/152, Conference between Navy and Munitions Ministry , 16 December 1940.

61. See MHS 107 BAM, NSW, p.275.

62. In February 1941, the Navy claimed equal priority with Army, AA A816, File 3/301/152, War Cabinet Agenda 72/41 of 17 February 1941. This was approved in War Cabinet Minute 813 of 18 February 1941.

priority to their orders in place of those of Air Force. Lewis was able to show that in fact this had not happened, but he was quite entitled to take such action if he had wished[63]. Instead of drawing the conclusion the Navy reached, the Air Force continued to go its own way. Jensen observed:

‘... there seemed to be resistance to placing their orders for manufactured requirements through the Department of Munitions — the argument in their minds being that the goods needed were not “munitions”, and therefore could be ordered direct from contractors, particularly when they were labelled as being of “First Priority”’[64].

Throughout 1941 the competition for resources increased. Many authorities attempted to gain priority for their projects. These included the Armed Services, with the Air Force working largely outside of the BAMs and Directorates of the Ministry of Munitions. Such authorities included the Department of Aircraft Production, the Department of Supply, the Department of Commerce, State governments and other public bodies[65]. Lewis had the power in most of these situations to insist on priority for Ministry of Munitions projects, but the advent in June 1941 of the Department of Aircraft Production, created great confusion, because Lewis had no power to resolve clashes of priority with it[66]. This was resolved when Lewis was made Director General of Aircraft Production in late 1941[67].

63. J.K.Jensen, ‘Defence Production ...’, *op.cit.*, Chapter 11, Volume 11, pp.77–79. Lewis’s power was affirmed by National Security Regulations in April/May 1941, see Jensen, *ibid.*, p.86.

64. AA MP956, S2, Box 11, Item 62.

65. AA MP730, S10, Box 2.

66. AA MP730, S10, Box 2, War Cabinet Minute 1257 of 23 July 1941.

67. AA MP956, S2, Box 11, Item 61, Jensen stated that Lewis’s new appointment, which was held in conjunction with that of DGM, was to remove the chaos of more than one

The Air Force continued to create problems for Lewis. Realising that only the Munitions Ministry could find the new capacity required for 500 lb Semi Armour Piercing [SAP] bombs, the Air Force gave the project to OPD in July 1941. The procedure for orders as refined between the Army and Munitions, and confirmed by War Cabinet, was that the DGM had the power to proceed with the preparation of new production capacity without a formal order, but a firm order from the Service had to follow quickly. The Air Board refused saying that the Munitions Ministry had the responsibility of having production capacity available if and when it was wanted, and that there was no obligation upon the Air Force to place orders until it saw fit[68]. This showed how unrealistic the Air Force was towards the Ministry of Munitions, as such action locked up contractors and resources without any result, until the Air Force deigned to place an order. It ignored all the development since July 1940, in ordering procedure and forecasting of demands. Lewis took the matter to War Cabinet, which summarily told the Air Force in October 1941 to conform to the established practice[69].

The Air Force continued to insist on placing the bulk of its munitions orders with commercial industry, directly. However, in April 1942 they complained to Lewis that the manufacturer of their radio masts could no longer get materials despite enjoying absolute priority from the Air Force. Lewis probably took great satisfaction in replying that no priority at all could be given because the orders

authority being allowed to impose production priorities for materials and machine tools, manpower, etc.

68. *ibid.*

69. *ibid.*, War Cabinet Minute 1425 of 22 October 1941.

had not gone through the Ministry of Munitions[70]. Competition for priority in resources had become intense. Many authorities were still attempting to place orders directly with commercial industry and gained priority for themselves by making special representations to the firm concerned[71]. Perhaps because it had more orders in this situation, the Air Force became more desperate than the other two services. An RAAF officer threatened to commandeer a prominent engineering works unless it gave the Air Force priority over everyone else, including orders placed through the Munitions Ministry [72]. Lewis was able to quash this threat, and re-impose the normal priorities as determined by his Department. He observed, largely for the benefit of the Air Force:

‘... if the Services required the help of Munitions in sponsoring any orders, the only way they could obtain that help is to place the order through the Department of Munitions, and by so doing they would doubtless obtain a better delivery than by placing the order direct on the contractor, and then when the delivery position became difficult, appealing to Munitions for assistance’[73].

The Air Force gave in, and the Ministry of Munitions took over the contracts for radio equipment in June 1942. This was probably the main reason for the creation of the new Directorate of Radio and Signal Supplies. By October Lewis had gained the absolute power to stop the Services placing direct orders on commercial industry which competed directly with those placed by the Munitions Ministry[74]. By early 1943, OPD had a good working relationship with the

70. AA MP956, S2, Box 8, Item 40, p.59.

71. AA MP730, S11, Box 1, Secretary of the BAM for Victoria, T.N.Hannelly to Lewis, 25 May 1942.

72. *ibid.*

73. AA MP956, S2, Box 11, Item 62, Lewis at the Directors Meeting of 2 June 1942.

74. AA MP730, S11, Box 1, Directors Meeting with Lewis, 5 October 1942.

Air Force[75].

The Problems of Design

Continuity of orders was not the only area where co-ordination was poor between the Army and the Ministry of Munitions. Early in August 1940, Hartnett became worried that too much time was being wasted while the Army finished its designs of Munitions, translated them into orders and then placed them with the Department. Hartnett argued that OPD had to know what the Army was designing well before the issue of an order, as it might be based on a design which was impossible to implement by Australian industry. Developmental design and manufacturing design had to proceed concurrently, and not follow each other as in peacetime[76].

Hartnett gained the support of Lewis, and the matter was discussed at the major conference of 27 August 1940 which was called by the Prime Minister to examine problems in Service orders[77]. The result was that Government decided to create the position of Chief Military Adviser (CMA) to the Director

75. MHS 120, Director of OPDs Weekly Reports to the DGM, Report of 26 February 1943.

76. See Annex I for Hartnett's definition of responsibility for Design.

77. AA MP730, S9, Box 2, Minutes of Conference, 27 August 1940. 'The Munitions representatives emphasised the importance of the Department of Munitions being in contact with the Army during the formulation of proposals, instead of having to await a firm order before being brought into the matter. This is necessary in order to determine whether the Army's requirements can be produced in Australia to the design required, or whether without prejudice to the efficacy of the weapons, variations necessitated by local production considerations might have to be introduced. This method was considered the only way to ensure the earliest possible start on production planning'. The munitions representatives were Lewis, Hartnett, Brodribb and Brigden.

General of Munitions, so that close contact and co-operation in design could be encouraged between the Army and the Ministry of Munitions. Major General T.R. Williams was appointed, and held the responsibility for the Army for technical specifications, design, trials and experiments, supervision of the Inspection Branch, and to act as adviser and consultant to the Ministry of Munitions in Army matters generally. These functions had been split off from the Army MGO Branch[78].

The Army was slow in implementing this plan, and the relations between OPD and Army Design had deteriorated further before Williams arrived in January 1941. The issue was Army Design section's refusal to fully integrate their activities with the Directorates of the Ministry of Munitions, particularly OPD. Projects like the Machine gun carrier were held up or thrown into confusion while the Army Design section changed designs without reference to OPD. This prompted Hartnett to observe to Lewis in November 1940:

'I wish to stress the importance of production engineering accompanying design engineering so that the two can run concurrently and the time span from design to actual production be shortened to a minimum. In other words, organisation and procedure should be such that basically design, manufacturing design, production engineering, jigs, tools, fixtures and gauges, plant layout and equipment should all run concurrently, even

78. AA A5954, Box 476, Press Release by Minister for Army, 17 December 1940. The MGO Branches new functions were limited to those of demand, storage, receipt, issue, accountancy and maintenance of munitions and stores. The CMA's Branch was created to take over technical specifications, design, trials and experiments, inspection. The MGO was to be responsible for all demands on the Ministry of Munitions and in caring for all material once it was handed over to the Army. The CMA was responsible for specification, design and inspection of future requirements of equipment. He was also the head of the Army technical staff within the Ministry of Munitions and the chief representative of the Military Board as regards progress and development of munitions production.

if there is some wastefulness in modifications, resulting from final trials of pilot models.

It appears that we will have the same kind of situation arising with a number of items yet to be released, such as mechanical cable layers, certain generating sets and, eventually, tanks'[79].

Hartnett expanded these thoughts in relation to the machine gun carrier and the tank one week later:

'The matter is a rather technical one: on the one hand, the Army is insisting that they are responsible for design, and, on the other hand, we insist that aspects of design dramatically affect the ability to produce in quantity or otherwise...

Peacetime procedure compared to wartime must differ because of the time factor involved.

Whereas it may be practicable, when time is of no great importance to create a design, make a prototype, layout the tools and start production — one phase following after the other, in wartime, when the shortening of the time factor is so essential, these phases of the work and others should run concurrently.

This means that Army Design Section and the Engineering and Production Sections of this Directorate must be brought together, or nearly fused, as one body'[80].

This last sentence gave the clue to which way Hartnetts mind was now beginning to turn. He felt that Army Design would function more efficiently under the control of the Ministry of Munitions [81]. In March 1941 Hartnett

79. Weekly Reports of the Director of OPD, *op.cit.*, Report of 1 November 1940.

80. *ibid.*, Report of 8 November 1940.

81. AA MP730, S9, Box 2, Hartnett to Lewis, 24 December 1940. He objected to the CMA having control over design, experiments, trials and technical specifications. 'I feel that the Army is consistently wrong in its expressions concerning design'. 'Design has become a compromise between British specifications, Australian Army requirements, and what is eventually able to be made from facilities and materials within Australia.'

objected to the Chief Military Adviser being responsible for basic design and performance specification, detailed technical specification and design, and final specification and design, as well as refereeing trials, experiments and inspection. Hartnett wanted Williams to tell the Ministry of Munitions what the Army required in broad basic principle, and leave it to OPD to interpret in terms of manufacturing design for local industry:

'I cannot possibly subscribe to the CMA being responsible for all detailed specification and design, in terms of having them executed in conjunction with industry when he has, in the final analysis, the approval or rejection of the finished job'[82].

The issues were pinpointed by the Services Liaison Officer to the Ministry of Munitions, Major R. A. Briggs. He thought that the Services should be responsible for laying down all the functions and other requirements for an equipment, but all design should be left to the Ministry of Munitions because the details had such a tremendous influence on the ease of production and its cost. Service involvement in design only complicated the difficulties of the Ministry of Munitions in trying to meet the Service requirements[83].

Apart from the logic of his argument, Hartnett deserved to be taken seriously because of his experience. He had been trained by the armament firm of Vickers-Armstrong, and had become a senior manager of the largest company in the world, General Motors. He had more experience in the problems of

82. AA MP392 S36 Bundle17 File241/21/3, Hartnett to Brodribb 5 March 1941. Brodribb replied 8 March 1941 that Hartnett's view was not possible to implement as Lewis and the Army had already agreed to the CMA's powers on 20 February 1941.

83. MHS 66 Major R A Briggs May 1946, October 1946.

developmental and manufacturing designs for mass production than probably anyone else in Australia. For years he had run GMH which introduced annually hundreds of design modifications to many different models of cars and trucks. These had been developed rapidly into viable manufacturing designs and then mass produced. The whole complex process had been carried out under the most exacting time constraints and deadlines to meet each years change of style[84]. The Army had no one who could approach Hartnett's broad and detailed experience[85], and treated him not as an ally in solving the problem of early supply of efficient munitions, but as a competitor for its traditional control over design. Thus for example, Hartnett's requests for different types of information from London were seen by the Military Liaison Officer there as:

'...raising questions which did not concern the Production branches at all. You will be interested to hear that some of his enquires ran like this:-

- (a) Which Military Branch at the War Office originates a request for a new type of equipment?
- (b) Describe the method adopted in proving 2-pr and 25-pr Gun?
- (c) What Military factors govern the requirements of speed of carriers and Tanks?

You will see that these can have no bearing at all upon his particular activities...it is fairly obvious that he is trying to steal other people's thunder. We have been absolutely firm and have taken from his letters only those parts which concern manufacturing processes and replied to those;...' [86].

84. L J Hartnett, *Big Wheels and Little Wheels*, *op.cit.* pp73-4.

85. MHS 66 Major R A Briggs *op.cit.*, and MHS 67 J H Poulton to J K Jensen 18 October 1945. The Army had no engineering staff with significant experience in production planning and manufacturing design.

86. AA MP159 Bundle10 File78/1/3, Colonel J K Coffey to Lieutenant Colonel H S Nurse 12 February 1941. Earlier Coffey had written to the CMA on Hartnett's letters: 'Hartnett's letters asked many questions concerning purely manufacturing information and these were quite straightforward. However, the bulk of them were concerned with matters of relations between the Army and Munitions, advice as to the types of equip-

The new CMA, approved this approach[87], and decided to launch a personal attack on Hartnett. Williams wrote to Lewis that Hartnett ignored the correct routine in relation to the Army, rushed firms into production without notifying Lewis, placed orders without first notifying the Inspector General of Munitions, Colonel Gipps, would not inform the Inspector General of Munitions of changes in specifications, and had not instituted manufacturing checks on production at the local level[88]. Williams first charge was probably correct, but many businessmen who had joined the Ministry of Munitions tended to think that Army routine contributed to many important delays[89]. The second charge was easily answered by stating that this was one of the reasons why Hartnett was employed. The next two charges related to a dispute which had been running with the Inspection Branch for some months. In November 1940 Hartnett had complained to Lewis that Army Inspectors were causing chaos in production programmes as they were changing specifications and contracts without informing OPD or the BAMs[90]. Prior to the establishment of the

ment found most suitable, details of design, inspection and proof; all of which appeared to us to be matters not for a production branch but for the design branch under the MGO or the Chief Inspector . . . [Colonel] Geyton and I came to the conclusion that an impression might be gained that there was some embarrassment here between Geyton and myself. Nothing could be further from the case; we are as thick as thieves and work out these plots together Geyton, although representing Munitions, still remains a soldier and naturally, as I do, always feels a bit embarrassed when asked to send information regarding the Army's activities to a branch not properly concerned with them.' Coffey to Williams 24 January 1941.

87. AA MP159 Bundle10 File78/1/3, Coffey to Williams. Coffey writes that he is glad Williams agrees with his approach on Hartnett, and notes that Hartnett is getting increasingly difficult, writing sometimes direct to the High Commissioner and others.

88. AA MP159 File23/1/18, Williams to Lewis 27 March 1941.

89. For example the problem over orders already cited.

90. AA MP730, S11, Box 1, Item 3, Hartnett to Lewis, 20 November 1940.

no
punct

Ministry of Munitions, the Inspection Branch in relation to any order with commercial industry, could reject or change any procedure of a manufacturer. OPD and the BAMs now had the responsibility for managing contracts, but the Inspection Branch was carrying on as though they did not exist. Thus the Inspection Branch was claiming, in Williams charges against Hartnett, a responsibility it no longer held. No doubt it would have made final inspection of products easier if OPD had informed the Inspection Branch of changes in manufacturing specifications, but Hartnett was unaware that there was any problem in this area:

‘... the Inspector General of Munitions has not to my knowledge entered my office over the past six months at least, and the CMA has not previously raised the question now under review’[91].

Williams’s last charge was so generalised that it was almost meaningless. Lewis managed to assuage the dispute at a meeting with Williams and Hartnett on 22 May 1941[92].

The meeting did little to change the Army’s attitude or procedure on design. But the problem was being recognised in its different facets by other organs of government. In March 1941 the Minister of the Army, Percy Spender, was becoming uneasy as this Chapter will show, at the slowness with which design was being finalized for submachine guns. AFV design was also in a constant state of flux, particularly in regard to the Australian cruiser tank. The situation was no better in July 1941, and the Prime Minister transferred the function of developmental design of AFV to Hartnett’s OPD, so that design

91. AA MP730, S11, Box 2, Item 3, Hartnett to Lewis, 22 May 1941.

92. AA MP159 Box3 File23/1/18.

could be stabilised to the extent of allowing the production of some tanks for the defence of Australia (see this chapter).

The Treasury was less interested in the instability of design but was concerned with the standard of design and specification by the Services. The Treasury Liaison Officer to the Defence Department, Dunk, complained in February 1941 of the unduly high specifications and unnecessary polish and trimmings insisted on by the Services[93]. The same issue was raised by the Pearce Committee in its report of April 1941 on the consolidation of the munitions programme[94]. Lewis himself mentioned the problem in the Advisory War Council in May 1941[95]. Among other things Lewis wanted the simplification of specifications by the elimination of non essentials and all unnecessary finish and embellishment. He thought that when such specifications and designs had been decided, they should be adhered to unless the alteration was one which definitely was essential to the efficiency of the equipment.

Of course, an unduly high specification for a munition not only increased its cost, but increased the inspection standard which would be applied, and made it more difficult for a manufacturer to produce an acceptable product. This increased the probability of rejections, adding to the eventual cost of the munition's manufacture. As the Military Liaison Officer to the Ministry of Munitions observed:

93. AA A571, 1941/795, Part 1, Dunk to Nixon, 18 February 1941.

94. AA MP730, S10, Box 2, War Cabinet Agenda No.63/1941, Supplement No.1 of 23 April 1941.

95. AA A5954, Box 478, File Advisory War Council, Munitions Programme, Minutes of Advisory War Council Meeting 1 May 1941.

‘The cost of “Service Inspection” to the nation is...beyond calculation. Suffice it is to say that hoards of perfectly good serviceable stores and munitions of all descriptions have been rejected and scrapped — not because they could not stand up to the task required of them, frequently that aspect was not given a moments consideration, but just because in some items of specification, they did not reach an arbitrary standard or dimensions laid down by inexperienced [Service] designers’[96].

In previous years, the Inspection Branch of the Army had sufficient professional training and experience to have altered the more absurd aspects of specifications itself. These were the days before 1939 when the branch was under the control of Leighton and the MSB. But the huge wartime expansion of the Inspection Branch had led to an infusion of inexperienced and poorly trained personnel, who naturally enough, did not feel confident to challenge or modify specifications on the behalf of manufacturers. Instead specifications were enforced to the letter, in the interests of the Army and other Services[97]. This made the situation worse. The MGO Branch admitted after the war that it was not until late 1943 that an adequate and competent staff of inspectors and examiners could be trained[98].

96. MHS 66 Major R A Briggs May, October 1946.

97. AWM 74 Box3 Bundle1 File ‘Mobilising Industry for War’, Director of Artillery (1942) Colonel John O’Brien to D P Mellor 27 March 1955.

98. AWM, Printed Records File 55/3/3, ‘Branch of the Master General of the Ordnance: History and Activities During the War 1939–45.’ p144. The Military Liaison Officer to the Ministry of Munitions, in a view reminiscent of Leighton, thought that: ‘Rejection by Service Inspection after manufacture amounts in principle to destructive criticism, whereas inspection carried out by [a] Supply Ministry is constructive.’ MHS 66 Briggs May, October 1946. In other words, Inspection placed within the Ministry of Munitions would have been more inclined not to punish manufacturers for failing to reach high standards of specification, but rather to question the need for high standards of specification — forcing the Services to justify their decisions more carefully.

Until that time, complaints over design and specifications continued to appear. In January 1942 Jensen wrote to Shedden saying that the Minister for Munitions, Makin had complained that the finish on equipment, especially guns, as demanded by the Services, was too good. Canadian and British practice resulted in rougher finish with no decline in performance and the saving of many man hours of machining[99]. The Defence Committee replied that:

‘...the standard of finish demanded for war equipment was a matter for the Services Inspection Departments which were responsible for ensuring that equipment manufactured in Australia for the Services is in accordance with specifications, but that...the policy had been not to require any standard of finish above what is functionally necessary. The result of this policy was that there had been a progressive decline in the degree of finish demanded...’[100].

The truth was that this decline was not as fast as for Britain and Canada. Lewis was still complaining to the Army in July 1943. He pointed out that British Inspection had granted many concessions on munitions, particularly in regard to guns, which had not been introduced in Australia. This had led to more complicated and expensive production methods being employed than necessary and involved the 2Pdr ATgun, 25Pdr Field gun, 3.7" AA gun, and the 17Pdr ATgun projects[101]. Lewis could have added many more projects includ-

99. AA CRS A816 File3/301/187, Jensen to Secretary of Defence 14 January 1942.

100. *ibid*, Defence Committee Minute No14/1942 of 22 January 1942. The CMA, Williams, thought that: ‘Even though there may be a minority [of manufacturers] not favourable to Inspection, I am convinced...that the majority look to the Army Inspection Branch for assistance and guidance.’ AA MP956 S2 Box11 item62, Williams to the Secretary of Army 20 February 1942.

101. AA MP730 S11 Box1, Lewis to the MGO 12 July 1943. The worst example was the auto frettaging of the 17pdr AT gun barrel which the British had dropped but Australia continued to use.

ing search lights, engineer stores, the 4.2" mortar, and gun ammunition[102]; but the areas of greatest controversy were submachine guns, and AFV's.

The Design of Submachine Guns

The difficulties caused by the Army in matters of design are highlighted by the example of Submachine guns [SMG]. Of all the munitions made in Australia during the Second World War, the Owen SMG was the only munition designed and developed wholly in Australia; and it turned out to be the best SMG in the Western Allies arsenal of armaments. However, the weapon would never have emerged if it had been left in the hands of the Army MGO Branch and the Chief Military Advisers Branch*.

Evelyn Owen twice presented his prototype SMG to the Australian Army before the Second World War[103]. The rejection of his invention was based on the factors described at the beginning of Chapter 2. Australian Armed Services maintained uniformity of armaments with Britain, and Britain had not outlined any requirements for an SMG[104]. The British attitude changed after the dis-

102. See MHS 107 History of the Board of Area Management NSW, MHS 120 Weekly Reports of the Director of OPD to the DGM, MHS 112 Weekly Reports of the Director of AFVP to the DGM; and AA CRS A816 File3/301/187 Defence Committee Minute No14/1942 of 22 January 1942 which noted that the British Supply Mission to Australia had stated in February 1941 that: '...the finish [on gun ammunition] being obtained at the present moment is considerably better than that insisted on by the authorities in Great Britain, and we would suggest that, in order to assist production, consideration should be given to the possibility of some relaxation in this matter.'

* I am indebted to Dr Ron Haycock for many ideas and useful sources on the SMG controversy.

103. It was first presented in 1936 and then in July 1939.

104. The Official Historian D.P.Mellor says the Australian Army regarded SMGs as unimportant or as weapons for gangsters. Only the German Army was developing a

aster of Dunkirk and large orders were placed in May-June 1940 for the US made Thompson SMG. Predictably the MGO Branch of the Australian Army followed suit. The Thompson involved complicated machining during production, consequently, it was expensive to purchase costing £40 to £50. It was not surprising that Britain in late 1940 began to design its own cheap and simple SMG so that British reserves of US currency could be saved, and early delivery could be achieved of the very large numbers of SMGs required. The Sten gun went into production in June 1941. The Australian MGO Branch decided to wait for the Sten gun before establishing SMG production in Australia. If the Sten gun proved satisfactory, and the MGO Branch was confident it would be, production of the Sten gun in Australia would begin.

In August 1940, the CGS, General Brudenell White, had realised that there was growing public criticism in the way the Army was responding to the wave of patriotically inspired war-inventions. By September a new inventions organisation had been created called the Central Inventions Board[105]. It included representatives of all three Services, and had a small full time secretariat to support its activities. Its creation increased the opportunities to re-examine

requirement. See *The Role of Science and Industry*, Canberra, AWM 1958, p.326, see also AWM 74, Box 5, Bundle 1, Colonel J.Coffey to Mellor, 9 June 1955. Before 1939 the Army had relied entirely on Britain for small arms designs, and had few officers technically trained in weapons design.

105. Before 1940 the Army was the only Service with an organisation to deal with inventions by the public. This was the Army Inventions Board and it was staffed by officers who also had more important duties elsewhere in the Army. Inventions referred to the Navy or Air force were referred to the Admiralty and Air Ministry in London. AA CRS A816, File 12/301/40, Brudenell White to Defence Committee 9 August 1940, Defence Committee Minute No.73/1940 of 20 August 1940. See D.P.Mellor, *op.cit.*, pp.640-641.

Owen's invention. The person responsible for resurrecting the invention was Mr V.A.Wardell, Manager of Lysaght's Port Kembla Steel Works. He lived next door to Owen in Wollongong and drew the attention of his old friend Essington Lewis to the potential of the weapon. Lewis who had recently been appointed to the position of Director General of Munitions, arranged for the matter to be examined by the Central Inventions Board in September 1940.

The Central Inventions Board ordered development of Owen's SMG to begin immediately and referred the matter to the ordnance officers of the MGO Branch[106]. As the History of the MGO Branch has related, the Branch was poorly prepared for the onset of war, and its fully trained personnel were by late 1940 becoming lost beneath the avalanche of new work[107]. The extra responsibilities which had to be picked up from the Central Inventions Board were unwelcome. The Branch condemned the Owen SMG as being too costly and complained that it would take at least six months to make a working model. The Secretary of the Central Inventions Board, Captain Dyer, did not accept this, and in December 1940 encouraged Wardell to develop the SMG. Wardell placed Owen with the Chief Engineer of Lysaghts Port Kembla works. This was V.A.Wardell's brother, Mr G.S.Wardell, who had been a captain in 7th Battalion CMF (Vickers and Lewis machine guns) until 1931. Together he and Owen set out to create a well designed SMG which was also easy to manufacture.

Within four weeks the first test model, in 0.32" calibre, was produced[108].

106. AA MP508, S1, File 177/701/1948.

107. History of the MGO Branch *op.cit.*

108. MHS99, V.A.Wardell to Lewis 29 January 1941. The SMG had proved to be easy

When it was taken to Melbourne in February, no progress was made with the MGO Branch which had recently received news of the development of the British Sten gun. The Branch was unwilling to commit itself until it knew more from Britain. It was unimpressed when V.A.Wardell produced another Owen gun in 0.45" calibre in March 1941. Although this was the same calibre as the Thompson SMG which the MGO Branch had ordered from the US, it felt no obligation to test the new Owen gun[109].

However, events were bypassing the MGO Branch. The value of the Owen gun began to be appreciated in political circles in early 1941. Australia had shipped many thousands of rifles to Britain, and by February 1941 had denuded herself of stocks[110]. Although production capacity at SAF was being increased greatly, the precision engineering in a rifles production did not allow any results for many months. The Minister of the Army, Percy Spender, was looking for an alternative which he thought he had found with SMGs, which generally were easier to mass produce than rifles. Most of the industrial techniques were in common use by commercial industry. In March he found out about the existence of the Owen gun. He had not been informed by the Army that the Owen gun represented an alternative to awaiting the costly Thompson SMG, or the Sten gun from Britain[111]. Spender invited V.A.Wardell and Owen to

to manufacture, and worked well when test fired. The 0.32" calibre was chosen because Wardell could get this ammunition privately.

109. AWM 54, File 385/9/2, 'Owen Gun: Notes on Development', by V.A.Wardell, July 1942, p.2.

110. AA CRS A2671, War Cabinet Agendum 88/1941, Minute No.868 of 27 February 1941. A deficiency of 80,000 rifles was identified.

111. MHS99, V.A.Wardell to Lewis 31 March 1941. Wardell had met Spender at Newcastle and at Spender's request gave him some notes on the Owen gun. 'Spender is quite

attend War Cabinet on 9 April 1941 to explain the invention. Subsequently Spender advised the full War Cabinet to place an order with Lysaghts for 100 experimental Owen guns. He stated that:

'In view of the present position of our munitions programmes and the relative shortage of rifle equipment I have conferred with the Chief of the General Staff and now recommend that an experimental order ... be placed for immediate manufacture ...

Only the unorthodox action of this description can we hope to achieve results in the shortest possible time'[112].

War Cabinet agreed completely with Spender and added:

'... while agreeing that the procedure ... was an unorthodox one, War Cabinet emphasised that the order for these guns should be placed without delay'[113].

What the War Cabinet had done was to infringe the hitherto sacrosanct principle that the Army alone should decide what weapons it should have. Spender and the War Cabinet clearly did not believe that the MGO Branch was responding appropriately to what was a growing small arms emergency in Australia. The MGO Branch saw the issues in terms of Wardell exercising political influence to foist his product on the Army before it had the opportunity to evaluate the British Sten gun. The Branch seems to have decided to employ whatever stratagem it could to delay the progress of the Owen gun until the

definite that a gun of this kind is required urgently'. Wardell's case was that there was little point in waiting for other SMGs because the Owen was already an efficient weapon, which could be made easily in large numbers in a few months. Lewis was pleased with progress, Lewis to Wardell 2 April 1941.

112. MHS99, V.A.Wardell to Lewis 10 April 1941. AA CRS A2671, War Cabinet Agendum 132/1941 of 18 April 1941. AA CRS A5954, Box 497, File 'Production of Owen SMG', War Cabinet Agendum 132/1941, Supplement No.1 of 24 April 1941.

113. AA CRS A2671, War Cabinet Minute 965 of 24 April 1941.

Sten gun appeared finally.

The War Cabinet decision had left the choice of calibre for the 100 Owen guns to the CGS. Having been forced by the War Cabinet to take the Owen gun seriously, the MGO insisted when meeting Wardell in April that all experimental guns should be made in 0.38" calibre. There were several things wrong with this choice. Firstly, SMGs needed thousands of rounds of ammunition in order to be tested properly. The Army had virtually no 0.38" ammunition available, which meant that no new Owen gun could be tested[114]. A better choice would have been 0.45" as the Army was receiving such ammunition with its Thompson SMGs[115]. Failing this, the choice of 0.455" could have been made for test purposes, as the Army held stocks in excess of 500,000 rounds[116]. Secondly, 0.38" ammunition was rimmed, and so produced very serious design problems for the magazine of the SMG because of cartridge rims needing to interleave properly. No SMG anywhere else in the world attempted to use rimmed ammunition. Thirdly, 0.38" ammunition was revolver ammunition and consequently was too underpowered to give good penetration for a SMG and to operate an SMG properly. Captain Dyer told the MGO, Major General Milford, during his meeting with Wardell in April 1941, that 9 mm ammunition was the best as Milford himself knew because it was the ammunition used by the British

114. 0.38" pistol ammunition was not being produced by the Ministry of Munitions, and it was not to be produced until many months into the future — see DGM Reports to War Cabinet.

115. However, the MGO Branch already knew that Lysaghts could manufacture good 0.45" calibre Owen guns because G.S. Wardell had built a successful model in March 1941.

116. See Munitions Digest December 1940. This ammunition was being made by the Ministry of Munitions.

Sten gun[117].

Having set Lysaghts what seemed an insuperable set of engineering problems, the MGO Branch was no doubt surprised when two months later Owen and G.S.Wardell had developed a practical version of a 0.38" calibre Owen gun. Many difficulties had been surmounted despite the complete lack of assistance from the MGO Branch and the Chief Military Advisers Branch, which were the two areas of the Army most involved with the specification and design of new weapons[118]. The Army felt no special responsibility for the Owen project even though it had received War Cabinet endorsement. On 4 August 1941 the Army informed Lysaghts of what Wardell had begun to suspect, that the 0.38" ammunition velocity was too low, and that all of the developmental work had been in vain[119]. But the 0.38" calibre remained in force for the 100 experimental Owen guns order.

117. AWM 54, File 385/9/2, 'Owen Gun ...', *op.cit.*, p.13. This was common knowledge in the top levels of the Army. Essington Lewis had found this out for himself from Colonel Gipps the Chief Inspector of Munitions, MHS99, Wardell to Lewis 2 April 1941, Gipps to Lewis 8 April 1941.

118. MHS99, V.A.Wardell to Lewis 31 July 1941, Wardell to Major Roberts (Chief Inspector Small Arms) 11 August 1941, Wardell to Lewis 15 August 1941, Wardell to Spender 22 September 1941. Wardell claimed to Lewis that Milford had said the previous March that no SMG had ever been made to shoot satisfactorily with rimmed cartridges. The correspondence between Wardell and Lewis, and Wardell and Roberts gives a strong impression that the MGO Branch was attempting to add to Lysaghts difficulties in any way it could. This extended to the placement of the War Cabinet April order for 100 Owen guns. Lysaghts finally received it from the Army late in June 1941. AA CRS A2671, Agendum 132/1941, Jensen to Shedden 4 July 1941. Lewis saw these problems in May 1941 and ordered the NSW BAM to liaise with Lysaghts unofficially, to see what could be done; Lewis to BAM 27 May 1941.

119. AWM 54, File 385/9/2, 'Owen Gun ...', *op.cit.*, p.17.

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V.A.Wardell decided to ignore this, and with Spender's approval, G.S.Wardell and Owen reverted to the 0.45" calibre, and also made a 9 mm calibre Owen[120]. These were ready for the SMG trials ordered by Spender for 29 September 1941. Also included were the Thompson, and the Sten gun which the Army had had for two months[121]. The Sten gun proved to be poorly engineered and broke down after a short time. The Thompson performed well except that it demonstrated its well known propensity to jam after being placed in mud or sand. The Owen performed all tests with no difficulty showing itself to be an accurate, well designed, and extremely reliable weapon in all conditions[122]. These results were reported widely in the Press generating a considerable groundswell of public interest and support for the 'Australian' SMG[123]. Spender was ^{publicly} quoted as having ordered the Army to place immediately an order on Lysaghts for Owen guns. In placing this matter under public scrutiny, Spender was creating an environment which made it difficult for the MGO Branch to continue with its attitude towards the Owen. Further

120. *ibid.*, pp.17-18. MHS99, Wardell to Roberts 19 September 1941.

121. AA MP508, File 17/715/67, Spender to Sinclair 28 August 1941. When Wardell had asked to see the Sten in July, so that he could adjust the Owen to be more in conformity to British design practice, Milford had denied its existence in Australia. MHS99, Wardell to Lewis 31 July 1941. Spender had to ask the Secretary of the Army Department (Sinclair) to confirm the Sten guns presence before he was told officially by the Army of its arrival. AA MP508, File 17/715/32, Spender to Sinclair 28 August 1941.

122. AA MP508, S1, File 177/701/1948, 'Report on Tests — SMGs', by Chief Military Tester, Major P.F.Dawson 29 September 1941. MHS99, Wardell to Lewis 15 October 1941. See MP508, File 17/715/67 Major H.V.Howe to Spender 30 September 1941, and report of the NSW BAM, Donaldson to Chairman 4 October 1941.

123. AA CRS A2671, War Cabinet Agendum 135/1941 clipping *Sydney Morning Herald* 29 September 1941, MHS99 clipping *Sydney Daily Mirror* 29 September 1941, Wardell told Lewis 30 September 1941 that the test results reported in the Melbourne press were more reliable.

trials which followed a few days later confirmed the results of the 29 September. Spender's support was continued by his successor, Forde, of the new Labor Party Government, who confirmed Spender's order for 2000 Owen guns[124].

The MGO Branch had realised in early September 1941, that the politicians and V.A.Wardell were driving it into a corner in regard to the issues of 0.38" rimmed cartridges and low velocity ammunition. The Branch began to prepare another approach which envisaged dropping the more overt forms of opposition to the Owen gun in favour of its acceptance, subject to adequate redesign to Army standards. The redesign cycle could be then extended indefinitely to give more time for the Sten gun Mark II to arrive from Britain, and to produce an inferior Owen gun. This strategy was begun on 17 September 1941 when Army representatives met officers from the OPD of the Ministry of Munitions, and handed over a list of demands for redesign of the Owen gun. The next day these were presented by OPD to V.A.Wardell, along with OPD's ideas on manufacturing design. The 56 criticisms amounted to a complete redesign[125].

Much of this criticism was shown to be invalid when the Owen gun passed the

124. AA MP508, S1, File 177/701/1948, Spender asked V.A.Wardell to keep him informed although he had lost office, Spender to Wardell 8 October 1941. AA MP508, File 17/715/67, Forde to Secretary of Army (undated). Forde was openly sceptical of the Army's estimates of under 10,000 SMGs. He calculated the Army needed 100,000, which the CGS confirmed in February 1942. See also Forde to Secretary of Army 29 October 1941. Forde said that he had the Prime Ministers authority for the immediate placement of Spender's order for 2000 Owen guns. The calibre specified by Spender was 9 mm — Spender to Secretary of the Army 3 October 1941. The MGO Branch ignored this subsequently.

125. MHS99, V.A.Wardell to Director of OPD (Hartnett) 2 October 1941.

SMG trials of 29 September 1941 much better than all its rivals[126]. However, the Army ignored the results and insisted on many points of redesign at a meeting with OPD and Lysaghts on 14 October 1941[127]. The order for 2000 Owen guns which the Army placed on 22 October 1941 stated that the calibre type of ammunition and other modifications were still to be defined[128]. This promised further months of delay before production could actually begin. The Wardell brothers were in no doubt there was no sound technical reason for the Army prevarication. They were supported by the Chairman of the NSW BAM, Sir Phillip Goldfinch, who questioned the need for any further design changes to the Owen gun. By implication, he objected to the way in which Hartnett and the OPD had allowed themselves to become associated with the Army's proposals[129].

126. MHS99, V.A.Wardell to Lewis 2 October 1941. However, Major General Milford told Wardell that the trials did not amount to much, and that the Owen gun would have to be sent overseas for combat evaluation before design and manufacturing details could be finalised. Wardell complained that the Army had not insisted on this when it acquired the Thompson SMG. The real point was that the procedure outlined by Milford was inappropriate for the extreme urgency Australia faced with the deteriorating situation in the Pacific. The Owen had proved itself sufficiently to be put into mass production in the circumstances, or so Lewis thought. Lewis to Wardell 2 October 1941. See also AA MP508, File 17/715/67, Major H.V.Howe to Spender 8 September 1941.

127. MHS99, Wardell to Hartnett (copy to Lewis) 16 October 1941.

128. MHS99, Wardell to Lewis 24 October 1941. Wardell complained that on 13 October he had received a letter from the Secretary of the Department of Army stating that the new calibre would be 9 mm; but on 24 October had received another letter stating that the production model had not been fixed in any way.

129. AA MP508, S1, File 177/701/1948, Goldfinch to Hartnett 31 October 1941. Goldfinch enclosed a technical report on the design changes which had been written by Mr L.A.Treglown. The design of the Owen gun was sufficiently advanced to have attracted great interest from Canada, Netherlands, East Indies and India, see External Affairs to Secretary of Department of Defence Co-ordination 24 October 1941 and other correspondence of same period.

Hartnett was in an invidious position. It was his responsibility to organise the creation of production for any Service equipment for which he knew there would be an important requirement. His experience of the last 18 months had shown that the Army was very slow in giving early warning of such requirements, and this was shown at the beginning of this Chapter. Hartnett's method of solving this problem was to pursue the responsible Army officers until they made known their requirements for particular pieces of equipment. Knowing the urgent need for SMGs, Hartnett set out to force the Army to define its needs in this area, on the assumption that the user Service was professionally competent to specify such requirements. When Hartnett met Army representatives on 23 October, they refused to specify their objections clearly enough to allow drawings to be sealed. There was every indication that the Army would insist on tests on all features of the Owen gun of indefinite length[130]. But by 10 November 1941, Hartnett's determination and persistence had seemingly forced the Army to specify its preferred design changes, and the new design had been sealed[131]. The Wardell brothers and Owen were horrified at what Hartnett sent them because the sealed design outlined an inherently inferior SMG to the Owen gun which already existed. In all probability this is what the Army had intended, and V.A.Wardell was charitable enough to inform Lewis

130. MHS99, Wardell to Lewis 24 October 1941, 27 October 1941. AA MP508, S1, File 177/701/1948, Chief Military Adviser (Major General Williams) to MGO (Milford) 8 November 1941. While pointing out that the Owen was a good gun, Williams insisted it needed many changes.

131. MHS99, Hartnett to Williams 10 November 1941. Hartnett gained agreement and sent a telegram to Lysaghts 10 November 1941, which said the drawings were being sealed. Forde was under the impression from the MGO that these were only minor design changes — they were not. AA MP508, File 17/715/67 Forde to Makin 6 November 1941.

that he felt the Army had forced the changes on OPD[132]. He was more direct to the Minister for the Army, F.M.Forde. Wardell charged that the Army and OPD did not have the technical knowledge to evaluate and change the Owen gun design[133]. This was nearer the possible truth. Hartnett relied on the Army for expert advice on SMG design. There was no one in the MGO Branch or the Chief Military Advisors Branch who was an expert on this area at this time[134]. Professional incompetence, and resentment over the Owen gun, had led the Army to take advantage of Hartnett and his efforts to clarify design.

The Army's attempts to redesign the Owen gun came to an abrupt end when Forde called a conference of all parties on 24 November 1941. Bluntly he told them that the Government would tolerate no more delays and no more obstructions. Production of an efficient gun had to begin:

'... quickly and in sufficient numbers. Delay will be paid for in Australian lives'.

Forde was satisfied that Australian set backs in Crete demonstrated the Army's urgent need for a SMG. He felt that the British Sten gun was much inferior to the Owen gun. The group had to meet until all differences were resolved[135].

132. MHS99, Wardell to Lewis 13 November 1941, Hartnett agreed with Wardell on this, Hartnett to Lewis 22 November 1941.

133. MHS99, Wardell to Forde 13 November 1941. Wardell gave a point by point evaluation of the OPD/Army design which supports his case well.

134. The experts on SMG design were Owen and G.S.Wardell. Their design was based on their own inventiveness and the principles laid down in the British *Text Book of Small Arms* 1929. Many of the Army's design changes to the Owen contravened the principles of this classical reference work on small arms design. See also AWM 74, Box 5, Bundle 1, Colonel J.Coffey to D.P.Mellor 9 June 1955 which supports this view.

135. MHS98, 'Conference Re: Owen Gun 24 November 1941', transcript.

The result was that the Lysaght design was approved in all its most important aspects. The question of calibre and ammunition was also settled. Under pressure from Lysaghts, Milford revealed that the Army's requirement for SMGs was 25,000 instead of 10,000, and that the Ministry of Munitions would need to create production capacity to manufacture 9 mm ammunition for the Owen gun. This came as a surprise to Brodribb, who complained of the very short warning the Department had received[136]. In fact the Army should have placed these requests no later than June 1941, for it knew by then that the British were placing great importance on SMGs and 9 mm ammunition in particular. The Wardells thought that the large numbers of SMGs the Army now required[137], could also have been anticipated by the MGO Branch months before November 1941. While it may have been true that the MGO Branch had proven its incompetence once more, it is also worth pointing out that the Branch probably recognised that the early statement of definite SMG requirements would have led to the early acceptance of the Owen to which it was opposed. The preferred Sten gun was not ready for manufacture in Australia, whereas the Owen gun could have come quickly into mass production and become the Army's SMG by default. Forde's action had now created this situation, for although the Sten gun had arrived in Australia some months before, it was so poorly engineered and developed, it could not be considered as a production rival to the Owen. The Army needed a production alternative to the Owen gun if it was to have any chance of stopping the gun's acceptance. It looked hopefully towards the

136. *ibid.*

137. In February 1942 the CGS signed a requirement for 100,000 SMGs. This was communicated to the Ministry of Munitions 10 March 1942, MHS99, Conference 10 March 1942.

arrival of the British Sten gun Mark II.

Despite Forde's orders on the behalf of the War Cabinet to bring the Owen to production, the Army found another way in which to impede progress. The new strategy was built around Priority rating, which was explained earlier in this chapter. The value of a high Priority rating was mainly in the distribution of machine tools. Forde had agreed that Lysaghts should establish production at 500 Owen guns per week, as soon as possible; but the despatch of machine tools to Lysaghts to accomplish this aim was thwarted by the Army placing the Owen project too far down its Priority list for any machine tools to be assigned by the Ministry of Munitions.

Wardell found this out in December 1941, and told Forde. When challenged, the Army pointed out that the Bren gun, Vickers and rifle projects based at SAF needed the same machine tools as the Owen gun, and they had to have higher priority[138]. The MGO, Major General Milford, told the Director of Machine Tools and Gauges (Colonel Thorpe) of the Ministry of Munitions, not to supply the Owen project with machine tools lest it impede the current Army small arms projects at SAF[139]. However, as Wardell found out in January and February 1942, the Army projects based on SAF had received all the machine tools they needed, and many desired by the Owen gun project were lying around disused in workshops throughout NSW[140]. There was therefore no reason why

138. AA MP730, S9, Box 2, Minutes of Army and Munitions Coordination Committee 30 December 1941.

139. AA MP729, S6, File 26/401/768, MGO to CGS 31 December 1941.

140. AA MP508, File 17/715/290, Wardell to Forde 18 February 1942. The Bren gun project for example was six months ahead of schedule. See 'The Munitions Digest 1945',

the Army could not have lifted the Owen gun project to the same level of priority as for example, the Bren gun.[141].

Wardell also discovered that Forde, in his desperation to get SMGs, had been persuaded to allow the production of the Sten gun Mark I. This was proceeding on the Army's assurance to Forde that there would be no clash between the Owen and Sten projects over industrial resources[142]. However, the news of the Sten project had reached Lysaghts subcontractors on the Owen gun, and many felt that this project would soon supplant the Owen gun which only had an order for 2000 guns. The MGO Branch had not bothered to increase this order despite outlining a requirement in excess of 20,000 SMGs in November 1941. The subcontractors knew that 2000 Owen guns were not worth tooling up for at the rate of 500 per week, and preferred to accept orders for the Sten gun which they were receiving in much greater numbers[143]. Wardell found that his subcontracting organisation was disintegrating around him.

Forde was justifiably exasperated with these latest revelations. Only a

pp.77-78.

141. In fact, the Owen gun was meant to have a No.1 priority rating, but this had not been communicated to Lysaghts or its subcontractors by the Army — nor it would appear had the information reached the Directorate of Machine Tools and Gauges. MHS99, Wardell to Lewis 18 February 1942. —

142. MHS99, Wardell to Lewis 18 February 1942.

143. *ibid.* Typical of most of Lysaghts subcontractors, British Tube Mills had received secret blueprints for a very large number of certain Sten gun components which were required urgently. Since these were required in larger numbers than firm Owen gun orders, British Tube Mills preferred to direct their efforts to the Sten gun, and told Lysaghts they could only supply a small fraction of the Owen components they had promised. They had been led to believe that the Army was no longer interested in the project.

few weeks before had he chaired a conference the object of which was to reform the Army's approach to evaluating inventions from the public[144]. He had stated that proposed changes had to end the constant and unnecessary embarrassment to the Government occasioned by unnecessary rebuffs to inventors. The ignoring, sidetracking or slow acceptance of potentially valuable ideas had to stop.

'The present public attitude is definitely critical even hostile. The Press is watchful, indeed petulant. Inventors are looking for grievances and they get space in the newspapers and that criticism creates a very bad atmosphere. Rightly or wrongly the history of relations between the Army and Inventors is regarded by the great part of the public as distinctly unfortunate. The government definitely require that an imaginative step forward be taken in dealing with the whole matter'[145].

Everyone present knew that the best example of what Forde was criticising was the Owen gun, which was gaining increased publicity in the Press over its tribulations[146]. The conference rejected the excuses and ideas put forward by Milford, and quickly decided that a new organisation should be formed, with its own funds and secretariat, responsible only to the Minister for the Army. The Army was relegated to an advisory role only[147]. Despite this

144. AA CRS A816, File 26/301/8, Transcript of Conference called by F.M. Forde 14 January 1942 at Victoria Barracks, Melbourne. Present were the Executive of the Central Inventions Board, the MGO (Milford), Hartnett, Brodribb, Sir David Rivett, Sir George Julius, F.R. Sinclair.

145. *ibid.* Forde to conference.

146. For example *Daily Telegraph* 5 November 1941. Army blamed for obstruction over Owen gun, Melbourne *Argus* 27 November 1941, *Daily Telegraph* 14 January 1942, delays in production of Owen gun.

147. AA CRS A816, File 26/301/8, Transcript of Conference 14 January 1941 *op.cit.* The government approved these suggestions creating the Inventions Directorate of the Army, and appointed Hartnett to be its Chairman in March 1942.

damning criticism and censure, Forde had now found at the end of February, that the MGO Branch was still creating those situations he had condemned at the conference. He appointed Mr Stuart Thorpe, Assistant Secretary of the Department of the Army, to act as his agent to investigate the latest delays to the illfated Owen gun.

Thorpe found that Wardell's latest charges were all true. In particular, machine tool hold ups had been created by the Army's pressure for production of the Sten gun[148], which had convinced the Director of Machine Tools and Gauges and his staff, and also staff of the NSW BAM that the Owen was unimportant[149]. Thorpe thought that incompetence and conspiracy had combined to prevent the timely despatch of machine tools to the Owen gun project[150]. This was a view with which the Chairman of the NSW BAM con-

148. Thorpe discovered that the CMA had told the Director of Machine Tools and Gauges in October 1941 and January 1942 that the Owen gun was not important.

149. Contrary to the belief of V.A. and G.S. Wardell, Hartnett was not behind this muddle. In his weekly reports on OPD projects for the DGM, he accurately informed Lewis that the Owen gun project was being held up because of lack of machine tools. OPD was not responsible for the location and distribution of machine tools; and Hartnett often had difficulties with the Directorate of Machine Tools and Gauges in regard to other projects. See MHS120, reports for 6 February 1942 and 27 February 1942. Hartnett admitted to Wardell that: 'On machine tools I have almost given up, and for the life of me cannot understand what it is all about, but I am quite prepared to come back in the fray if someone will bust it open'. MHS99, Hartnett to V.A. Wardell 22 December 1941. S. Thorpe discovered that members of the Machine Tool Directorate had deliberately misled Hartnett when he had tried to get machine tools released for the Owen in February 1942.

150. AA MP508, File 17/715/290, Stuart Thorpe to Secretary of the Army 27 February 1942. After the war one of the senior men of OPD explained that the Machine Tools Directorate was in a constant muddle. Unlike the OPD which had a progress division, and in charts and graphs, knew the progress of each project each week, the Machine Tools Directorate had no similar progress reporting on orders or projects. The

curred fully[151]. On 3 March 1942, Forde directed that the order for Owen guns was to be increased to 20,000 and that it should have number one priority in any clash with the Sten gun for machine tools and subcontractors. This and Thorpe's efforts combined to get machine tools flowing to Lysaghts[152].

While Thorpe was preparing to investigate the denial of machine tools to the Owen gun project, the Sten gun Mark II arrived in Australia. Despite its expectation that this weapon would be in the best traditions of British small arms design, the Army discovered once more that it was a poorly engineered and manufactured equipment. Realising that it urgently needed a suitable production rival to the Owen gun, the Army turned to Hartnett to see if he could modify the Sten gun appropriately. Hartnett had been making known his view during February that he thought the Sten gun (Mark I) could be adapted to the new and very cheap industrial technique of diecasting[153]. The main centre of this technique was the firm of Diecasters, and there had been, in late 1941, political complaints that this valuable capability was being under-utilised by the Ministry of Munitions [154]. Hartnett had attempted to involve Diecasters

result was that orders would be accepted without regard to delays occurring in other machine tools orders. No one knew clearly when delays were occurring or why. MHS67, J.Poulton.

151. AWM 54, 385/9/2 *op.cit.*, Conference 28 May 1942, Goldfinch agreed with Wardell that forces were attempting to impede the progress of the Owen project through denial of machine tools.

152. Eventually the Owen gun project had the services of three tool rooms for machine tools and gauges — BHP Newcastle, Ryland Brothers, and AIS of Port Kembla. AA MP730, S11, Box 1, Meeting with DGM et al 3 June 1942.

153. MHS99, Wardell to Lewis 18 February 1942. Hartnett had been trying to persuade Forde to let him try this procedure. Wardell thought that Hartnett was trying to undermine the Owen gun project.

154. AA CRS A5954, Box 477, File 'Diecasting Annex', Makin to Prime Minister

in the Owen gun project, where he invited them to develop shortcut production methods[155]. Nothing seems to have come of this, possibly because Lysaghts experience with Army delays made them understandably resistant to any further changes to their SMG. Diecasters were involved in the Sten gun Mark I project where their abilities seemed more useful. The Army's demand for production of the Sten gun Mark II in late February 1942 caused Hartnett to turn again to Diecasters who seemed to offer a quick and cheap means of manufacturing the now desperately needed SMGs. Hartnett would have been irresponsible if he had not attempted to use this manufacturing capability when all other industrial resources were becoming over-utilised following the fall of Singapore. Diecasters significantly modified the Sten gun Mark II to make it more adaptable for production and a better field weapon. When the DGM called a meeting on SMG policy on 10 March 1942, Hartnett had the Diecasters prototype which was called the Austen.

This meeting was notable because the Army claimed that the Owen was rather suspect since it had not been tested in service, whereas the Sten (really the Austen) was a proven weapon both in battle and as a production unit. Hartnett pointed out that the Sten gun was a 'production dream' requiring little machining whereas the Owen gun was not well designed from a production point of view. The meeting decided that the largest number of SMGs could be produced if both the Owen gun and the Sten gun (Austen) proceeded at

2 September 1941. Makin became the Minister of Munitions in October 1941.

155. Diecasters appeared at the conference of 18 September 1941 with Lysaghts and OPD.

once[156]. From the Munitions Ministry point of view, this decision was justified because the Sten gun project allegedly needed few machine tools, and could reach mass production with no interference with the Owen gun project.

However, as the MGO knew, the Austen bore little resemblance to the Sten gun Mark II[157]. It was in effect a totally unproven weapon, untested in battle and in mass production, and in fact retained major design faults of the Sten gun[158]. By 1942, the Owen gun could claim to have been tested far more extensively than the Austen, yet the Austen had been accepted for production with none of the Army's objections and tests which had been applied to the Owen gun in 1941.

The faults in the design of the Austen were demonstrated in new trials during June 1942. The Austen trial gun, like the Sten before it in the 29 September 1941 trials, became inoperative during firing because of a broken sear-trigger spring, causing the dangerous situation of run-away automatic fir-

156. AA MP730, S11, Box 1, Meeting on SMGs 10 March 1942. Those present were Lewis, Jensen, Hartnett, Colonel F.G.Thorpe, Major General T.R.Williams, Major General Milford, Colonel H.B.L.Gipps, Major Roberts, and Stuart Thorpe representing Forde.

157. AA MP729, S6, File 26/401/768, MGO to CGS 31 December 1942. The barrel was all that remained of the Sten in the Austen. See IC66 84/1 Sten, Hartnett to W.E.Hill. Hartnett claimed the Austen had been so much changed from the Sten, that it was virtually an entirely new weapon.

158. These were firstly, the Austen was easily jammed by dirt, sand or mud; secondly, it had a weak trigger/sear spring; thirdly, it required a special tool to load the magazine; fourthly, it was poorly balanced with a strong tendency to veer to the right when firing. There were other less important weaknesses. The Owen suffered from none of these. See W.H.B.Smith et al *Small Arms of the World*, Harrisburg Penn. Stackpole 1969, pp.198-203. See also G.S.Wardell, 'The Development and Manufacture of the Owen Gun', November 1982.

ing. It also failed the dirt and mud test. The Owen passed all tests easily, as usual[159]. Taking inspiration from a recent British report on the Owen and Sten gun[160], the Chief Inspector of Small Arms, Major Roberts, concluded that the Austen had performed 'satisfactorily' while the Owen was judged to have a serious fault in its magazine design. His report caused the Chief Military Adviser, Williams, to recall all Owen magazines from field service. Williams order was countermanded by Forde. This 'fault' had been standard in the design of small arms since conceived by Mauser designers in the 1890s. It had been one of the praiseworthy Owen characteristics noted in the previous tests of late 1941, which Roberts had attended[161]. Williams was forced to admit later that the test report had been biased and incorrect[162].

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159. AWM 54, File 385/9/2, 'Owen Gun ...', *op.cit.*, V.A.Wardell, 12 July 1942.

160. AA MP729, S6, Box 64, File 26/401/653, Lieutenant Colonel C.A.Geyton to Secretary of Department of Army 31 March 1942 enclosing British CSAD report which inter alia stated: 'The Owen gun ... has very few genuine new features to recommend it. Most of the *parts which are novel* are poor in design and have not been ... studied from the production angle. We anticipate that before this gun comes from the factory in large quantities, much development work will be required and many teething troubles will be experienced which will involve radical re-design'. The British had been critical earlier — AA MP508, File 177/701/1948, RAAFLO (London) to Air Board 31 October 1941, and MHS99, MLO (London) to Army HQ (Melbourne) 23 December 1941. Since none of the things predicted happened, one can only conclude that the British did not understand the Owen gun, or that they were trying to discredit it for fear that it would replace the British designed Sten gun in world wide sales for SMGs. India, Canada, New Zealand, and the US Army were all interested in the Owen gun.

161. AWM 54, 385/12/4, 'Notes on the Thompson Sub Machine Gun 1941'. The Owen bolt mechanism stopped on the magazine follower plate upon the last cartridge being ejected. This warned the firer, in the heat of battle, that his weapon was empty. Roberts wanted to alter the magazine so that this would not happen.

162. AWM 54, 385/9/2, Inventions File, 'Owen Gun: Notes on Development', 12 July 1942 by V.A.Wardell. Williams own summary and conclusions of the test reports introduced new material and showed that he was biased against the Owen gun. See CMA to LGA 18 June 1942. The Wardell brothers answered all criticisms with

Although Lysaghts reached their target production of 500 Owen guns per week on 8 August 1942[163], the Owen gun had not been issued to combat troops by October 1942. The Army preferred to use the 17,000 Thompson SMGs it had acquired, despite complaints by combat troops in New Guinea that the Thompson was too heavy and jammed too easily. They also stated that the total number of SMGs issued was inadequate[164]. The Commander in Chief, Blamey, and CGS, Northcott, were only persuaded to change this policy when ammunition for the Thompson SMG was exhausted[165]. Both Blamey and Northcott professed to be very worried that the Owen was still not proven in the field[166], but the reports received of the October trials in New Guinea had been uniformly supportive of the qualities of the Owen in combat[167]. The Owen continued to be preferred by combat troops when the

devastating objectivity, see V.A.Wardell to S.Thorpe 24 June 1942 and G.S.Wardells attached notes.

163. MHS99, Wardell to Lewis 8 August 1942.

164. AA MP729, S6, Box 64, File 26/401/748, Forde to Secretary of Army 14 October 1942.

165. *op.cit.*, Blamey to Northcott 2 November 1942, Northcott to Blamey 5 November 1942, Blamey to Northcott 19 November 1942. Total rounds of 0.45" ammunition remaining was 1,800,000. By the end of October 1942 10,000 Owen guns had been produced, and 7.5 million rounds of 9 mm ammunition. This did not include stocks of 9 mm ammunition which the Army had imported, see DGM Reports to War Cabinet. See also AA CRS A5954, Box 497, File 'Production of Owen ...', War Cabinet Minute 2447 of 28 October 1942: 'Reference was made to public statements by the inventor and manufacturer of the Owen gun regarding the limited use that had been made of the gun in operations in New Guinea, and allegations that the Army was prejudiced against the Owen gun. The Chief of the General Staff said that allegations of Army prejudice against the gun were entirely without foundation'.

166. AWM 54, File 385/13/3, CGS to DCGS (Berriman) 19 November 1942. AA MP729, S6, Box 64, File 26/401/748, Blamey to CGS 19 November 1942.

167. AA MP729, S6, Box 64, File 26/401/748, Report of Brigadier I.N.Doughty, 21 Australian Infantry Brigade, 7 Division 31 October 1942; 2/2 Australian Infantry Battalion

Austen was released. The familiar reasons were that it worked better under adverse conditions, had less recoil and fewer parts. The Austen magazine also suffered from the limitation of being unable to be loaded without a separate, and easily lost, magazine spring depressor — a design fault of the Sten carried into the Austen. As a consequence the New Guinea Force GOC, General Mackay, advised Army HQ Melbourne to send only Owen guns to New Guinea[168].

With the passing of the threat of invasion in late 1942, there was not the same urgent demand for SMGs at all costs. The MGO Branch in December 1942, raised the issue of standardisation of SMGs[169]. With the increasing pressure on industrial resources, the idea to standardise was sensible as it would release resources for other purposes. Ignoring the known design weaknesses the Army chose the Austen to be the standard SMG. Its main argument was that the Austen was cheaper to manufacture than the Owen gun, and gave equivalent performance in the field[170]. The CGS, and Blamey, suggested to Forde that the Owen gun could be sold to US forces who admired it, to redress the

to 16 Australian Infantry Brigade, 7 Division 24 October 1942, report by DCGS, SWPA (Berriman) 28 October 1942: '... Owen gun was effective and satisfactory in battle in extreme conditions prevailing'.

168. AWM 54, 385/13/1, Lieutenant General I. Mackay to LHQ, April 1943. Gavin Long, the editor of the official histories of the Second World War, commented to Spender on 16 October 1943, that of the many soldiers he had met who had fired the Owen gun at the enemy, everyone preferred the Owen to any other SMG. See AWM 51, File 128.

169. AA MP729, File 26/401/768, MGO to CGS 31 December 1942.

170. *ibid.* Blamey to Minister for the Army 19 February 1943. Blamey had been advised by the MGO to settle this issue before Owen gun orders ran out, and the Army was forced by public pressure to place more orders for it. Jensen said orders would run out by May 1943 — Jensen to Secretary of the Army 18 January 1943. Newspaper interest in the Owen gun was still high, e.g. Melbourne *Herald* 18 January 1943 which asked why the troops were not getting more Owen guns as they demanded.

lend lease imbalance[171]. What Northcott did not disclose was that the tests conducted by the US Army to accept the Owen had also rejected the Austen as the inferior SMG[172]. Australian soldiers had also concluded this, but were now to have the inferior gun anyway.

When Forde had become aware in mid February 1943 of the Army's latest attempts to eliminate the Owen gun, he had set Stuart Thorpe to work to check the Army's argument on SMG costs. Thorpe showed quickly, in conjunction with the Ministry of Munitions, that no reliable costs existed for the Austen, so categorical statements on the cost advantages of the Austen could only be based on conjecture and prejudice[173]. Having received this information, Forde then asked Blamey to prepare a War Cabinet Agendum stating the Army's case[174]. This request manoeuvred the Army into exposing itself on record as opposed to the Owen on very biased grounds. While he waited for the Army's submission, Forde placed another order for 5000 Owen guns[175]. Although the CGS subsequently attempted to withdraw the War Cabinet submission, the Prime Minister, Curtin, ordered Forde to bring it and all other correspondence

171. AA MP729, S6, Box 64, File 26/401/768, draft War Cabinet Agendum, CGS to Forde 29 March 1943; Box 65, File 26/401/949, Forde to Blamey 5 March 1943.

172. AA MP729, File 26/401/768, BGS HQ (SWPA) 9 January 1943, 'Report on US User Trials'; File 26/401/949, Army and Munitions Coordination Committee Minute 2 July 1943.

173. AA MP729, Box 65, File 26/401/949, Thorpe to Secretary of Army 23 February 1943.

174. *op.cit.*, Forde to Blamey 5 March 1943.

175. AA MP729, Box 65, File 26/401/949, Forde to Makin 25 March 1943. The Army was refusing to give any new orders or forecasts of future requirements, causing considerable uncertainty in Wardell's subcontractor organisation. The Army would not even pass on US orders for the Owen, Wardell to Forde 26 March 1943.

to him. He directed that the Owen gun should be the authorised equipment of the Australian Military Forces[176]. Curtin and his colleagues were much more impressed by the production record of the Owen gun than the questionable cost arguments of the Army. By March 1943, Lysaghts had made 22,000 Owen guns compared to 4000 Austens by Diecasters and its partner Carmichaels[177].

Clearly, the Austen was more difficult to make than originally suspected, despite the use of new manufacturing techniques. Actually the Austen project had made quite extensive use of machine tools in its operations, but this had been obscured by the fact that Diecasters made its own machine tools instead of having to request them from the Directorate of Machine Tools and Gauges like Lysaghts[178]. The Austen project also had the misfortune to have Carmichaels, Diecasters partners in NSW, get into a serious muddle over production[179]. These factors combined to produce lower production at higher costs than expected. When reliable costs became available, there was little difference between the Austen and the Owen. When toolage costs were included, there was a small margin in favour of the Owen gun[180].

176. AA CRS A816, File 23/301/86, Forde to Curtin 13 April 1943. AA MP729, Box 65, File 26/401/949, special War Cabinet Minute of 14 April 1943, see Forde to Makin 14 April 1943, and Forde to Blamey 14 April 1943.

177. AA MP729, Box 65, File 26/401/949, Wardell to Forde 26 March 1943.

178. AA MP730, S11, Box 1, G.W.Griffith to Lewis 24 March 1942, Hartnett to Lewis 14 May 1942, Daley to Lewis 7 August 1942. Diecasters made machine tools and gauges commercially, whereas Lysaghts did not. Diecasters supplied its own needs, as well as complicated machine tools for its subcontractors such as British Tube Mills. Diecasters even supplied a set of inspection gauges for use by Army Inspection on the Austen.

179. *op.cit.*, Goldfinch to Jensen 27 June 1942.

180. AA MP729, Box 65, File 26/401/949, Secretary of Munitions to Secretary of the Army 18 November 1943 plus enclosures, Makin to Forde 15 March 1944. Estimated costs

The rebuff by War Cabinet does not seem to have deterred the Army for it continued to intrigue against the Owen to regain control of SMG design[181]. In May and June 1943 Blamey tried to depress Owen gun production and order more Austens. One example was his attempt to have the Air Force repay an old debt of 12,000 Thompson SMGs by ordering a similar number of Austens, which the Air Force would then give to the Army. When Wardell heard of this plot, he went straight to the Prime Minister. He claimed that the Army was letting Owen orders run out thereby forcing Lysaghts to disband their production team. Once this had happened the Army would then place more orders on OPD for the Austen[182]. Again the Prime Minister confirmed War Cabinet policy on the Owen, and the Air Force placed an order for 10,000 Owen guns[183].

This should have showed the Army that the Government could not be circumvented. However, it began to design its own new SMG, which would eventually replace both the Owen and the Austen[184]. The War Cabinet decided that the projected SMG would not be put into production without a submission fully justifying its necessity[185]. The Army did give up at this point and

at November 1943 were Austen £12-14-0, Owen gun £11-11-0; at March 1944 these we estimated to be Austen £14, Owen gun £14.

181. This was the avowed aim of the new MGO, Major General L.E. Beavis, who wanted the Army to regain control of the design and selection of all its weapons, see AWM 54, 435/3/3, Beavis to Secretary of Army 26 May 1942.

182. AA CRS A816, File 23/301/86, Wardell to Curtin 21 June 1943.

183. AA CRS A816, File 23/301/86, Curtin to Wardell 25 June 1943. AA MP729, Box 65, File 26/401/949, Forde to Army Secretary 26 June 1943, Secretary of Army to Secretary of Defence 17 August 1943, Forde to A.S. Drakeford (Minister for Air Force) 29 June 1943. Blamey did not like this, Blamey to Forde 9 July 1943.

184. AA CRS A5954, Box 497, File 'Production of New Sten Gun'. AA CRS A816, File 23/301/86, Draft War Cabinet Agendum 5 May 1944, No.219/1944.

185. AA CRS A816, File 23/301/86, Forde to Makin 24 June 1944 and War Cabinet

decided to wait for new British developments in SMG design[186]. The Owen gun remained in service well into the 1950s, because as the British admitted in 1945, it was functionally better than any other British designed weapon in this class[187]. Perhaps the last word in defence of the Armys resistance to the Owen gun over all this time can be given by the Director of Artillery, Colonel John O'Brien who observed in 1955 that:

'It was the reluctance to believe that any thing good could come out of Australia or that we should ever be so bold as to depart from the British standards ...'[188].

The Design of AFVs

In the opinion of the Army, the biggest area of failure in the Ministry of Munitions was the manufacture of Armoured Fighting Vehicles (AFVs):

'... apart from machine gun carriers which were largely a counterpart of a proved British design, no (AFV) project ... could be considered as really suitable for Service use'[189].

This view appears to be supported by the production record. Eleven AFV projects were attempted but only six reached mass production; A rate of failure far in excess of any other technological area covered by the Ministry of Munitions[190]. Of the six successful AFV projects at least half had had the

Minute No.3535 of 9 May 1944.

186. AWM 54, File 419/1/4, 'GS Policy Infantry Weapons', July 1944.

187. AWM 54, 385/9/2, MGO: Technical Library, No.A2/1018, Small Arms Circular Volume 1, No.1, January 1945.

188. AWM 74, Box 3, Bundle 1, File 'Mobilising Industry for War', Colonel John O'Brien to D.P.Mellor 27 March 1955.

189. History of the MGO Branch, *op.cit.*, p.72.

190. See A.T.Ross *Wartime Munitions Expansion in Australia 1939-45*, Central Stud-

standards of quality relaxed, so that they became easy enough to manufacture in Australia[191]. These AFVs did not represent what the Army wanted for suitable battlefield survivability, but they were all that were available in 1940-1942, the critical phase of the war.

The explanation of this general failure according to MGO Branch was that in July 1941, the Government had taken the responsibility for Developmental Design for AFVs from the Army and given it to the Ministry of Munitions[192].

'... while the responsibility for design was vested in the Ministry of Munitions, the primary consideration was what could be produced and not what was needed to meet operational requirements. The importance of standardisation was overlooked. There was no army authority to insist on modifications, if not satisfactory as a result of inspection. Furthermore, Inspection Division had no approved Army design on which inspection could be based'[193].

'... the lesson of AFV design in Australia was that new spheres of activity must be handled on the sound principles that have been based on experience with other equipments. In every case where enthusiasts for a particular activity ... have endeavoured to develop through a special machinery without taking full advantage of the vast amount of assistance

ies Report 13, June 1978, Department of Defence; and A.T.Ross, *An Examination of Strategies for Technological and Industrial Support for Munitions Production in Australia During World War II*, Central Studies Note 51, January 1984, Department of Defence. The AFV projects affected adversely were AC1 tank, AC2 tank, Heavy Armoured Car, AC3 tank, AC4 tank. Note that 66 AC1 tanks were manufactured, but never gained Army acceptance, and so cannot be said to have attained mass production successfully. Those projects which did were, Machine gun carrier LP1, LP2/3, 2 Pdr AT gun carrier, Scout car, Light Armoured car, 3" Mortar carrier. Of these six, four were derivatives of the British machine gun carrier which was the simplest type of AFV to make.

191. History of the MGO Branch, *op.cit.*, pp.72-77. A.T.Ross, *Wartime Munitions Expansion ...*, *op.cit.*, *An Examination of Strategies ...*, *op.cit.*

192. History of the MGO Branch, *op.cit.*, p.73. Meeting of 15 July 1941 between Departments of Munitions, and Army, presided over by R.G.Menzies, Prime Minister.

193. History of the MGO Branch, *op.cit.*, p.77.

available to an existing organisation like the MGO Branch the eventual result has been chaotic'[194].

The Ministry of Munitions view was different. The problem was the Army's inability to decide on AFV designs. Initially, the problem centred on the Machine gun carrier LP2 which between June and October 1940 went through a protracted series of changes. In the opinion of OPD these were essentially trivial in their addition to the equipment performance when compared to the time which could have been saved, if drawings had been released promptly to the contractors. Furthermore, the design changes had been made without regard to the manufacturing design problems they were likely to cause[195].

This experience was surpassed by that of the Australian Cruiser tank Mark I (AC1) project. The Army indicated its requirement for a medium tank in June 1940, but the General Staff Specification only emerged in November[196]. Little could be done until the specification appeared, but in the months following, it was changed frequently, and consequently so was the Army's design[197].

194. *ibid.*, p.72.

195. MHS120, Reports of the Director of OPD to DGM, 11, 25 October 1940; 1, 8, 15 November 1940; 17 January 1941. AA MP508, File 325/702/184, 'Universal Carrier'.

196. A.T. Ross, *The Wartime Munitions Expansion ...*, *op.cit.*, pp.158-160.

197. *ibid.*, pp.165-166; MHS7, 'Australian Armoured Fighting Vehicles Draft Notes', pp.8-10. The Army gained the services of British tank design expert Colonel W.D. Watson who arrived in Australia in December 1940, and changed the General Staff Specification so that it reflected the latest developments in US tank automotive design. Also, the Army was receiving technical information on the gun-armour race in Europe and Africa, and altered the specification to conform with battle experience, e.g. in February 1941 the latest advice indicated that tank armour of 40 mm to 50 mm thickness was required. The DCGS, Major General Northcott, altered the specification for the AC1 to 50 mm for the hull and 75 mm for the turret. Hull armour was later increased again to 65 mm. These developments caused major problems for the AC1s

The Ministry of Munitions found that its attempts at manufacturing design were continually thrown into chaos; and a large number of contractors were left with nothing to do while they waited for manufacturing designs and orders for the AC1. In April 1941 OPD realised that the Army had committed itself to a tank design which could not be manufactured in Australia[198]. The Ministry of Munitions attempted to get the Army to make sufficient design concessions to make possible the production of a tank in Australia, but had failed to make progress by July 1941.

It was at this point that the Government stepped in and gave the responsibility for developmental design for AFV to the Ministry of Munitions. It has been shown in other parts of this thesis that the Government was well aware of the weakness of forces in Australia and was anxious to do something about them before the situation in the Pacific deteriorated further. It appeared, as for the Owen gun and other projects, that the MGO Branch and the Chief Military Advisers Branch, were not responding in the manner appropriate to the strategic situation. The Government was prepared to ignore the Army's search for perfection in tank design in favour of stabilising design sufficiently to allow some tanks to actually be built. Tanks which were less than the best in quality were nevertheless better than no tanks at all.

A new division of AFV Production was created within OPD, and in April 1942 it was transformed into a separate Directorate of Armoured Fighting power unit.

198. A.T.Ross, *Wartime Munitions Expansion . . .*, *op.cit.*, pp.158-169. Australia could not acquire the necessary machine tools which would allow industry to manufacture the automotive components of the US M3 tank on which the AC1 was based closely.

ing Vehicle Production (DAFVP). This organisation proceeded immediately to simplify the more difficult components of the AC1 tank design. DAFVP attempted to extend a policy initiated by its predecessor (OPD) in regard to AFVs. This was the importation of standard proprietary components such as car engines, chassis and gear boxes, and building new AFVs around such components. Important production problems were thus meant to be circumvented, leaving production capacity available for other important components for which there were no proprietary alternatives[199]. Consequently AFVs as a group in Australia had far more imported components than any other area of technology covered by the Ministry of Munitions[200].

The power unit of the AC1 was built around imported components, including Cadillac car engines. American tank or aeroengines would have been better, but they were not available. Nor were appropriate gear boxes, and so DAFVP and its contractors redesigned the US M3 Tank syncromesh gear box so that it became a crash gear box. Australian industry could make this, but not syncromesh gears. Other important areas of the power unit and transmission were also modified from the M3 designs[201].

Australia could not import rolled armour plate, nor could it produce it of the required thickness. In what was the-most original development in the

199. A.T.Ross, *Wartime Munitions Expansion ...*, *op.cit.*, pp.35-46. See also D.P.Mellor, *op.cit.*

200. Ingenious as this procedure was, the limitations of available proprietary components meant that substantial changes to AFV designs had to be made to accommodate these components. Such changes introduced new and unexpected design problems.

201. See A.T.Ross, *footit Wartime Munitions Expansion ...*, *op.cit.*, pp.158-169.

entire Australian AFV production programme, the steel industry succeeded in casting the entire tank hull. The result was an armoured hull of superior ballistic qualities to any made elsewhere in the world[202].

The AC1 reached quantity production during August/September. It had reached this stage without going through a detailed inspection or trial phase. Although DAFVP did listen to MGO Branch and Chief Military Advisers Branch criticisms of the emerging AC1, it did not allow suggested design changes to interfere significantly with the early production of the tank. Major criticisms were put off to be incorporated in tank designs for the AC3 and AC4 tanks, which would follow on from the AC1[203].

The result was that Australia did get the early production of a tank which in specification was capable of meeting the best Japanese tanks available in 1942[204]. However, it was untested and subsequently proved to be unreliable mechanically. The power unit overheated, there were problems with gearbox lubrication and with the clutch[205]. If Australia had been on the verge of

202. *ibid.* and see D.P.Mellor, *op.cit.*

203. A.T.Ross, *Wartime Munitions Expansion . . .*, *op.cit.*, pp.158-169, 187-191, 194-197.

204. AWM 74, Box 5, Bundle 1, Professor C.H.Munro to Mellor, 12 January 1953. The bulk of Japanese tanks available operationally in 1942 had armour of less than 50 mm which could be penetrated easily by the AC1 2 Pdr tank gun. The AC1 armour was considerably thicker and of superior quality than all Japanese tanks used widely by the Japanese army. See P.M.Roland, *Imperial Japanese Tanks 1918-1945*, Argus Books, England, 1975.

205. A.T.Ross, *Wartime Munitions Expansion . . .*, *op.cit.*, pp.66-67. See also AA MP508, File 325/703/3084, Director of AFV, Colonel Crouch, comments on AC1 faults of 8 October 1942, Director of AFVP (Code) rejoinder of 5 November 1942, and Crouch's reply of 10 November 1943 (this is probably 10 November 1942).

being invaded, the Army would have been happy to accept these tanks, even with their weaknesses, which could have been fixed progressively in the manner of the early British tanks of 1940/41. This was the objective of DAFVP. But by October 1942, the Australian Army had begun to receive some supplies of US M3 tanks and British Matilda tanks, and so now had a choice. It decided not to accept the AC1s coming off the production line until basic faults had been corrected[206]. DAFVP spent the next seven months attempting to correct these faults. In his special report of May 1943 to the Minister for the Army, Colonel G.A.Green, US Army, was still sceptical about many features of the AC1 including power plant cooling, reliability of turret traverse mechanism, air cleaners, bogie wheel rubber bonding, clutch, turret ring size. He conceded that the general design was excellent, but doubted that the AC1 had really emerged from its experimental status[207].

Green also considered the projected AC3 and AC4 tanks. He stated that while the major design features of the AC3 were fundamentally sound, insufficient test data had been accumulated from the single test model, and that it could be assumed from overseas experience that teething problems would inevitably appear. In other words, tanks were sufficiently complex equipments that it was impossible to foresee all problems which could emerge from major

206. AA MP508, File 325/703/3084, Report by the Director of AFV (Army), Colonel L.P.Crouch, 8 October 1942. He requested that the DAFVP be requested to stop manufacturing 'defective and unserviceable tanks'. He was supported by the Chief Military Adviser 9 October 1942.

207. AA MP508, File 325/703/3084, 'Australian Tank Production', Report by Colonel G.A.Green, US Army 17 May 1943. Green was an Australian, and an expert on automotive engineering for AFV designed in Britain and the USA.

developmental initiatives such as those undertaken by Australia. Green suggested that AC3 tank production should be kept to a bare minimum to provide an adequate test background to the AC4 tank, and to keep intact a skeleton manufacturing organisation pending the introduction of the AC4[208].

Since the Army had been promised supplies of the latest US M4 tank, it saw no reason to persevere with the Australian project. The Government agreed, and the tank projects were all cancelled in October 1943, with 66 AC1 tanks and one AC3 having been manufactured. The AC4 never left the drawing board[209]. In the recriminations which followed, the Ministry of Munitions considered that the AC1 had served its purpose, while the AC3 and AC4 had failed to emerge because of the endless demands by the Army for major changes of design. Despite having control of developmental design and manufacturing design for AFVs the Department was responsive to Army demands because ultimately, the Army had the right of rejection of any equipment which did not meet its standards of quality. DAFVP felt that many design changes contributed little to the capability of the AC3 and AC4 tanks, and recreated the situation of pre-July 1941[210].

208. AA MP508, File 325/703/3084, Green Report, *op.cit.*

209. A.T.Ross, *Wartime Munitions Expansion* ..., *op.cit.*, p.67. In fact no US M4 tanks ever reached Australia except for two or three left by the British after trials in tropical Queensland.

210. A.T.Ross, *Wartime Munitions Expansion* ..., *op.cit.*, pp.187–191, 194–197. See also MHS112, Director of AFVP reports to Director General of Munitions. AWM 74, Box 5, Bundle 1, Professor C.H.Munro to Mellor 12 January 1953: ‘... when one realises the personal enmities and interdepartmental jealousies between Army and Munitions, a person with a suspicious mind might infer that the Army was criticising the tank merely to bolster up an administrative argument between Army and Munitions’.

For its part the Army felt that DAFVP consistently underestimated the technical difficulties involved in making tanks[211]. It felt that huge sums of money were being wasted in preparing for AC3 and AC4 production without an adequate test programme being completed first. The Army was not prepared to accept tanks which it judged to be inferior to those which it could get from overseas.

The Reform of Army Design

Although all Services had created problems in design and specification, the Army was the biggest offender. It can be asked, justly, whether during 1939–1942 the Chief Military Advisers and the MGO branches had been more interested in preserving peacetime procedures and relationships, than in responding to urgent strategic necessities related to equipping the frontline troops properly. At various times these branches became locked in protracted battle with the Government and the Ministry of Munitions, on absurd points of principle, which had been borrowed from Britain without regard to the realities of wartime. The energy with which the SMG and AFV controversies were pursued detracted from the energy which should have been given to more important issues such as the stabilising of designs and relaxation of specifications etc. so that frontline troops could get more equipment more quickly.

The MGO, Major General Milford, and the CMA, Major General Williams,

211. AA MP508, File 325/703/3084, Director of AFV (Army), Colonel Crouch, to Brigadier Lloyd (Director of Staff Duties) 10 November 1943.

set the standard of seeing the Ministry of Munitions as the Army's adversary on design matters, rather than an ally with a legitimate point of view. They were supported on important occasions by two CGSs, Lieutenant Generals Sturdee and Northcott, and the Commander in Chief, General Blamey. Milford did not seem to accept that civilian advice on weapons could ever be technically superior to equivalent advice from the Army's own experts. Williams seemed incapable of accepting any criticism of the Army's performance in his area of responsibility. For example, in early 1942 Hartnett was invited by War Cabinet to make a submission on how the efficiency of the war effort could be improved. One of the things he mentioned was the problem of design and inventions:

'These two extremely important phases of war work, resting almost entirely with the Army, when it comes to their equipment, is . . . wrong, for the reason that it is not so much a question of the basic design being good or bad, but which design lends itself to the easiest method of production, bearing in mind our limited resources, raw materials and production capacity, therefore we should do everything to look for new ideas and designs of known requirements in terms of how we can best produce them'[212].

Williams was incensed by this view and rushed to the defence of the Army Superintendent of Design. In pointing out that the Superintendent had been given a favourable report on his professional competence by the Institute of Engineers, and that many concessions in design were often given for ease of production[213], Williams showed that he had misunderstood Hartnett. He concluded that Hartnett was just manoeuvring for power and glory — a motive of which the Army was more guilty than the Ministry of Munitions:

'In conclusion, I would like to add that this attack on the Army Admin-

212. AA MP956, S2, Box 11, Item 62, Hartnett to War Cabinet 24 January 1942.

213. *ibid.*, Williams to the Secretary of Army 20 February 1942.

istration is unwarranted and, to me, displays a weakness in the armour of [Hartnett] who has not taken full advantage of the various Committees etc. now in existence — not by any fault on our part — but by his great desire for limelight and window dressing'[214].

The War Cabinet did not agree, and as related earlier this chapter, created a new Inventions Directorate independent of the Army, under Hartnett's control.

The War Cabinet would probably have continued to whittle away at Army design and related functions if the Army had not sought to change its attitude shortly afterwards. In April 1942, Major General L.E. Beavis was brought back from the Middle East to replace the MGO Major General Milford. Beavis was as determined as either Milford or Williams, to preserve the Army's powers over design and specification against any outside interference, but he acknowledged that the system had to be made to work better[215]. He had gained wide practical experience from a major war zone, and was inclined to view the problem of munitions supply as one which stretched from the frontline to the heartland of Australian industry.

One of the first actions by Beavis was to clear up the problem of inadequate ordering, mentioned earlier in this chapter. The War Cabinet had taken steps which had forced the Services particularly the Army, to make long range forecasts so that the Ministry of Munitions had some basis on which to plan for production. Beavis rationalised the Army's position by reformulating its stocking policy:

'The MGO considered that the basis used was unscientific and unsound ...

214. *ibid.*

215. History of the MGO Branch, *op.cit.*, p.120.

in that it did not provide for adequate maintenance stocks to be held in Ordnance Depots and was unsatisfactory from the point of view of the Production Departments who would be unable to deliver the goods fast enough once the Army's inadequate maintenance stocks were exhausted'[216].

With the Army holding larger stocks, it was able to produce a much more orderly pattern of ordering for the Departments of Munitions and Supply. By mid-1943 erratic ordering had all but disappeared from the Army.

However, Beavis greatest contribution was in the area of design and specification. He encouraged the policy of placing technically trained fighting soldiers in the key technical positions within the Army. These men understood from personal experience, the requirements of battlefield munitions. They were much more certain in outlining the vital features of munitions, and more flexible on less important characteristics. Thus the instability of design declined and specifications became less severe. The same men were more inclined to compromise with Ministry of Munitions over manufacturing design as they appreciated from personal experience, that the first requirement of the frontline troops was reasonable equipment in large quantities. Refinements of developmental designs to produce 'perfect' munitions could follow later. These changes in attitude allowed the Army to respond effectively to the beginning of jungle warfare, for which it could draw no useful technical information from Britain or the USA. As Beavis confided to Jensen in 1943, the tremendous amount of new munitions required:

'... are being designed by experts who are fighting soldiers and have been placed in appointments where the benefit of their experience can be fully

216. *ibid.*, Beavis gained War Cabinet approval for his approach.

utilised.

As a result we find that the general tendency is now that instead of depending on Britain and USA for our designs and information on fighting equipment the pendulum has swung in the opposite direction and the flow of information re jungle requirements is largely in the reverse direction. Every scrap of information regarding new equipment for jungle warfare that we produce is eagerly seized upon by countries overseas ...'[217].

Beavis' influence took time before it had an effect on Army design, largely because he controlled only some of the Army organisations concerned with these problems. The most important of these bodies, including the Inspection Branch, were under the CMA, Major General Williams. In March 1943 the CMA Branch was absorbed into the MGO Branch, giving Beavis a dominating control over all design and specification in the Army[218]. Previous to this Beavis had been critical of the Army complicating the problems of design and specification by attempting to speak with too many voices to the production departments. Now there would be one authority.

All these measures had their effect, eventually, in improving the efficiency and co-operation with which the Army approached design problems with the Ministry of Munitions. Hartnett commented to Lewis in early 1943:

'I would like to record with you that the co-operation and close working as between the Army and the Ordnance Production Directorate today is on the happiest basis, and we all find it extremely stimulating to be brought in closely with the Army on the common problems of equipment and its manufacture as is now the practice between us'[219].

217. AA MP730, S11, Box 2, MGO to Secretary of Munitions Ministry 30 August 1943.

218. AA MP392, S36, Bundle 16, File 241/10/18.

219. AA MP730, S11, Box 1, Hartnett to Lewis 19 January 1943.

Problems continued to occur along familiar lines, as Hartnett's deputy, Daly, told Lewis three months later[220], but much of the acrimony had departed, and the incidence had declined. The Army had, tacitly at least, accepted that the Ministry of Munitions had an important role to play in the design and specification of munitions[221].

220. *ibid.*, Daley to Lewis 29 April 1943.

221. There is no formal acknowledgement of this in the History of the MGO Branch , *op.cit.*

CHAPTER 7

THE COST AND EFFECTIVENESS OF SELF CONTAINMENT

Introduction

In 1919, A.E. Leighton propounded a strategy for the self containment of munitions production within Australia. This strategy was adopted in most important aspects by all Australian Governments between 1921 and the beginning of war in 1939. In this time £4,029,462 in capital expenditure and £4,335,567 in maintenance was expended on the MSB and its organisation, to implement the strategy of self containment to give Australia a measure of insurance against the possibility of the British Fleet being unable to protect Australia (see Chapters 1-3). Leighton claimed that the scientific and technology centres he established at Maribyrnong and Lithgow would allow the duplication of specialised munitions production in other parts of Australia in time of emergency. These centres would also act as training and support facilities to commercial industry when the time came to utilise its services. A plan outlining an orderly scheme for the incorporation of commercial industry into munitions production in support of government factories had also been developed (see Chapter 4). How successful was the strategy of self containment in achieving the production rates and quality desired by the Armed Services during the Second World War? Specifically, how well did the munitions capabilities established by the MSB perform in producing munitions during war? This will be examined from the basis of how well the government factories were duplicated, the extent and success of training and advice extended to commercial industry, and the quality and rate of production achieved by March-June 1942, when Australia was under most threat of invasion. Having established how successful the Ministry of Munitions was in producing the required armament, we will examine the costs associated

Table 7-1 : MAXIMUM ANNUAL CAPACITY ESTABLISHED FOR
GOVERNMENT FACTORIES, 1940-1945

	ACTUAL ANNUAL PRODUCTION - JUNE 1940	MAXIMUM ANNUAL CAPACITY
SAA	110,000,000	850,000,000
Small Arms		
Rifles	15,000	200,000
Bren	-	6,000
Vickers MG	1,000	2,500
Explosives		
TNT	125 ton	10,000 ton
Cordite	265 ton	14,000 ton
FNH	-	6,000 ton
Filling		
Gun Ammunition	500,000	12,300,000
Mortar Bombs	-	4,000,000
Aircraft Bombs	-	135,000
Depth Charges	2,400	10,000
Naval Mines	-	6,000
AT Mines	-	260,000
Grenades	-	1,500,000
Gun Cartridge Cases	1,000,000	15,100,000

Sources

Director-General of Munitions Reports.
Munitions Digest 1945.

Notes

The figures for June 1940 do not mean that Government Filling Factories were not capable of filling mortar bombs, naval mines and grenades etc., or that they had never done so. There were no outstanding orders for these items in June 1940. Capacity was being used on other orders.

with such production.

Duplication of Government Factories

Perhaps the most obvious way in which to demonstrate the ability of the old MSB organisation to duplicate its major production units is Table 7-1. This lists the major munitions production areas covered by the government factories. It lists against these areas the actual annual production rate as it existed in June 1940. Against this are the maximum annual capacities the government factories had attained between June 1940 and June 1945. The general increase was about 10 times the annual production at June 1940. Obviously many new factories had been built and fully equipped, and operated by efficient staffs. Possibly the success of Leighton's scheme needs no further justification. However, the different munitions areas listed in Table 7-1 will be examined in turn, in more detail.

The intention here is to show how quickly the duplicate factories were built and brought into full operation. One factor which influenced this was the capability of Australian industry to supply building materials and tradesmen to construct factory buildings. Leighton and the MSB had never in their planning, attempted to influence this factor. The Australian building industry was well established and did not need any help from the MSB. The tables in Annex J (see Tables J-1 to J-11) indicate broadly the influence of this factor. The time taken between Building Initiated and Initial Plant Installation indicates the ability of local industry to complete the building of the factory.

The MSB had attempted to influence the other two major factors in factory

duplication. The first of these was the provision of factory plant and machine tools. Leighton had insisted, with the support of the MSB, that the original Factory groups should pay attention to building up their plant from machines which Australian industry could copy reasonably easily. The First World War had taught the MSB that sources of overseas supply for almost all machine tools and factory plant would contract or dry up completely in another major war[1]. The actual success of Australian industry in duplicating the plant of the MSB's Factory groups is indicated broadly in the tables of Annex J. The time taken between Initial Plant Installation and Initial Production is a measure of the ease with which factory plant and machine tools were supplied. Because of the world wide shortage of factory plant and machine tools during World War Two, most of these items had to be supplied by Australian industry.

The third major factor in factory duplication was the supply of the trained staffs for the new factories. The MSB's Factory groups were meant to be capable of training the regiments of new staff, and supplying the executive staff from their own personnel. The success of this MSB policy is indicated broadly by the time interval in the tables of Annex J between Initial Production and Quantity Production. This was the time taken to work a new factory up to full production after the major construction and equipping activities were over.

In Chapter 5 it was stated that a munition took not less than nine to 12 months to manufacture from the receipt of an order. This assumed that the munition was already in production. When a new factory had to be built this

1. Before 1939 Australia still imported nearly all machine tools and factory plant — it was one of the main items of trade between Britain and Australia (see Annex CA).

time was obviously longer. This allows the conclusion that for any new factory to reach Quantity Production (when a factory's full production line operated to manufacture the first complete product for which the factory was designed) in 12 months or less was very fast indeed. Times of 15 to 21 months would be a good performance; and any new factory which took substantially longer could be examined to see which of the three major factors of factory duplication influenced the delay. If the areas of significant delay were the supply of factory plant, or the time to work from Initial Production to Quantity Production (i.e. training of staff), then the MSBs duplication policy could be said to have failed in some way.

The results from Annex J show that nearly all new factories reached Quantity Production within 21 months, many much sooner. The small number of exceptions were held up largely because of building difficulties caused from other huge munitions projects swamping the entire building capability of particular states. The remaining exceptions were delayed because of similar circumstances occurring in respect of the supply of factory plant and machine tools. In this respect the plant etc. could be made by industry but capacity was temporarily over extended. Leighton's MSB Factory groups succeeded in providing models of factory plant and machine tools, which could be copied by Australian industry to the extent that this was made necessary by inability to import. The training of new staffs and dilution of Factory group executive staff to provide the leadership of the new factories worked efficiently. The provision of new factory capacity was, in the end, well ahead of the requirements of the Armed Services. This is one reason why some of the last factories had longer

lead times, because there was no longer much urgency in their construction. Priority was given to other projects.

Assistance to Commercial Industry

Leighton and the MSB had always accepted that if commercial industry were to make a useful contribution to any war effort, significant assistance had to be extended to it in regard to the manufacture of munitions. Chapter 3 relates the attempts of the MSB to develop commercial industry in ways which were useful to the strategy of self containment of munitions production in Australia. Leighton's concept of Central Research Laboratories mentioned in Chapter 1, and the explanation of the concept of self containment in Annex A, outline the measures taken by the MSB to modify munitions so that they could be made more easily by commercial industry in Australia. Manufacturing designs of British munitions were modified to include Australian materials and industrial practices.

The crucial organisation in this policy was MSL, which from 1921 to 1945 was the largest industrial research organisation in Australia. While it had many routine responsibilities in supporting the activities of the other MSB organisations and in conducting research for the Armed Services, MSL worked steadily throughout 1921 to 1939 to modify the manufacturing designs of munitions including the components of gun shells, artillery equipments, mortars, mines and depth charges (etc.) This activity was pursued in close association with the Inspection Branch of the MSB, and the engineering skills of the MSB Factory groups and Central Drawing Office.

During the war, this activity broadened to include new areas including tropical proofing, in which much highly original research was completed. MSL was joined in 1940/41 by the new industrial research laboratories of the CSIR which were co-ordinated in their research activities with MSL[2]. Together they supplied an industrial research service which commercial industry could use for any problem related to munitions manufacture. This was complemented by technical and engineering advice extended by the MSB Factory groups. Later, as commercial industry began to manufacture different types of munitions successfully, it began to contribute independently to the body of technical information on munitions production in Australia. Much of this information was held by the production directorates of the Ministry of Munitions (e.g. OPD and Gun Ammunition Directorate) and the state BAMs. It was used to enlighten contractors involved in new methods of producing munitions for which there was no relevant MSB experience. In fact, much of the munitions production experience gathered by the MSB between 1921 and 1939 for training commercial industry had been overtaken by new industrial developments by 1942. For example, commercial firms which contributed heavily to this process in gun production were GMH and Charles Ruwolt. GMH improvised many new ways of making anti-tank guns; and Charles Ruwolt showed that even the most difficult manufacturing process of gun manufacture could be mastered by commercial industry, when it started to make 25 Pdr Field gun barrels. Commercial firms were very quick to modify manufacturing processes once they understood the basic engineering of a munition[3].

2. See 'Munitions Supply Laboratories: War History 1939-1945', MHS43.

3. See for example MHS48-65, 'Industrial Stories'. These include the activities of GMH

However, the successful launching of commercial industry into munitions production during 1939–1941, was largely because of the technical preparation of the MSB. Working towards the objectives outlined by Leighton in 1921, MSL, the Factory groups, Central Drawing Office, and the Inspection Branch of the MSB, gathered the necessary technical information, modified it for Australian use, and opened their doors to technical enquiries from commercial industry. Not only was technical information passed on, the instrumentalities of the MSB often trained key executive staff of commercial contractors engaging in munitions work. This tradition began with the first munitions annex. BHP sent its key staff for training in shell production to the Ordnance Factory group at Maribyrnong. That these preparations were effective is demonstrated by the following results.

The main munitions for which commercial industry had the responsibility for manufacture were, metal components of gun shells, naval mines, anti-tank mines, depth charges, mortars, field guns, AA Guns, optical munitions, submachine guns and AFV. All of these areas had been covered by the MSB with the exception of submachine guns and AFV, which were only identified by the Army as being important well after the war had started. All of these munitions were produced with outstanding success by commercial industry, with the exception of AFV of which more will be said later. Given that commercial industry had never made any of these items before in Australia, a lot of credit must go to the MSB for the technical preparation. In other areas of Armed Service equip-

and Ruwolts, plus many other examples of production achievement and design of original machine tools.

ment, such as engineering equipment and motor transport, commercial industry knew more than the MSB, and needed no assistance. Such areas were usually associated with large civil markets.

The Quantity of Production

The successful MSB plans to duplicate government factories, and to train and assist commercial industry in munitions production, paved the way to a more important objective. This was to produce the *quantity* of munitions required by the Armed Services before the need to use such munitions in battle. In other words, to have equipped the Armed Services with sufficient munitions to handle the worst contingency before it occurred. This contingency had been defined before the war as defence against invasion of Australia, and the force required by the Army was seven heavily armed divisions.

It will be remembered from Chapter 6, that the Army was persistently slow in placing orders for its requirements on the Ministry of Munitions until late 1941, when the problem began to be resolved. This was very close to the beginning of the Pacific war, which led in the first six months of 1942 to the Australian Government accepting that Japanese invasion of Australia was imminent. If the Ministry of Munitions had failed to supply the required armament during this period, the Army, as the largest consumer, would only have had itself to blame. But as will be shown, the Department did not fail. The insurance premiums which Australian Governments had paid, since 1921 in supporting the MSB, against the day when the British Fleet could not prevent a Japanese assault, matured fully in the first half of 1942 with the flood of

Table 7-2 : THE PRODUCTION OF GUNS AND AMMUNITION FOR THE ARMY - JUNE 1940 TO DECEMBER 1942

GUNS AND AMMUNITION	PRODUCTION DURING JUNE 1940	TOTAL PRODUCTION JUNE 1940 TO JUNE 1940	TOTAL PRODUCTION JUNE 1940 TO DECEMBER 1941	TOTAL PRODUCTION JUNE 1940 TO MARCH 1942	TOTAL PRODUCTION JUNE 1940 TO JUNE 1942	TOTAL PRODUCTION JUNE 1940 TO SEPTEMBER 1942	TOTAL PRODUCTION JUNE 1940 TO DECEMBER 1942
25 Pdr Field Gun	-	1	75	267	459	647	877
25 Pdr HE	-	-	93,973	238,448	608,942	1,415,610	2,446,869
25 Pdr Cartridge	-	-	97,544	252,224	616,836	1,324,316	2,317,578
25 Pdr AR Piercing	-	-	-	-	-	-	15,389
25 Pdr Smoke	-	-	-	-	-	-	-
2 Pdr Anti-Tank Gun	-	38	393	669	839	882	-
2 Pdr AT Ammunition	-	-	28,421	120,739	210,311	336,557	357,337
6 Pdr AT Gun	-	-	-	-	-	32	146
6 Pdr AT Ammunition	-	-	-	-	-	11,666	12,108
3" AA Gun	-	1	1	5	6	8	12
3" AA HE	-	28,936	28,936	28,936	38,896	38,896	38,896
3.7" AA Gun	8	104	178	216	264	318	363
3.7" AA Ammunition	-	38,866	56,088	110,439	178,975	212,489	291,084
3" Mortar	-	319	1,144	1,261	1,541	1,840	2,076
3" HE	-	116,307	432,632	514,426	810,389	1,105,861	1,466,609
40 mm Bofors	-	-	-	-	-	-	11
40 mm HE	-	-	-	-	-	-	-
Grenades Hand) Rifle) Smoke)	-	160,143	426,085	942,415	1,492,729	1,964,806	2,516,193
Anti-Tank Mines	-	26,165	66,228	138,277	162,294	235,195	292,852
18 Pdr Ammunition	12,330	248,065	361,459	402,051	509,684	628,401	675,516
4.5" Ammunition HE	-	111,494	121,335	266,231	367,656	381,912	382,516
4.5" Cartridge	8,760	81,330	104,970	240,880	410,630	424,260	424,260

Sources

Director-General of Munitions Reports.

Munitions Digest, October 1940.

War Cabinet Agendum No. 439/1943, Supplement No. 1 of 30 November 1943.

Note

1. April to December 1942, 217,968 Cartridge Cases made and stockpiled.

munitions which poured forth from Australian Industry.

Tables 7-2 to 7-4 indicate the scope and quantity of munitions produced between June 1940 and December 1942 for the Army. Table 7-5 shows similar data for the Navy and Airforce. The major fact from Tables 7-2 to 7-4 is that the production of munitions for the period January to March 1942 in most cases equalled or doubled the production of the preceding 18 months (i.e. June 1940 to December 1941). Further huge increases in production continued to occur for each of the remaining monthly quarters of 1942. Thus while the actual total *quantity* of munitions produced since June 1940 was very important, so also was the fact that munitions production was *accelerating* rapidly during most of 1942.

The actual quantity of munitions required by the Army to equip its seven division anti-invasion force is hard to determine because the realities of battle in the Second World War were much different to what had been assumed for planning before the war. During the war, the Army appears to have had one armament establishment for the AIF and another lighter scale for the Militia — the force on which the defence of Australia most depended. Although the Army upgraded the armament establishment progressively for the Militia, it is difficult to pinpoint the scale of armament for which it was aiming. The easiest solution is to take the armament establishment for an AIF division and corps organisation and modify for a force of seven divisions organised into three corps. Such data is available for the AIF for battle in conditions similar to those of Australia, i.e. North Africa August 1940[4]. The armament establishment of

4. AWM 54, 327/1/11, 422/7/8, 'Arms and Ammunition of an AIF Division and Corps',

Table 7-3 : THE PRODUCTION OF SMALL ARMS AND SAA FOR THE ARMY - JUNE 1940 TO DECEMBER 1942

SMALL ARMS AND AMMUNITION	TOTAL PRODUCTION DURING JUNE 1940	TOTAL PRODUCTION JUNE 1940 TO JUNE 1941	TOTAL PRODUCTION JUNE 1940 TO DECEMBER 1941	TOTAL PRODUCTION JUNE 1940 TO MARCH 1942	TOTAL PRODUCTION JUNE 1940 TO JUNE 1942	TOTAL PRODUCTION JUNE 1940 TO SEPTEMBER 1942	TOTAL PRODUCTION JUNE 1940 TO DECEMBER 1942
Rifles New	1,260	36,500	69,780	92,638	118,598	149,300	209,262
Converted	-	27,549	31,740	34,340	34,340	34,340	34,340
Vickers MG	120	1,951	3,651	4,411	5,213	6,121	7,911
Bren Gun	-	186	1,087	2,047	3,267	4,957	8,383
Submachine Gun	-	-	102	280	1,909	7,851	17,483
0.303" Red Label	9,300,000	250,000,000	468,000,000	594,000,000	727,000,000	811,500,000	873,000,000
0.303" Armour Piercing	-	500,000	1,600,000	3,000,000	7,900,000	12,000,000	26,500,000
9 mm	-	-	-	-	100,000	3,800,000	16,400,000

Sources

Director-General of Munitions Reports.

Munitions Digest, October 1940.

War Cabinet Agendum No. 439/1943, Supplement No. 1 of 30 November 1943.

Notes

1. For production of new rifles since 1933 see Table 2-2, Production of Small Arms and Ammunition in Australia 1912-1940.
2. For production of converted rifles since late 1933, see Table 2-2 Production of Small Arms ...
3. For production of Vickers until June 1940 see Table 2-2.
4. Production of 0.303" Red Label was for all three Services, although the Army consumed the huge majority.

the AIF division and corps had just been amended in the light of the armoured warfare experienced in France during May and June 1940. Although this establishment was modified again during the next 12 to 18 months, it changed little in its fundamentals. It will therefore serve as a means of measuring roughly the total munitions required to equip the force of seven divisions required to defend Australia.

Table 7-6 lists the major armaments required for a seven division force, organised into three corps. Also listed is the total munitions produced between June 1940 and March 1942, and June 1940 to June 1942. No Japanese invasion of Australia could have taken place sooner than March 1942, because the Japanese Army was tied down in major operations everywhere until at least mid February 1942 when Singapore fell. In consideration of the problems of logistic support for such forces, and the necessary shipping to transport and supply them to Australia, it is more realistic to assume June 1942 as the earliest date on which a Japanese invasion of Australia could have commenced[5].

As Table 7-6 shows, the total munitions produced to March 1942, were, with one exception, sufficient to equip a force of seven divisions organised into three corps. Naturally, large reserves of ammunition were required to replace the ammunition held by divisions, and so the large excesses of gun ammunition produced compared to what was held by the seven divisions is not as impressive as it might have appeared. However any doubts on this, or any other area,

14 August 1940.

5. Japanese shipping and land forces were committed heavily to mopping up Allied resistance in the Dutch East Indies, Phillipines and Burma until the end of April. See L.Wigmore, *The Japanese Thrust*, AWM, Canberra, 1968.

Table 7-4 : THE PRODUCTION OF AFV FOR THE ARMY - JUNE 1940 TO DECEMBER 1942

AFVS	TOTAL PRODUCTION AT JUNE 1940	TOTAL PRODUCTION AT JUNE 1941	TOTAL PRODUCTION AT DECEMBER 1941	TOTAL PRODUCTION AT MARCH 1942	TOTAL PRODUCTION AT JUNE 1942	TOTAL PRODUCTION AT SEPTEMBER 1942	TOTAL PRODUCTION AT DECEMBER 1942
Armoured Carriers							
LP1	20	160	160	160	160	160	160
LP2	-	289	1544	1755	1945	2426	2839
2A, 3, 3A	-	-	129	349	725	881	952
Total	20	449	1833	2264	2830	3467	3951
Mortar Carrier	-	-	-	-	-	-	115
2 Pdr AT Carrier	-	-	-	-	36	196	200
Lt Armoured Car	-	-	-	-	60	133	198
Scout Car	-	-	-	8	70	171	211
Tanks							
Light Tank	-	-	-	-	-	-	-
Heavy Tank	-	-	-	-	-	4	22

Sources

Director-General of Munitions Reports.

War Cabinet Agendum No. 439/1943, Supplement No. 1 of 30 November 1943.

completely disappear by June 1942. Indeed, the fact that production in all key areas was *accelerating* meant that the capacity to make munitions was growing faster than mere total quantities produced would indicate.

Thus by March 1942, or at the very latest June 1942, the Munitions Ministry had produced enough armament to equip completely the anti-invasion force of which the Army had dreamed. This had been produced in time to be issued before any Japanese invasion could take place. This armament was additional to that held by the Army before June 1940. Thus for example, the fact that only 267 25 Pdr Field guns had been produced by March 1942 against a first line requirement of 576, was not as bad as it looked because the Army held over 400 18 Pdr Field guns and 4.5" Howitzers. While these were obsolete for European warfare, they were useful additions to any force fighting the Japanese. Of course the Army also obtained many armament supplies from overseas. These would never have been enough to equip the Army adequately, but they were a useful addition to what the Ministry of Munitions had made.

This shows that the Army should have been in a position by no later than June 1942, to confront the Japanese with the sort of land campaign in Australia which would have proved most difficult for Japan to succeed against. At the end of long supply lines, stretching back to Japan, Japanese land forces should have faced heavily armed forces capable of causing intensive and prolonged fighting, eating up Japanese supplies faster than they could be replaced. By contrast, Australian land forces were backed by a vast and self contained expanding munitions production capability within a few hundred miles of their battle lines.

Table 7-5 : PRODUCTION OF MUNITIONS FOR THE NAVY AND AIR FORCE - JUNE 1940 TO DECEMBER 1942

NAVAL AND AIR FORCE	PRODUCTION DURING JUNE 1940	TOTAL PRODUCTION JUNE 1940 TO JUNE 1941	TOTAL PRODUCTION JUNE 1940 TO DECEMBER 1941	TOTAL PRODUCTION JUNE 1940 TO MARCH 1942	TOTAL PRODUCTION JUNE 1940 TO JUNE 1942	TOTAL PRODUCTION JUNE 1940 TO SEPTEMBER 1942	TOTAL PRODUCTION JUNE 1940 TO DECEMBER 1942
<u>NAVY</u>							
Mines	-	320	1,536	3,105	4,689	5,652	6,031
Depth Charges							
450 lb Mk VII	80	6,269	8,922	10,496	11,896	12,096	12,268
250 lb Mk VIII	-	-	-	-	138	563	795
25 lb	-	-	-	-	-	55	399
2 Pdr AA Cartridges	-	-	-	?	110,644	287,978	322,083
4" Gun Cartridges	220	?	27,600	34,808	39,720	45,302	47,000
4.7" Shell	-	-	-	-	-	628	1,722
<u>AIR FORCE</u>							
Bombs							
20 lb Frag	-	-	-	6,514	24,072	44,861	44,862
100 lb Anti-Sub	-	3,985	7,667	7,883	7,883	7,883	7,883
250 lb Anti-Sub	-	2,042	3,364	3,364	3,364	3,364	3,364
250 lb General Purpose	-	7,013	15,136	22,613	29,243	36,194	41,087
250 lb SAP	-	299	299	299	467	3,886	10,431
SAA							
0.303" Tracer	-	700,000	1,750,000	3,000,000	6,900,000	12,400,000	16,060,000
0.303" Incendiary	-	-	-	-	40,000	1,600,000	5,200,000

Why then were Curtin and the Labor Government so worried during the first part of 1942? Much of the production of the Ministry of Munitions since the last half of 1940, had gone to the AIF in the Middle East and been consumed in the battles there. The munitions organisation had been built primarily to supply forces defending Australia, but the Menzies Government had in 1940 agreed to become responsible also for the supply and equipping of its AIF divisions serving overseas. This was a gesture to assist Britain against the threat of invasion after the fall of France. Naturally, the AIF took the best of all the equipment produced, as it was the only Australian ground force in active combat.

The Menzies Government was aware of this trend, which was leaving Australian defence forces comparatively weak. By late 1940, it was actively encouraging the Army to forecast its requirements for many months ahead, so that the munitions production effort could be expanded further if necessary. There was no obstacle in finance or government approval. However, as the last chapter has shown, the Army did not place the orders. In April 1941, the Government ordered the Munitions Ministry not to wait for the Army to indicate requirements for munitions which were obviously needed. At the same time, the Government was having chronic difficulty in getting the Army to decide what weapons it required for certain crucial combat roles. This was the controversy over SMGs and the design of AFVs, particularly the tank. In exasperation the Government began to order the Army to place orders for the Owen SMG, and took the design function for AFVs and gave it to the Ministry of Munitions. As the last chapter has shown, the Army was still not placing

*David
Patt
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Table 7-6 : THE ARMAMENT REQUIRED FOR SEVEN DIVISIONS AND THREE CORPS COMPARED TO TOTAL MUNITIONS PRODUCED UP TO MARCH AND JUNE 1942

ARMS AND AMMUNITION OF AN ARMY FORCE OF SEVEN DIVISIONS IN THREE CORPS		TOTAL PRODUCTION JUNE 1940 TO MARCH 1942	TOTAL PRODUCTION JUNE 1940 TO JUNE 1942
Rifles	86,889	124,378	152,938
Bren Gun	3,419	2,047	3,267
Vickers MG	536	4,411	5,213
0.303" Ammunition	23,974,870	594,000,000	727,000,000
2 Pdr AT Gun	392	669	839
2 Pdr AT Gun Ammunition	71,064	120,739	210,311
25 Pdr Field Gun	576	267	459
25 Pdr Gun Ammunition	108,192	238,448	608,942
3" Mortars	882	1,261	1,541
3" Mortar Ammunition	44,800	514,426	810,389
Anti-Tank Mines	27,000	138,277	162,294
Grenades	28,680	942,415	1,492,729
Armoured Carriers	980	2,264	2,830
Light Tanks	196	NEVER MADE IN AUSTRALIA	
0.303" Armour Piercing Ammunition	801,070	3,000,000	7,900,000

Sources

AWM 327/1/11, File 422/7/8, Arms and Ammunition of a Division and Corps at 14 August 1940.
See tables 7-2 to 7-4.

Notes

1. The table does not include non-AFV mechanical transport as this was a Department of Supply responsibility.
2. The table does not take into account what had been produced before June 1940, nor does it include what the Army already held in stocks, and supplies from overseas.

sufficient orders or indicating new requirements properly at the end of 1941. The Army only began to respond adequately, in the administrative sense, in 1942 when the prospect of invasion had led Curtin to call the AIF home to Australia. The forces which were available to take the field in mid-1942 were below full strength in terms of munitions, as Annex K shows, although still a powerful defensive army.

One of the reasons for this defensive strength was the *quality* of the munitions held by Australian forces. With the exception of the Owen gun, these munitions had all been selected by the Army, largely from British designs. The explosive power and penetration of Australian made gun ammunition was comparable to Japanese munitions, and probably slightly better. Small arms such as the Vickers Heavy machine gun, the Bren light machine gun, and the Owen submachine gun, were as good or better than equivalent weapons held by the Japanese forces which might have invaded Australia. The 25 Pdr Field gun was a versatile and efficient weapon for which the Japanese had no obvious alternative. The AFVs made by the Japanese were probably mechanically more reliable than Australian AFVs; especially tanks, but more poorly armoured. However, with a 47 mm gun, the heavier Japanese tanks outgunned the AC1 which only had a 2 Pdr or 37 mm gun. Yet this tank gun, and its AT gun equivalent (2 Pdr) could penetrate at normal firing range, any Japanese tank available in the South Pacific in 1942. In this regard comments by the official historians that Australian AT guns were obsolete are incorrect[6]. In other

6. S.J.Butlin and C.B.Schedvin, *War Economy 1942-45*, Canberra, AWM, 1977, pp.65-66. These comments were directed towards the 2 Pdr and 6 Pdr AT guns and German tanks. But there were no German tanks in Asia; Japanese tanks were of less developed

weapon areas such as AA guns, Australian made munitions were comparable to Japanese equivalents with the possible exception of mortars.

There was no reason why Australian defence forces in early 1942 should not have been adequately equipped with munitions. The huge expansion in production during January to September 1942, could have started in 1941, had the Army MGO Branch and the Chief Military Adviser's Branch been efficient. Whereas it is always tempting to blame governments, the Menzies Government never stood in the way of any Army demand for more munitions; indeed the government often took the lead in pushing the Army into thinking more expansively. The Curtin Government carried on this policy even more vigorously, and instituted many reforms designed to force the Army to respond more efficiently in administration (see Chapter 6 of this thesis).

The Failure in AFV Manufacture

The major failure of the Ministry of Munitions was in AFV manufacture (see chapter 6); and it is informative because it was the only area of military technology covered by the Department, for which the policy of self containment had not been applied as Leighton would have wished.

The fundamental weakness underlying the Australian AFV programme was not the Army's propensity for endless design changes, nor DAFVP failure to follow equipment development procedures laid down by the MGO Branch. It was the complete lack of any laboratory and engineering capability for the

designs, for which the 2 Pdr AT gun, and later the 6 Pdr AT gun, were good counter weapons — see P.M.Roland, *Imperial Japanese Tanks . . .*, *op.cit.*

design and manufacture of AFV. Whereas Leighton had developed such centres of research for gun, small arms and ammunition as well as assorted naval and airforce munitions, the government in the 1920s and 1930s had elected to encourage the development of auto engine, chassis and gearbox production in commercial industry. Had the car industry in Australia progressed this far by 1940, the ground work would have been laid for an AFV research and engineering capability which could have guided DAFVP through its worst problems of manufacturing design[7].

The Menzies Government had of course been aware of this weakness (see Chapter 3) for it was one of the reasons it had attempted to encourage the expansion of the automobile industry in 1939/40. The automobile production monopoly conferred by Menzies on Australian Consolidated Industries was a further example of the urgency the Government placed on the development of the industry for war purposes. It was all in vain. The automobile industry was not ready economically to expand its manufacturing capabilities, and by 1940 had still not made a complete car. Major components continued to be imported until the Holden of the late 1940s.

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Missing.

The Ministry of Munitions and the Army had recognised the fundamental

7. This might still have been optimistic. British experience was that even with the existence of Vickers-Armstrong and Woolwich's pre war experience in tank design, the protracted difficulties of tank production during the first three or four years of war demonstrated that both the motor industry and the heavy locomotive firms had everything to learn. Tank production and design '...proved to be a highly-specialised industrial art without parallel in peacetime industry and without any special affinity with any branch of civilian engineering.' M M Postan *British War Production*, HMSO London 1952, p426.

difficulty they faced in June 1940, and sensibly elected to follow closely proven and tested designs for AFVs from Britain and the USA. But when it was realised that many components of these designs, particularly for tanks, could not be made in Australia and machine tools could not be imported, the Ministry of Munitions was forced to improvise. The Army tendency to demand continual design changes made this situation more complex.

The decision to break away from proven AFV designs and to improvise, took DAFVP into new design and engineering problems for which it was poorly trained to solve[8]. The formation in October 1940 of the AFV Design and Development Section at Fishermans Bend Victoria did not alleviate the situation. It was not the AFV counterpart of a laboratory of MSL whose staff had had years of technical training and research experience. Nor was it the equivalent of a factory of the MSB whose staff had had years of engineering training and experience. There was no organisation in Australia with any significant experience in the design and manufacture of AFVs, and this confined the AFV Design and Development Section to being a final assembly and test centre for more or less completed AFV.

Tragically, the more the DAFVP was forced to improvise, the more desperately it needed the services of an effective AFV research laboratory and engineering facility to guide it through, or around the problems of development and manufacture. But it was not possible under the exigencies of war

8. See Annex A to this thesis; in particular the consequences of modifying proven ^{capab} Development Designs and Manufacturing Designs without R and D and Specialised Engineering Capabilities to guide the effort.

to improvise these capabilities. The greatest deficiency was that of automotive engineering, and most of the persistent problems in AFV design and production in Australia were related to this area[9]. The greatest successes were achieved in the area of hull armour and gun turret design. In the first case, the iron and steel companies of Australia had much experience in metallurgy, and most had highly trained technical staff and good laboratories to back them up. Thus the scientific and technical infrastructure existed to solve the problems of cast armour tank bodies. In the second case, the engineering problems of gun construction, cradling and recoil were well understood by OFM, which had passed on much of its experience to the company of Charles Ruwolt. This company, which had much experience of basic engineering, applied the principles learnt from OFM to modifying the design of 25 Pdr Field guns and 17 Pdr AT guns, so that they could be placed in the turrets of the AC3 and AC4 respectively. This made the Australian tanks the most powerfully gunned in the Western Allied arsenal[10].

The failure of the AFV manufacturing effort demonstrated the correctness of Leightons' policy of establishing scientific and engineering facilities to cover key military technologies so that self containment could be achieved. Without such facilities and properly trained staff, it proved to be impossible

9. The development of aeroengine manufacture by CAC was of no help to this problem, for it was narrowly specialised to the single and double row Wasp engines for which all machine tools and technical data had been imported from the USA. In this respect it conformed to the Technology Package Strategy outlined in Annex A. CSIR's development of an aeronautical and engine testing laboratory was too late to give useful assistance to the tank problem.

10. A.T.Ross, *Wartime Munitions Expansion ...*, *op.cit.*, pp.187-191, 194-197. See also D.P.Mellor.

in wartime to mass produce AFVs of the appropriate level of quality to meet Army requirements for basic battlefield utility. This was the only area of failure amongst all the Ministry of Munitions manufacturing activities. All other activities either had laboratories and engineering facilities created by Leighton to support them; or were backed by equivalent facilities and trained personnel spread throughout key commercial industries, and the universities. This was the case with electronics which was well covered by the PMG Laboratories and AWA. Similarly, military optics was covered by the optical section of MSL, Commonwealth Solar Laboratories, and the physics departments of a number of universities.

The Cost of the Ministry of Munitions

The total cost of the Ministry of Munitions between 1939/40 and 1944/45 is cited in the Commonwealth Parliamentary Budget Papers for 1939–1946. It is as follows:

1939/40	4,408,628
1940/41	14,941,742
1941/42	27,870,939
1942/43	28,181,948
1943/44	19,259,103
1944/45	10,050,807
TOTAL	£104,713,167

This table represents the parliamentary appropriations made to pay for the operations of the Ministry of Munitions, and is a Treasury calculation. It does

not necessarily represent what the Ministry of Munitions calculated the figure to be in total, or by year. Therefore we will examine the data more carefully.

The major item of Government expenditure in the operations of the Ministry of Munitions was *Capital Cost* and not the Value of Production. Being a supply department, Munitions received payment for all goods produced, from consumers such as the Armed Services. Therefore the main expense of the Department was in providing the means of production and not the production itself. Capital Cost was made up of the cost of factory plant, machine tools, buildings, and works. Table L-1 in Annex L, compiled from Ministry of Munitions records, gives the Capital expenditure by the Government by major item for 1939 to 1945. These figures do not include the costs of Capital equipment gained through Lend Lease or Canadian Mutual Aid as these represented no cost to the Government. The cost of Plant and Machine Tools etc. to the Government was £56,939,587, and Buildings and Works cost £27,644,174, giving a total capital expenditure of £84,583,779.

*Should you not make a
proof read?*

The other major component of the Government's expenditure on munitions production was the *Residual Cost of Production*. This was not equivalent to the *Value of Production*, which will be examined later. The Residual Cost of Production was the difference between the total costs for munitions cited by the Treasury, minus Capital Cost:

Total Cost of Ministry of Munitions	£104,713,167
Subtract Capital Cost	£ 84,583,779
Residual Cost of Production	£ 20,129,388

The activities which made up the Residual Cost of Production are shown in Table L-2 of Annex L. The figure for munition production costs to the Government from this table is £20,505,557, which allowing for different methods of accounting in government departments, tends to confirm the figure derived earlier from Treasury sources. It is probably safe to assume that the Residual Cost of Production was about £20 million. Some of this sum was recoverable against post war construction. Technical Training referred to the training of tool makers who could be expected to be of great importance to almost any engineering industry, including munitions production. Technical Training in Table L-2 of Annex L cost the Government £2,086,146.

The Value of Production under the control of the Ministry of Munitions was made up from two sources:

- a. government factories and establishments; and
- b. commercial industry and annexes.

The Value of Production from Government Factories and Establishments 1939/40 to 1944/45 is given in Table L-3 of Annex L.

The Value of Production for commercial industry and annexes is not given discretely in the records of the Ministry of Munitions. However, the annual figures from 1941/42 to 1944/45 for the Manufacture of Munitions Trust Account give the total value of production for commercial industry, annexes, and government factories[11]. Figures are also produced for 1939/40 and 1940/41, but appear to only refer to commercial industry and annexes. This is because the

11. MHS File30, 'Finance Branch' pp37-8.

figure for 1939/40 is £612,000 which is far less than the figure for 1939/40 for government factories, i.e. £3,674,588 and so could not possibly be a total of *all* munitions production for 1939/40. Since the Manufacture of Munitions Trust Account did not get established until November 1940, replacing the Munitions Annexes and War Materials Trust Account, it seems likely that the figures for 1939/40 and 1940/41 were adjusted from the old account and do not include the government factories and establishments. The following table emerges:

	VALUE OF PRODUCTION FROM GOVERNMENT FACTORIES (Table L--3)	COMMERCIAL INDUSTRY AND ANNEXES	TOTAL
	£	£	£
1939/40	3,674,588	612,000	
1940/41	10,142,795	13,692,000	
1941/42	22,384,806		50,023,000
1942/43	33,265,023		82,432,000
1943/44	25,564,003		70,514,000
1944/45	13,698,825		53,832,000

The table above can now be completed to give Table 7-7:

Table 7-7 TOTAL VALUE OF PRODUCTION FOR MUNITIONS DEPARTMENT
1939/40 TO 1944/45

	GOVERNMENT FACTORIES AND ESTABLISHMENTS	COMMERCIAL INDUSTRY AND ANNEXES	TOTAL
	£	£	£
1939/40	3,674,588	612,000	4,286,588
1940/41	10,142,795	13,692,000	23,834,795
1941/42	22,384,806	27,638,194	50,023,000
1942/43	33,265,023	49,166,977	82,432,000
1943/44	25,564,003	44,949,997	70,514,000
1944/45	13,698,825	40,133,175	53,832,000
TOTAL	£108,730,040	£176,192,343	£284,922,383

For further details on the annexes see Annex H.

There are several assumptions in this table. The most important is that expenditure from the Manufacture of Munitions Trust Account is equivalent to money received for the sale of munitions into the Account. In fact the Ministry of Munitions had about £70 million owing to it on 30 June 1945 in the Manufacture of Munitions Account. Since the vast amount of this sum was owed by Government Departments (e.g. Department of Army) and foreign governments (e.g. Britain)[12], we may safely assume that all debts were paid and total munitions sales were eventually equivalent to total expenditure. However, because of the difficulty in compiling this table, it would be wise to treat the figures for

12. See Annex M, 'Value of Munitions Sales to Foreign Governments'.

commercial industry and annexes as being approximate[13]. Annex N gives the manpower associated with the total munitions production effort.

The achievement of the Ministry of Munitions is indicated by the amount of finance invested by the Government compared to the return as measured by the Value of Production. Thus approximately £105 million (including Capital and Residual Costs of Production) was invested to give £285 million worth of munitions production (including government factories, annexes, and commercial industry). In fact, the Value of Production would have been far higher except that by the beginning of 1943 the danger of Japanese attack on Australia had been removed unexpectedly. The huge capital investment in munitions factories had been based on a higher demand for war materiel than now emerged. In many cases major factories were on the verge of completion, but never began full production despite the capital investment. Many factories which had in fact reached their assigned production capacity in the late 1942 or early 1943, had their production reduced after only a few weeks or months at full production. Factories which fell within these two categories are listed in Table L-4 of Annex L, along with the Capital expenditure on plant and buildings etc which had been invested in them.

13. See AA MP730, S14, Box 1, Item 2, 13 September 1944. This cites the value for production 1942/43 as:

Govt Factories	£29,306,057
Commercial Ind & Annexes	£50,496,000
TOTAL	£79,802,057

This is close to the figure cited already for 1942/43, i.e. £82,432,000. After the war finished, more careful accounting from financial records of the war tended to increase calculations of costs. Therefore the figures quoted in the main text for the Value of Production are more likely to be correct than, for example, the figures above.

It would be correct to claim that £17,424,895 or 20% of the total capital costs of £84,583,779 was under utilized in terms of its potential to generate production. This was not a failure of planning, but the result of unexpectedly early success in the fortunes of war in the Pacific.

Of course, much of the capital expenditure by the Government on the means of production was recoverable. For example the cost of the Loan Machines and Pool in Table L-1 was £15,725,441, but the Government regained during the war in excess of £9 million through rental, hire purchase and direct sales of machine tools to commercial industry[14]. At the end of the war, the Government sold many of the factory buildings and machine tools to state governments and commercial industry. The sales of these realized according to the Final Report of the Commonwealth Disposals Commission[15]:

£21,882,417	from Liquidations Branch
£10,562,416	from sales of Machine Tools and Gauges
Total	£32,444,833

It is assumed that the Liquidations Branch of the Ministry of Munitions was engaged in leasing and selling factory buildings and plant. Certainly, a very large number of the armament annexes, and government factory buildings had been disposed of in this way by January 1948 according to Ministry of Munitions records[16].

Other capital expenditure was on projects of great significance to post war

14. MHS 30, 'Finance Branch', pp.69-72.

15. PP C10275 of 31 July 1949, Annex G.

16. MHS 45, 'Factories and Annexes — Position as at 1 January 1948'.

development by industry — i.e. see Table L-1 Annex L.

Manufacture of Aluminium	£ 141,325
Equipment for Training Tool Makers	£ 239,980
Ship Building	£7,428,472
Special Ship Building Plant	£1,437,801
Nitric Acid Plant	£ 67,711
TOTAL	£9,315,289

While this Capital expenditure was important for the war effort, it cannot be credited wholly against the Ministry of Munitions. The investment remained virtually intact at the end of the war for use in industrial development. It is perhaps reasonable to assume that 75 per cent (i.e. £7 million) of this Capital expenditure was transferrable to other Government Departments, or recoverable by direct sale to state governments or private companies.

Through these rudimentary and somewhat superficial calculations it can be shown that the Government regained:

£ 9,000,000 through sales and rentals of Machine Tools
during 1939-45

£32,444,833 through post war sales of Machine Tools,
buildings and property

£ 7,000,000 through investment in post war industries.

£48,444,833 Total

The total cost to the Government of the Ministry of Munitions during the war has already been shown to have been approximately £105 million. Thus the Government generated £284 million in Value of Production from a real expenditure of:

	£105 million
subtract	£ 48 million
	£ 57 million

Obviously, this figure cannot be accepted as being completely accurate as it is not the result of proper accounting, but it serves to demonstrate the broad relationship between money the Government actually spent on the Ministry of Munitions and what was generated in Value of Production.

The efficiency of the Ministry of Munitions is also indicated by the general decline of unit costs of munitions by the mid point of the war in 1942. Annex O presents representative data on the cost of production of individual munitions. Some of these costs began to rise again towards the end of the war, probably because of declining rates of production and contracting economies of scale. Also the costs of materials had begun to rise from inflation.

CONCLUSIONS


This thesis has presented a detailed account of the development of the Australian Self Containment policy to 1945. It has outlined the growth of early ideas on self containment of Supply within the Defence Department before and during the First World War, which led to the arsenal plan for Tuggeranong. It has shown how A.E.Leighton overcame a powerful coalition of departmental interests - led by the Minister George Pearce - and inserted his own plan.

This plan gave emphasis to co-locating government munitions factories with industry, and was based on a comprehensive system of scientific research laboratories, which were to supervise the implantation of foreign munitions technology, and to nurture its growth in Australia. The plan also outlined the need to place all defence supply operations under one authority with the power to develop and implement policy for all aspects of defence supply. This became the MSB, and under Leighton's leadership (1921-1939), it developed the system of laboratories and factories which adjusted munitions technologies to Australian conditions, materials and industrial practices, so that industry could be taught the art of making modern armaments when war came.

This thesis has shown that Leighton's unified organisation of supply and its emphasis on science and engineering, was justified fully by the results achieved by the Ministry of Munitions during the Second World War. Areas of munitions technology which had been prepared and suitably modified by the MSB, were able to be taught to industry, which then succeeded in producing the

necessary quantity and quality of munitions required by the Armed Services. Areas of technology for which no preparation had been made, and for which no civilian research capability existed, were not able to be developed during wartime in terms of the quality and quantity of production required by the Armed Services. From this it would appear that the small sum of £8 million invested in Leighton's scheme between 1921 and 1939 was money well spent by Australian Governments. It produced a massive dividend at the critical period of the war, when Australia had only its own resources to rely on for defence against invasion. Had the Japanese been able to reach Australia, it is doubtful whether they could have fought a successful land campaign, because Australian land forces had easy access to huge quantities of excellent armaments from Australian industry. Japanese forces would have been at the end of tenuous supply lines thousands of miles long.

Much of the politics which surrounded the pre-1939 activities of the MSB were to promote the financial survival of the organisation and to prevent the stealing of its functions by competitors. In the first case, the Great Depression led to the Department of Defence suffering very severe cuts in finance. The Armed Services collapsed, in terms of combat effectiveness, and the MSB would soon have followed in terms of being a production agency. However, the soundness of the MSB being based on comprehensive research laboratories and modern engineering skills was dramatically demonstrated when Leighton led his organisation into large scale commercial production to offset the decline in Government funds. The MSB proved capable of manufacturing a wide range of commercial products and contributed significantly to the Governments' import



replacement scheme. Through these methods Leighton was able to preserve most of his organisation intact throughout the Great Depression.

In the second case, the Armed Services resented the power and authority of the MSB, and attempted persistently between 1923 and 1939 to gain control of supply functions. They wished to control the entire chain of supply to the factory floor itself, because supply factors had a vital influence on the outcome of military operations. Leighton's prestige as the head of the MSB and the Australian Government's senior technical adviser, gave him a status equivalent to a Service Chief. He used this to expose the Armed Services ignorance of factory management and technical research, while at the same time demonstrating the advantages of having a unified supply system under civilian control. The wisdom in excluding the Armed Services from the MSB appears to have been supported by the experiences of the PSOC. Leighton had created this committee in 1933 to involve the Armed Services in the planning for the organisation of industry for wartime munitions production. They deadlocked the committee because of faction fighting amongst themselves, and through a refusal by the Army and Airforce to accept the Government's defence policy. over

In 1936 another competitor emerged. Since 1926, the CSIR had been jealous of the heavy involvement in industry of the laboratories of the MSB. Because of the general lack of scientific facilities available to much of industry, the MSB laboratories had often given technical advice to help firms overcome persistent problems. The aim of this was to help industry develop so that it would prove to be more technically capable of making munitions should the need arise. The CSIR also held a functional responsibility to assist industry,

but had been unable to develop any laboratories for this purpose because of lack of Government finance. In 1936 it saw its chance to expand activities through the Government's new policy towards secondary industry. Through the aegis of the SITR Committee, the CSIR attempted to gain support for laboratories which duplicated those of the MSB, and claimed that it was more capable of organising and preparing industry for war than the MSB. It was only with difficulty that Leighton was able to fend off this challenge. He was aided greatly by the fact that the functional breadth of his organisation ensured that it was a large part of the Defence Department. Because of this he gained the support of the Secretariat and the Minister.

With the creation of the Department of Supply and Development, and Leighton's retirement in 1939, the MSB was finally defeated. The old unity of supply functions was destroyed, and the carcass of the remaining organisation buried under many new layers of control, all dominated by the Armed Services. But not before the MSB had produced a detailed plan for a proper department of munitions and had succeeded in getting together a workable plan for the organisation of industry.

Apart from the memory of what a unified and powerful supply organisation could achieve, the most important legacies Leighton left in 1939 were his two lieutenants and colleagues N.K.S. Brodribb and J.K. Jensen. The former was the technical expert who knew how to solve any crisis concerning laboratories or factories. Brodribb kept intact the technical cohesion of the defunct MSB after Leighton had left. This was inherited by the Ministry of Munitions in June 1940.

Jensen was Leighton's assistant in long term planning, and his accomplice in bureaucratic politics. With the departure of his chief, Jensen took on the task of regaining a proper voice in the councils of state for the munitions supply point of view. His determination and persistence carried with him the first two heads of the Department of Supply, as he sought to reveal the problem of lead-time and finance to the Armed Services and the Government. It was Jensen who showed the way to overseas orders as a means of escaping subservience to the overly complex system of coordination accepted by the War Cabinet. In the crisis of May 1940, it was Jensen who led the revolt of the senior staff of the Department of Supply against the slowness of the system of control, and the ineptitude of the Government's handling of supply. This helped in encouraging Menzies appointment of Essington Lewis as the new Director-General of Munitions. Lewis was given complete control of munitions supply, virtually recreating the unified organisation which had once existed under the MSB. The plan Lewis adopted for his new Ministry of Munitions was the MSB plan developed by Jensen in 1938. The basis of the new department's organisation of industry was the plan developed by Leighton from the chaos of the PSOC. / 1940

Lewis was too powerful to be challenged directly over munitions supply by the Armed Services. But instead of viewing the Ministry of Munitions now as an ally, the Services, particularly the Army, transferred their politics to a lower level. Munitions design, inspection procedure, priority rating and size of orders became the issues around which the Services once again sought to gain dominance over aspects of supply. The Army in particular insisted on pursuing absurd points of principle without regard to the fundamental objective of

increasing production by any means available. The Army only began to show signs of changing its bureaucratic behaviour in early 1942 when military disaster seemed imminent; and the Government threatened to whittle away what remained of Service discretion in ordering supplies. The disruptive effect on munitions supply of the Services' desire to play politics cannot be over emphasised. Much more production could have been achieved with a different attitude towards the Ministry of Munitions.

There are some general implications for current historiography which flow from this thesis. One of these is that an undue popular attention has been placed on combat operations, and the politics of central government and its foreign policy. This has encouraged the belief that Australian Governments did not do enough for defence before the Second World War and naively placed too much faith in British promises of military assistance. As this thesis shows, this view ignores the economic difficulties of the period. In fact Australian Governments did much for defence, given their financial resources. Furthermore, they recognised the unreliability of British promises and set out to give Australia what insurance she could afford. Instead of squandering the small sums of money available in peacetime on expensive standing Armed Services whose equipment and training could become quickly outdated, Australian Governments chose to invest heavily in developing the technical capability to make modern weapons and their ammunition. The MSB was developed on a scale which showed clearly that its main purpose was to arm very large Armed Forces in wartime.

The failure of historians to recognise the role of the MSB, and to study the

activities of the Ministry of Munitions, has encouraged the belief that Australia was defenceless in early 1942. It is true that the training of military units may not have been complete, and some deficiencies existed in some categories of equipment. However, the Chiefs of Staff chose to over-emphasise these factors to an inexperienced Labor Government, and did not point out that armies rarely have time to complete all training before going to war. Adequate alternatives existed in Australia for all important categories of equipment. As mentioned earlier, munitions were in fact pouring off the production lines of industry and were sufficient to equip the anti-invasion force desired by the Army. It is unlikely that the Japanese could have maintained a dominating air presence because of difficulties in logistic supply. This applied with even more force to large land forces. Australian forces had their sources of supplies immediately to hand.

Because there has been insufficient historical study of the politics surrounding the Ministry of Munitions, there is the comfortable belief, fostered by certain post war Service publications, that no serious problems existed in relations with the Armed Services. It has been stated here that there were; and these problems show that the technical branches of the Armed Services, particularly the Army, were poorly prepared for the tasks they undertook during the war. This in turn relates to the preference given in training to fighting personnel within the Army in peacetime, and the lack of attention given to providing technical staff capable of supporting modern warfare. The Armed Services relied on Britain heavily for these activities, and mainly envisaged operations in which Australian forces operated as adjuncts of British forces, living off the British logistical tail. It is ironical that for all its posturing for an Australian based

anti-invasion force, the Army apparently never prepared in peacetime even the vestige of a competent technical organisation which could support such a force.

It is often asserted in articles and books on current defence policy, that a similar munitions expansion to that of 1939–1945 can be obtained in future wars by making vast sums of money available. In other words, it is possible to improvise scientific and technical support to solve munitions production problems during wartime. Given the extensive long term planning, research and training carried out by the MSB between 1921 and 1939; and as shown in this thesis, the great importance this had for the Ministry of Munitions; it is probable that the above view is a dangerous oversimplification based on ignorance of the actual history of defence science and manufacturing policy.

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Notes on the Bibliography and Sources

1. The bibliography of this thesis is laid out with unpublished material being listed first, followed by Parliamentary material, then newspapers, followed by books, articles and finally theses.
2. Within the unpublished material, files have been listed by number, with a short statement of their interest to the thesis. This was done in preference to stating file titles which are often misleading in regard to relevance, and not useful as a location device.
3. All files are listed by Department or Agency, except for those of the Departments of Supply and Munitions. In this case they are combined because the filing systems became intermingled during and after the war. No useful purpose is served in attempting to distinguish them. Australian Archives provides search aids which are cross-referenced to both Departments.
4. It is interesting to note from the bibliography that little reliance was placed on secondary sources. The reason for this was that very little has ever been published on the subject of the thesis and related areas. The writer was forced to use primary sources for even trivial points of detail.
5. There were significant problems with many primary sources as well. In the early 1950s the Department of Supply culled all the old files in its possession,

which resulted in the devastation of the records of the MSB and the Department of Munitions. However, the effect of this action was reduced by Sir John Jensen. Before his retirement in 1948, and for some years afterward, Jensen collected any papers of historical relevance to the above two organisations. These were to be the basis of his history of defence production in Australia, and are the Jensen Papers listed in the bibliography under Australian Archives. They are the most important collection of documents still remaining on the MSB and the Department of Munitions. Fragmentary collections of papers surviving in the records of other departments and organisations complement the Jensen Papers.

6. As a supplementary action to his collection of documents, Jensen in 1943 ordered every branch of the Department of Munitions to prepare a war history. These histories formed a collection of unofficial files which the writer has termed the Munitions Historical Series (MHS). They disappeared after the war, until they came into his possession in 1974 as a consequence of performing official duties within the Department of Supply. They will probably become part of Australian Archives accession number MP438 which already contains some duplicates of the original MHS files.

7. The Army also destroyed many files after the war. Particularly thorough destruction was carried out in the technical areas covered by the MGO Branch. This is clear from the registration books held by Australian Archives which record the destruction of files. While a significant part of this destruction was probably done innocently in the cause of reducing the enormous quantity of documents built up during the war years, the writer is of the opinion that the occasion was also used to remove embarrassing papers on such subjects as the

Owen gun, Army Inspection and other issues of contention between the Department of Army and Department of Munitions. Although such destruction made research extremely difficult, many of the issues were able to be established through records of joint organisations such as the Army and Munitions Coordination Committee, and papers backing Cabinet agenda. Personal papers often afforded valuable insight into Army activities within the MGO Branch.

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RECORD OF THESIS USE

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ANNEX A

*SELF CONTAINMENT AND OTHER STRATEGIES FOR THE DEVELOPMENT
OF MUNITIONS PRODUCTION IN A MINOR POWER*

Introduction

In the first years of the Twentieth Century, Australia was cast in the role of a minor power, seeking to establish some indigenous capability to supply her own munitions. The main method used before 1914 was what shall be termed the strategy of the Technology Package. By 1921 the Australian Government had embraced a different strategy called Self Containment, which was employed until the Second World War. An understanding of the difference between these technical strategies is useful in understanding some of the issues concerning munitions supply policy, and also the scope of the concept derived by A E Leighton for the Munitions Supply Board [MSB] in its implementation of the Self Containment strategy.

Strategies of Munitions Development in Minor Powers

The development and production of even basic munitions such as a gun shell or bullet, was an increasingly complicated business by 1900. The requirement for high performance, less weight, more mobility etc. led major munitions suppliers (the major powers) to develop increasingly sophisticated support facilities for scientific research and precision engineering. These support facilities tended to fall into two types of organisation for each new military technology:

- a. a Research and Development (R and D) Capability; and
- b. a Specialised Engineering Capability.

The main purpose of an R and D Capability was to generate a sound Developmental Design for a particular family of munitions. A Developmental

Design defined the physical and chemical parameters which established the feasibility of achieving certain nominated Operational Requirements within the scope of a particular munition. The components of an R and D Capability were modern, well equipped laboratories and testing facilities, staffed by specially trained scientists, who had acquired an extensive knowledge of relevant military technologies.

The main purpose of a Specialised Engineering Capability was to generate a sound Manufacturing Design for a particular munition. A Manufacturing Design defined the most practical design in which a munition could be mass produced, as well as the optimal layout for the production line. The components of a Specialised Engineering Capability were modern engineering workshops, tool rooms and draughting rooms, staffed principally by experienced mechanical engineers and draughtsmen, with an extensive knowledge of relevant military technologies for a particular munition.

These support facilities would be grouped usually with a factory specialising in production of the relevant family of munitions. For example a factory producing gun carriages and ordnance would have associated with it a Specialised Engineering Capability which included extensive knowledge of forging, precision machining and steel, and also an R and D Capability specialising in applied physics and metallurgy.

The development of new munitions after 1900 had been carried out mainly by major European powers, and the USA. It had involved high financial costs because the period of investigation to achieve adequate Developmental Design

and Manufacturing Designs was usually long, and the probability of failure was high. The major world arms dealers accepted these challenges as they had the resources and commercial interest to accept the risks of failure.

Minor powers, like Australia, were rarely at the forefront of munitions technology, and consequently, were reluctant to accept the technical and financial risks in developing their own munitions through original research. It was more convenient to gain some form of technical support from a major power, and to concentrate on munitions for which there already existed proven Developmental Designs and Manufacturing Designs.

The technical strategy which provided the lowest technical and financial risk was for the minor power to accept unchanged the Developmental Design and Manufacturing Design of a proven munition, or family of munitions, from a major power. This typically entailed the purchase of the above designs, the acquisition of a production licence, and the construction of a factory equipped almost identically to those making the munition for the major power. The latter, or one of its commercial armament firms, would supply all the drawings of the production layout, and most of the machine tools and factory plant. Trained personnel would be despatched to set up the new factory, and to train the new owners in the necessary production techniques.

This *Technology Package* strategy was a quick and practical way to establish new munitions production within a minor power, and this was its main advantage. Its disadvantage was that the enterprise remained heavily dependent on its overseas parent for all technical advice, processed raw materials and

components. The skill of commercial industry within the minor power could not be utilised to lessen this dependence as it usually had insufficient knowledge of the manufacturing techniques being used in the munitions production. Any attempt to modify the Manufacturing Design of the munition so that it reflected the industrial techniques and practice common to the industry of the minor power was almost certainly doomed to failure as the minor power had no appropriate Specialised Engineering Capability for the family of munitions. This existed in the major power, and reflected its industrial techniques and practice. Thus, for many years, the new munitions factory in the minor power would remain linked technically by umbilical cord to the original manufacturer overseas. Technical uncertainty in munitions design would be removed at the price of overseas dependence. In this respect the maintenance of satisfactory communications with the major power was vital in war as well as in peace.

The technical strategy which provided an escape from this dependence was that of *Self Containment*. It involved initially the acquisition from a major power of an appropriate set of Developmental and Manufacturing Designs for some well proven munition or family of munitions. The purpose of the strategy was then to modify the Manufacturing Design so that it was more compatible with the prevailing skills and industrial technique of the minor power. Consequently, an appropriate Specialised Engineering Capability was set up within the minor power. This development helped to reduce the effect of the smaller range of industrial capabilities available within the minor power and the lower level of precision engineering. Major powers also used commonly many materials, specialised items of factory plant and machine tools, which minor powers

used infrequently or did not even possess. Industrial practice assumed in major power Manufacturing Design could, (and usually did) differ significantly from that of minor powers. The development of a Specialised Engineering Capability for a particular type or family of munitions was a most important step towards overcoming these problems inherent in the Manufacturing Design of the major power, and introduced a significant degree of technical independence, reducing the influence of the major power.

The Self Containment strategy also sought to modify the Developmental Design gained for a munition from a major power. The Developmental Design for a munition reflected originally the Operational Requirements (or levels of performance) defined by the Armed Services of the major power. Such Operational Requirements were based, among other things, on the physical conditions (including weather and climate) dominating the geographic areas of prime operational importance — for most nations, including major powers, their land, sea and air environments inside and around their national borders. The appropriateness of a Developmental Design for a minor power was based partially on the assumption that the physical conditions of the major power were similar to those of the minor power. In fact, they often were not, because physical conditions could vary considerably even between adjacent nations. The objective of many Armed Services of minor powers was to modify the munitions of major powers so that they accommodated more comfortably the different physical conditions prevalent in their main operational areas. The Operational Requirements of a major power were also based on many factors (including physical environment) which tended to vary from one nation to another and

hence lead to significant differences in doctrine between nations. This was another influence which tended to lead to Developmental Designs for particular munitions from major powers, giving an inexact reflection of the Operational Requirements of minor powers. Sometimes these differences were not important enough to attempt to modify. But when such action was deemed necessary, it could only be carried out successfully by the creation within the minor power of an appropriate R and D Capability.

While the modification of the Developmental Design and Manufacturing Design of a proven munition of a major power held a lower probability of failure for a minor power than the original design of a munition (given that R and D and Specialised Engineering Capabilities existed) the procedure was not without its own peculiar difficulties. Significant changes to Developmental and Manufacturing Designs of a proven munition tended to upset the delicate balance between components and materials, with the result that a series of unintended interactions took place altering the operational performance of the munition in unintended ways. These interactions were not easy to predict without considerable technical knowledge of the relevant scientific disciplines and military technology, and hard to correct. For example, changes wrought to Manufacturing Design could have the unintended effect of changing the operational performance of the munition, requiring modification of the Developmental Design. Similarly, changes to the Developmental Design to correct the operational performance could upset the Manufacturing Design by defining a munition which was more difficult to produce than the original. Such problems were controlled by the existence of R and D, and Specialised Engineering Capabilities, working

together closely.

The advantage of the strategy of Self Containment was that it reduced the level of Technical dependence of a minor power on the major power. The disadvantage was that it took much longer to establish munitions production than the Technology Package strategy, because R and D and Specialised Engineering Capabilities took a long time to establish properly. The problem of training scientific and engineering staff so that they had mastered new and unfamiliar technologies was complex, and usually required the assistance of a major power. Such training then had to be kept up to date so that key personnel could continue to be in touch with the state of the art for particular munitions. The Self Containment strategy was also more costly to support as it entailed building and then maintaining not only an appropriate factory for the munitions concerned, but also the R and D and Specialised Engineering Capabilities and all their staffs.

Lying inbetween the technical strategies of Self Containment and the Technology Package were two other strategies. The first of these will be termed the *In-Country Manufacturing Design* strategy. Its objective was to select a family of munitions which satisfied some appropriate operational requirements of the defence forces (thereby requiring no modification of Developmental Design), and to modify the existing Manufacturing Design so that it was compatible with the known skills of local industry, so that the munitions could then be produced on a large scale. This meant that apart from a factory, the government also required an appropriate Specialised Engineering Capability in order to solve the problems of modifying Manufacturing Design.

A 7A

Figure A-1

		IMPACT OF DEFENCE FORCES OPERATIONAL REQUIREMENTS ON OVERSEAS DEVELOPMENTAL DESIGNS	
		MODIFY OVERSEAS DEVELOPMENTAL DESIGN - (R AND D CAPABILITY REQUIRED)	ACCEPT OVERSEAS DEVELOPMENTAL DESIGN - (NO R AND D CAPABILITY REQUIRED)
COMPATIBILITY OF OVERSEAS MANUFACTURING DESIGN WITH CAPABILITIES OF LOCAL INDUSTRY	MODIFY OVERSEAS MANUFACTURING DESIGN - (SPECIALISED ENGINEERING CAPABILITY REQUIRED)	SELF CONTAINMENT STRATEGY	IN-COUNTRY MANUFACTURING DESIGN STRATEGY
	ACCEPT OVERSEAS MANUFACTURING DESIGN - (NO SPECIALISED ENGINEERING CAPABILITY REQUIRED)	IN-COUNTRY R AND D STRATEGY	TECHNOLOGY PACKAGE

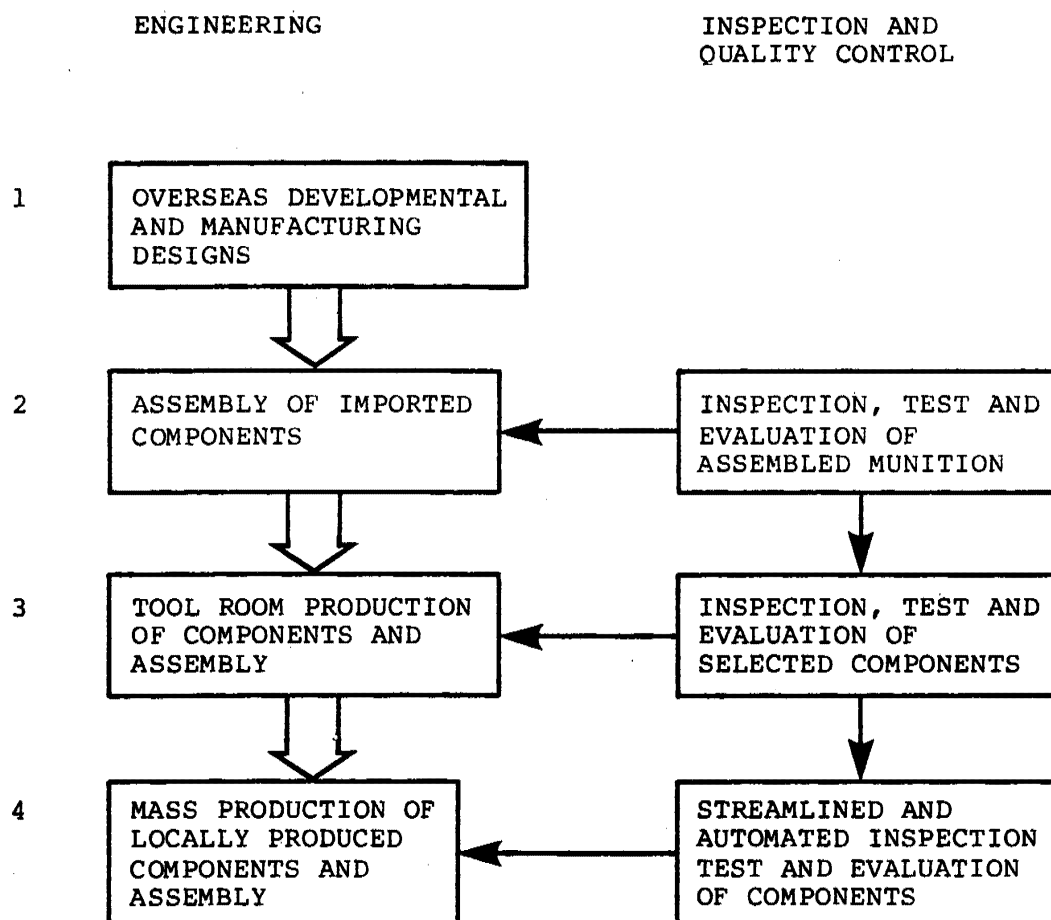
The last technical strategy is termed the *In-Country R and D* strategy. Its objective was to select a family of munitions for which the Manufacturing Design could be implemented by local industry, and to modify the Developmental Design so that the munitions operational performance more nearly suited some group of local operational requirements defined by the minor power's Defence Forces. For this a government required a factory and an appropriate R and D Capability.

The basic relationship between all four strategies is outlined in Figure A-1.

Technology Package Strategy

The process by which military technology was actually transferred in the Technology Package strategy is outlined in Figure A-2. The first stage was the acquisition by the minor power of the relevant Developmental and Manufacturing Designs from a major power. The second stage was usually the assembly of complete munitions from components imported from the original manufacturers, who would also have supplied most of the jigs, machine tools and factory plant. The problem of actual manufacture by the minor power was therefore sidestepped for the moment, while workers and executive staff got experience in assembly techniques under the tuition of trained personnel from the original manufacturer. Similarly, local personnel were trained in elementary Inspection, Test and Evaluation procedures in order to ensure that the defined levels of operational performance for the munition, were achieved for those assembled in the minor power. Stage three was the first major attempt at serious manufacture. Under the close supervision of technical staff from the original

Figure A-2. DEVELOPMENT OF A TECHNOLOGY PACKAGE



manufacturer, selected components were produced by Tool Room Production techniques[1]. This was later broadened to include all important components. Component production introduced a more detailed form of Inspection, Test and Evaluation as techniques had to be learnt by local staff to test each specific component to see if they met specifications and performance as laid down in the Developmental and Manufacturing Designs. The last stage was the achievement of Mass production. Executive and manufacturing staff were taught how to construct the standard production line for the munition, and to co-ordinate the process of mass production of components and finished munitions. New, automated techniques of Inspection, Test and Evaluation also had to be learnt in order to cope with the greatly increased flow of munitions.

The Technology Package was the strategy used to set up Small Arms Factory [SAF] Lithgow. The Australian Defence Department acquired from Britain the Developmental and Manufacturing Design for the Short Lee Enfield 0.303" Rifle, and in March 1909 called for quotations from local and overseas firms to supply a complete plant, machine tools, jigs and inspection gauges. The new factory had to be capable of manufacturing rifles whose components would be interchangeable not only with those of all Short Lee Enfield rifles to be made in Australia, but also with the same pattern of rifle made in Britain[2]. This was because the stock of service rifles held in Australia were mostly the Short Lee

1. Tool Room Production — The assembly of production units (or components) on a one-off basis without the use of systematic production line techniques. Jobbing manufacturing techniques predominate as components, materials and personnel are brought to one central location and operate around a stationary semi-completed production unit.

2. D.P.Mellor, *The Role of Science and Industry*, AWM, Canberra, 1958, pp.2-3.

Enfield, made in Britain, and that Australian forces attempted to gain general uniformity of equipment with British forces. Pratt and Whitney of the USA was the commercial firm which won the contract for SAF, largely because it had devised a more advanced method of mass producing rifles than used by British firms. Thus the unusual situation had occurred in which the Developmental Design was coming from Britain, and an updated Manufacturing Design was coming from the USA as well as the factory plant and machine tools. Indeed, Pratt and Whitney had to prove, as part of their contract for SAF, that their updated Manufacturing Design defined a production line of machines capable of producing Short Lee Enfield rifles to the quality desired and at a rate of 50 per day[3]. While the factory plant and machine tools etc. were being produced and assembled into a trial production line, in the USA, Pratt and Whitney sent out an engineer F.R.Ratcliffe, to advise on the construction of buildings for SAF. He was followed by a number of other qualified staff to help install machinery when it arrived in Australia, and to train Australian executive staff in production and inspection techniques. The first permanent manager of SAF was also a Pratt and Whitney employee A.C.Wright, who stayed until July 1915 when he returned to the USA and was replaced by F.R.Ratcliffe. Six engineering staff and one accountant were sent from Australia in 1910 to Pratt and Whitney for special training[4].

3. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 2, Volume 1, pp.117-123.

4. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 2, Volume 1, pp.158-162, 166-171. The accountant was Jensen.

AA MP598, S30, Box 3, 'Annual Report' on SAF Lithgow 1915-1916. See also Box 2, Item 3 for details on Jensen's despatch to USA and Canada.

SAF does not appear to have imported components from Enfield Britain during the initial stage of production. It seems that the six Australian engineering staff sent to Pratt and Whitney, plus the Pratt and Whitney staff sent to Australia, all gained sufficient production experience during the test runs of the production line in the USA that initial production in Australia went straight into the manufacture of components (i.e. stage three of Figure 2). Mass production was not reached until the First World War[5]. This was because a complete set of machines for continuous production (i.e. Mass Production) was not purchased, but instead a small number of multipurpose machines were obtained which were capable of several different tasks, and these would be shifted around into new positions after each separate phase of production was completed. This was Batch production[6], and its main advantage was that it saved considerable capital expenditure on factory machines. During the First World War, when the demand for rifles was high, SAF duplicated its factory plant and machine tools, and it is believed that this allowed the beginning of Mass production[7].

This was not achieved without some controversy, which pointed in 1916 to

5. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 2, Volume 1, pp.180-181.

6. Batch Production - The division of the production cycle for a particular product into a number of phases for each of which the production line is rearranged each time (i.e. there is no continuous production cycle). Batch production is particularly useful when insufficient factory plant and machine tools are available for continuous production, or when the size of order does not warrant the high capital expenditure on machines and plant for continuous production. In this situation maximum use is made of what is available by redeploying the scarce machines at each new phase of the production cycle into different places of each new production line.

7. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 5, Volume 3, pp.99-109, 120-121.

a weakness in Inspection, Test and Evaluation at SAF. The Army had produced an intermittent flow of complaints about SAF rifles since 1914[8]. Most of these complaints were poorly founded, indicating that the technical knowledge of rifles and SAA in many quarters of the Army was rudimentary[9]. But by 1916, the complaints had reached the level of political controversy and George Pearce, the Minister of Defence, was forced to initiate some form of action[10]. On the advice of Ratcliffe, the manager of SAF, and other experts, he decided to place Inspection at SAF under the Army and to strengthen the inspection staff. This was done on the principle that the user should be able to pass final judgement on the acceptability of the product[11].

A possible explanation as to why Inspection had apparently failed in 1916 was the departure back to Pratt and Whitney of Mr H.E. Wright in October 1915 who had previously been the Chief Inspector of the SAF viewing and inspecting staff. His position had not been filled[12]. However, before the Royal Commission on Navy and Defence Administration in November 1917, J.K.Jensen gave

8. AA MP598, S30, Box 3, Report of the Chief Armourer of the Fifth Military District (L.Monk) 25 March 1914, Report of the Military Board of the Fifth Military District 27 April 1914, Confidential Despatch GOC AIF 21 December 1915, further complaints by the Commandant of Fifth Military District 2 June 1916, L.Monk writes to his friend T.Trumble (acting Secretary of the Department of Defence) 23 June 1916, Adjutant General condemns SAF rifles 3 July 1916.

9. AA MP598, S30, Box 3, Reply by Chief Inspector SAF 22 February 1915. See also J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 5, Volume 3, pp.122-131.

10. AA MP598, S30, Box 3, see Report of Commandant of Fifth Military District to acting Secretary of Defence 2 June 1916 which mentions Sir John Forrest's interest and also the deputation of four MPs enquiring on the state of rifles in Western Australia.

11. AA MP598, S30, Box 3, Ministers reply of 4 July 1916 to Report of the Adjutant General of 3 July 1916, and Ministers minute of 25 July 1916.

12. AA MP598, S30, Box 3, 'Annual Report' on SAF Lithgow 1915-1916, p.15.

plausible technical explanations for all alleged SAF rifle failures which indicated that there probably never was any significant problem, and that the Australian Short Lee Enfield rifle had reached a standard which was consistently higher than that produced by the original manufacturer, Enfield, in Britain[13].

Even though SAF could claim to have achieved its full production potential during the First World War, thereby signalling a successful conclusion to the transfer of the Technology Package from Britain and Pratt and Whitney, SAF remained reliant on Britain for most technical advice and was unable to modify the Manufacturing Design so that the Short Lee Enfield rifle could be produced by commercial industry as well. This was partly because SAF did not then have a R and D or Specialised Engineering Capability associated with it, being basically just a modern rifle factory, and partly because commercial industry was too immature to handle the inescapable precision engineering. The gap was too wide to close. SAF was also dependent on Britain for virtually all raw and processed materials (e.g. rifle steel, spring steel). This dependence was reduced during the First World War, but not entirely eliminated by the end of it[14].

The other major munitions factories in existence in Australia before the First World War had also been established according to the Technology Package strategy. The Small Arms Ammunition [SAA] Factory run by the British Colonial Ammunition Company was set up before 1900[15] and for many years did not get beyond Stage 2 of Figure A-2 (i.e. assembling imported components).

13. AA MP598, S30, Box 2, Jensen's evidence on rifles 16 November 1917.

14. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 5, Volume 3, pp.116-119.

15. See J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 1, Volume 1.

But in 1912, a brass foundry was established with a rolling mill to produce brass cups for 0.303" SAA. By the end of the First World War few components were imported any longer[16] and the SAA Factory had reached Stage 4, (Mass production of all major components), although raw and processed materials continued to come from Britain.

The Cordite Factory began operations in June 1912. It was based closely on the manufacturing processes developed at the Royal Gunpowder Factory at Waltham Abbey in Britain, and not on the less technically advanced methods of making cordite by European and British private manufacturers[17]. A British expert in explosives and chemical engineering was obtained, A.E.Leighton, to supervise construction and management of the new Cordite Factory. He brought with him a British foreman experienced in all aspects of Cordite manufacture[18]. All factory plant and machines were imported from British firms in association with Waltham Abbey. The Cordite Factory did not assemble components initially in the sense of SAF or the SAA Factory, but it is believed that the first few production runs were based on imported chemical components, e.g. gun cotton and nitroglycerine from Britain. By late 1914, the Cordite Factory was making nearly all of its own chemical components, and was obtaining most of its chemicals from within Australia with the exception of Acetone. The Acetone problem was not solved until the Acetate of Lime Factory was built and

16. *ibid.*, Chapter 5, Volume 3, pp.58-59.

17. *ibid.*, Chapter 2, Volume 1, pp.81-82.

18. *ibid.*, Chapter 2, Volume 1, pp.82-83, 87. The British foreman was Mr E.G.Monk, father of Albert Monk former President of the Australian Council of Trade Unions.

Table A-1: Production at SAF, Cordite Factory, and Colonial
Ammunition Factory, 1912-1919.

YEAR	SAF		CORDITE FACTORY		COL.AM.CO
	RIFLES	COST PER	NO OF	COST PER	SAA-MILL.RDS
	RIFLE	£	LBS	LBS £	APPROX.
1912/13	40	?	133,604	00-05-02	?
1913/14	4760	13-18-01	229,608	00-03-08	?
1914/15	13786	09-09-09	264,312	00-03-07	31
1915/16	30460	07-17-08	306,345	00-03-04	49
1916/17	23960	09-18-07	431,340	00-03-04	72
1917/18	23251	08-18-11	326,055	00-05-07	93
1918/19	42129	07-10-08	?	?	60

SOURCES

Commonwealth Government Small Arms Factory Annual
Report of the Manager for the Year ended 30 June
1918, AA GGO 1912-27, file 78/22, 1919/472.

AA MP730 S8, Box 3, File No 4, Secretary of MSB to Secretary
of Defence, 3 November 1938.

AA CRS A664 File 474/401/452, Leighton to Secretary
of Defence, 28 April 1930.

MHS 39, History of the Ammunition Factory Footscray.

J K Jensen, 'Defence Production...' op. cit., Chpt 5, Vol 3, p52.

put into operation shortly after the end of the First World War[19].

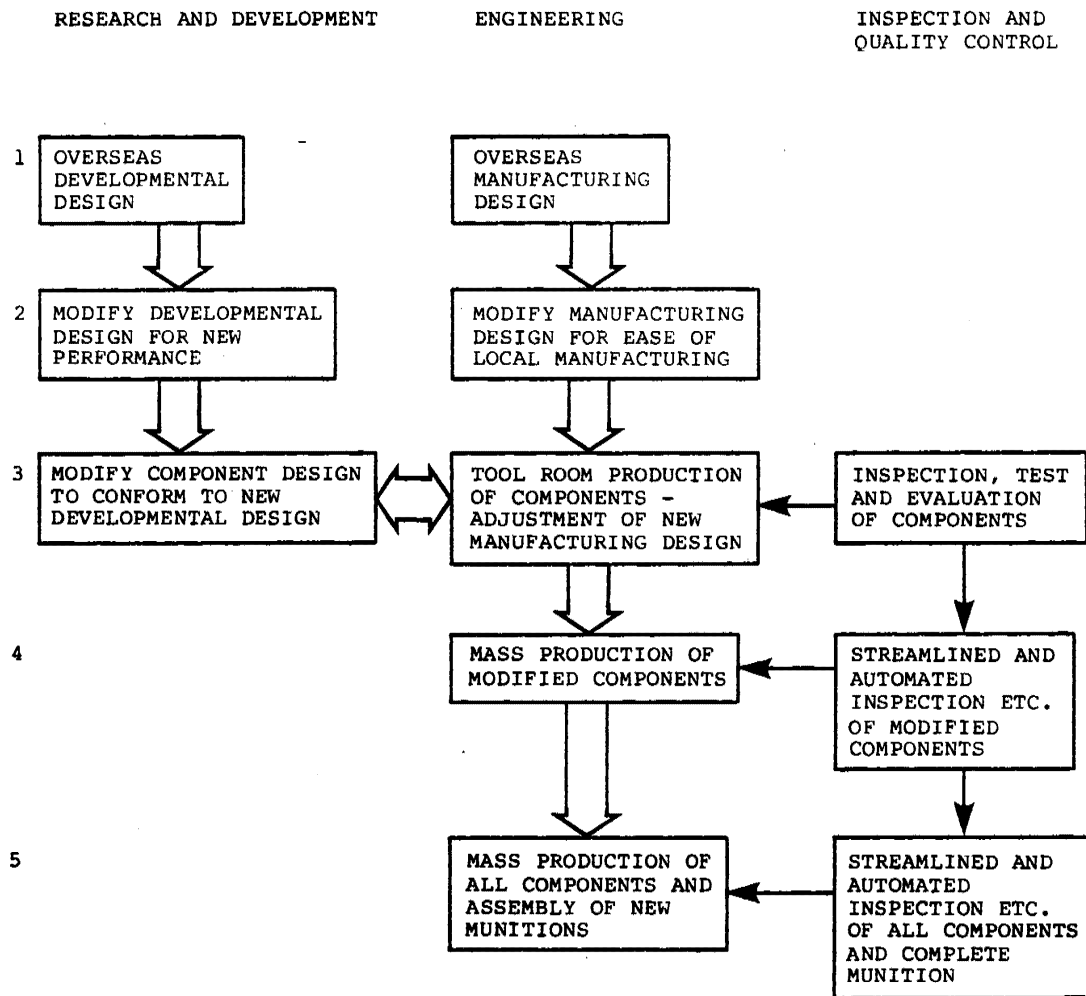
However, the production of SAA and Cordite was not expanded into commercial industry during the First World War, but remained like rifle manufacture, contained within the three main government munitions factories. The technologies were too advanced for local industry which lacked the knowledge of chemical and precision engineering, most of the machine tools, and the modern management skills for mass production[20]. The only attempt to use commercial industry for major munitions was the 18 pdr shell body project supervised by the Federal Munitions Committee [FMC]. A technology package was imported from Britain in the form of Developmental and Manufacturing Designs. Industry had difficulty in making this relatively simple component of a complete gun shell and cartridge, and mass production was never established properly. Furthermore, the project had collapsed by June 1916 because communications with the mother factories in Britain were not good enough to keep Australia informed of the rapid changes to the shell specifications brought on by developments at the battlefield. Also demand shifted from 18 pdr shell to heavier calibres such as 4.5" and 6", which also changed specification rapidly[21]. Table A-1 provides wartime production figures for SAF and the Cordite Factory. Approximate figures are presented for SAA production.

19. J.K.Jensen, 'Defence Production . . .', *op.cit.*, Chapter 5, Volume 3, pp.21-26, 37-40.

20. J.K.Jensen, 'Defence Production . . .', *op.cit.*, Chapter 4, Volume 2, pp.387-388.

21. E.Scott, *Australia During the War . . .*, *op.cit.*, pp.245-248. These problems had been foreseen by Dr W. Rosenhain (Superintendent of the Metallurgy Department of the National Physical Laboratory of Britain) in late 1914 when he visited Australia for the meeting of the British Association for the Advancement of Science, and was consulted by the Australian Government. E.Scott, pp.241-242.

Figure A-3. DEVELOPMENT OF SELF CONTAINMENT



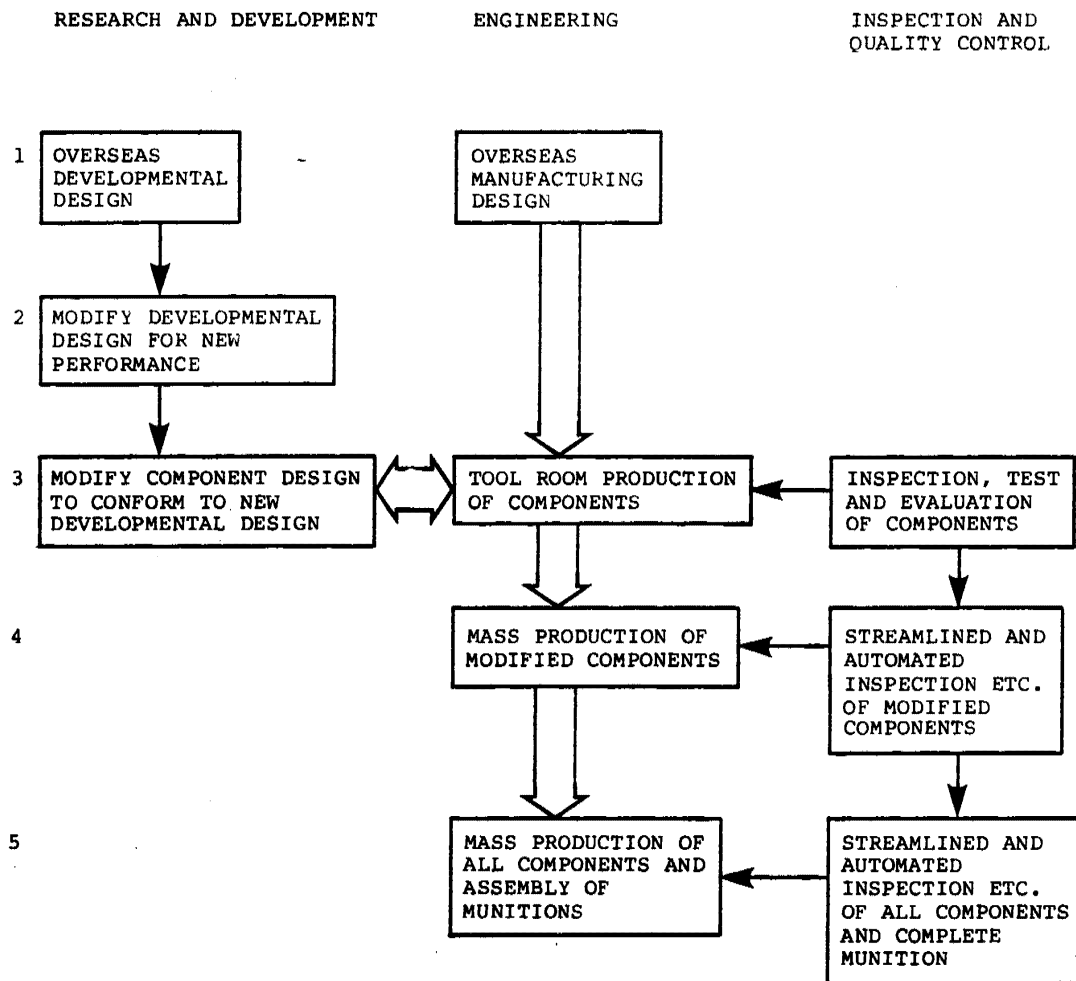
Self Containment Strategy

The process by which a military technology was actually transferred in the Self Containment strategy is outlined in Figure A-3. The major differences with the processes outlined for the Technology Package strategy were the insertion of Stages 2 and 3 for R and D, and Engineering. It was one of the objectives of the Self Containment strategy to modify Developmental Designs and Manufacturing Designs of munitions designed by major powers. In this respect the insertion of Stage 2 is not surprising. The only need for explanation is in relation to the interaction between R and D and Engineering at Stage 3. This signified that modifications to Developmental Design to achieve different operational performance for a munition, and modifications to Manufacturing Design to accommodate the capabilities of local industry, were likely to have a complex influence on each other. This became more obvious when the modifications to Developmental Design had resulted in new components, and the modifications to Manufacturing Design had constricted the available industrial processes in order to suit local industry. The new components might not fit into the concept of the emerging Manufacturing Design, necessitating the further modification of both Developmental and/or Manufacturing Designs. Stages 4 and 5 in Figure A-3 are similar to Stage 4 in Figure A-2 except that a distinction is drawn on the Mass production of modified components. This event was significant because the minor power was no longer following the Manufacturing Design of the originator of the munition. Any problems encountered here were likely to be unique, and could only be solved by recourse to the minor powers relevant R and D and Specialised Engineering Capabilities.

The master plan for Australian munitions development outlined by A E Leighton in 1919 is discussed in detail in chapter one. Suffice here to note that it was in effect the strategy of Self Containment. He was probably the only person in Australia who properly understood at this time, all the aspects of Self Containment as an objective, particularly those in the technical area. The first post war construction he sponsored was not another factory but his central research laboratories (Munitions Supply Laboratories). These Laboratories encompassed the function of modification of Developmental Design for a range of military technologies, which grew wider as more laboratories were added in later years. The Laboratories shared the function of modification of Manufacturing Design with the executive engineers of the munitions factories (see Annex C). Under Leighton's guidance, and with the support of the Munitions Supply Laboratories, all the old factories such as SAF and the SAA Factory, were moved gradually to a position of true self containment in which Developmental and Manufacturing Designs for particular munitions could be modified without particular reliance on British technical support. The newer factories built by Leighton such as Ordnance Factory Maribyrnong [OFM] and the Gun Ammunition Factory were designed from their inception to have a strong mechanical engineering component as well as a productive component. They were not just factories but also Specialised Engineering Capabilities, as SAF and the SAA Factory also became. The Cordite Factory became a Specialised Chemical Engineering Capability as well as the productive centre for explosives. The personnel who made up the senior technical staff of all these new Specialised Engineering Capabilities, as well as the Munitions Supply Laboratories had

A 17A

Figure A-4. DEVELOPMENT OF IN-COUNTRY R AND D



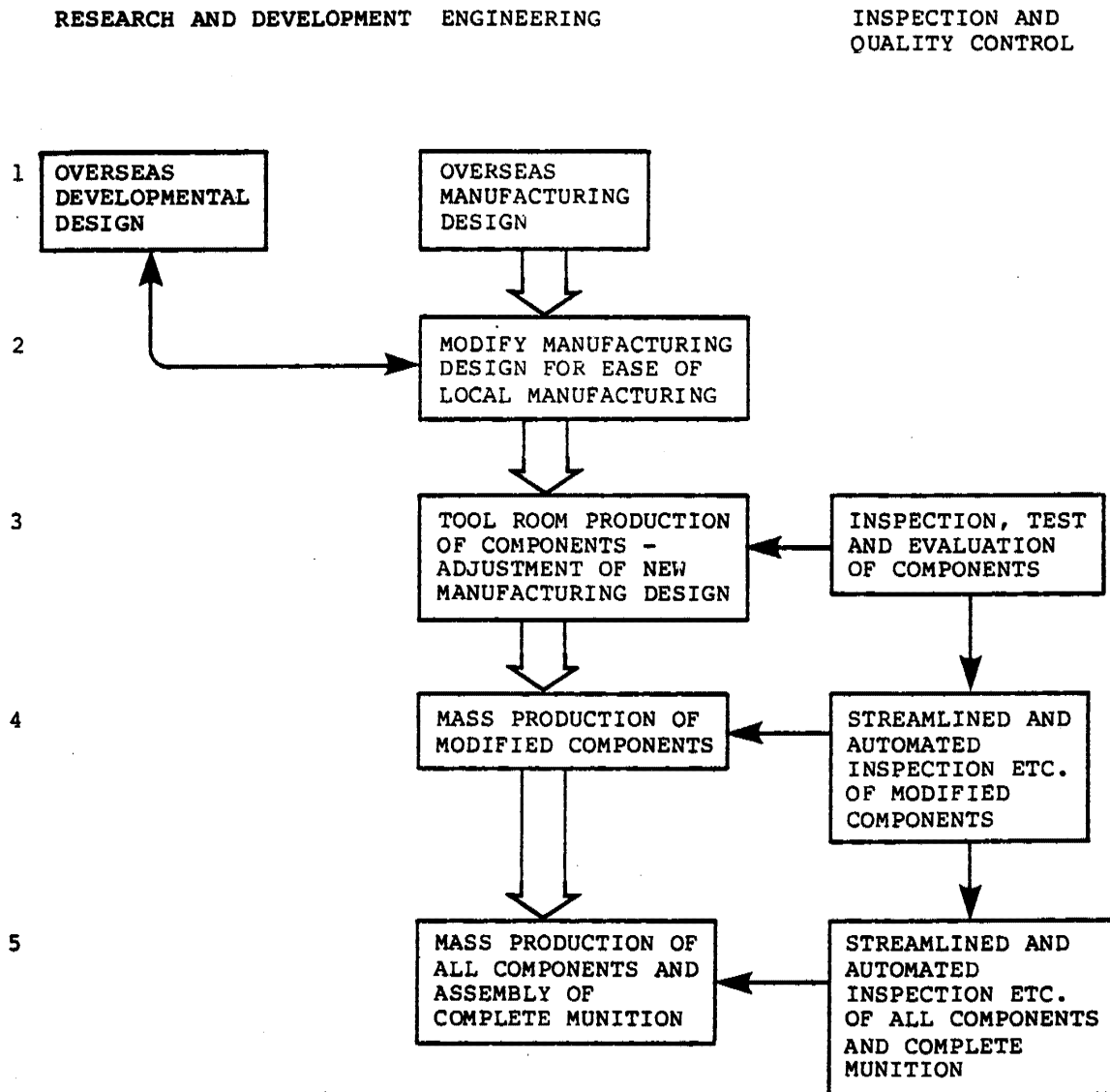
received their training in Britain while being members of Leightons Technical Enquiry Staff during the First World War.

In-Country R and D, and In-Country Manufacturing Design Strategies

The strategies of In-Country R and D, and In-Country Manufacturing Design were in effect hybrids of the strategy of Self Containment. The process for the first is outlined in Figure A-4. The difference with that of Figure A-3 (Self Containment) is that Stage 2 of Engineering is left out. This was because overseas Manufacturing Design was compatible with the technical capability of local industry, and therefore needed no modification. The objective was to concentrate on modifying Developmental Design; so Stages 2 and 3 of Research and Development in Figure A-3 remain in Figure A-4. The disadvantage of the In-Country R and D strategy was that the level of modification to Developmental Design was restricted to the extent that it did not cause significant changes to the Manufacturing Design. Such changes could quickly make the munition impossible to produce by local industry.

The process for the In-Country Manufacturing Design strategy is outlined in Figure A-5. The difference with that of Figure A-3 (Self Containment) is that Stages 2 and 3 of Research and Development are left out. This was because Developmental Design was acceptable without modification in that it satisfied local operational requirements as defined by the Defence Forces. The objective was to concentrate on modifying Manufacturing Design, so that Stages 2 and 3 of Engineering in Figure A-3 remain in Figure A-5. The disadvantage of the In-Country Manufacturing Design strategy was that the level of modification to

Figure A-5. DEVELOPMENT OF IN-COUNTRY MANUFACTURING DESIGN



Manufacturing Design was restricted to the extent that it did not cause significant changes to Developmental Design. Such changes could quickly make the operational performance unresponsive to local operational conditions, and/or unreliable.

ANNEX AA

TABLE OF EMPLOYMENT FOR THE MSB

TABLE OF EMPLOYMENT FOR THE MSB

YEAR ENDING 30 JUNE	EFM	SAF	HARN FACT	WOOL FACT	CLOTH FACT	SAA FACT	GN/AM FACT	ORD FACT	ADMIN MARIB	MSL	DRAW OFFICE	INSPECT BRANCH	CNTRCT OFFICE	CENT ADMIN	ACET FACT	TOTAL
1913	78	285	165	-	587	COL AM CO	-	-	-	CHEM ADV.2	-	ARMY CONTROL	ARMY CONTROL	-	-	1117
1914	84	373	168	-	439		-	-	-	4	-			-	-	1068
1915	96	526	283	114	714		-	-	-	4	-			-	-	1737
1916	137	1238	441	210	701		-	-	-	5	-			-	-	2732
1917	161	1378	171	245	505		-	-	-	5	-			-	-	2465
1918	183	1161	142	256	668		-	-	-	?	-			-	-	2410
1919	183	1080	104	266	498		-	-	-	7	13	JOINS		-	39	2190
1920	152	789	44	316	254	JOINS	-	-	-	?	9	MSB		-	65	1629
1921	99	829	77	359	361	MSB	-	-	-	MSL	9	1921	JOINS	-	55	1789
1922	81	302	55	321	174		-	-	-	11	10	?	MSB1921	-	24	978
1923	64	327	4	291	249	177	-	-	-	23	11	33	28	9	30	1246
1924	99	345	CLOSED	CLOSED	222	189	-	-	-	24	16	33	25	9	30	992
1925	127	370			283	201	10	30	13	23	32	52	26	9	29	1205
1926	123	371			243	190	26	101	23	28	31	48	36	9	22	1251
1927	131	348			249	272	35	86	28	30	30	56	36	7	5	1313
1928	125	350			252	261	28	133	30	30	30	55	33	6	4	1337
						SAA + GUNAMMO										
1929	147	359			243		241	162	30	33	27	61	33	6	4	1346
								ORD+ADMIN								
1930	142	257			245		225	180		29	19	46	24	5	2	1174
1931	134	245			238		270	252		34	18	39	20	4	2	1256
1932	121	278			227		362	302		34	17	45	21	4	2	1413
1933	158	271			285		389	332		37	18	51	22	4	2	1569
1934	213	268			400		446	378		41	20	63	22	4	CLOSED	1855
1935	281	285			482		625	489		57	30	71	24	5		2349
1936	349	283			358		707	624		68	33	74	25	5		2526
1937	423	328			397		818	655		80	40	95	29	7		2872
1938	488	385			423		870	791		93	54	128	30	11		3273
1939	1086	536			484		1916	1237		192	88	299	31	15		5884

Sources

MSB Reports to Parliament 1921-1939

MHS33, Central Drawing Office

J.K. Jensen, 'Defence Production ...', op. cit., Chapter 5, Volume 3, Chapter 8, Volume 6.

ANNEX B

THE VALUE OF PRODUCTION BY FACTORY GROUP

VALUE OF ANNUAL PRODUCTION OF MSB FACTORY GROUPS AND VALUE OF COMMERCIAL ORDERS EXECUTED.

YEAR	SMALL ARMS GROUP		AMMUNITION GROUP		EXPLOSIVES AND FILLING GROUP		ORDNANCE GROUP	
	VALUE OF ANNUAL PRODUCTION	VALUE OF COMMERCIAL ORDERS EXECUTED	VALUE OF ANNUAL PRODUCTION	VALUE OF COMMERCIAL ORDERS EXECUTED	VALUE OF ANNUAL PRODUCTION	VALUE OF COMMERCIAL ORDERS EXECUTED	VALUE OF ANNUAL PRODUCTION	VALUE OF COMMERCIAL ORDERS EXECUTED
	(£)	(£)	(£)	(£)	(£)	(£)	(£)	(£)
1922/23	47,423	7,784	40,337	-	6,316	?	-	-
1923/24	53,315	5,587	48,196	-	1,237	?	-	-
1924/25	55,829	5,077	51,674	-	9,120	?	591	?
1925/26	55,039	4,285	28,590	-	4,778	?	434	?
1926/27	54,801	7,268	54,971	-	6,969	?	735	?
1927/28	56,313	3,901	85,392	-	15,360	?	1,404	?
1928/29	59,842	4,922	57,712	-	30,749	?	5,010	?
1929/30	44,660	13,722	67,427	-	28,519	-	10,952	?
1930/31	57,896	32,986	55,765	3,690	23,919	567+	16,643	?
1931/32	52,506	33,447	76,428	25,905	42,246	2,951+	55,762	?
1932/33	41,601	15,519	103,384	50,887	49,016	6,538+	49,066	?
1933/34	39,680	11,736	98,220	59,898	83,276	8,537+	47,430	?
1934/35	39,757	11,605	187,165	70,475	96,730	5,650+	74,795	?
1935/36	38,964	11,162	230,483	74,506	57,490	6,553+	63,163	?
1936/37	50,771	13,806	311,186	114,333	73,187	7,487+	72,630	?
1937/38	65,505	14,865	362,536	107,387	141,655	8,212+	95,847	?
1938/39	68,624	11,584	496,900	34,176	243,447	-	279,967	?
1939/40[1]	266,000	-	1,405,000	-	581,000	-	710,000	-

Sources

Annual Reports of the MSB to Parliament (Including Unpublished Report for 1938/39).

AA CRS A664 file 474/401/452, Jensen memo February 1932; MP 730 S8 Box4 item5-6.

J K Jensen 'Defence Production...' op cit Vol7 pp202-3.

Note

- Derived from Report of Ministry of Munitions, 'Organisation, Production Programme and Designed Capacity', 31 December 1940. J.K. Jensen, 'Defence Production ...', op. cit., Chapter 8, Volume 6, p. 50.

*Annex C**THE ROLE OF MSL 1921-1939*

The objectives of the MSB were broadly, to establish and perfect different forms of munitions production within Australia through use of government factories and laboratories; to encourage the technical development and growth of industry so that all important raw materials for such munitions could be supplied from within Australia; to teach Australian industry, in time of war, the technique of manufacturing particular munitions[1]. Within this context, the functions of MSL were stated to be:

- a. to maintain standards of manufacture and supply by the application of chemical and physical science;
- b. to promote by research, the production of defence supplies from Australian raw materials, by government or civil industry;
- c. to study special problems in manufacture, inspection and Armed Service use of defence stores and equipment; and
- d. to co-ordinate the scientific methods of production control practiced by Laboratories attached to each major defence factory group[2].

The structure of MSL which emerged during the 1920s was of five laboratories under the control of Marcus Bell. The first of these was the Explosives and Ammunition Laboratory. It studied the development, production and safe storage of military explosives; and the chemical and ballistic aspects of ammu-

1. See Thesis Chapters 1 and 2.

2. MSB Report to Parliament 1927-1929.

munition manufacture[3]. It was well equipped to carry out all aspects of relevant research as were all the other Laboratories[4]. The second was the General Chemical Laboratory which dealt with research into all materials other than explosives, metals and timber. The range included fuels, lubricants, rubber, leather, paints, lacquers, varnishes, textiles, stores, supplies and chemicals used as raw materials[5]. The third was the Physics Laboratory and this was divided into three sections. The Metrology Section established standards of length and mass which were uniform to those of Britain[6]. The Optical Section studied the design, repair and calibration of optical instruments such as range finders, dial sights, binoculars, clinometers and other optical systems and artillery instruments[7]. The Electrical Section tested electrical stores held by the Armed Services and calibrated them when necessary[8]. The fourth Laboratory was for Metallurgy and was equipped for both ferrous and non-ferrous research into heat treatment, hardening, annealing, ductility, and casting etc.[9]. The last laboratory was for Chemical Warfare. Its main function was to investigate defence measures against chemical attack. In this regard it tested Service respirators, and oversaw the gradual development of production of complete respirators and

3. *ibid.*, 1922–1923, p.7.

4. For details on the equipment for this laboratory and others see the MSB Reports to Parliament 1921–1928, and D.P.Mellor, *The Role of Science and Industry*, AWM, 1958, pp.1–27.

5. MSB Reports to Parliament 1922–1923, pp.8–10.

6. *ibid.*, 1922–1923, pp.6, 9–10. All metrology equipment was checked and certified by the National Physics Laboratory, Britain.

7. *ibid.*, 1922–1923, pp.9–10. AA MP730, S8, Box 2, Item 8, Jensen, 24 January 1936.

8. J.K.Jensen, 'Defence Production ...', Chapter 8, Volume 6, pp.160–165. MSB Reports to Parliament 1927–1929, p.7.

9. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 8, Volume 6, pp.165–166.

bleaching agents in Australia[10].

In addition to the laboratories there were two semi autonomous sections which covered subjects of interest to more than one laboratory. The first of these was the Timber section, which studied the methods of seasoning, strength testing, gluing and preservation etc. of Australian timbers[11]. The second was the Scientific Information section and included a library, technical records, standard reference works, text books and journals bearing on the activities of MSL and the MSB. It was in effect an information co-ordination centre and a store of recorded experience in manufacture, inspection and research[12].

The small production control laboratories associated with each factory group of the MSB[13], were also under Marcus Bell.

MSL Support for MSB Factories

MSL was in charge of the scientific control of production at the munitions factories. The most important aspect of this was the provision of uniform standards so that the entire system of factories operated on the same concepts of mass, length, temperature and electrical measurement. The standards chosen were those of Britain, so that munitions and their components made in Australia would be interchangeable with the same munitions made in Britain[14]. The

10. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 8, Volume 6, pp.167-177.

11. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 8, Volume 6, pp.150-153. MSB Reports to Parliament 1931-1933, p.5.

12. *ibid.*, 1922-1923, pp.11-12.

13. The factory groups were Small Arms, Ammunition, Explosives, and Ordnance.

14. MSB Reports to Parliament 1922-1923, p.8. This was part of the longstanding arrangement, reaffirmed by Prime Minister, S.M.Bruce, in 1926 to simplify logistic support

National Physical Laboratory of Britain checked and certified MSL measuring equipment, which then allowed the Physics Laboratory to check factory gauges, tools and precision instruments on a regular basis, so that standards could be maintained in all parts of the factory system[15]. This measuring equipment was very modern and allowed many hundreds of items to be checked quickly.

Other aspects of the scientific control of the munitions factories concerned the development of standardised methods for analysing factory materials and complex manufacturing operations. For example the General Chemical Laboratory developed standard methods of analysis for a wide variety of materials, and instructed the production control laboratories of the factory groups in how to apply them[16]. Similarly the Metallurgy Laboratory developed a classification of tool steels for rifle production, and standard methods for the analysis of nickel, copper, bronzes, white metal alloys and aluminium alloys[17]. Other laboratories did work on standardising complex industrial processes. The Explosives and Ammunition Laboratory, for example, studied the moisture content of fuze powder so that filling operations could be standardised[18]. With the development of production of Naval Solventless Cordite, the laboratory invented

problems when Australian forces operated with those of Britain.

15. *ibid.*, 1922-1923, pp.9-10, 1921-1922, pp.7-8.

16. *ibid.*, 1921-1922, pp.7-8, 1924-1925, p.5. General Chemical Laboratory also developed a classification of oils and lubricants for the factory groups, and this was adopted by all Federal Government Departments. *ibid.*, 1929-1931, p.6, 1931-1933, p.6.

17. *ibid.*, 1921-1922, pp.7-8, 1924-1925, p.5. There was widespread interest from government bodies and commercial industry in these and other efforts by MSL at classification.

18. *ibid.*, 1922-1923, p.8.

a new and more efficient method of testing the material[19]. The Physics Laboratory was responsible for extending the influence of metrological control when it initiated a system of training factory staff in gauge checking on the factory floor[20]. The Metallurgy Laboratory standardised the manufacture of cartridge cases after studying their metallurgy throughout all phases of production[21]. Most interesting of all, the Explosives and Ammunition Laboratory conducted continuous climatic trials on explosives and ammunition which by 1937, had led to a general refinement of production methods and raw materials resulting in very stable and reliable products suited well to Australian conditions[22].

MSL examined new sources of raw materials for the munitions factories, especially if the source was being developed from within Australia. The Metallurgy Laboratory carried out many examinations including the testing of carbon steels for rifle production, the use of local cupro-nickel for bullet envelopes, the properties of local steel for bayonets, and the use of manganese bronze for anti-aircraft guns[23]. The Timber Section for example identified the Australian woods which were suitable for use as rifle furniture[24].

The most dynamic influence MSL had on the munitions factories was in the development of new industrial processes for the production of munitions. Here the objective was first to adjust British materials specifications to incorporate

19. *ibid.*, 1933-1935, p.7.

20. *ibid.*, 1924-1925, p.6.

21. *ibid.*, 1925-1926, p.5.

22. *ibid.*, 1935-1937, p.8.

23. *ibid.*, 1921-1922, p.7, 1922-1923, pp.8-9, 1935-1937, p.9.

24. *ibid.*, 1921-1922, p.8.

Australian produced raw materials, and secondly, to then refine British manufacturing designs so that they reflected industrial techniques and methods used by Australian industry. The laboratories most concerned with these activities were the Explosives and Ammunition, and Metallurgy Laboratories.

For example, in 1922 the Explosives and Ammunition Laboratory developed new methods of producing small arms ammunition[25]. It later refined the mixing composition for the tracer bullet[26]. Meanwhile the Metallurgy Laboratory was developing new processes to cast cupro-nickel and brass for bullets and cartridge cases[27]. More dramatically, the Laboratory developed and performed the casting of alloy pistons for aeroengines. No other body or industry in Australia had been able to achieve this feat. Similarly, the laboratory also developed the casting of metal feedblocks for Australian-made machine guns[28]. Towards the end of the 1920s the Metallurgy Laboratory was putting a big effort into studying problems such as hardening and tempering, non-shrinking steels, and quick firing cartridge case annealing[29]. These studies contributed further to the development of the Australian technique of making munitions, as did later work in chill casting of practice shot, the welding of bullet proof plates, and the methods for casting large bombs[30].

25. *ibid.*, 1921-1922, p.7.

26. *ibid.*, 1924-1925, p.5.

27. *ibid.*, 1923-1924, pp.6-7.

28. *ibid.*, 1925-1926, p.5, 1926-1927, p.5.

29. *ibid.*, 1926-1927, p.5.

30. *ibid.*, 1933-1935, p.8. The laboratory also developed dies for drawing and bottling operations on projectiles, and developed the use of controlled gaseous atmospheres during heat treatment.

As might be expected, whenever the munitions factories had any specific problems, they turned to MSL. For example, in 1922, the Explosives Factory group was experiencing problems with the mineral jelly content of cordite, which was solved by the Explosives and Ammunition Laboratory[31]. Later, the Ammunition Factory group was producing a high number of cracked cartridge cases for small arms ammunition; and with the assistance of the Metallurgy Laboratory, this problem was surmounted[32]. The General Chemical Laboratory produced special mercury vapour lamps, using the technique of high temperature quartz working, for the Ammunition Factory group to reduce the danger of explosion during filling operations[33].

Support for the Inspection Branch

MSL also had a close relationship with the Inspection Branch of the MSB. The Branch held the responsibility for ensuring that all stores submitted by contractors (including munitions from the government factories) met the high standards of quality demanded by the Armed Services. These standards were generally far higher than for goods produced for civil consumption, and contractors often had difficulty in reaching such standards. The Inspection Branch used MSL to see if contractors were conforming to specifications, and to explore the causes for repeated failures — if these were not obvious to the

31. *ibid.*, 1921–1922, p.8.

32. *ibid.*, 1925–1926, p.5. In another example, the Metallurgy Laboratory identified deterioration in the cotton treatment plant of the Explosives Factory group, and devised a means of correcting it, MSB Reports to Parliament 1933–1935, p.8.

33. *ibid.*, 1933–1935, p.6.

Branch itself[34]. The standards of measurement and mass etc. used by the Inspection Branch were provided through the Physics Laboratory which ensured that the gauges and precision instruments used were properly checked. The laboratory also modified many of the Branches gauges for ease of production and reduction of wear[35].

The area of most important collaboration between MSL and the Inspection Branch was the modification of British specifications. These often listed, for example, materials which were costly to Australia, or not produced from Australian sources. Where possible, the Inspection Branch wished to substitute cheaper Australian materials, so that contractors would have fewer difficulties, and that the objective of self containment would be further enhanced. This was not as simple as it seemed. Changes in specified materials could lead to complex chemical and physical interactions between a munitions component parts, changing the operational performance of the completed article (see Annex A). The Inspection Branch often sought the advice of MSL in order to test changes in specifications for their effect on operational performance[36]. The Timber section for example, was involved heavily with the Inspection Branch, in substituting Australian timbers for hardwoods in British specifications[37]. The Metallurgy Laboratory assisted in changing specifications for metals used in rifle and small arms ammunition[38]. The Physics Laboratory advised on the

34. *ibid.*, 1935-1937, p.9, 1927-1929, p.7.

35. *ibid.*, 1923-1924, p.7, 1933-1935, p.9.

36. *ibid.*, 1933-1935, p.7.

37. *ibid.*, 1922-1923, p.8, 1923-1924, p.6, 1925-1926, p.5.

38. *ibid.*, 1921-1922, p.7.

revision of specifications for dry cells and batteries[39]. All laboratories, including Chemical Warfare, were continuously involved in the Inspection Branches activities modifying specifications received from Britain.

MSL gave advice to the Contracts Board of the MSB, together with the Inspection Branch, on the technical capabilities of particular firms tendering for the supply of stores and materials to the Armed Services and the munitions factories. In order to encourage the growth of Australian sources of supply, the Contracts Board, and Inspection Branch would often encourage firms to accept contracts which were beyond their technical competence to fulfill. This was done deliberately, because such technical assistance as was necessary would be supplied by MSL. Thus the firm concerned learnt new technology, and gained confidence and experience through completing successfully a defence contract. Some examples of this partnership with MSL include the development by the Metallurgy Laboratory of iron founding for special brass alloys and bombs, and local sources of steel for rifles, machine guns and shells[40]. The Timber Section was very active in teaching the wood industry how to season and prepare Australian hardwoods so that contracts for the Armed Services could be fulfilled from local supply. Much of this work involved the supply of wood and glues for aeroplanes[41]. The General Chemical Laboratory gave technical support to encourage local supply of different types of oils and lubricants, as well as glazed board and leather board among other things[42]. The Physics Laboratory co-

39. *ibid.*, 1927-1929, p.7.

40. *ibid.*, 1927-1929, p.6, 1931-1933, p.7.

41. *ibid.*, 1922-1923, p.8, 1923-1924, p.6, 1927-1929, p.6.

42. *ibid.*, 1927-1929, p.6.

operated with commercial firms on many projects including the production of naval range dials, the extension of proper metrology standards for the production of defence stores, the development of dry cell and battery production in Australia[43]. A major objective of the Chemical Warfare Laboratory was, of course, to extend technical assistance to industry to encourage the eventual production of gas respirators and all their components in Australia[44]. MSL even published pamphlets and reports for the assistance and encouragement of firms supplying goods and materials to the Defence Department[45].

Support for the Armed Services

Notwithstanding its deep involvement with all parts of the MSB, MSL also had considerable direct contact with the Armed Services. This involved investigation into equipment failures; and long term research into the problems of preservation of military equipment and stores, the production of aircraft components, and the repair of optical instruments.

The failure of equipment during use was a dramatic event for which the Armed Services often wanted a prompt explanation so that remedial action could be taken. Air crashes were a good example, and the Metallurgy Laboratory often assisted the Air Accidents Committee of the Defence Department, in determining the causes[46]. The laboratory also investigated naval problems

43. *ibid.*, 1927-1929, p.7, 1929-1931, p.6, 1922-1923, p.10.

44. *ibid.*, 1923-1924, p.7, 1931-1933, p.6.

45. *ibid.*, 1921-1922, p.7 'Standard Methods of Analysis of Plain and Alloy Steels'; 1925-1926, p.4 'Standard Methods for the Examination of Materials'.

46. *ibid.*, 1927-1929, p.7, 1931-1933, p.6. The failure of metal engine components often contributed to air crashes. The General Chemical Laboratory on one occasion

such as anchor failures, broken condenser tubes in destroyers, and cracked boiler pipes[47]. Equally serious was an investigation by the General Chemical Laboratory into the sudden perishing during service of rubber goods held by the Navy[48]. The Army had similar problems: The General Chemical Laboratory investigated for example, the failure of gun recoil systems through corrosion in piston rods[49]. The Metallurgy Laboratory investigated matters such as defective brass caps for cartridge cases, faulty cupro-nickel and defective steel forgings[50].

The preservation of military equipment and stores was a perennial problem for the Armed Services, and provided MSL with much research work. A few examples will demonstrate its scope. The Timber Section studied timber mould growths, wood preservatives, and etymological control of wood borers; the Explosives and Ammunition Laboratory studied the long term stability of explosives from shell corrosion and different climatic conditions; the General Chemical Laboratory studied many problems of waterproofing and rotproofing of materials, and the protective qualities of paints; the Metallurgy Laboratory investigated problems of corrosion in rifles and messtins, the deterioration of aluminium sheets, and the rustproofing of steels through tinning and nickelplating[51].

investigated the failure of parachute silk; MSB Reports to Parliament 1935-1937, p.9.

47. *ibid.*, 1923-1924, pp.6-7, 1924-1925, p.5.

48. *ibid.*, 1923-1924, p.6.

49. *ibid.*, 1933-1935.

50. *ibid.*, 1921-1922, p.8, 1926-1927, p.5.

51. *ibid.*, 1925-1926, 1926-1927, 1929-1931, 1933-1935, 1935-1937, etc.

The RAAF often found it difficult to acquire certain aircraft components because of long times for importation, and because of lack of scientific knowledge in Australia on how to manufacture them locally. MSL carried out much basic research into aeroengines and airframes. The Timber Section examined and treated Australian timbers and glues to see which were suitable for the stresses and weight limitations of airframes[52]. The General Chemical Laboratory among other things helped to develop specifications for the correct fuels and lubricants for aeroengines. It also developed fireproofing for aviation suits[53]. The Metallurgy Laboratory for example, made alloy pistons for RAAF aircraft and studied the corrosive action of castor and mineral lubricating oils on parts of aircraft engines[54].

All the work of the optical section of the Physics Laboratory was done directly for the Armed Services. At first this concerned mainly the repair and maintenance of sighting devices for the Army and Navy. Later, the section received glass grinding machines and started to make range dials for the Navy, graticules and cells for binocular collimators for the Army, edged and engraved glass discs, and special mirrors[55].

The Support by MSL to Other Government Institutions

Although MSL was created primarily to assist the Defence Department,

52. *ibid.*, 1922-1923.

53. *ibid.*, 1929-1931, p.6, 1935-1937, p.9.

54. *ibid.*, 1926-1927, p.5, 1927-1929, p.7, 1929-1931, p.6, 1933-1935, p.8.

55. *ibid.*, 1925-1926, p.5, 1929-1931, p.6, 1933-1935, p.9. The Explosives Laboratory also assisted by developing the technique of silvering prisms for binocular and dial sights, MSB Reports to Parliament 1929-1931, p.5.

it extended extensive assistance to other federal government bodies, and state governments. All the Laboratories were involved.

The Explosives and Ammunition Laboratory advised the Australian Standards Association on the transport of hazardous goods, and assisted state governments in areas such as the police and the control of explosives[56]. In the early 1930s, the laboratory began to run a special testing station for commercially manufactured explosives to support state governments in the regulation of safety standards in mining[57].

The General Chemical Laboratory assisted the Development and Migration Commission by sitting on its Producer Gas Committee[58]. The laboratory advised the Commonwealth Supply and Tender Board on the use of motor lubricants, and was represented on several committees of the Australian Standards Association concerned with lubricating oils, leather and rubber belting and the co-ordination of testing[59]. The laboratory aided the Australian War Memorial in preservation problems, the federal government's note printing branch in unspecified ways, and developed specifications for oil paints for federal departments[60]. For the Victorian Railways the laboratory determined the

56. *ibid.*, 1927-1929, p.5, 1931-1933, p.5.

57. *ibid.*, 1929-1931, p.5. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 8, Volume 6, pp.152-158. This testing station was set up largely at the request of the NSW and Victorian state governments, which offered to pay a substantial part of its costs.

58. MSB Reports to Parliament 1927-1929, p.5.

59. *ibid.*, 1927-1929, p.5, 1923-1924, p.6. The Australian Standards Association relied heavily on research conducted by the General Chemical Laboratory and other MSL Laboratories.

60. *ibid.*, 1922-1923, p.11, 1929-1931, pp.4-5. The laboratory also did research into

moisture in local coal, and prepared a graphite lubricant for tracks for Victorian trams[61].

The Physics Laboratory was involved closely with the Australian Standards Association, and the CSIR. By arrangement with the former, the laboratory installed equipment to allow testing machines in Australia to be calibrated against the standards of the British National Physical Laboratory[62]. The ally of the Association was the CSIR which had been provided under its Act with powers and functions to enable it to carry out the testing and standardising of scientific apparatus and instruments, and the carrying out of scientific investigations connected with standardisation of apparatus, machinery, materials and instruments used in industry. For many years the CSIR lacked the capability to fulfill these functions, and relied on MSL, and the Physics Laboratory. When CSIR created the Committee on Maintenance of Standards, it consisted of Professor Madsen of Sydney University, Marcus Bell of MSL, and the head of the Physics Laboratory, Norman Esserman. Among other things, the committee recommended that MSL should continue to give extensive support to the Australian Standards Association, and that MSL should be the Australian reference centre for the standards of length until a national standards laboratory was established by the Federal Government[63]. The Physics Laboratory also carried out for federal and state departments the production and measurement of gauges and precision engineers tools, and mechanical tests on railway and tramway ma-

alternative sources of oil supply, MSB Reports to Parliament 1927-1929, p.6.

61. *ibid.*, 1924-1925, p.5, 1933-1935, p.6.

62. *ibid.*, 1926-1927, p.6, 1927-1929, p.7.

63. AA MP730, S8, Box 2, Items 4 and 5.

terials[64] and many other items. Support was also extended to the Physics Departments of Adelaide and Melbourne Universities and to the Radium Research Laboratories[65]. The Physics Laboratory also had a good liaison with the Victorian Electricity Commission in regard to electrical standards, and also with the PMG[66].

The assistance extended by the Metallurgy Laboratory was equally varied. The Australian Standards Association ran a panel committee under its Locomotive Committee which had the head of the Metallurgy Laboratory, W.R.Jewell, as a member. It drew up standard methods of analysis for ferrous metals and alloys, and these were based on MSL research and publications[67]. Later, the laboratory heat treated 400 cobalt magnet steel bars for the University of Sydney[68], and examined the traction gears for electric locomotives for state governments[69]. The repair and calibration of pyrometric equipment was carried out for various federal and state departments, and similarly the welding and x-ray examination of high pressure vessels[70].

The Timber Section assisted the Development and Migration Commission in studying Australian hardwood utilisation[71]. It also assisted forestry bodies of the Victorian, Queensland, Tasmanian and New Zealand governments, as

64. MSB Reports to Parliament 1929-1931, pp.4-5.

65. *ibid.*, 1926-1927, p.5, 1929-1931, pp.4-5.

66. *ibid.*, 1929-1931, pp.4-5, 1931-1933, p.5.

67. *ibid.*, 1923-1924, p.6.

68. *ibid.*, 1927-1929, p.7, 1929-1931, p.6.

69. *ibid.*, 1933-1935, p.8.

70. *ibid.*, 1929-1931, pp.4-5, 1935-1937, pp.8-9.

71. *ibid.*, 1927-1929, pp.5-6.

well as the CSIR[72]. This was mainly in regard to seasoning and preservation of cut timber. Co-operation with Victoria was particularly close with long term joint projects of research.

Even the Chemical Warfare Laboratory had something to contribute in that it advised government bodies on safety for industrial gases, acid fume, paint spraying, sand blasting and degreasing[73]. It also explored the use of smoke for meteorological analysis, and the use of various types of chemical fumes to protect vineyards and orchards from frost and insects[74].

72. *ibid.*, 1927-1929, p.6, 1929-1931, p.5, 1931-1933, p.5. MSL presented a paper on seasoning of timber to the Australian Association for the Advancement of Science, MSB Reports to Parliament 1927-1929, p.6.

73. *ibid.*, 1931-1933, p.6.

74. *ibid.*, 1931-1933, p.6.

ANNEX CA

THE EXPANSION OF SECONDARY INDUSTRY AND TRADE DIVERSION
1936-1937

The Need to Expand Secondary Industry

In the early thirties, elements of the Australian Government were beginning to appreciate that primary industry could not be the main basis of future development for Australia. While total crop yield and acreage had increased in Australia in the preceding 10 years, the rural population had continued to decrease rapidly relative to the national population. Agricultural practices were becoming more efficient, requiring fewer people, creating a surplus rural population[1].

This problem of diminishing returns from primary industry had been pinpointed by Australian economists in the 1920s[2], and was picked up by the Development and Migration Commission between 1926-1929[3]. The minister in charge of the Commission was George Pearce.

1. B.Fitzpatrick, *The British Empire in Australia 1834-1939*, MacMillan, Australia, 1969, pp.276-285. C.Forster, *Industrial Development ...*, *op.cit.*, pp.4-5.

2. N.Cain, 'The Economists and Australian Population Strategy in the Twenties', in the *Australian Journal of Politics and History*, December 1974.

3. P.Cochrane, *Industrialisation and Dependence ...*, *op.cit.*, p.113. The Commission challenged the widespread belief in Government circles that land settlement was the centre of all economic activity in all sectors of the economy, and disseminated the view that an aggressive migration policy was dependent on the expansion of new secondary as well as primary industries.

The implication of the problem for future population growth, on which depended the main hope for future security from Asian immigration and a high standard of living, was not appreciated immediately within Government circles, because of the intrusion of the Great Depression between 1929 and 1933. Governments were more interested in the current problem of restoring Australian primary export markets and prices. However, by 1934/35, it was becoming something of an open secret that Australia's only realistic hope for further population expansion lay in the much greater development of secondary industry, which offered expanded employment of a much higher level than primary industry. This view was espoused by the politically influential General Manager of the Bank of NSW, A. Davidson, after a trip abroad in 1934[4]. But there are also clear signs that the essence of the problem had been recognised within the Department of Trade and Customs in the first half of 1934[5]. It was also raised in a resolution from the annual meeting of the Associated Chambers of Manufactures in October 1935[6].

It could be claimed that in setting up the royal commission into banking in 1935, the Lyons Government was making its first tentative step to address the problems of secondary industry growth. The banking system was more responsive to the financial needs of primary industry than to secondary industry which tended to be ignored. One of the reasons for a royal commission was to

4. P. Cochrane, *Industrialisation and Dependence . . .*, *op.cit.*, pp.72-73.

5. AA CRS A461, File D353/1/3, see undated minute entitled 'Trade with Countries with which Treaties are under Discussion', early 1934.

6. AA CRS A461, File D353/1/3, Annual Meeting for Associated Chambers of Manufacturers 22-24 October 1935.

gain recommendations on how to adjust the banking system to allow more financial support for secondary industry[7].

However, it was not until early 1936 that the expansion of secondary industry was addressed directly by the Government. The Treasurer, R G Casey, linked it with the current balance of payments problem. In a long memo of 16 March 1936, Casey showed that the Government had to reduce Australian imports to a level which could be financed by declining export earnings. This decline was likely to be a long term trend because of the chronic instability of primary export prices. His solution was to adjust the protective tariff to encourage a major further development of secondary industry so that a large part of Australia's import demands could be satisfied by local industry[8].

'This problem of the overseas balance of payments has, I think, made it necessary for us to adopt an attitude towards our Tariff policy that had not occurred to me before — ie, we will be obliged, in the future, to frame our Tariff policy with a view to our being sufficiently self-contained in Australia to enable us to carry on with imports at a level of £23 millions less than our exports. This means the adoption of rates of Customs Tariff that will encourage new industries to establish themselves in Australia so as to enable our imports to be "cut" to this extent....

One is led from the above argument to what I think is the inevitable conclusion that, instead of waiting for British manufacturers to be driven by the logic of the situation to establish branch factories in Australia, we should *GO OUT AFTER THEM*; we should go carefully through our list of imports and select items of which the Australian public consumes sufficient to warrant the establishment of an economic industry...and we should discuss with principle manufacturers of these goods in England the

7. See L F Giblin *The Growth of a Central Bank...* *op.cit.* p212. See U Ellis *op.cit.*, p216.

8. AA CRS AA1421 item3.

advantages of their opening up in Australia. We could... promise them adequate tariff protection'[9].

Although the scope of secondary industry had continued to expand after 1929 behind the enhanced tariff barriers of the Depression, there was still much room for the further development of import replacements. For example many basic chemicals continued to be imported; some of considerable importance to munitions production such as nitrates for nitric acid in explosives production[10]. The steel industry had not succeeded in capturing the bulk of the Australian steel market. In 1930 its share had stood at 40 per cent. Further progress was now dependent on the development of new secondary industries such as shipbuilding and large steel fabrications, rolled plate and sheet, tubular

9. *ibid.*, Casey to Bruce 23 March 1936. The significance of £23 million is indicated in the following table:

YEAR	EXPORTS OF MERCHANDISE SILVER, GOLD. £	IMPORTS OF MERCHANDISE AND SILVER £	CENTRAL AND STATE GOVT. INTEREST PAID ABROAD £
1925/26	146,712,000	151,276,000	23,542,000
1926/27	135,937,000	164,094,000	25,057,000
1927/28	142,486,000	146,934,000	27,031,000
1928/29	140,517,000	143,300,000	28,332,000
1929/30	100,129,000	130,788,000	29,556,000
1930/31	79,207,000	60,586,000	31,345,000
1931/32	79,422,000	44,059,000	27,033,000
1932/33	83,154,000	56,872,000	25,995,000
1933/34	96,897,000	59,502,000	24,977,000
1934/35	88,677,000	72,440,000	23,595,000
1935/36	104,000,000	82,000,000	22,907,000

Note 1. 1935/36 figures are an estimate by the Treasury.

10. D.P.Mellor, *op.cit.*, pp.114-144. See also A.Hunter (ed.), *The Economics of Australian Industry*, *op.cit.*, pp.290-323 — the Chemical Industry.

steel and tinned plate[11]. It had been hoped that British firms would establish branches in Australia for subsidiary steel industries, and so meet the extensive domestic demands for such products, thereby increasing the demand for Australian iron and steel. This did not happen because British firms had excess capacity in Britain and consequently would have been competing against themselves if they set up in Australia[12]. Although important automobile companies such as Ford and General Motors had been encouraged to set up assembly factories in Australia in order to capture the large domestic market and beat the general tariff rate, the most important components — the chassis and the engine, were wholly imported, with many other items. Attempts to get British firms to fill the gap failed because such firms enjoyed the British preferential tariff rate and found it more worthwhile to export components to Australia[13]. The machine tool industry was very small, most of the market being supplied by imports[14]. There were, of course, other important industries which were capable of significant expansion, but those mentioned above were of the most interest to the MSB.

11. C.Forster, *Industrial Development ...*, *op.cit.*, p.128. Shipbuilding in Australia had been developed during the First World War, but had been allowed to collapse by Australian Governments in the 1920s.

12. *ibid.*, pp.128, 133, 151. An exception to this trend, in the area of wire making was the partnership between BHP, Rylands and Lysaghts, which captured quickly 75 per cent of the Australian wire market.

13. *ibid.*, pp.29-30, 38, 43-48. A.Hunter (ed.), *op.cit.*, pp.12-13, 501-503. The Australian market for automobiles in 1930 was the sixth largest in the world.

14. D.P. Mellor, *op.cit.*, pp. 162-63.

The Balance of Trade Between Australia and Britain

It was one thing to realise that secondary industry needed to be expanded, but quite another to achieve it without a trade war with Britain. The economic relationship between Australia and Britain in the early 1930s was governed by the Ottawa Trade Agreement of 1932. This gave most of Australia's major rural products, excepting wool, a 10 per cent preference in the British market; and in return, Australia gave British manufactured goods 10 per cent preference against foreign competitors for the Australian market. Tariff protection was to be extended only to Australian secondary industries which were reasonably assured of sound opportunities of success. The level of tariffs for Australian secondary industry were to be only as high as would not deny British manufacturers the full opportunity of reasonable competition on the basis of the relative cost of economical and efficient production[15].

The British preference to Australia allowed Australian rural products to be competitive in the British market. The adoption of extreme agricultural protectionism by many foreign nations which had formerly imported large quantities of agricultural produce, had concentrated competition on the British market; and without the assistance of preferences, Australian exporters would have suffered very severe losses. Although prices had remained low, at least

15. AA CP498, S1, Bundle 2, File 430/B/20d, 430/B/20f. In implementing this agreement the Tariff Board worked on the principle of recommending protection for those industries with the least comparative disadvantage. This was to be judged (according to the Brigden Committee) by the absolute level of duty required to protect the industry. Other considerations were to be the efficiency of the industry, and the possibilities in the future of gaining the economies of mass production. G.J.Hall, *op.cit.*, pp.232, 235.

Australian primary industry had retained its major market[16]. Until the middle 1930s, this situation had altered little. Britain remained Australia's largest export market, while Britain was the major exporter to Australia[17].

The important fact about this economic relationship was that Australian exports to Britain were far more critical to the Australian balance of payments, than British exports to Australia were to the British balance of payments. For example, throughout the first half of the 1930s, British exports to Australia were never more than 7.7 per cent of total British exports, whereas in the same period Australian exports to Britain were more than 50 per cent of total Australian exports[18]. Australia was therefore

16. AA CP498, S1, Bundle 2, File 430/B/20e, Minister for Trade and Customs 2 May 1937, 7 December 1937. In the late 1920s Britain was Australia's largest market for exports. Australia was Britain's second largest market for exports after the USA. Britain had the largest proportion of Australian imports which for 1927/28 and 1928/29 was approximately 43 per cent — see File 430/B/41.

17. AA CP498, S1, Bundle 2, File 430/B/20d.

YEAR	AUSTRALIAN IMPORTS (£)	AUSTRALIAN EXPORTS (£)
1930/31	59,165,000) British	89,326,000) Exports to
1931/32	43,499,000) exports	85,349,000) Britain
1932/33	56,489,000) made up an	96,597,000) made up an
1933/34	59,385,000) average of	98,573,000) average of
1934/35	72,262,000) 40 per cent	90,225,000) 54 per cent
1935/36	85,250,000)	107,847,000)

18. AA CP498, S1, Bundle 2, File 430/B/20d. -

YEAR	TOTAL AUSTRALIAN EXPORTS (£)	PERCENTAGE TO BRITAIN	TOTAL BRITISH EXPORTS (£)	PERCENTAGE TO AUSTRALIA
1930/31	89,326,000	57%	390,622,000	3.7%
1931/32	85,349,000	53%	365,024,000	5.5%
1932/33	96,597,000	55%	367,909,000	5.8%
1933/34	98,573,000	51%	395,986,000	6.9%

much more dependent on Britain, than Britain was on Australia[19].

The other aspect of this relationship was the imbalance of trade. Between 1922-32, Britain imported £472,769,182 worth of Australian primary products, while Australia imported goods worth £537,507,742 from Britain, which was a balance of £64,711,560 in favour of Britain. In the same period Australia also paid Britain £280,000,000 sterling in principal and interest on loans[20]. By the mid 1930s, Australia had paid Britain, for goods and debt service £532,000,000 more than Australia had received from Britain. During the period 1920/21 to 1935/36 Australia had sought to make good the difference by borrowing £187,000,000 from overseas (mainly from Britain) and by exporting all her newly mined gold (£57,000,000) plus nearly all her gold reserves (£51,000,000). The large remaining deficiency of £237,000,000 absorbed all of Australia's favourable trade balances with all other countries[21].

To some extent this economic tutelage had been brought about by Australia's own actions during the 1920s when so many loans were raised in Britain for development. The money was now locked up in public utilities (eg electricity, sewage systems, roads) and rural industries which were giving declining returns, and the repayments fell due during the early 1930s. This disadvantage, when

1934/35	90,225,000	56%	425,834,000	7.2%
1935/36	107,847,000	50%	440,719,000	7.7%

19. Australian export industries, such as dairy products, had been developed specifically to supply the British market, and there was no realistic prospect of them supplying any other. British manufactured goods had an appeal well beyond the Australian market.

20. AA CP498, S1, Bundle 2, File 430/B/20d.

21. AA CRS AA1968/391, Folder 50, Casey to Bruce 19 October 1936.

combined with the others already mentioned, gave Britain a powerful position from which to resist the Lyons Government's attempts to develop secondary industry at the expense of British exports. The existence of such a dependence on Britain as well as the unfavourable trade balance, were additional inducements to the Lyons Government to try to change the relationship.

The most obvious measure available to the British to thwart Australian economic ambitions was to restrict the sale of Australian primary products in Britain[22]. The British Government had begun to show its willingness to use this measure by 1934. The Lyons Government sought to gain entry on favourable terms into the British market for more primary products. The British refused to acquiesce without a further relaxation of tariffs in Australia to favour the entry of more British manufactured goods. At the heart of this refusal lay the British belief that Lyons had not fulfilled the terms of the Ottawa Trade Agreement. Instead of lowering tariffs to British goods, to allow the full opportunity of reasonable competition, Lyons had raised tariffs against non-Empire countries, giving the British a wider margin of preference, but leaving Australian secondary industry still heavily protected[23]. The British could point to the basic trade figures between the two countries since 1932, and claim that Australia was getting superficially very much the better of the Agreement

22. This possibility was recognised as early as March 1933 by the powerful Australian industrialist, W.S.Robinson of the Collins House metals conglomerate, see P.Cochrane, *Industrialisation and Dependence* . . . , *op.cit.*, p.99.

23. P.Cochrane, *op.cit.*, pp.46-48. C.B.Schedvin, *op.cit.*, pp.368-370. Such tariffs as were lowered on British goods did not directly threaten major Australian industries. For example, cheap capital equipment was needed by Australian industries if they were to keep their domestic costs down. See also D.C.S.Sissons, 'Manchester versus Japan . . .', *Australian Outlook*, Volume 30, No.3, December 1976, p.500.

if one ignored debt repayments[24].

Lyons saw the issues differently to the British. If he had lowered the tariffs in the manner expected by Britain, he would have lost the support of business and his Government would have disintegrated. The Ottawa Agreement, as he had chosen to implement it, had still caused a great deal of political opposition, which was still continuing as late as 1937[25]. When faced by the British insistence of a quid pro quo for any increased access to markets, Lyons realised it was futile to hope that British trading arrangements would be altered any further to suit Australia, or that Australian long term hopes could be placed on the expansion of inter Empire trade[26]. Some observers did not think that the British would tolerate the *existing* situation for much longer without retaliatory action against Australian exports[27].

24. AA CP498, S1, Bundle 2, File 430/B/20d. These figures took no account of capital outflow, and debt repayments which when added pointed to an imbalance against Australia. Basic trade figures were:

YEAR	BRITISH EXPORTS	AUSTRALIAN EXPORTS
	TO AUSTRALIA	TO BRITAIN
	(£)	(£)
1930/31	14.5 million	51.0 million
1931/32	20.0 million	45.2 million
1932/33	21.3 million	53.0 million
1933/34	27.3 million	50.2 million
1934/35	30.6 million	50.5 million
1935/36	34.0 million	54.0 million

25. AA CRS CP498, S1, Bundle 2, File 430/B/20d, 430/B/20e Part 2.

26. The *Mercury* newspaper 22 June 1934 quoting Lyons. Noted by P.R.Hart, 'J.A.Lyons: A Political Biography', PhD Thesis, ANU, 1967, pp.277-278. Despite this view, Lyons went to Britain in 1935, with R.G.Menzies, and spent much time trying to persuade the British to change their attitude. He failed.

27. Colin Fraser of the Collins House metals conglomerate thought in December 1934

Trade Diversion — USA

The method by which the Lyons Government planned to expand Australian secondary industry, and assuage British objections was by trade diversion. This idea appears to have first surfaced within the Department of Trade and Customs in early 1934 in relation to trade negotiation problems:

‘The only method by which Trade Treaties could be arranged without detriment to Australia would appear to be the transfer of trade from those countries with whom we have an unfavourable balance viz. Canada, USA, Britain - to the countries with whom we have a favourable balance. The Ottawa Agreement limits the choice to transfer of American trade’[28].

The choice of the USA was agreeable as Australia sold comparatively little to this country, but bought millions of pounds worth of manufactured goods each year. Attempts to develop trade to correct the imbalance had been rebuffed by the USA[29].

The plan, which was revealed publically by the Government on 22 May 1936, restricted US exports to Australia, particularly motor components, whereas

that continued high protection encouraging import substitution would provoke British retaliation. See P.Cochrane, *Industrialisation and Dependence . . .*, *op.cit.*, p.99. Fraser was to become the Director of the Materials Directorate of the Ministry of Munitions. See Chapter 5 of this thesis.

28. AA CRS A461, File D353/1/3, Minute ‘Trade with Countries with Which Treaties are Under Discussion’.

29. AA CRS A2694, Volume 17, Part 2, Agenda 2117 of 14 July 1937. In the 10 years ended June 1935, the accumulated balance against Australia with the USA was £180 million sterling. In addition interest payments on dollar loans was £1,300,000 annually and there were also interest payments and dividends on US investments in Australia, profit taking from oil, motor car, and film industries and shipping services. Australia had tried to reduce this burden by increasing exports to the USA, but the prohibitive US tariff policy against Australian products had forced another approach.

there were no restrictions on British exports[30]. This amounted to a diversion of trade towards Britain so that British exports to Australia would increase. The Government also introduced a charge of 0.7 pence per pound weight on imported chassis, which was to be used as a bounty to help start engine and chassis production in Australia by 1938. British objections were to be overcome by inviting British car firms to carry out the development. A majority shareholding had to be British or Australian capital[31]. The Lyons Government focussed its energies on the automobile industry because this was the key industry for an advanced industrialised economy in the mid 1930s. This was largely because it drew on so many other industries and skills. It was an obvious catalyst to promote further growth in secondary industry.

One of the implications of this initiative was that the established major car assemblers in Australia, the US firms of Ford and General Motors — Holden (GMH), would be cut out of further development of the automobile industry in Australia, and the British would take over. In fact, the Government expected

30. CPD Volume 150, pp.2211–2218, Minister for Trade Negotiations, Gullett, statement of 22 May 1936. AA CP498, S1, Bundle 2, File 430/B/20d. The details of the restrictions were:

- a. Prohibition of the importation of specified goods from nations outside the British Empire except under licence. Licences were to be issued for goods from countries which were good consumers of Australian goods.
- b. Prohibition of importation of motor vehicle chassis from any country other than Britain except under licence. Licences to be granted for importations up to 100 per cent of the quantity imported during the year ended 30 April 1936.
- c. A special duty of 0.7 pence per pound weight to be imposed on all imported motor chassis and parts to provide a fund from which a bounty on Australian made engines would be paid.

Cabinet had first discussed these measures 23 April 1936, AA CRS A2694, Volume 15, Part 2.

31. *ibid.*, chassis included also gears, radiator core, and petrol tank.

no serious response from the British automobile industry[32] and intended to combine with GMH. On 2 June 1936, White, the Minister for Trade and Customs, explored the prospects of production of complete automobiles with senior executives from GMH[33]. When asked whether GMH could expect the Government to raise the protective tariff against British motor car industry imports, in order to protect the local industry, if it were established fully, White replied:

‘Yes certainly. They have, between ourselves, squealed a lot. All sorts of people say we favour the American car. Nothing is further from my thoughts. But I know how hollow the show [is]. I have said, “Your bluff is called. You show just what you are going to do in Australia”’[34].

The Government was right. British motor car producers proposals were

32. AA CP211, S2, Bundle 107, File ‘Transport Vehicles ...’, Australian Governments had been trying to persuade British motor car manufacturers to set up in Australia for years without success. In 1927, a British Motor Producers Delegation visited Australia to see what could be done to correct the drastic decline in British post First World War car sales in Australia. The Australian Prime Minister, Bruce, had encouraged the visit, apparently to correct the imbalance of trade with the USA in favour of sales to the Empire (i.e. Britain). He warned the British that their product was inferior to that of the USA, and that they needed a very radical change of attitude towards design and sales organisation for Australia. Bruce wanted the British to start production in Australia. The British delegation ignored Bruce, claiming that British cars were suitable for Australia and asked for a wide range of tariff benefits for some years so that British sales could be lifted. It made no definite proposal to set up production in Australia. The delegation claimed that US cars were inferior, and stated that the British light car was the best designed and manufactured in the world, and that the USA would soon be following this trend. The British position was very arrogant considering that Ford and General Motors had just set up in Australia. Bruce’s belief in the poor quality of the British product was confirmed by the Chairman of the Technical Committee of the Royal Automobile Club of Australia, W. McNeill, who was himself an Englishman. British motor car producers were to behave very similarly in 1936.

33. AA CP576, S1, Bundle 6, they were J. Storey and E. W. Holden.

34. *ibid.*, Holden replied ‘I don’t think they will’. White answered, ‘They need not expect any sympathy ...’.

extremely cautious, and dependent on further favoured treatment to give them most of the Australian market before they began production in Australia[35]. The Lyons Government was not deceived and continued to pursue its main objectives. The acting manager of GMH attempted to summarise these when he wrote to White to confirm the conclusions of their meeting of 2 June:

‘Are we correct in our understanding of the recent Government Statements and enactments concerning Motor Car chassis, i.e. that it is concerned, not so much with Overseas Trade Balances, or a diversion of trade to Great Britain, as it is with the expansion of industry in Australia, and the defence of this country?’[36].

In April 1936 the Cabinet had begun planning an engine research laboratory to aid the new initiatives in automobile manufacture[37]. This had broadened by June into a fullscale plan to give scientific support to secondary industry. Under the influence of the Minister for Trade Negotiations, Sir Henry Gullett, the Cabinet had co-opted the Chairman of the CSIR, Sir George Julius, to conduct an enquiry into secondary industry (the Secondary Industries Testing and Research Committee). Its purpose was to determine the best way to secure more efficient and economical secondary production and employment, thus cor-

35. AA CRS A461, File F353/1/1. Interestingly, the leader of the Country Party, Page, appeared willing to fall in with British proposals for further tariff concessions (on top of trade diversion). He thought the British motor producers would then increase their sales, and could set up assembly plants in Australia, which could grow towards production of the full motor car. Page to Lyons 19 June 1936. His coalition partners, the United Australia Party, were not so naive.

36. AA CP571, S1, Bundle 2, Acting General Manager of GMH to the Minister for Trade and Customs 4 June 1936. Defence was in fact a secondary interest to the Government, see later this Annex, and Chapter 3 of this thesis.

37. AA CRS A2694, Volume 15, Part 2, Cabinet minute 23 April 1936.

recting the major abuse of the protective tariff system referred to earlier[38]. As Lyons himself stated, the contraction of world markets for primary products had forced Australia to accept that the expansion of secondary industry was not only essential for the provision of an increased home market for primary products, but also necessary to place Australia in a position to carry a progressively larger population[39]. The Government knew that in initiating such an enquiry it was virtually committing itself to build an engine laboratory, a national standards laboratory, and further laboratories for industrial chemistry and physics[40]. The value and interest to defence of a more efficient and broadly based secondary industry was obvious.

In November, Gullett instructed the Tariff Board to determine the best means of implementing the Governments policy of establishing engine and chassis production in Australia. The reasons which the Government advanced in support of local manufacture included the industry's defence potential, its contribution to trade diversion, its assistance to increased employment and immigration etc.[41]. These facts, and those already cited, show how serious the

38. Julius had been approached initially by the Secretary of the Prime Ministers Department, Strahan, but had extensive conversations with Gullett subsequently at the Council of Agriculture. CSIRO Archives, S67, Volume 21, Julius to Strahan 15 May 1936, Volume 18, Julius to Rivett 20 May 1936, Volume 17, Richardson to Rivett 16 June 1936.

39. AA CRS A461, File H398/1/1, Part 1, Lyons press statement issued 8 July 1936. Menzies reiterated this view to the Victorian Chamber of Manufacturers. See *The Age* newspaper 14 August 1936.

40. See for example CSIRO Archives, S67, Volume 18, Julius to Rivett 23 June 1936, Volume 17, Richardson to Rivett 16 June 1936, Volume 18, 'The Need for the Establishment of a National Testing ... Laboratory', 10 June 1936 (Julius to McLachlan). Only with these facilities could the Government develop engine production, and lift the general standards of efficiency of secondary industries.

41. PP1937-40, Volume II, pp.1763-1818, Tariff Board Report of 6 September 1937.

Government was in its desire to develop secondary industry as a first priority, in contrast to the emphasis placed previously on primary industry. But the problem of competing with British exports to Australia, while retaining Australian primary export markets in Britain, was not likely to be overcome with only the diversion of US trade and the suggestion of British participation in new industries. The Lyons Government knew this from its experience with the British opposition to the new Australian aircraft industry.

The Australian Aircraft Industry

Throughout the first months of 1936, a bitter dispute had been building up between the Australian and British Governments over Australia's plan to build an aircraft factory. In November 1935, against British pressure, the Lyons Government had approved the import of US made commercial aircraft. The British aircraft manufacturers had been used to regarding the Australian market as their unchallenged preserve; but by 1935 their commercial aircraft were uncompetitive, and the Australian Government bowed to domestic political pressure, and allowed the entry of US commercial aircraft into Australia. These suited Australian conditions admirably[42].

The Australian Government had also been conducting, throughout 1935,

Defence potential is cited as one of nine reasons for creating the industry. The rest were all to do with economic development and the growth of population.

42. J.M.McCarthy, *op.cit.*, pp.186-191. Because of a legal technicality over airworthiness, the British were the only nation able to export aircraft to Australia. However, the Australian Government became impatient of holding the market for the British when their commercial aircraft were inferior and had a bad accident record. British companies were apathetic, late in delivery and gave poor maintenance support. The US companies were quite the reverse.

negotiations with a consortium of commercial interests, including BHP, Broken Hill Associated Smelters and GMH, to establish a protected aircraft manufacturing industry in Australia. The major reason was defence, as Lyons could not get any guarantee from Britain for the continuity of supplies of military aircraft, in the event of an emergency arising[43]. Current deliveries of military aircraft had also been slow, which had stimulated the Minister for Defence, Parkhill, to initiate negotiations for an Australian based aircraft production company. Although invited, British aircraft companies had been uninterested; so Parkhill had turned to other commercial interests[44].

In February 1936, the Australian Government had informed the British of the existence of the Commonwealth Aircraft Corporation (CAC). A torrent of protest erupted from the British aircraft industry and the British Government; ostensibly, because an American company (GMH) was involved and therefore technical secrets could not be released to CAC, even though it wished to build British aircraft. The real reason was that the British saw CAC as providing a protected opening into the Australian market, through which the USA could extinguish the British aircraft and motor trade in Australia[45]. The British Government insisted on the removal of all USA interests from CAC and their replacement by British. The more obvious criticism was that the Australian aircraft industry was going to be uneconomic, but the Ottawa Agreement

43. G.Blainey (ed.), *If I Remember Rightly . . .*, by W.S.Robinson, Cheshire, Melbourne, 1967, p.175.

44. J.M.McCarthy, *op.cit.*, p.199.

45. *ibid.*, p.203. Australia was the biggest importer of British chassis and engines in 1936, and similarly for British motor cycles. AA CP498, S1, Bundle 3, File 430/F/8.

allowed such industries to be created if vital for defence. So the British could not use this argument.

The Lyons Government appears to have been sympathetic to the use of British firms, largely because the dispute threatened to disrupt the plans for the expansion of secondary industry and diversion of US trade to Britain. The engine research laboratory suggested by Gullett in April was in fact as much for aeroengine research as for automobile engines[46] so the connection was there, and appeared to lend credence to the British view of CAC. In an attempt to dispell this fear Casey and Gullett argued in favour of British capital replacing that of the USA[47] probably as this was the general deal they planned to offer over the development of automobile engine production. It did not work because British aircraft companies were not sufficiently interested, and more importantly, CAC refused to replace GMH, because the latter was vital in many technical aspects to the successful operation of CAC[48]. Although Lyons asked the British Prime Minister, Baldwin, in April to assuage the hostile British reaction, he refused, and a serious crisis grew in the relations between Australia and Britain.

A strong and unequivocal gesture was needed to prove the good faith of the Australian plans for aircraft production. The Lyons Government found it

46. AA CRS A461, File H398/1/1, Part 1. This relates that the Cabinet meeting of 23 April 1936 discussed the idea of an engine research laboratory for car and aeroengines for the Australian car and aircraft.

47. J.M.McCarthy, *op.cit.*, pp.204-205. Casey kept the British High Commissioner informed of the Cabinet's considerations.

48. GMH was the only part of the CAC syndicate which had any knowledge of Light Engineering which was the predominant technique in the manufacture of aircraft bodies.

in diverting Japanese trade with Australia to Britain. This was announced at the same time as the trade diversion from the USA, i.e. 22 May 1936, and no doubt the combination of both was expected to impress Britain with Australia's loyalty to the Empire and to British trade aspirations. But once again, there was rather more to Australia's Japanese ploy, than at first seemed obvious.

Trade Diversion — Japan

The original Department of Trade and Customs minute of early 1934 which explored trade diversion against the USA also had some observations about nations with which Australia had a positive balance of trade. These were that Australian primary exports did not compete with any locally produced goods; but the exports of these nations did threaten Australian secondary industries. In asking for more balanced trade these nations were virtually suggesting that they would continue to take the noncompetitive primary exports of Australia, while they were allowed to unload greater quantities of their competitive goods on Australian domestic markets[49]. This was the source of some worry in regard to Japan.

In 1935 the Japanese were attempting to capture the large British trade with Australia in cotton piece goods and textiles. By slashing her prices and devaluing her currency, Japan had been able to make the British preferential tariff rate ineffective, and was undercutting British prices[50]. The British

49. AA CRS A461, File D353/1/3, 'Trade with Countries with which Treaties are Under Discussion'.

50. AA CRS A425, File 37/2066. Gullett was certain that the Japanese were deliberately dumping goods to wipe out British Trade. Japanese prices were unrealistic and defied

cotton and textile industry was in recession, and the steady loss of the important Australian market was a serious blow. The industry and British Government, in 1935, began to exert pressure to get the Australian Government to do something to help the situation[51].

The Australian Government was deeply suspicious of Japanese intentions, which it felt were aimed at isolating Australia politically and economically from Britain[52]. Gullett observed:

‘It seems to me that they would inevitably next have attacked Australian secondary industry in a number of directions, and as increasing buyers of our wool would have become more and more effective in their threats against us if we endeavoured to check them’[53].

Probably, the more important reason was the Government was worried that in conceding to the Japanese the right to balance her trade with Australia, it would have to concede the same to other countries with which Australia had trade negotiations, and receive a flow of manufactured goods which competed with Australian secondary industry[54]. The Australians were also conscious that Britain was Australia’s best customer for primary exports, and the only world market open to them for dairy products and meat exports[55]. The British had reminded the Australian Government more than once in the past,

all competition.

51. D.C.S.Sissons, ‘Manchester versus Japan ...’, *op.cit.*

52. P.R.Hart, ‘J.A.Lyons: A Political Biography’, *op.cit.*, p.277. The key ministers who held this belief were Pearce, Lyons, Gullett and Page.

53. AA CRS A578, S1, Bundle 2, Gullett to Hawker, early June 1936.

54. AA CRS A425, File 37/2066, Gullett to J.N.Lawson, MP, 4 July 1936. The other countries were Belgium and France.

55. *ibid.*, Gullett to Baron Sakatani, President of the Australia Japan Society 30 May 1936. AA CRS CP578/1, Bundle 2, Gullett to Sir MacDonald.

that a serious decline in British exports to Australia reduced Britains ability to buy Australian exports. This had been the argument which also governed the expansion of trade between Australia and Britain.

‘Obviously it would be unreasonable to expect the United Kingdom to continue to extend tariff preferences to Australian primary products and safeguard their position in the British market when the Commonwealth ... is not prepared to act similarly towards British products’[56].

During the early months of 1936, the Australian Government attempted to persuade the Japanese to desist from their trade practices within Australia. Despite offering the same value of trade, but at a lower yardage, i.e. the Japanese would charge higher more competitive prices, the Australian Government found that this was rejected, and the Japanese threatened trade reprisals if any attempt was made to stop their actions[57].

This was not a credible threat as at this time the main hold Japan had over Australia was its consumption of Australian wool, which made them the largest customer after Britain. However, as Gullett explained to J.N.Lawson, MP, the world demand for fine wools was expanding, but the number of suppliers was severely restricted — only Australia and South Africa were significant exporters. If the Japanese boycotted Australian wool sales, the wool would be bought by other buyers, and the Japanese themselves would have nowhere to go[58].

The Australian Government was not prepared to let the Japanese dictate

56. AA CRS CP578/1, Bundle 2, Gullett to A.Carter 24 July 1936. See also A425, File 37/2066, Gullett to H.McClelland, MP, 13 July 1936.

57. AA CRS A425, File 37/2066, Gullett to J.C.Blackmore, October 1936.

58. *ibid.*, Gullett to J.N.Lawson, MP, 4 July 1936.

to them, and decided to take action to preserve their interests with Britain. As has been mentioned these included the plans to expand secondary industry in Australia including aircraft manufacture. When the diversion of Japanese and USA trade to Britain was announced on 22 May 1936[59] parts came as a surprise to the British Government, but it seems to have had the desired effect of proving Australia's good faith towards Britain and the Empire. It is perhaps not coincidental that the major aspects of the dispute over CAC were settled in Australia's favour in June 1936, shortly after Australia's trade diversion gesture[60]. Britain made no threats over the Australian plans to expand secondary industry. In the climate created by the Australian actions it would have been difficult.

Indeed, the Australians appear to have exploited the situation to gain expanded meat exports to Britain as a reward for their gesture over Japan. The Lyons Government depicted their actions over Japan as entirely a friendly gesture to help 'mother' Britain and to strengthen Empire bonds. By pretending that this was done at great political cost, Lyons and Gullett persuaded the

59. CPD, 22 May 1936, Volume 150, pp.2211-2218, Gullett's statement. Heavy tariff duties were placed on cotton and artificial silk piece goods, whereas British goods were unaffected.

60. J.M.McCarthy, *op.cit.*, pp.207-211. The agreement was that the British Government would now accept CAC, if the GMH holding was reduced to a minor level, if CAC had only British management and made only British aircraft, and if technical secrets were preserved from the CAC Board. Since the whole enterprise was being launched for patriotic reasons and not in anticipation of profits, GMH and its partners had no objection to ICI Australia taking up half of GMHs shares in CAC — this probably saved GMH money. The other aspects were exactly what CAC had always intended to do anyway. Later, when CAC chose a US aircraft to produce, the dispute broke out all over again — see McCarthy, pp.213-223. The Australians won this point as well.

British that without a gesture towards increasing Australian primary exports to Britain, the Australian Government was in danger of falling[61]. This was most unlikely. The major group which stood to lose were the woolgrowers, and the Government had taken the leaders of the Woolgrowers Council into its confidence and gained their acquiescence to the Governments trade diversion[62]. Consequently, the expected Japanese boycott resulted in no serious domestic attacks from this quarter on the Government. The manufacturers also supported the Government[63]. Despite the realistic misgivings of the British Foreign Office, the British Government conceded increased meat imports to the Australian Government[64].

Results and Consequences

The immediate result of the Trade Diversion was that in December 1936, the Japanese Government accepted similar terms to those offered by Gullett in the early part of 1936[65]. Britain regained some of her lost cotton goods market, or at least had some assurance that it would no longer contract. The value of trade diverted from the USA by the end of the financial year 1936/37

61. D.C.S.Sissons, 'Manchester versus Japan . . .', *op.cit.*, Sissons thinks that Lyons and Gullett were serious in this belief. I disagree.

62. AA CRS A425, File 37/2066, Gullett to J.C.Blackmore, October 1936.

63. *ibid.*, File 37/985, Manufacturers Bulletin 1 November 1936, Statement by President of the Associated Chambers of Manufacturers, Kneeshaw, supporting the Trade Diversion policy and action taken against Japans threat to secondary industries.

64. See D.C.S.Sissons, *op.cit.*

65. AA CP498, S1, Bundle 2, File 430/B/20d. AA CP576, S1, Bundle 7, Canberra Times 1 July 1937.

See also D.C.S.Sissons, 'Private Diplomacy in the 1936 Trade Dispute with Japan', *Australian Journal of Politics and History*, Volume 27, No.2, 1981.

was £1,700,000, of which approximately £600,000 went to Australian secondary industry, £650,000 to British industry, and the rest to other countries[66]. The British share would have been bigger, except that British rearmament prevented British manufacturers from producing more goods for export, to take advantage of their new opportunities in Australia[67].

Much import substitution took place after 1936, partly as a consequence of the Government's determination to further expand secondary industry, and partly because of the continued effect of the protective tariff[68]. But behind these many developments in secondary industry lurked the threat of British trade sanctions against Australia. Trade Diversion might have left the British Government satisfied in the short term, but Lyons's election policy statement of September 1937 removed any ambiguity about British long term trade prospects in Australia:

'The difficulty of finding profitable markets for our primary products indicates the need for a greater spread and more rapid growth of our secondary industries in order to find employment for more people and a greater consumption of primary products in Australia'[69].

66. AA CRS A2694, Volume 17, Part 2, Agenda 2117 of 14 July 1937, 'Considerations Which Led to the Adoption of the Trade Diversion Policy'.

67. *ibid.*, Rearmament was producing manufacturing bottlenecks for key components, preventing the rapid expansion of British trade.

68. See M K Feil, 'An Assessment of the Role of the Tariff Board in the Growth of Australian Industry 1921-1939.' MEC thesis University of Sydney, 1976.

69. AA CP498, S1, Bundle 2, File 430/B/20f, Lyons Policy Statement made at Devonport, Tasmania, 28 September 1937. Lyons went on to promise a programme of assisted migration, and special assistance to secondary industry: 'For the success of our secondary industries a bigger home market is required. In other words more people to use or consume our manufactured goods'. Lyons thoughtfully also declared that his policy was to maintain Imperial Preferences with due regard to the great advantages Australia derived from the preferences given to her products in Britain.

By 1938 the Department of Trade and Customs could observe:

‘... if the Commonwealth Government succeeds in promoting additional secondary industries it will be mainly at the expense of United Kingdom trade and some of these losses are almost certain to provoke reactions’[70].

Possibly distracted by the European crisis and rearmament, a firm British reaction does not appear to have come until 1940, when the British High Commissioner complained bitterly about the Australian Governments attempts to establish the automobile, and tin-plate, industries, under the guise of war. He claimed, correctly, that they were essentially uneconomic and destroyed British trade[71]. Australia imported from Britain over 50,000 tons of tinplate annually, and the Australian Government was anxious to set up production because of the importance of tin cans to primary industries. However a modern tinplate plant only became economical to run when it produced 100,000 tons annually, and the domestic demand in Australia did not support that quantity of tin plate. BHP offered in 1939 to set up such a plant if it were given adequate tariff protection for seven years[72].

Under pressure from Britain, the Government dropped its plans for tin plate, but does not seem to have taken much notice in regard to automobile production. The beginning of war increased the value to Britain of Australian primary products, at the same time providing opportunities for further import substitution by secondary industry in response to defence requirements. This

70. AA CP498, S1, Bundle 2, File 430/B/20f.

71. AA CRS A461, File B353/1/3, Aide Memoire from the British High Commissioner 23 April 1940.

72. H.Hughes, *op.cit.*, p.128. A.Trengove, *op.cit.*, p.170.

was recognised within the Ottawa Trade Agreement as a legitimate reason, and only the more blatant abuses such as tinsplate and automobile production could be criticised by Britain. War prevented any serious British retaliation against the Australian development of secondary industry. After the war, the further development would be an accomplished fact, and for some time afterwards there was likely to be a sound demand for Australian primary exports.

*Annex D**THE FOREST PRODUCTS DISPUTE**The Emergence of the CSIR*

The origins of CSIR went back to the supply crisis in Britain in 1915. In the early months of the First World War, the British Government discovered that industry had become almost totally dependent on Germany for many manufactured articles, chemicals and refined raw materials such as tungsten and zinc. Optical glass, magnetos, drugs and pharmaceutical preparations were other areas of significant dependence. This problem, combined with escalating munitions demand from the Western Front in France, helped to cause a crisis in supply. Part of the solution was seen to be the promotion of scientific participation in industry. The British Minister of Munitions proposed a comprehensive scheme for scientific and industrial research[1].

This policy had an effect on Australia where scientists had been bewailing the poor use of science to assist primary and secondary industry. A complicated and varied set of interests, including state governments and universities began to exert pressure for a government policy on the matter[2]. They found a convert in the Prime Minister (W.M.Hughes):

1. AA MP598, S37, Box 2, Item 25, Command Paper 8005, 'Scheme for the Organisation and Development of Scientific and Industrial Research, 1915'.

2. See G.Currie and J.Graham, *The Origins of CSIRO: Science and the Commonwealth Government 1901-1926*, CSIRO, Melbourne, 1966.

'Science can make rural industries commercially profitable making the desert bloom like a rose; it can make rural life pleasant as well as profitable. Science can develop great mineral wealth of which, after all, only the rich outcrop has yet been explored. It can with its magic wand turn heaps of what is termed refuse into shining gold; and by utilisation of bi-products make that which was unprofitable to work profitably. Science will lead the manufacturer into green pastures by solving for him problems that seemed to him insoluble. It will open up a thousand new avenues for capital and labour, and lastly science thus familiarised to the people will help them to clear thinking; to give rejection to shams; to healthier and better lives; to a saner and wider outlook on life'[3].

Hughes was supported by the Deputy Prime Minister (George Pearce) who summed up the problem more succinctly:

'... It is, I believe, the organisation of industry and its linking up with science here for the first time on such big lines that will help us to learn one of the lessons that our enemies have taught us in this war— the benefit of organisation of industry and linking up the brains of a nation with the brawn of a nation'[4].

The Australian Government experimented with various types of organisation between 1916 and 1926 in the attempt to utilise science more widely in Australia. Its aim seems to have been to produce a co-ordinating agency which drew upon existing scientific resources and laboratories to solve outstanding primary and industrial problems. The creation of the CSIR in 1926 was an acknowledgement that if science were to be used for the lasting benefit of primary and secondary industry, an organisation had to be created which had the political freedom, and economic support, to define problems in its own way, and

3. W.M.Hughes at conference on the future role of science, 5 January 1916, quoted in G.Currie, et al, *op.cit.*, p.44.

4. Statement by Acting Prime Minister on the establishment of the Advisory CSIR, AA Cabinet Papers, Supplementary Folders 1915-16, 14 April 1916.

to build its own laboratories. The previous organisations had lacked finance and were unable to exert themselves successfully against state and federal jealousies. The CSIR enjoyed very wide freedom to determine its own policy and priorities, and was not under direct departmental control like its predecessors. A trust fund was established to make it more or less independent of annual appropriations from the Government's budget. CSIR *liaised* with the Government through the Vice President of the Executive Council (George Pearce) and had direct access to the Prime Minister[5]. The CSIR could ignore all attempts to impede the development of new research, if it chose; and this began a tradition in which the original idea of a co-ordinating agency became subordinate to a policy of direct and vigorous executive action to attack new problems concerning the primary industries.

The major source of scientific support to the precursor of the CSIR, the Institute of Science and Industry, had come from the MSB. When the Institute was replaced in 1926, the MSB continued this support for the new CSIR. MSL carried out materials testing for CSIR, and supplied personnel to sit on CSIR sponsored committees such as the Maintenance of Standards[6]. This association was valued sufficiently by the CSIR Executive Committee to prompt it to nominate the chairman of the MSB, Leighton, as a member of the governing Council of the CSIR[7]. MSB personnel, including Leighton, were also

5. See G.Currie, et al, *op.cit.*

6. Reports of the Munitions Supply Board to Parliament, 1925-26, 1926-27, 1927-29.

7. Leighton was appointed in 1926. The Council was in favour of the senior technical officer of the Defence Department being appointed because, like the Department, the Council had an interest in the creation of particular secondary industries. CSIRO Archives, Council Meeting, 22-25 June 1926, 23-25 November 1926. See also Executive

involved heavily with committees of the Commonwealth Engineering Standards Association (later the Australian Standards Association) which was virtually run by the CSIR. The CSIR took steps to see that the standards established at MSL were adopted as the authoritative Commonwealth standards[8].

The Forest Products Laboratory

The CSIR established a comprehensive set of laboratories and research stations throughout Australia to support primary industry. This was in line with the Bruce Governments wishes, for primary industry was seen as the major vehicle of future economic growth[9]. As the reputation of CSIR grew, it began to receive many requests for assistance from different quarters, one of which was the Forest Products industry. In 1927 the industry had come under strong competition from imported Baltic pine. This outlined the need to carry out standard strength tests on Australian and imported timbers to see what could compete. No means of doing this existed in Australia except at MSL[10], where detailed timber research had been conducted for some years[11].

As usual, Leighton offered immediately to assist the CSIR. Despite such assistance, the Council of the CSIR had decided within a year that a major initiative was needed, probably involving the creation of a Forest Products laboratory. Leighton did not agree with the creation of a new laboratory because

Committee Minutes, 13 April 1926, 17 August 1926.

8. CSIRO Archives, Executive Committee Minutes, 10 September 1926.

9. W.H.Richmond, 'S.M.Bruce and Australian Economic Policy', *Australian Economic History Review*, Volume XXIII, No.2, September 1983.

10. CSIRO Archives, Council Meeting, 12-14 December 1927.

11. Reports of the Munitions Supply Board to Parliament 1922-1927.

it duplicated the facilities at MSL. He felt that the MSB could assist CSIR in any timber problem, and results would be achieved immediately instead of waiting several years for the building of a new laboratory[12]. Like many state government critics of the CSIR, Leighton was not anxious to see an unnecessary duplication of an existing laboratory, when there were so many other major scientific areas to be investigated. It is relevant to point out that Leighton applied the same standards to MSL when he was considering extensions of scientific research. Thus, for example, in 1923 Leighton had been planning to expand the Metrology laboratory of MSL to cover electrical standards; but after talks with Sir John Monash - Chairman of the Victorian Electricity Commission, Leighton decided not to proceed as the Commission's laboratory covered this area quite well[13].

However, during the early months of 1929, it became clear that the Council and Executive Committee of the CSIR planned to cover many new areas of timber research not covered by MSL[14]. Once he had understood this, Leighton suggested that the new laboratory should be placed at Maribyrnong. The point of this was that the Forest Products laboratory could use the existing

12. CSIRO Archives, Council Meeting, 11-13 April 1928, 12-14 December 1928, 25-27 March 1929; Executive Committee Minutes, Meeting 9 May 1928.

13. AA MP730, S8, Box 6, MSB Agendum 1923/751.

14. CSIRO Archives, Series 577, 'The History of CSIRO's Connection with Forest Products Laboratory - Part 1', Boas to Rivett 2 April 1929. This reveals the huge area of work in timber research which the head of the division of Forest Products (Boas) said CSIR had to undertake to support the timber industry. It included seasoning, preservation, chemistry, tanning, technology, utilisation, industrial investigations, testing, physics, pulp and paper, glues and gluing, mycology and entomology. MSL had experience in only 80% of these activities. See also S67, Volume 0, Rivett to Richardson 15 May 1929.

timber research facilities of MSL, while adding the facilities for the new areas of timber research.

This suggestion split the CSIR Executive Committee. The Chief Executive Officer, Rivett, and the head of the division of Forest Products, Boas, were in favour of accepting Leighton's proposal. Boas wanted the laboratory close to the trade which meant locating the laboratory either in Sydney or in Melbourne. He favoured Melbourne because of the facilities MSL could offer, which would lead to substantial savings in construction costs and in annual maintenance[15]. Rivett was impressed with the possibilities of useful assistance from MSL:

'... we shall need a very strong case indeed if we are to justify to the Minister the erection of the laboratory elsewhere with the consequential passing over of the facilities already existent'[16].

The Chairman of the Executive Committee, Julius, mistrusted the Defence Department and thought that if the laboratory was placed anywhere near Maribyrnong, efforts would probably be made by Leighton at a later date, to oust CSIR from Forest Products work[17]. Rivett checked out the Leighton proposal carefully, and met Leighton and the Superintendent of MSL, Bell, in May 1929. Leighton saw no difficulty in making suitable co-operative arrangements for the utilisation by CSIR of all facilities, both for certain experimental purposes, and for the construction of plant and apparatus at the MSB workshops[18]. Rivett became intolerant of Julius's attitude:

15. CSIRO Archives, S67, Volume 0, Rivett to Julius 1 March 1929; S30, Rivett to McDougall 22 April 1929. See also S577, *op.cit.*

16. CSIRO Archives, S67, Volume 0, Rivett to Julius 30 April 1929.

17. CSIRO Archives, S30, Rivett to McDougall 22 April 1929.

18. CSIRO Archives, Executive Committee Minutes, Meeting 20 June 1929; S67, Vol-

'... Julius is still thoroughly unconvinced about the wisdom of building at Maribyrnong. The chief reason for this is his utter distrust of the Defence Department, a distrust which I find it almost impossible to share'[19].

Further investigations only served to reinforce Rivett's belief and he told Julius:

'... if it [the laboratory] is to go to Maribyrnong, a great deal less will be required than if it is to be put up at Canberra. Boas has had a long talk on the spot with Mr Noel Brodribb ... and I think he has discovered even more material advantages in Maribyrnong than any of us had seen before. I talked the matter over with Sir George Pearce yesterday ... He himself was definitely inclined towards Maribyrnong ...'[20].

Cabinet approved Maribyrnong as the site on 26 July 1929, subject to CSIRO having sole control of the new laboratory, and satisfactory arrangements being concluded with the Defence Department[21].

Julius was not specific about his suspicion of the Defence Department, but it is clear that it was centred partly on a personality clash between him and Leighton. Both men had had a strong religious education and had rebelled against the strict control this implied. Both gravitated towards science where they gained outstanding reputations - Leighton in industrial chemistry and explosives, Julius in engineering[22]. Leighton had a grand vision to establish self

ume 0, Rivett to Richardson 15 May 1929.

19. CSIRO Archives, S67, Volume 2, Rivett to Richardson 27 May 1929.

20. CSIRO Archives, S67, Volume 2, Rivett to Julius 11 July 1929, Pearce was the Minister representing CSIR in Cabinet.

21. CSIRO Archives, S577, *op.cit.*, Rivett to the Minister (George Pearce) 24 July 1929. Cabinet approval was noted at the bottom of Rivett's submission.

22. G.Currie, J.Graham, *The Origins of CSIRO ...*, *op.cit.* Writer's interview with Miss Anne Leighton 24 January 1984 and Leighton papers in her possession.

contained munitions production in Australia so that Australia's defence could be effective under all circumstances. Julius held similar grand ideas for the impact of scientific research, under his control, on Australia's economic development. Both men were powerful advocates for their own ideas and objectives. Julius was quick to recognise a mind as powerful and determined as his own, and began to ascribe sinister motives to Leighton. Psychologically, Julius prepared himself to look for proof that Leighton wanted to take over all timber research for MSL. Predictably, he soon found it.

The circumstances were the detailed negotiations between the CSIR and the Defence Department over the placement of the Forest Products laboratory at Maribyrnong. These had begun on 20 June 1929, although they lacked certainty until the Cabinet decision of 26 July 1929. On the 7 August the Secretary of the CSIR, Lightfoot, wrote to the Secretary of the Defence Department to finalise the negotiations[23]. The Department did not reply in August because it was absorbed in imposing significant financial reductions on the Armed Services and the MSB. The latter was affected badly, and had to close the rifle factory at Lithgow[24]. This was the beginning of the Great Depression, although the Defence Department had known of the Government's growing financial difficulties in 1928[25]. In the face of such a major crisis, the need for an early reply to CSIR was not appreciated.

The CSIR was aware of some financial difficulty for the Government,

23. CSIRO Archives, S577, *op.cit.*, Lightfoot to Shepherd 7 August 1929.

24. See Chapter 2 of this thesis.

25. *ibid.* The Government had been unable to continue the current defence programme because of the fall in revenue in 1928. Economies were imposed.

but had been insulated from the true seriousness of the situation, by George Pearce's successful efforts in Cabinet to stop the Treasury inflicting financial cuts on CSIR[26]. Unaware, or disinterested, in the impact of the financial reductions on the Defence Department, Julius was able to persuade his fellow Executive Committee members that Leighton was stalling negotiations[27]. If Leighton was actually doing this, which is by no means certain, he had several good reasons. In September a political crisis led to the collapse of the Bruce Government; and the election of October 1929 gave power to the Scullin Labor Party Government. Noone knew whether there would be the same government policy in regard to the Forest Products laboratory. More importantly, Leighton knew from first hand experience how serious the Government's financial position was, and realised that there was little prospect of any Government finding the funds for the Forest Products laboratory at Maribyrnong or anywhere else[28]. In the Council Meeting of 4-6 September 1929, Leighton began to make it clear that the cheapest and most politically realistic solution was for the CSIR to fund MSL to extend its activities.

This won Leighton no friends at all in the Council, which did not appre-

26. CSIRO Archives, S67, Volume 2, much of this volume outlines the build up of financial pressure on CSIR, and George Pearce's more or less successful attempts, as the Minister representing CSIR, to withstand it.

27. CSIRO Archives, S577, *op.cit.*, negotiations were still stalled by late November 1929; Rivett to Lane-Poole 25 November 1929, Rivett to Minister (Senator Daly) 28 November 1929.

28. The proposal to place the laboratory at Maribyrnong to share MSL facilities would have saved £6000 in capital and £2000 in annual maintenance over any other location. CSIRO Archives, Council Minutes, 4-6 September 1929. This was a large sum at 1929 values.

ciate the economic situation, and feared departmental control of any activity of the CSIR. Council members remembered the unhappy history of the Institute of Science and Industry, which had been stifled by departmentalism and government interference[29]. Leighton's position strengthened Julius's credibility within the Executive Committee, because it looked as though Leighton was really after total control of forest products research. Rivett commented:

'We finished quite a successful session of the Council some days ago ... Everything went well except that A.E. Leighton continued his extraordinary antagonism towards the establishment of a Forest Products Laboratory. He is in a minority of one, but is extraordinarily persistent and causes a certain measure of irritation amongst other members. For the rest, there was thorough unanimity throughout and the Council continues to be a very happy family'[30].

The idea that Leighton sought to dominate all research connected with secondary industry stemmed from this dispute over forest products and was to be a persistent theme in CSIR propaganda for the next eight years. And yet it was most implausible when judged against Leighton's record. The area of potential research covered by MSL was vast, but inadequate funds did not allow proper coverage of many important subjects. Leighton knew he would never receive sufficient funds by government, and so welcomed new research bodies which could take over responsibility for special subjects, allowing MSL to redeploy resources to other areas. This helped to achieve his major objective of making Australia technically self dependent in the production of munitions. For this reason

29. CSIRO Archives, Council Meeting, 25-27 March 1929, Minutes. See Masson's comments. See also G. Currie, et al, *The Origins of CSIRO ...*, *op.cit.*

30. CSIRO Archives, S577, *op.cit.*, Rivett to McDougall 17 September 1929.

Leighton would not let MSL duplicate laboratories which existed elsewhere[31], and he was anxious to encourage the growth of new technical organisations which could take over existing MSL research areas. For example, while MSL was prepared to be the CSIRs centre for national standards of length, Leighton never tired of suggesting that CSIR should build a proper laboratory for such standards. MSL kept standards for use by the Armed Services, and did not welcome the extra expense and added responsibility of being a national standards reference centre[32]. A similar attitude was taken towards commercial industry. Many requests were received for assistance, and whenever possible commercial laboratories were urged to take on the work. The more technical capabilities supported by commercial industry, the more self containment of munitions pro-

31. The case of the Victorian Electricity Commission Laboratory has been cited. Another is the MSB had the responsibility for wireless and electrical research for the Armed Services, but developed only its interests in testing and calibration of working standards for this field, because the PMG had a large laboratory covering most of the area. J.K.Jensen, 'Defence Production ...', Chapter 8, pp.162-163, unpublished manuscript held in Australian Archives Brighton, Victoria, and the Department of Defence, Canberra.

32. On 10 September 1925 Leighton had informed the Standards Association that the MSL laboratories would serve as a stop gap, but he advised the Association to set up their own laboratory as soon as possible - AA MP730, S8, Box 2, Items 4 and 5. In June 1929, the final report of the Committee on Maintenance of Standards suggested again that the use of the MSB and other organisations (i.e. Sydney and Melbourne Universities) to cover national standards was a temporary arrangement and should be replaced by a Commonwealth Standards Laboratory. The significance of this view was that the Committee was Professor Madsen of Sydney University, and Bell and Esserman of the MSB. Since the CSIR Act covered standards, the Committee was in no doubt that the new Standards Laboratory should be under the CSIR. Leighton made no move to disavow the Committees views. In 1934, the MSB was approached by the Defence Communications Committee for MSL to be recognised as the authority on substandards of electrical measurement in Australia. The MSB refused preferring to see an independent National Standards Laboratory.

duction was enhanced; and the more freedom MSL had to concentrate on areas for which there were unlikely to be any commercial capabilities, e.g. ordnance, shell, poison gas, and armour.

Leighton found that the Executive Committee's and Council's refusal to take any notice of his point of view, typical of the attitude taken towards another area of difficulty between the MSB and the CSIR. The Executive Committee was in the habit of paying very high salaries for the men it wanted to run its laboratories. Its argument was that if it wanted the best men available, it had to pay for them. This had a destabilising effect on the public service and MSB, which were prevented from paying the same higher salaries for equivalent positions of authority, because they were pay linked to national salary trends by the public service arbitrator. Nor was the CSIR obliged to fill its positions by open and fair competitions on merit. It hired whom it liked.

The Parliamentary Joint Committee on Public Accounts recognised some of these problems and had been pressuring for the CSIR personnel to be brought under the Public Service Commissioner. Leighton had complained that the appointment of Boas, the head of the CSIR Forest Products Division, was at an excessively high salary compared to equivalent positions in the Commonwealth Public Service. The position had never been advertised, the unions had protested and there was general discontent within his organisation[33]. Leighton thought that this problem could be avoided if the CSIR allowed its salaries to be reviewed by the Public Service Arbitrator, which might also make it possible

33. CSIRO Archives, Council Meeting, 4-6 September 1929. See also Council Meetings of 12-14 December 1928, and the Executive Committee Meeting Minutes of 11 June 1928.

for the CSIR to uplift the higher salaries of the Public Service as a whole[34].

Leighton was seeing the CSIR as essentially another Australian Government instrumentality, and expected it to be sensitive to general employment problems within the Public Service. The CSIR did not agree. Julius stated in September 1929, that the Executive Committee intended to adhere to Council policy in keeping clear of public service control because it did not allow high enough salaries, and this stultified the senior management[35]. This attitude seemed grossly hypocritical to Leighton. The CSIR was supported by Government funds like any other Commonwealth organisation. Despite the assistance Leighton and the MSB had extended to CSIR since 1926, the CSIR did not regard any of Leighton's problems with any sympathy or interest.

Leighton attempted to communicate his dissatisfaction, over the Executive Committee's examination of the options for the Forest Products Laboratory, to the Minister representing CSIR in Cabinet. This was George Pearce, with whom Leighton had had a long and close association when Pearce was Minister of Defence between 1914 and 1921. Following normal departmental procedure, Leighton sent his letter through the CSIR Executive Committee. The Committee claimed subsequently that it had been mislaid, and Pearce was never informed of Leightons objections while in office[36].

34. *ibid.*, Council Meeting 4-6 September 1929, Leightons comments.

35. *ibid.*, the Council agreed.

36. CSIRO Archives, Council Meeting, 26-28 February 1930.

The Rustication

It is clear, that when the new Labor Government of October 1929 began to make major cuts to all government expenditure, Leighton and the MSB were in no mood to do the CSIR any favours. Leighton gave to the MSB a frank and accurate statement of his opposition to the Forest Products Laboratory on grounds of economy. He had supported its placement at Maribyrnong as the best course to be followed given the CSIR's determination to build a new laboratory. The MSB decided that these views should be passed on to the new Minister of Defence[37]. The Secretary of the MSB, Jensen, prepared a report which purported to show that contrary to its Act, the CSIR was engaging in unnecessary duplication and was not utilising existing facilities in the Commonwealth, e.g. MSL. The crux of the advice was:

'... if the Government desires to give monetary assistance for further research on timber, the means for making prompt use of that assistance are available ... If the Commonwealth Government wishes to spend more money on timber research, direct grants in money or men could be made to the institutions or associations now carrying on such work'[38].

This meant principally the MSL. On 26 November 1929, the Treasurer, Theodore, had been informed of this view, and began to investigate the CSIR scheme.

This action was bound to be taken eventually, because of the economic crisis facing Australia; but Julius blamed Leighton personally. He and the

37. AA MP730, S8, Box 8, MSB Agenda 78, Meeting 31 October 1929.

38. CSIRO Archives, S577, *op.cit.*, Jensen to Secretary of Defence Department 20 November 1929.

Executive Committee claimed among other things that Leighton had breached CSIR confidentiality in communicating doubts to his minister[39]. This view was answered by the Minister of Defence, A.E.Green, in a letter to the Prime Minister, Scullin:

'The Council's excuse is that Mr Leighton was guilty of disloyalty to its members. It appears to me that what the Council regard as disloyalty on Mr Leighton's part might well be regarded as loyalty to principles which he as a responsible Government servant felt bound to maintain. In my opinion, the Council in not placing Mr Leighton's dissenting views before the responsible Minister in the important matter of the Forest Products Laboratory, did not act fairly either towards Mr Leighton or the Government'[40].

Julius and the Executive Committee might have remained isolated in their anger, except that Jensen's summary of Leighton's views contained some inaccuracies, including some misquotations from members of the Council. Not that these were relevant to the central issue, but the misquotations annoyed the Council members, and turned them into supporters of Julius's quest for retribution against the ungodly malefactor in their midst. Julius and the Executive Committee had an easy time in preparing the opposition. One day before the crucial Council Meeting of 26 February 1930, Professor Orme Masson could inform Leighton that he would lose his position on the Council[41]. Indeed he

39. CSIRO Archives, S577, *op.cit.*, Executive Committee to Daly 24 December 1929.

40. AA CRS A1606, File I36/1, 'Leighton, A.E.: Appointment as Co-opted Member . . .', Green to Prime Minister 30 March 1930. The responsible Minister was George Pearce of the Bruce Government. See also S577, *op.cit.*, Executive Committee to Senator Daly 24 December 1929.

41. AA MP392, S11, File 709/501/5, Leighton to Secretary of Defence Department 17 December 1936 and attached letter from Orme Masson to Leighton 25 February 1930. Masson was an old friend of Leighton, and a prominent member of the Council. While he had warned Leighton of the coming events, he also said that he supported Leighton's

did, and the Council minutes show that most of the hostility directed towards Leighton was on account of Jensen's misquotations[42]. It is also clear that Julius still had the naive belief that the Government would find the money for a Forest Products Laboratory. His final touch to Leighton's rustication was to ensure that all copies of the Council's minutes circulated to the State Councils of the CSIR contained the following statement:

'The Chairman [Julius] remarked that the most objectionable feature of the (MSB) report was the deliberate misstatement of the facts it contained'[43].

This action branded Leighton publically as a liar in front of all his peers. Julius no doubt thought this action justified because he had frustrated a devious Leighton plot, which had to be exposed properly and punished[44]. However, whichever way the action is justified, it was still essentially vindictive, and exposed the personal side of the conflict between Leighton and Julius. More than anything else, it helped to poison relations between the Defence Department and CSIR until 1938. Leighton ordered that no officer of the MSB was to have

expulsion. In his view CSIR had to remain free from Departmental control and the rules of the Public Service. Leighton had frequently opposed this view. He had also opposed the Forest Products Laboratory despite the unanimous approval of the Council. Masson claimed that Leighton had even appealed to the Government through an outside channel. This overstated some aspects of the dispute. For example Leighton had not suggested that CSIR should be under the Public Service (most of his own organisation was not under it), and the Executive Committee had not allowed Leighton to use the proper channels for voicing his dissent.

42. CSIRO Archives, Council Minutes of Meeting 26-28 February 1930.

43. AA MP730, S8, Box 8, Agenda 169, Meeting 3 April 1930.

44. Leighton was able to get a personal interview with the Prime Minister, Scullin, to complain about this action and to assure him that all the statements made by the MSB could be substantiated. AA MP730, S8, Box 8. The prevailing characteristic of Council minutes between 1926 to 1939 was that they were bland and non-controversial. The minutes quoted above are an exception.

any contact with the CSIR; an order which was never implemented fully[45]. The Government rejected CSIR requests for a Forest Products Laboratory, as it was always bound to do because of the economic crisis[46]. Julius and the Executive Committee blamed Leighton.

45. CSIRO Archives, VM 10/13, Esserman to Currie 10 April 1969.

46. *ibid.*, S577, *op.cit.*, the Government deferred the project indefinitely on 4 March 1930.

ANNEX E

LEIGHTON AND THE IMPERIAL HONOURS SYSTEM

While he was in Britain during the First World War, Leighton had begun a scheme by which Australian chemists, and later many other tertiary trained personnel, were sent to Britain to assist in the munitions production effort. In 1916 this scheme was broadened to include semi skilled workers. Honorary Lieutenant Colonel Henry Barraclough of Sydney University was sent to administer this new scheme, under Leighton's overall control. At the conclusion of the War, many thousands of 'war workers' had gone to Britain. Leighton received from the British Government many expressions of gratitude for his personal contribution to the war effort in explosives production, as well as for his many other activities. Among these correspondents were members of Lloyd George's Cabinet including Lord Milner, and Winston Churchill[1].

In February 1919, the Australian Minister for Defence George Pearce, recommended Barraclough for the OBE, and Leighton for a higher honour, the CBE. Pearce found out subsequently that the British Government had already awarded Barraclough the CBE. Despite this implied insult from Britain, Leighton decided to accept the CBE on 8 March 1920. On 3 April 1920, the Melbourne newspapers published that Barraclough had been specially honoured by the King with a KBE for his services as 'Superintendent of the Australian

1. Leightons papers in the possession of Anne Leighton. See also J K Jensen *Defence Production...* *op.cit.* chapter 6, Vol 4, pp 95-7; AA CRS A457 File551/1/5, CRS A1606 File22/2 A E Leighton.

Munitions Workers'. Leighton withdrew his acceptance of the CBE on 7 April, having been upstaged by his subordinate once more, apparently with the connivance of the Royal Court[2].

This drove Pearce, who had appointed Barracrough originally as 'Officer in Charge of Munitions Workers', and subordinate to Leighton's authority, to write to the Australian Prime Minister, Hughes:

'You will remember that at the time R.McC. Anderson obtained his title, we took strong exception to the British Government conferring Honours on Administrative officers, except upon the recommendation of the Commonwealth Government... Both Leighton and Barracrough were occupying Administrative positions. Mr Leighton has done most valuable work throughout the War in far more important positions than Barracrough — in fact, in regard to the Munitions work, Barracrough has been his subordinate.

I am not aware whether you have made any recommendations in regard to these officers, but, if not, I would suggest that ... you ascertain how this Senior Honour came to be conferred upon Barracrough, and upon whose recommendation. Leighton naturally feels very sore: he holds the most flattering testimonials from the British Government as to the value of the work that he did in helping to organise Munitions-Plants in England, as well as in connection with the supply of Chemists and Munitions workers... If as I assume, this Honour has been conferred by the British Government on Barracrough without reference to us, we should make a strong protest against it, and I think — in justice to Leighton should insist on his receiving at least equal recognition'[3].

In fact, the British Government had asked Hughes to approve their proposal to knight Barracrough, which he did in February 1920, without any reference

2. AA CRS A1606 File22/2 A E Leighton, Miss Anne Evans; Leighton papers in the possession of Miss Anne Leighton.

3. AA CRS A1606 File22/2 *op.cit.*, Minister of Defence to Prime Minister 9 April 1920.

to Pearce or the Defence Department[4]. Hughes, who had thought that the case was clearcut, now found himself as the unwitting cause of a great personal injustice. He took the case to London in April 1921[5]. Nothing ever came of it, probably because the British authorities had two grounds for not taking any further action: firstly, Leighton had refused an imperial honour, secondly Hughes had been the cause of the apparent injustice to Leighton.

For many years after these events, it was rumoured around the MSB that Barracrough had been proposed by the King for his knighthood because he had some special influence at Court. Jensen thought that Barracrough's wife had been the source of this influence[6], but Barracrough did not marry until some years after receiving his imperial honour, which makes this theory untenable.

Yet these rumours were basically correct in their assertion that non-official influence had been exerted on Barracrough's behalf. While in Britain during the war, Barracrough had formed a strong emotional attachment (most probably platonic) to a Lady Mary V De La Rue and other members of her family. He became the god father of one of her children. Lady Mary was very well connected at Court, and when she decided that Barracrough deserved a knighthood she went to see the King's secretary, who saw her immediately[7]. Ponsonby agreed to take her letter on Barracrough's merit to the King. The

4. *ibid.* This was typical of the way Hughes ran his government see L F Fitzhardinge *The Little Digger 1914-1952...*, Angus and Robertson 1979 p269.

5. AA CRS A1606 File22/2 *op.cit.*

6. Conversation between Mr Jack Knight and J K Jensen recalled in an interview with A T Ross.

7. Sydney University Archives, Barracrough Papers P.10, Box21, Lady Mary De La Rue to Colonel Barracrough 8 February 1920.

result is best stated in Lady Mary's own words to Barracrough:

'You will remember, I told you I wrote to the King, concerning you, and it was a cause of great satisfaction not only to myself but also to Evelyn, when I received the most charming letter last Thursday the 12th — from Sir Frederick Ponsonby informing me 'that his Majesty said that Colonel Barracrough should get a KBE'. etc etc — The King I gathered from this letter had sent his express wishes to your Government that you should be made a KBE in the War Honours lists, and the expression of gratitude to you was I understand cabled to your country some 3 weeks ago...' [8].

8. *ibid.* Lady Mary De La Rue to Colonel Barracrough 16 March 1920.

*ANNEX F**POSTSCRIPT ON THE SITR COMMITTEE AND THE INDUSTRIALISTS*

Julius did not accept defeat, although the Defence Department was now recognised as a friendly agency. He mobilised the major industrialists who had been represented on the SITR committee. Political pressure began to be exerted on the Lyons Government to live up to its promises to secondary industry of implementing the SITR Report. During the 1937 conference of the Associated Chambers of Manufacturers, which was attended by Lyons, the Government was informed that secondary producers were becoming very restless at the Government's delay. The national President of the Association, Fred Kneeshaw, took a prominent role in this, and later led a deputation of manufacturers to see Lyons on 14 December 1937. Resolutions were presented applauding the Government's initiatives in secondary industry research and demanding that it take action on the SITR Committee Report. The deputation concluded:

'...we venture the opinion that if the CS and IR were to give to secondary industry anything like the measure of assistance it has given to primary industries Australia could expect even more rapid progress in the future'[1].

Rivett thought he saw Kneeshaw's hand in this piece of propaganda for the CSIR. Kneeshaw was a friend of Julius and had on at least one occasion, allowed the latter to write part of his Presidential address to the NSW Chamber of Manufactures, so that the importance of secondary industry research by CSIR

1. CSIRO Archives, S67, Vol19, Rivett to Richardson 14 December 1937.

could be emphasised[2]. Julius appears to have done almost the same for the 1937 national conference[3].

It seems that the major industrialists were happy to take Kneeshaw's lead and to support the CSIR. Most of them knew Julius well. These tactics obliged the Government to eventually find the funds for the aeronautical and engine testing laboratory, and the national standards laboratory in 1938, although funds for industrial research in chemistry and physics were not forthcoming until the beginning of the Second World War[4].

2. CSIRO Archives, File P1/20, 'Secondary Industries Testing and Research Committee', Kneeshaw's address for 1936.

3. CSIRO Archives, S67, Vol20, Julius to Richardson 19 August 1937.

4. CSIRO Archives, S30, Rivett to McDougall, 15 September 1938.

ANNEX G

POSTWAR RESURRECTION OF BEAVIS AND THE DEFENCE RESOURCES BOARD

Beavis wrote a special report after his dismissal[1], in which he sought to exaggerate the progress made by the Defence Resources Board and the alleged obstruction of the MSB. Much of what Beavis had to say in this and other reports was a onesided presentation of the facts[2], but they served an unfortunate purpose when the official historian, P Hasluck, got hold of some of them.

In particular Hasluck referred to the Defence Resources Board annual Report of February 1937 and extolled the latter as:

‘...one of the clearest and most realistic documents among the pre-war papers...and showed a rare grasp of those features of the problem which wartime experience proved were all import[3].

Hasluck concluded that the abolition of the Defence Resources Board was because of:

‘...petty considerations which crystallised into an opinion held by the Chairman of the Principal Supply Officers Committee that the Defence Resources Board was tending to develop too much independence for smooth working. [The organisation had been imperfect]...very largely because of unwillingness on the part of the Controller-General of Munitions, Leighton, to accommodate himself to the ideas that government munitions works

1. AA MP598 S30, ‘Report by Chairman, Defence Resources Board, on Progress made ...to 22 April 1937’.

2. See this thesis and J K Jensen, ‘Defence Production...’ *op.cit.*, Chapter 9, Volume 9, pp81-106. See also AA MP598 S30 item19, ‘Reorganisation of the Principal Supply Organisation’ by the Secretary of the Defence Resources Board, M J Connolly, 4 May 1937.

3. P Hasluck *The Government and the People 1939-1941*, Volume 1 *op.cit.*, p454.

would not be able to do the whole job in wartime, and that expansion of production, including the training of men and management and the provision of machines and tools in private industry, had to start before war came'[4].

In this way one reputation was resurrected and another destroyed. Hasluck's facile summary did no justice to the complexity of pre-war planning problems, and showed no awareness of the disruptive role of the Army in particular. Like Beavis, Hasluck did not understand the technical and financial dimensions of the problem of organising commercial industry for munitions production. Preceding chapters of this thesis show the MSB's acceptance of the need for commercial industry to produce the bulk of wartime munitions. But this could not begin until the MSB was itself in a satisfactory position to teach commercial industry. Consequently, MSB factories and laboratories had to be equipped properly before any large scale attempt to use commercial industry.

4. *ibid.*, footnote p454.

ANNEX H

VITAL STATISTICS ON THE ANNEXES

An Annex was a production enterprise run on the behalf of the Ministry of Munitions by a private firm. The Department had usually supplied the land, the buildings and the plant and machine tools. The private firm received a commission or management fee (See Munitions Digest 1945, pp.397-398).

YEAR	NUMBER OF NEW ANNEXES (a)	CAPITAL COST OF ESTABLISHMENT (a) (£)	NUMBER OF EMPLOYEES (b)
1938/39	1 (c)	340,677	
1939/40	19 (c)	318,708	2,296
1940/41	65	1,812,756	8,670
1941/42	71	3,109,185	18,134
1942/43	69	3,423,519	19,273
1943/44	15	2,046,381	9,994
1944/45	3	1,342,949	5,823
TOTAL	243	12,394,175	

Sources

- a. MHS 30, 'Finance Branch', p.78.
- b. Munitions Digest 1945, p.133A.
- c. These figures came from Chapter 4 of this thesis.

The efficiency of an Annex was judged by its cost of production compared to Government Factories or other Annexes making the same munition. All An-

nexes were subject to rigorous cost investigations by the Ministry of Munitions.

No figures exist separately for the Value of Production for the Annexes.

*Annex HA**THE MANAGEMENT STYLE AND PERSONAL RELATIONS OF THE
DEPARTMENT OF MUNITIONS*

Lewis set the pattern of management within the Ministry of Munitions by the influence of his personality, and the scope of his wide financial and organisational powers. Blainey has noted that Lewis was blunt and to the point in his dealings with other people, and a master of technical detail. Once his mind was made up and a decision made, further discussion was pointless. He would refuse to answer further comments or pretended he had not heard them[1]. Some of these characteristics had to be modified when dealing with the senior industrialists who were joining Lewis's organisation. These men were experts in their own right, and would not respond well to any management style which was too blunt and autocratic. They were used to being listened to, and making decisions themselves.

Lewis devised the mechanism of a regular meeting of all Directors and their deputies. Any issue could be raised, and would be discussed fully, during which Lewis was careful not to reveal his own attitude. At the end of discussion, he would then expound a concensus, including his own opinion, all of which was open to debate or agreement[2]. This seemingly anarchic method, which sometimes involved 30 people around one table, worked quite well in providing an

1. G.Blainey, *The Steel Master* . . . , MacMillan, 1971, pp.64, 70-74.

2. J.K.Jensen, 'Defence Production . . .', *op.cit.*, Chapter 10, Volume 10, pp.121-123.

informal means of debating important issues. Jensen said that it often resulted in important decisions being made, and that the extraordinary team spirit led to little ill-feeling amongst the Directors, even if they had received an adverse decision[3]. Probably, this method exposed clearly why a decision was made, and the industrialists being practical men, could appreciate readily the need for it, and were disinclined to pursue the matter further. On specific problems Lewis held more restricted meetings which included only those who had some intimate knowledge of the subject to be discussed. On these occasions he would open the meeting by outlining the subject, and so much of his viewpoint as would give a lead to a free expression of opinions[4].

Lewis encouraged his Directors to take the initiative in manufacturing preparations, and used his powers to remove obstacles from their path. He did not like 'yes' men or people who waited to be told what to do. Temperamentally, the senior industrialists were disinclined to do either of these things. Problems were more likely to be caused by zealous actions taken with little knowledge of the public service's accountability to Parliament, particularly in regard to how money was spent. A key figure in reducing these problems was Jensen. Lewis had quickly appreciated Jensen's qualities in June 1940. Apart from proving to be an informed source on any policy issue, Jensen made it his business to adapt public service regulations to fit the circumstances of the Directors[5]; something for which he was well suited since he on many occasions in his career, had chosen to bend such regulations himself. Hartnett recalled that Jensen was sensitive

3. *ibid.*, pp.170-172.

4. *ibid.*, pp.121-123.

5. L.J.Hartnett discussion with A.T.Ross.

to the difficulties and pressures confronting the Directors, and always had the answer to any administrative problem which might have been delaying them. Jensen was the epitome of discretion and ingenuity[6].

The cosy working relationship which Lewis established generally between his fellow industrialists, and also senior public servants, was the cause of suspicion for some sections of the Labor Party opposition. They feared that there were conflicts of interest between the industrialist's business connections and the granting of munitions orders to commercial industry. The faction led by Beasley argued that the industrialists should be subject to approval by an independent authority[7]. More moderate Labor Party leaders also had doubts, but the opposition leader Curtin, did not; and concentrated his criticism on gaining a more dynamic minister to head the Munitions Ministry, as well as a more vigorous permanent head[8].

The current permanent head was Brigden. When he had taken charge in 1939, he had known little of munitions production and had relied heavily on Jensen, who in terms of experience and ability had a better claim to be in charge. However, Jensen supported Brigden, who in turn always supported Jensen and Brodribb whenever important issues arose. Brigden knew his own

6. *ibid.*, Hartnett recalls that when working pressure was particularly high, he would discover a bottle of wine in his car or office from Jensen, although Jensen himself neither drank nor would admit having sent it. Small gestures like this helped to keep the personal atmosphere in Munitions harmonious, despite the tremendous rate of work.

7. AA CRS A5954, Box 478, File 'Advisory War Council', Minutes 357 of 5 June 1941.

8. *ibid.*, Minutes 357 and 359 of 5 June 1941 and 6 June 1941 respectively. The current minister was P.A.M.McBride. Curtin and Evatt supported Lewis's extraordinary organisational and financial powers and were satisfied with his performance.

weaknesses, and skillfully, and critically as a good manager should, used his two subordinates to cover such weaknesses. By June 1941, when Labor Party criticism of him surfaced, Brigden had gained much experience in munitions production, and his Department[9] lacked nothing from his administration, as Jensen admitted[10]. Labor Party criticism centred on Brigden's inability (or disinclination) to project an image of dynamic action and energy, which led Labor leaders to believe that someone with those qualities would achieve more success than Brigden:

'... Mr Brigden had a first class brain, but [Forde] considered him unsuited for his present position ...'[11].

The person whom the Labor Party thought was most suited was Jensen[12]. Chifley was his main admirer and influenced Forde and Curtin. The connection between Jensen and Chifley had begun in 1931, when Chifley was Minister for Defence, and Jensen was Secretary of the MSB. Both men had made an impression on the other; and in June 1940 Jensen had suggested Chifley to be the Director of Labour Supply within the Ministry of Munitions [13]. Chifley was then out of Parliament, although still associated with the Labor Party. Lewis agreed with Jensen, and Chifley became the first Director of Labour. A few months later he regained a seat in Parliament and ceased his connection

9. In June 1941, the Departments of Munitions, and Supply were separated from Brigden's joint control, and A.V.Smith took charge of Supply, while Brigden now controlled Munitions.

10. J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 11, Volume 11, pp.135-137.

11. AA CRS A5954, Box 478, File 'Advisory War Council', Minutes 359 of 6 June 1941. See also 357 of 5 June 1941 for other views of Brigden.

12. *ibid.*

13. J.K.Jensen, 'Defence Production ...', *op.cit.* Volume 11, Chapter 11, pp.173-178.

with the Munitions Ministry. But he carried with him his impression of Jensen, whom he saw predominantly, as a public servant who would not let regulations get in the way of getting on with the job[14].

Jensen was embarrassed by the Labor Party's attack on Brigden in June 1941, and took action to be disassociated from any attempt to replace Brigden with himself[15]. However, six months later, after the Labor Party had gained office, Brigden was made the Economic Councillor in the Australian Embassy in Washington, and Jensen became the Secretary of the Ministry of Munitions. Chifley was the first to tell Jensen of his promotion[16].

The main area of friction within the Ministry of Munitions was between the BAM of NSW, and the central administration which was situated in Melbourne, Victoria. The issue was the devolution of power from Victoria, and had its origins in the concentration of government munitions factories in Victoria. Originally, this had been convenient because the chemical industry was concentrated in Victoria. And so the Explosives, and Ammunition Factory groups were near their main source of raw materials. The SAF group was placed in NSW because this was the source of the iron and steel industry. Lithgow was the centre of this industry in 1913. On this logic, the Ordnance Factory group should have been placed in NSW, but for administrative convenience, it was located with the other factory groups in Victoria. When these factory groups began to leave their nucleus state in the successive rearmament programmes of

14. *ibid.*, pp.93-94.

15. *ibid.*, pp.135-137. Jensen had a genuine esteem and regard for Brigden.

16. AA MP956, S2, Box 8, Item 40, p.30.

the late 1930s, Victoria was favoured disproportionately with the increase in employment, and higher demand for raw materials of all kinds. It is no surprise that this became a political issue in 1938[17] with NSW being prominent in its criticism.

This criticism continued, causing the Prime Minister, Menzies, to admit in an address to businessmen in Sydney, October 1940, that:

‘... I come from a state [Victoria] which had admittedly a most unfair share of the war business ...’[18].

The criteria for selecting new sites for government munitions factories were accessibility to adequate labour, transportation and raw materials; with particular stress on accessibility to machine tool and gauge supply[19]. Since NSW was the major industrial centre in Australia, it was inevitable that as the munitions effort expanded, it would get its fair share of government munitions factories. However, the business community of NSW continued to be suspicious, and this attitude was reflected by the prominent industrialists who took over the BAM for NSW. They felt that too many contracts were going to Victorian industry simply because the central administration of the Munitions Ministry

17. AA MP730, S9, Box 1, see also Minister of Defence, G.A.Street, CPD 6 December 1938, pp.2763–2764, op. cit.

18. Quoted in *The Manufacturers*, op.cit., p.596, 14 October 1940. Menzies implied that this was the reason why his Party had lost five seats in NSW in the last election. No seats were lost in other states. See also p.580.

19. AA CRS A1608, File C49/1/3, Secretary of Munitions to Secretary of Prime Ministers Department, 11 March 1941. See also AA MP730, S9, Box 2, Shedden to McVey 26 June 1939. Interestingly, the 1914–18 emphasis by the military on placement away from the coast had been dropped, for obvious reasons raised originally by Leighton (see Chapter 1 of this thesis).

was more accessible to Victorian businessmen than for those of NSW. Of course, many other states felt the same way, while country interests, irrespective of state, felt too much was being given to the large cities[20].

The NSW BAM also felt that the projects which were situated in NSW, were not allowed to progress properly because the Directorates of the Munitions Ministry exercised too much central control. This interference was often made in ignorance of local conditions, and in disregard of the role that the BAM was meant to be playing within the Ministry of Munitions[21]. The Directorates saw the issue differently. For example, Daley of OPD told Lewis that:

'It is my opinion that the original write up on the working of the Ministry of Munitions — the Directorates and the [BAMs] — was one of the finest pieces of forward thinking I have seen. Had it been accepted and supported from the outset, the Boards of Area Management properly directed in accord, much unnecessary effort and friction would have been avoided. Moreover, we would assert that the 0.38" pistol and the 25 Pdr Recuperator — from which OPD was politely but quietly excluded by the [NSW BAM] — need never have presented so poor a picture and so sorry a spectacle in production.'[22].

Obviously, there were many issues involved in the dispute between the NSW BAM and the central office of the Munitions Ministry; and Daley's remarks indicate some of the costs of the friction, from one point of view. To some extent, a similar conflict existed with the other BAMs. Apart from showing the existence of such conflict, it is not within the scope of this thesis to pursue the

20. AA CRS A1608, File C49/1/3, AA CRS A816, File 12/301/40, Secretary Prime Ministers Department to Secretary of Supply and Development, 9 August 1941.

21. MHS 107, *op.cit.*, p.389, MHS 66 J.W.Lees, MHS 67, R.J.A.Massie, G.Seward, Poulton.

22. AA MP891, S25, S26, Box 1, Item 1; Daley to Lewis 31 May 1943. For the NSW BAM view of these projects see MHS 107.

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matter any further.

*Annex I**HARTNETT'S DEFINITION OF RESPONSIBILITY FOR DESIGN*

Hartnett classified the responsibilities and the steps which had to take place between Army Design and the Ministry of Munitions in the establishment of production for a heavily modified munition.

- | | | |
|---|----------|---------------|
| 1. Requirement - Purpose, desired performance, effectiveness, quantities, abuse factor, scope of use, likely terrain/climate, associated equipment. | Army 95% | Munitions 5% |
| 2. Equivalent - Indicators of any known product, foreign or otherwise likely to meet the requirement | Army 85% | Munitions 15% |
| 3. Conception - Basic Design, form, strength loading, stress performance calculations, military usage, training factors | Army 60% | Munitions 40% |
| 4. Creation - Manufacturing Design, specifications, materials, replacement part usage, index, life, factory prototype | Army 30% | Munitions 70% |
| 5. Methods - Adaption, modifications to allow local materials and facilities to be used, layout and nature of tooling, gauging and production equipment | Army 10% | Munitions 90% |
| 6. Output - Production and Shop Inspection | Army 5% | Munitions 95% |
| 7. Delivery - Final Inspection and Acceptance | Army 95% | Munitions 5% |

AA MP730, S9, Box 2, Hartnett to Lewis, 12 August 1940. See also J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 10, Volume 10, pp.187-188.

While there might be argument over Hartnett's exact percentage distribution of responsibility for each step; there can be no doubt that his classification demonstrated the inter-dependence of the Design functions. Developmental Design for which the Army had responsibility, could not be carried out without reference to Manufacturing Design, for which the Ministry of Munitions held the responsibility.

*Annex J**THE DUPLICATION OF GOVERNMENT FACTORIES**Introduction*

The policy which led to the duplication of existing government factories was not based solely on the need for more production, but also on what commercial industry was *not* capable of manufacturing. Thus SAA production was left to the government factories, because the standards of quality required, and mass production techniques, were not widely appreciated or practiced within commercial industry. More importantly, SAA production required a large array of machine tools and factory plant which were highly specialised and not found in commercial industry. The Government decided that it was unreasonable to expect commercial industry to acquire such tools and plant because they could only be used for SAA production, for which there would be no commercial demand after the war. A similar argument applied to Small Arms manufacture, although the most important factor seems to have been the very fine tolerances required for such work. Commercial industry worked with very wide tolerances in comparison to SAF Lithgow.

Two other major areas of munitions production reserved for government factories were the manufacture, and filling of explosives into shells, cartridges, depth charges, grenades and mines etc. Both activities were considered to be too dangerous for commercial industry, requiring a special layout of plant

and buildings to minimise the danger of explosion. Thorough and rigid safety precautions had to be enforced involving all employees. The manufacture of mining explosives was well established in commercial industry, but the production of military explosives, and the complex methods required for filling, were beyond commercial industry's experience. Only one non-government factory for military explosives production was built during the war. This was ICIANZ's explosives annex at Deer Park (Albion). The parent company, ICI, had extensive experience in such production in Britain.

A fifth area reserved for the government factories was the manufacture of cartridge cases for gun ammunition. The reasons were similar to those for SAA in that the machinery required for cartridge case production was very specialised to that activity and of little use for any commercial purpose.

SAA Production

The seven SAA factories built in Australia up to 1945, are listed in Table J-1, together with the dates of major developments. Most of the latter are self explanatory except 'Initial Production', and 'Quantity Production'. Initial Production refers to a factory's first product which would usually be a simple component. It was a sign that factory equipment was almost complete. Quantity Production was achieved when a factory's full production line operated to manufacture the first complete product for which the factory was designed.

The SAA production capability in June 1940 was centred on No.1 SAA factory at Footscray. This was in fact the old Colonial Ammunition Factory, and much of its equipment dated from the First World War. A modern No.2

SAA factory was being constructed to replace No.1, but the war began before this could be completed. The Total Months taken to get No.2 into full operation was 40 months. This was very slow. Table J-1 shows that 11 months were taken from site selection to initiating building. Peacetime procedures made it more important for the MSB to fit its budget within the budget guidelines defined by the Treasury than to get on with the job (see Chapter 2). Nineteen months were taken from initial building to initial plant installation. The explanation was that the Department of Works was not giving Defence projects priority for building (see Chapter 2) and delays in the arrival of equipment from overseas[1].

The other SAA factories were mostly completed in under 15 months which was a short period of time. SAA No.3 would also have been completed this quickly except that the original plan was to give it the machinery and equipment from SAA No.1. After several months this idea was dropped in favour of a completely new set of factory machinery. Thus orders on Australian Industry were late in being placed[2]. SAA No.6 took 23 months because the industrial tool making capacity of Queensland became overloaded in supplying equipment to other munitions factory projects including SAA No.5 and the Rocklea Cartridge Case factory[3]. There was no suggestion that the manufacture of the factory machinery was beyond industry because SAA No.6 was a duplication

1. A large portion of the factory was taken over temporarily for fuze production—see History of Ammunition Factory Footscray, MHS39.

2. History of the Ammunition Factories 1939-45, MHS35. War Cabinet Agendum No.26/1940, Minute No.132 of January 1940. AA MP425, S1, File 230/191/5, 'No.2 SAA Factory Hendon South Australia'.

3. History of the Ammunition Factories, *op.cit.* AA MP425, S1, File 230/191/326. History Sheets of Government Munitions Factories and Establishments. Director-General of Munitions Reports to War Cabinet.

of SAA No.5 for which equipment had been made promptly. The urgency in the construction of SAA No.7 was not as great as for the other factories because the consumption of SAA by the Armed Services was less than the existing production capacity by June 1942.

Since most of the SAA Factories were operating in less than 21 months it is reasonable to conclude that the provision of new staffs was not a major problem. It shows that for SAA production at least the government factories at Footscray were able to provide the basic technical staff for the new factories, expeditiously, and that continued dilution of the original technical staff at Footscray did not affect the training function of SAA No.1 and No.2. All new supervisory staff were sent to Footscray for training, and then returned to train local staff at the new factories. Footscray remained the test centre for all new types of SAA production and developed the new methods and techniques which were then passed to the other factories[4].

In summary, the policy developed by Leighton for the eventual duplication of the SAA factories worked well during wartime. The choice of factory machinery was generally within the capability of Australian Industry to manufacture; and the training and dilution of technical staff provided new factory staffs which proved capable of bringing new factories quickly into full production.

Small Arms Production

The Small Arms factories built in Australia up to 1945 are listed in Table J-2, together with the dates of major developments. The explanation of

4. History of the Ammunition Factory Footscray, MHS39.

the latter was given for Table J-1.

The rifle factory at Lithgow was virtually rebuilt in the late 1930s, from its obsolete state from the First World War. It was the model for the rifle factories at Bathurst and Orange. Both of these factories were completed speedily, and moved without delay into Quantity Production, indicating that there were no problems with the duplication of factory machinery, or with training of staff[5]. It has been mentioned in Chapter 7 of this thesis, that any factory finished and in full operation in around 12 months was a very efficient operation indeed.

Similar times were achieved with the Vickers machine gun expansions. The model factory was built during the 1920s at a leisurely pace; but its progeny were more efficiently created.

The original Bren gun factory was begun in the late 1930s, and was developed in close association with the British Bren gun project. Many delays were experienced in the British project because of significant Developmental Design problems. These delays were then reflected in the Australian project. Only when the Bren gun design began to be stabilised towards the middle of 1939 was the Australian Bren factory able to start to be equipped properly. Extensive use of Australian industry was made to make much of the factory equipment[6]. These delays account for the long time between Initial Plant Installation and Initial Production. They were not repeated for the extensions to the Bren factory, which were completed in the fast time of 12 months. The

5. History of the Small Arms Factory, MHS41. Director-General of Munitions Reports to War Cabinet.

6. See J.K.Jensen, 'Defence Production ...', *op.cit.*, Chapter 8, Volume 7.

new No.2 Bren gun factory took 17 months, which was reasonably fast. It would have taken even less time except for some delays in completion of the buildings of the factory[7]. The extensions to the No.2 Bren gun factory only took 12 months.

All of the Small Arms factories were worked up to Quantity Production in short times, indicating that the training of new staffs was accomplished efficiently. The plan for duplication of government factories worked well for this area of munitions production.

Explosives Production

The Explosives factories built in Australia up to 1945 are listed in Table J-3, together with the dates of major developments. The explanation of the latter was given for Table J-1.

The Explosives Factory group at Maribyrnong was the centre of learning and expertise (with MSL) of military explosives production in Australia. Although the group had been started in 1909 with the construction of the Cordite factory, many parts had been added, or renewed by 1939. Some idea of this is given in Figure 1 in Chapter 2. The building of an explosives factory was the most complex project of all munitions factory construction, because of the elaborate dispersal and protection measures required for all sections of the factory. Therefore it should be no surprise if they tended to exceed 21 months in reaching full operation.

7. This appears to be the story from the Director-General of Munitions Reports. See also the Munitions Digest, August 1941.

There are few details recorded on Albion's construction, but the time of 18.5 months to begin full TNT production, and 20 months for Cordite, needs little comment. The ICIANZ Annex achieved these good times, despite an acute shortage of bricklayers during July-September 1940, and a one month strike between October and November 1940[8]. Factory plant became available when needed at the site, and most of it was made in Australia. Despite the complex nature of explosives production, the new staff at Albion moved from Initial Production to Quantity Production in two to four weeks.

Salisbury was the largest explosives factory built during the war. It involved all the architect and engineering firms in Adelaide, and monopolised all of the building effort save only that devoted to the much smaller projects for SAA and cartridge case production at Hendon and Findon respectively. There were some delays in the delivery of the huge amounts of factory plant which tended to be reflected in the long time taken between Initial Plant Installation and Initial Production. The time for the new staff to work the factory up to full operation was between one and two months. The complex nature of the Salisbury project is conveyed in some respect by Table J-4, and suggests that 23 months was a reasonable performance given the scope of project, and the limited industrial resources of South Australia[9].

Ballarat gunpaper factory enjoyed the top construction and plant priority

8. 'Explosives Factories History 1939-1945', MHS38. Director-General of Munitions Reports to War Cabinet. Director of Explosives Supply Reports, MHS113. 'Industrial Stories—ICIANZ', MHS58.

9. 'Explosives Factories History 1939-1945', MHS38. Director-General of Munitions Reports to War Cabinet. Director of Explosives Supply Reports, MHS113.

over all other munitions projects in Australia. The project lost two months from delays to its building schedule. Heavy rains, and an iron workers strike of one month, were the main causes. Factory plant was delivered on time from Australian contractors, as the time intervals between Initial Plant Installation and Initial Production show for each Production House in Table J-5. The average of three months was short. Similarly Table J-5 shows that the new staff of Ballarat had been well trained at Maribyrnong because they only took a total of six weeks to bring the factory from Initial Production to Quantity Production[10]. The total time of 12.5 months for the whole project was short, notwithstanding the loss of two months.

The total months, cited in Table J-3, taken to complete Villawood was 30, marking it as an overly long project. There were many delays, although most of these stemmed from the comparatively low priority Villawood enjoyed. The existing explosives factories were already meeting the demand of the Armed Services, before Villawood was partly completed. Construction was held up by heavy rain, a shortage of structural steel and special bricks, and the withdrawal of much labour by the Allied Works Council. The installation of plant was delayed by the late delivery of items from overseas and locally. Table J-6 shows that time taken from Initial Plant Installation to Initial Production in each section, was far longer than for the other factories, excepting Mulwala. However the new staff moved quickly from Initial Production to Quantity Production[11].

10. 'Explosives Factories History 1939-1945', MHS38. Director-General of Munitions Reports to War Cabinet. Director of Explosives Supply Reports, MHS113.

11. 'Explosives Factories History 1939-1945', MHS38. Director-General of Munitions Reports to War Cabinet. Director of Explosives Supply Reports, MHS113.

Given the low priority of Villawood, it cannot be claimed to have been a failure of the scheme of factory duplication.

Mulwala was conceived to make the new flashless Nitrocellulose powder. It competed for resources with Villawood, and Saint Marys Filling factory, which were all being built around the same time. This caused construction delays and shortages in skilled tradesmen. However, the most serious delay was for three months when Australian contractors for equipment in the NC Powder section failed to deliver on time. This contributed greatly to the long time duration between Initial Plant Installation and Initial Production cited in Table J-3. Perhaps it was to be expected, because the flashless Nitrocellulose process had just been invented, and had not been adapted by the Ministry of Munitions so that plant could be made easily by Australian industry. Table J-7 indicates the lead times for the major sections of Mulwala to reach full operation. The new staff took about four months, which in comparison to the other explosives factories was a long time. This probably reflected the lack of knowledge by executive staff of the new process for flashless Nitrocellulose, and the consequent difficulties of training junior staff adequately[12].

With the exception of Mulwala and Villawood, it is clear that the scheme of factory duplication worked for explosives. Villawood was no longer important to the war effort before it was half completed. Mulwala involved a very new process for which the MSB had been unable to make any preparation in peacetime.

12. 'Explosives Factories History 1939-1945', MHS38. Director-General of Munitions Reports. Director of Explosives Supply Reports, MHS113.

The Filling Factories

The Filling Factories built in Australia up to 1945 are listed in Table J-8, together with dates of major developments. The explanation of the latter was given for Table J-1.

The Filling factory at Maribyrnong had formed part of the Explosives and Filling group of factories during the 1920s. It was added to steadily during the 1930s as is indicated in part by Figure 1 in Chapter 2. This factory was the nucleus from which the Salisbury and St Mary's filling factories were drawn.

Filling factories had an elaborate layout, like explosives factories, to minimise the risk of explosion. This lengthened their construction time when compared to SAA, Small Arms or Cartridge Case factories. However, Salisbury was completed in only 16.75 months. Most of the plant was supplied between Initial Plant Installation and Initial Production which was 4.5 months. This compares well with the Explosives factories and SAA factories. The speed with which the new staff moved the factory from Initial Production to Quantity Production was very quick being only one week.

St Mary's had many problems in construction largely because it was competing with Villawood and Mulwala for scarce resources. The Allied Works Council also withdrew construction personnel. The time taken between Building Initiated and Initial Plant Installation was 14 months which was double that of Salisbury at the same stage. However Initial Production was established in only two weeks, and Quantity Production only 1.75 months later. The total time of 20 months for St Mary's was reasonable given the huge construction

programme for munitions in NSW at the time. Further details of Salisbury and St Mary's is given in Tables J-9 and J-10. There appear to have been no fundamental obstructions to the duplication of filling factories, and this seems largely because of the role once more of Maribyrnong.

The Cartridge Case Factories

The Cartridge Case Factories built in Australia up to 1945 are listed in Table J-11, together with the dates of major developments. The explanation of the latter was given for Table J-1.

The Cartridge Case Factory at Maribyrnong formed part of the Gun Ammunition group of factories during the 1920s. It had many sections added to it in the 1930s which is indicated in part by Figure 1 of Chapter 2. Typically, it was the model for the other cartridge case factories of World War Two, and provided the training centre for new staff.

Finsbury, and Rocklea were completed in the good times of only 17 and 19 months respectively. The supply of plant took about six months, but these factories reached Quantity Production in only two months from Initial Production.

Derwent Park was delayed because the supply of factory plant took over 12 months. This reflected the difficulty Tasmanian industry had in making many of the items. Great distance from the major industrial areas of Victoria and NSW added to loss of time in this area. This accounts for the total time of 22 months. Rutherford was little better. It took 14 months or almost three

times the period of the other factories between Building Initiated and Initial Plant Installation. The reasons are not known, but it is reasonable to assume the Rutherford suffered from low priority and was not needed to cover the Armed Services consumption of cartridge cases at that stage of the war.

Conclusions

Even though there were some partial failures in the duplication of government factories, such as Derwent Park, which were related to the supply of factory plant, it is clear that the scheme worked well. Factories were erected in reasonable times, and the MSB's nucleus Factory groups provided models of factory plant which could be copied by Australian Industry. The training of new staffs and dilution of nucleus Factory group executive staff to provide the leadership for the new factories worked efficiently. The provision of new factory capacity was, in the end, well ahead of the consumption of munitions by the Armed Services. This was why some of the later factories had longer lead times, because there was no longer much urgency in their construction. Priority was given to other projects.

Table J-1. THE CONSTRUCTION AND FIRST PRODUCTION OF THE SAA FACTORIES

J13

FACTORY	SITE SELECTED	BUILDING INITIATED	INITIAL PLANT INSTALLATION	INITIAL PRODUCTION	QUANTITY PRODUCTION	TOTAL MONTHS
SAA No. 1 FOOTSCRAY	Built in 19th Century					
SAA No. 2 FOOTSCRAY	March 1937	February 1938 11	September/ October 1939 19	January 1940 4	July 1940 6	40
SAA No. 3 HENDON	August 1939	December 1939 4	August 1940 8	November 1940 3	December 1940 1	16
SAA No. 4 HENDON	June 1940	August 1940 3	November 1940 3	April 1941 5	May 1941 1	12
SAA No. 5 ROCKLEA	December 1940	March 1941 4	September 1941 5	November 1941 3	February 1942 2	14
SAA No. 6 ROCKLEA	December 1940	March 1941 4	?	June 1942	October 1942 4	23
SAA No. 7 WELSHPOOL	May 1941	September 1941 4	April 1942 6	June 1942 3	November 1942 5	18

Sources

History of the Ammunition Factories 1939-45, MHS35.
 Director-General of Munitions Reports.
 Munitions Digests.
 History of Ammunition Factory Footscray, MHS39.
 Ammunition Factory Hendon, MHS40.
 History Sheets of Government Munitions Factories and Establishments.
 War Cabinet Agendum 26/1940; War Cabinet Minute No. 132.
 AA MP598, S30, Box 9, Secretary MSB Submission to MSB, 22 March 1937.
 No. 2 SAA Factory Hendon SA, Department of Supply Files 230/191/5 and
 also 230/191/102, 146, 316.

Notes

- a. SAA No. 1 was rebuilt on a new site at Footscray between July 1941 and December 1942. During this time production was decreased at the old factory by the same amount as it was increased in the new SAA No. 1. In this way, section by section, the old factory staff were transferred to the new factory, with no loss of production. The old SAA No. 1 was then demolished.

Table J-2. THE CONSTRUCTION AND FIRST PRODUCTION OF THE SMALL ARMS FACTORIES

FACTORY	SITE SELECTED	BUILDING INITIATED	INITIAL PLANT INSTALLATION	INITIAL PRODUCTION	QUANTITY PRODUCTION	TOTAL MONTHS
<u>RIFLES</u> LITHGOW	Built before the First World War					
BATHURST	October 1940	March 1941 5	August 1941 6	September 1941 0.5	November 1941 1	12.5
ORANGE	April 1941	August 1941 5	February 1942 6	March 1942 1	April 1942 1	13
<u>VICKERS</u> No. 1 LITHGOW (Capacity 500)	October 1922	June/July 1926	April 1926	July 1923(a)	May 1929	80
Extensions No. 1 LITHGOW (Total Capacity 1250)	N/A(b)	July 1940	October 1940 3	N/A	July 1941	12
No. 2 LITHGOW (Total Capacity)	September 1940	December 1940 4	June 1941 6	July 1941 1	August 1941 1	12
<u>BREN</u> No. 1 LITHGOW (Capacity 1200)	January 1937	?	February 1939	January 1941 21	April 1941 3	51
Extensions No. 1 LITHGOW (Total Capacity 1800)	N/A(b)	July 1940	October 1940 4	N/A	July 1941	12
No. 2 LITHGOW (Total Capacity 4000)	June 1940	September 1940 3	June 1941 9	October 1941 4	November 1941 1	17
Extensions No. 2 LITHGOW (Total Capacity 6000)	N/A(b)	December 1940	August 1941 9	N/A	November 1941	12

Sources

History of SAF, MHS41.

Director-General of Munitions Reports to War Cabinet.

Munitions Digest August 1941.

Notes

- a. The Vickers equipment had been largely acquired, and was tried out in another part of SAF before the Vickers factory was ready.
- b. Although site selection was irrelevant in these cases, preliminary planning took place before Building was initiated. This was about one month in duration and should be added to the Total Months.

Table J-3. THE CONSTRUCTION AND FIRST PRODUCTION OF THE EXPLOSIVES FACTORIES

J 15

FACTORY	SITE SELECTED	BUILDING INITIATED	INITIAL PLANT INSTALLATION	INITIAL PRODUCTION	QUANTITY PRODUCTION	TOTAL MONTHS
MARIBYRNONG	Built before the First World War					
ALBION	15 June 1939	?	?	TNT 30 November 1940 CDTE 8 March 1941	TNT 9 January 1941 CDTE 18 March 1941	18.5 20
SALISBURY	4 July 1940	November 1940 5	June 1941 7	TNT March 1942 CDTE May 1942 TNT 9 CDTE 10	TNT 5 June 1942 CDTE 5 June 1942 TNT 9 CDTE 1	 23 23
BALLARAT	29 September 1940	January 1941 4	May 1941 4	Gun Cotton 11 September 1941 3	Gun Cotton 11 October 1941 1	 12
VILLAWOOD	March 1941	July 1941 5	15 May 1942 9.5	TNT July 1943 14.5	TNT August 1943 1	 30
MULWALA	April 1942	November 1942 7	February 1943 4	FNH Powder February 1944 12	FNH Powder March 1944 1	 24

Sources

Explosives Factories History 1939-1945, MHS38.
 Director-General of Munitions Reports to War Cabinet.
 Director of Explosives Supply Reports to Director-General of Munitions, MHS113.
 Industrial Stories ICI, MHS58.

Table J-4. LEAD TIMES FOR EXPLOSIVES SECTIONS - SALISBURY

SECTION	SITE SELECTION	INITIAL PLANT INSTALLATION	INITIAL PRODUCTION	QUANTITY PRODUCTION	TOTAL MONTHS
Acid	4 July 1940	September 1941	February 1942	18 February 1942	19.5
Tetryl	4 July 1940	September 1941	March 1942	5-12 June 1942	23
TNT	4 July 1940	September 1941	March 1942	3-5 June 1942	23
Cordite	4 July 1940	June 1941	May 1942	1-5 June 1942	23
Ammonium Nitrate	4 July 1940	November 1941	May 1942	June 1942	23

Table J-5. LEAD TIMES FOR PRODUCTION HOUSES - BALLARAT

HOUSES	SITE SELECTION	INITIAL PLANT INSTALLATION	INITIAL PRODUCTION	QUANTITY PRODUCTION	TOTAL MONTHS
Oleum	29 September 1940	May 1941	11 September 1941	September 1941	11
Nitric Acid Retort	29 September 1940	June 1941	17 September 1941	September 1941	11
Paper Scrolling	29 September 1940	?	September 1941	September 1941	11.5
Nitrating House	29 September 1940	June 1941	September 1941	25 September 1941	12
Vat House	29 September 1940	June 1941	25 September 1941	26-30 September 1941	12
Beater and Potcher	29 September 1940	July 1941	26-30 September 1941	10-17 October 1941	12.5
Boiler House	29 September 1940	May 1941	July 1941	August 1941	10

Table J-6. LEAD TIMES FOR EXPLOSIVES SECTIONS - VILLAWOOD

SECTIONS	SITE SELECTED	INITIAL PLANT INSTALLATION	INITIAL PRODUCTION	QUANTITY PRODUCTION	TOTAL MONTHS
Acid	10 March 1941	July 1942	1 March 1943	2 March 1943	24
Ammonium Nitrate	10 March 1941	May 1942	2-17 April 1943	2-17 April 1943	25
TNT	10 March 1941	May 1942	July 1943	August 1943	30
Tetryl	10 March 1941	May 1942	Never Commenced		
Cordite	10 March 1941	Pending an inquiry to the USA on a new flashless nitrocellulose powder, action on the Cordite Section was suspended September 1941(a)			

Note

- a. Action was never resumed, and the new powder was made eventually at Mulwala.

Table J-7. LEAD TIMES FOR EXPLOSIVES SECTIONS - MULWALA

SECTIONS	SITE SELECTION	INITIAL PLANT INSTALLATION	INITIAL PRODUCTION	QUANTITY PRODUCTION	TOTAL MONTHS
Acid	April 1942	March 1943	December 1943	December 1943	21
Nitro Cellulose	April 1942	February 1943	1 December 1943	January 1944	22
NC Powder	April 1942	March 1943	February 1943	March 1944	24

Table J-8. THE CONSTRUCTION AND FIRST PRODUCTION OF THE FILLING FACTORIES

FACTORY	SITE SELECTED	BUILDING INITIATED	INITIAL PLANT INSTALLATION	INITIAL PRODUCTION	QUANTITY PRODUCTION	TOTAL MONTHS
MARIBYRNONG	Built during the 1920s					
SALISBURY	4 July 1940	November 1940 5	June 1941 7	14 November 1941 4.5	21 November 1941 0.25	16.75
St Mary's	10 March 1941	20 June 1941 3.25	4 September 1942 14.5	18 September 1942 0.5	November 1942 1.75	20

Sources

Explosives Factories History 1939-45, MHS38.
 Director-General of Munitions Reports to War Cabinet.

Table J-9. LEAD TIMES FOR FILLING SECTIONS - SALISBURY

SECTION	SITE SELECTION	INITIAL PLANT INSTALLATION	INITIAL PRODUCTION	QUANTITY PRODUCTION	TOTAL MONTHS
Fuze	4 July 1940	June 1941 12	February 1942 7	13 February 1942 0.5	19.5
Detonator	4 July 1940	16 September 1941 14.5	22 November 1941 2.25	2 December 1941 0.25	17
Cap	4 July 1940	1 October 1941 15	14 November 1941 1.5	21 November 1941 0.25	16.75
Cartridge Bundling	4 July 1940	January 1942 18	March 1942 2	March 1942 1	21
Shell Filling	4 July 1940	January 1942 18	7 April 1942 3	7 April 1942 0	21
Cartridge Assembly	4 July 1940	February 1942 19	April 1942 2	April 1942 1	22
Pyrotechnic	August 1941	February 1943 18	July 1943 4	July 1943 1	23

Table J-10. LEAD TIMES FOR FILLING SECTIONS - ST MARY'S

SECTION	SITE SELECTION	INITIAL PLANT INSTALLATION	INITIAL PRODUCTION	QUANTITY PRODUCTION	TOTAL MONTHS
Pyrotechnic	May 1941	September 1942 16	14-18 November 1942 1.5	November 1942 0.5	18
Fuze	March 1941 -	October 1942 19	February 1943 4	March 1943 1	24
Shell Filling	March 1941	October 1942 19	March 1943 4.75	March 1943 0.25	24
Bomb Filling	March 1941	?	March 1943	March 1943	24
Cartridge Bundling and Assembly	March 1941	?	August 1943	August 1943	29

Table J-11. THE CONSTRUCTION AND FIRST PRODUCTION OF THE CARTRIDGE CASE FACTORIES

FACTORIES	SITE SELECTED	BUILDING INITIATED	INITIAL PLANT INSTALLATION	INITIAL PRODUCTION	QUANTITY PRODUCTION	TOTAL MONTHS
MARIBYRNONG	Built during the 1920s					
FINSBURY	April 1940	September 1940 5	January 1941 4	July 1941 6	September 1941 2	17
ROCKLEA	December 1940	June 1941 7	November 1941 5	April 1942 5	June 1942 2	19
DERWENT PARK	May 1941	September 1941 5	December 1941 3	December 1942 12	February 1943 2	22
RUTHERFORD	May 1941	September 1941 5	December 1942 14	December 1942 1	January 1943 1	21

Sources

History of the Ammunition Factories 1939-1945, MHS35.
Ammunition History Hendon, MHS40.
Director-General of Munitions Reports to War Cabinet.

*Annex K**ARMY STOCKS AND REQUIREMENTS FOR WEAPONS AND AMMUNITION
FROM THE MINISTRY OF MUNITIONS, MARCH 1942, JUNE 1942*

The following tables describe the state of Army stocks of weapons and ammunition for March and June 1942, the deficiencies, and the monthly rate of production by the Ministry of Munitions. The 'Army Requirements' column does not represent the minimum the Army needed to carry out its functions, but more likely a comfortable margin in excess of minimum requirements, to allow for unexpected developments. There is some element of this situation reflected in the 'Initial Equipment' and 'Reserves' columns. Therefore the ability of the Munitions Ministry to furnish the Army's basic requirements in a timely fashion, was greater than is apparent from even this set of tables. On top of this, the Army was receiving useful quantities of munitions from Britain and the USA, and from refugee ships. These were ships bound for the Dutch East Indies, Singapore, or Burma etc., but diverted to Australia when these places fell to the Japanese. Their cargoes were offloaded in Australia, and contained a high proportion of munitions and valuable machine tools. From the Army point of view, Australia was far from being undefended in mid-1942.

Table K-1. ARMY EQUIPMENT REQUIREMENTS AND STOCKS ON HAND 31 MARCH 1942

EQUIPMENT MADE BY THE DEPARTMENT OF MUNITIONS	ARMY REQUIREMENTS	ARMY STOCKS ON HAND	ARMY DEFICIENCIES		MONTHLY PRODUCTION	COMMENTS
			INITIAL EQUIPMENT	RESERVES		
RIFLES .303"	397,875	194,460	142,801	60,614	8,500	44,000 Rifles .303 and 64,000 Rifles .310 impressed from civil population in addition to Army stocks. Army held 242 Lewis guns, 613 Hotchkiss guns in stocks on hand.
BREN GUN	14,723	5,368	6,918	2,437	350	
VICKERS MG	4,117	2,363	816	526	270	
SUBMACHINE GUNS	14,129	4,576	7,063	2,490	160	Chapter 6 of this Thesis shows that the Army had admitted its real requirements in SMGs to be 100,000 in February 1942.
ANTI-TANK GUNS	1,365	601	298	466	120	
TANK GUNS	813	-	549	264	NOT IN PRODUCTION	
3" MORTAR	1,151	854	61	147	100	Ministry of Munitions received its first request for production in December 1941/January 1942.
2" MORTAR	1,464	12	1,081	371	NOT IN PRODUCTION	
25 Pdr FIELD GUN	826	304	75	102	80	
18 Pdr FIELD GUN	4	272	-	-	NOT IN PRODUCTION	Obsolete.
4.5" HOWITZER	-	77	-	-	NOT IN PRODUCTION	Obsolete.
3.7" AA GUN	400	155	245	-	15	Low priority project.
3" AA GUN	90	30	60	-	3	
40 mm BOFORS	1,030	18	982	30	NOT IN PRODUCTION	
MG CARRIERS	3,290	1,605	661	1,024	150	Army places first major order (500) in September/October 1941. Before this it had placed an order for 43 in December 1940 - low priority.

Sources

Weekly Progress Reports by the Chiefs of Staff, 18 April 1942.

Reports of Director-General of Munitions to War Cabinet.

'Wartime Munitions Expansion in Australia 1939-45', CSE Report 13, op. cit.

Note

1. Totals do not include 15,000 tons of munitions landed in Australia from the Middle East with the returning AIF Divisions, nor imports of weapons from refugee ships and deliveries from Britain and USA during the month.

Table K-2. ARMY AMMUNITION REQUIREMENTS AND STOCKS ON HAND 31 MARCH 1942

AMMUNITION MADE BY DEPARTMENT OF MUNITIONS	ARMY TOTAL REQUIREMENTS			ARMY STOCKS ON HAND		ARMY DEFICIENCY	MONTHLY PRODUCTION	COMMENTS
	INITIAL	6 MONTHS WASTAGE	TOTAL	ROUNDS PER GUN	TOTAL			
3.7" AA	320,000	480,000	800,000	700	108,919	691,081	29,457	Prod of ammo not sched. until June 1942, order placed late 1941.
3" AA	50,400	108,000	158,400	2,776	77,724	80,676	-	
40 mm AA	800,000	1,500,000	2,300,000	2,606	41,675	2,258,325	-	
4.5" QF	22,800	410,400	433,200	3,622	236,278	196,922	55,000	
25 Pdr QF	170,400	4,078,400	4,248,800	1,185	784,288	3,464,512	48,000	
18 Pdr QF	81,600	1,703,600	1,785,200	2,063	439,794	1,345,406	20,739	
2 Pdr AT	312,000	1,452,960	1,764,960	272	149,813	1,615,147	32,000	
3" MORTAR	247,500	1,742,520	1,990,020	667	379,612	1,610,408	43,472	Army indic. 1st req for 2" mortar ammo Dec 1941.
2" MORTAR	237,930	1,854,000	2,091,930	-	117,559	1,974,371	-	
0.303" BALL SAA	80,500,000	180,000,000	260,000,000	NA	281,000,000	NONE	43,000,000	
0.310" BALL SAA			20,000,000	NA	683,000	19,317,000	508,400	
0.303" TRACER SAA	6,160,000	22,440,000	28,600,000	NA	1,600,000	27,000,000	644,000	
0.303" AP SAA	6,160,000	22,440,000	28,600,000	NA	359,286	28,240,714	60,000	
9 mm and 0.45" SMG	15,197,000	27,947,000	43,144,000	NA	17,346,630	25,797,370	-	
GRENADES - HAND	52,920	1,500,000	1,552,920	NA	299,786	1,253,134	79,000	Army indic 1st req for local prod of 9mm ammo Nov 1941. 0.45" ammo not request for prod.
GRENADES - RIFLE HE	27,000	500,000	527,000	NA	221,563	305,437	56,112	
GRENADES - RIFLE AT	20,400	60,000	80,400	NA	22,650	57,750	-	
GRENADES - RIFLE SMOKE	27,000	400,000	427,000	NA	139,440	287,560	12,000	
MINES - CONTACT	32,032	166,000	198,032	NA	29,515	68,517	16,248	

Sources

Weekly Progress Reports by the Chiefs of Staff, 18 April 1942.

Reports of the Director-General of Munitions to War Cabinet.

'Wartime Munitions Expansion in Australia 1939-45', CSE Report 13.

Note

a. Totals do not include 15,000 tons of munitions landed in Australia from the Middle East with the returning AIF Divisions nor imports of Ammunition from refugee ships, and deliveries from Britain and USA during the month.

Table K-3. ARMY EQUIPMENT REQUIREMENTS AND STOCKS ON HAND 30 JUNE 1942

EQUIPMENT MADE BY THE DEPARTMENT OF MUNITIONS	ARMY REQUIREMENTS	ARMY STOCKS ON HAND	ARMY DEFICIENCIES		MONTHLY PRODUCTION	COMMENTS
			INITIAL EQUIPMENT	RESERVES		
RIFLES .303"	456,641	316,977	70,058	69,606	7,131	Also Rifles 0.310" 84,000 on hand if needed. Production depressed prior to higher level next month (i.e. 10,000).
BREN GUN	14,555	7,563	4,649	2,343	385	Army held 2,425 Lewis guns, 613 Hotchkiss guns which were included in stocks on hand.
VICKERS MG	5,904	2,968	1,717	1,219	222	Production rapidly accelerating of Brens. Vickers production depressed prior to reaching higher level of production next month (i.e. 300).
SUBMACHINE GUNS	41,912	9,589	26,131	6,192	684	Chapter 6 of this Thesis shows that the Army's real requirements in SMGs to be 100,000.
2 Pdr AT GUN	1,082	788	96	198	43	Production depressed prior to switch to 6 Pdr AT gun production.
6 Pdr AT GUN	1,075	22	676	377	-	Production order placed July 1941.
3" MORTAR	1,392	1,218	158	16	354	In addition 112 3" Mortar Mk 1 on hand.
2" MORTAR	1,702	142	1,130	430	-	Ministry of Munitions received its first request for production in December 1941/January 1942.
25 Pdr FIELD GUN	826	760	83	291	64	All 18 Pdr and 4.5" Batteries to be replaced eventually by 25 Pdr Field Guns.
25 Pdr TANK GUN	276	-	300	?	-	Not in production yet.
18 Pdr FIELD GUN	127	262	-	-	-	
4.5" HOWITZER	64	77	-	-	-	
3.7" AA GUN	474	309	158	7	22	
3" AA GUN	90	28	62	-	2	Low priority project.
40 mm BOFORS	1,224	313	876	35	-	Army places first major order in September/October 1941. Production still being established.
CARRIERS	4,088	2,612	241	1,235	175	

Sources

Weekly Progress Reports by the Chiefs of Staff, 18 July 1942.

Reports of Director-General of Munitions to War Cabinet.

'Wartime Munitions Expansion in Australia 1939-45', CSE Report 13, op. cit.

Note

1. Although not listed as Army requirements at this stage in the Chiefs of Staff Report, 30 Anti-Tank Gun Carriers, 30 Light Armoured Cars, and 28 Scout Cars were produced for the month by the Ministry of Munitions.

Table K-4. ARMY AMMUNITION REQUIREMENTS AND STOCKS ON HAND 30 JUNE 1942

AMMUNITION MADE BY DEPARTMENT OF MUNITIONS	ARMY TOTAL REQUIREMENTS			ARMY STOCKS ON HAND		ARMY DEFICIENCY	MONTHLY PRODUCTION	COMMENTS
	INITIAL	6 MONTHS WASTAGE	TOTAL	ROUNDS PER GUN	TOTAL			
3.7" AA	358,400	537,600	896,000	814	214,837	681,163	11,600	Prod delay from fuze fail. Minor prob, expected prod for year 30/6/42 750000. production for year ended 30 June 1942 750,000.
3" AA	49,280	105,600	154,880	3,029	84,816	70,064	4,600	
40 mm AA	940,800	1,764,000	2,704,800	989	309,532	2,395,268	-	
4.5" HOW	14,400	259,200	273,600	7,408	355,590	-	-	Prod not sched until Aug. First order late 1941. Order filled. Only 48 guns on issue.
25 Pdr FIELD GUN	230,400	4,838,480	5,068,880	2,289	1,263,461	3,805,339	150,000	Plus 66,000 rds from o/s. Only 552 guns issued.
18 Pdr FIELD GUN	29,400	604,200	633,600	4,395	553,741	79,859	40,000	Only 126 guns on issue.
2 Pdr AT GUN	155,760	584,100	739,860	742	584,943	154,917	58,000	70,000 rounds received from overseas in addition. Not yet in production.
6 Pdr AT GUN	150,720	565,200	715,920	NO GUNS ISSUED	5,235	710,685	-	
3" MORTAR	296,700	2,230,749	2,527,449	784	774,041	1,753,399	112,650	Only 988 Mortars issued from stock of 1218.
2" MORTAR	275,814	2,364,120	2,639,934	1,800	225,645	2,384,239	-	Not in prod. First req. indicated Dec 1941.
0.303" BALL SAA	86,000,000	248,600,000	334,600,000	NA	400,000,000	-	41,000,000	First req. for prod 9mm indicated Nov 1941. Prod just started. 0.45" not produced..
0.310" BALL SAA	-	-	20,000,000	NA	2,500,000	17,500,000	1,386,720	
0.303" TRACER SAA	7,500,000	28,500,000	36,000,000	NA	6,068,000	32,532,000	1,649,532	
0.303" AP SAA	10,000,000	10,000,000	20,000,000	NA	1,822,225	18,177,775	1,474,512	
9 mm and 0.45" SMG	47,500,000	74,500,000	122,000,000	NA	20,000,000	102,000,000	65,828	
GRENADES - HAND	52,920	1,500,000	1,552,920	NA	949,846	603,074	137,952	Production not scheduled until October 1942.
GRENADES - RIFLE HE	27,000	500,000	527,000	NA	450,097	76,903	48,270	
GRENADES - RIFLE AT	20,400	60,000	80,400	NA	46,210	34,190	-	
GRENADES - RIFLE SMOKE	27,000	400,000	427,000	NA	216,146	210,854	10,410	
MINES - CONTACT	59,280	720,000	779,280	NA	194,195	585,095	5,931	

Sources

Weekly Progress Reports by the Chiefs of Staff, 18 July 1942.

Reports of the Director-General of Munitions to War Cabinet.

'Wartime Munitions Expansion in Australia 1939-45', CSE Report 13.

ANNEX L

THE COST OF THE MINISTRY OF MUNITIONS

Table L-1 CAPITAL EXPENDITURE FOR MUNITIONS PRODUCTION 1939-45

PROJECT	TOTAL PLANT AND MACHINE TOOLS ETC.	BUILDINGS AND WORKS	TOTAL (£)
MAJOR AMMUNITION FACTORIES	6,552,794	4,378,478	10,931,272
MAJOR EXPLOSIVES FACTORIES	5,589,797	15,619,760	21,209,557
MAJOR ORDNANCE FACTORIES	3,404,806	1,582,229	4,987,035
MAJOR SMALL ARMS FACTORIES	2,111,141	1,224,556	3,335,715
SMALL ARMS FACTORIES IN COUNTRY TOWNS	185,723	260,122	445,845
MSL ORDNANCE FACTORIES IN COUNTRY TOWNS	165,689	204,727	370,416
AMMUNITION FACTORIES IN COUNTRY TOWNS	60,135	66,897	127,032
STORES AND TRANSPORT	534,643	403,351	937,994
TOTAL GOVERNMENT FACTORIES	323,116	2,717,142	3,040,258
ARMAMENT ANNEXES	18,927,844	26,457,262	45,385,124
LOAN MACHINES AND POOL	11,970,095	-	11,970,095
EQUIPMENT FOR TRAINING TOOL MAKERS	15,725,441	-	15,725,441
ARMOURED FIGHTING VEHICLES	239,980	-	239,980
MANUFACTURE OF ALUMINIUM	TRANSFERRED TO OTHER PROJECTS	174,303	174,303
SHIPBUILDING	141,325	-	141,325
SPECIAL SHIPBUILDING PLANT	7,428,472	-	7,428,472
NITRIC ACID PLANT	1,437,801	-	1,437,801
AIR RAID PRECAUTIONS	67,711	-	67,711
FURNITURE FITTINGS	109,643	665,433	775,076
TORPEDO	-	71,554	71,554
CANTEENS	406,928	72,315	479,243
ELECTRICITY SUPPLY CONTROL	123,261	-	123,261
EXPERIMENTAL CHEMICAL WARFARE STATION	219,295	-	219,295
GOODS LOST BY ENEMY ACTION	18,570	188,307	206,877
FOREST ROADS	123,221	-	123,221
TOTAL (£)	-	15,000	15,000
	56,939,587	27,644,174	84,583,779

Table L-2 THE RESIDUAL COST OF PRODUCTION FROM DEPARTMENT OF MUNITIONS RECORDS

	1939/40	1940/41	1941/42	1942/43	1943/44	1944/45	TOTAL (£)
MATERIALS	624,888	2,502,116	-(a)	-	-	-	3,127,004
TECHNICAL TRAINING	26,928	635,944	753,884	529,237	83,458	56,695	2,086,146
ADMINISTRATION:							
Salaries	67,402	160,705	817,211	1,725,626	1,953,774	1,707,721	6,432,439
General Expenses	18,857	63,270	470,070	1,120,958	957,363	561,284	3,191,802
FACTORY AND LABORATORY OPERATIONS:							
Salaries(b)	107,317	91,859	140,500	217,500	263,609	262,701	1,083,486
General Expenses(c)	671,245	480,322	1,879,094	197,984	160,658	99,725	3,489,028
CLOSING DOWN OF FACORIES AND ANNEXES	-	-	-	-	-	144,619	144,619
MAINTENANCE AND RENT	9,950	19,706	82,416	219,913	271,048	258,666	861,699
BUILDINGS AND SERVICES	-	-	-	-	-	89,334	89,334
TOTAL £	1,526,587	3,953,922	4,143,175	4,011,218	3,689,910	3,180,745	20,505,557

Notes

- a. Henceforth materials were paid for wholly by sales of munitions.
- b. Executive and professional salaries only. Salaries of employees were paid for wholly by sales of munitions.
- c. The figures from the 1946 Munitions Digest include grants for working capital, finance for vehicle purchases, and MSL expenditure. These figures are therefore inflated because working capital was recoverable from sales of munitions, the purchase of vehicles was capital expenditure. This is probably the source of the discrepancy in the values for the residual cost of production as stated above, and as calculated from Treasury records ie £20,505,557 as compared to £20,129,388.

Table L-3 VALUE OF PRODUCTION BY GOVERNMENT ESTABLISHMENTS (£)

	AMMUNITION	EXPLOSIVES	ORDNANCE	SMALL ARMS	MSL	TOTAL (£)
1939/40	1,501,494	729,046	846,999	404,154	192,895	3,674,588
1940/41	4,193,072	1,897,082	2,031,936	1,526,073	494,632	10,142,795
1941/42	9,008,730	5,554,303	3,940,818	3,020,051	860,904	22,384,806
1942/43	12,078,796	9,600,959	5,246,283	5,435,689	930,296	33,265,023
1943/44	8,118,014	7,563,661	4,371,837	4,974,295	536,196	25,564,003
1944/45	4,681,833	3,871,091	1,805,292	3,287,698	52,911	13,698,825
TOTAL £	39,581,939	29,216,142	18,243,165	18,647,960	3,040,834	108,730,040

Table L-4 FACTORIES STOPPED FROM REACHING FULL PRODUCTION

FACTORY	TOTAL PLANT+ M. TOOLS ETC	BUILDINGS AND WORKS	TOTAL (£)
ROCKLEA C. CASES) SAA)	1,042,444	861,774	1,904,218
WELSHPOOL SAA	246,004	298,108	544,112
DERWENT PARK CARTRIDGE CASE	444,027	351,314	795,341
RUTHERFORD CARTRIDGE CASE	809,008	749,130	1,558,138
ST MARYS FILLING	514,478	4,769,815	5,284,293
VILLAWOOD EXPLOSIVES	754,992	1,572,956	2,327,948
MULWALA EXPLOSIVES	1,100,390	1,920,341	3,020,731
SMALL ARMS FACTORIES IN COUNTRY TOWNS	185,723	260,122	445,845
ORDNANCE FACTORIES IN COUNTRY TOWNS	60,135	66,897	127,032
AMMUNITION FACTORIES IN COUNTRY TOWNS	534,643	403,351	937,994
TORPEDO FACTORY	406,928	72,315	479,243
TOTAL (£)	6,098,772	11,326,123	17,424,895

SOURCES TO ANNEX LTable L-1;AA MP956 S2 Box14 item87.Table L-2;AA CRS A5954 Box 487-8, Munitions Digest 1946 pl74.Table L-3;AA CRS A5954 Box487, Munitions Digest 1945.Table L-4;AA MP956 S2 Box14 item87.

ANNEX M

VALUE OF MUNITIONS SALES TO FOREIGN GOVERNMENTS

	VALUE OF MUNITIONS (£)	CUMULATIVE TOTAL (£)
31/12/39	--	--
30/6/40	?	?
31/12/40	?	2,128,502
30/6/41	1,488,398	3,616,900
31/12/41	3,660,100	7,277,000
30/6/42	81,000	7,358,000
31/12/42	3,167,000	10,525,000
30/6/43	209,955	10,734,955
31/12/43	?	
30/6/44	?	25,551,618
31/12/44	?	
30/6/45	?	29,917,000

SOURCES

AA CRS A5954. Boxes 485-491, Munitions Digests, Director General of Munition's Reports to Cabinet.

ANNEX N

MANPOWER COMMITTED TO MUNITIONS PRODUCTION

EMPLOYMENT AS AT:	GOVT FACTORIES AND ADMIN(a)	ARMAMENT ANNEXES(b)	COMMERCIAL INDUSTRY	TOTAL
30 JUNE 1939	5,073	?		
30 JUNE 1940	12,250	2,296	1,126(c)	15,672
30 JUNE 1941	26,205	8,670		
30 JUNE 1942	51,942	18,134		
30 JUNE 1943	60,991	19,273	80,350(d)	160,614(e)
30 JUNE 1944	37,856	9,994		
30 JUNE 1945	28,398	5,823		

Sources

- a. Munitions Digest 1945, p.473.
- b. Munitions Digest 1945, p.133A.
- c. AA MP730 S10 Box1, Jensen to Macfarlane, 24 July 1940.
- d. *War Economy 1942-45*, Butlin et al, p401.
- e. Peak employment on munitions production.

*ANNEX O**THE COST OF PRODUCTION OF INDIVIDUAL MUNITIONS 1941-1945*

Table O-1 outlines the cost of production of selected munitions between 1941 to 1945. Virtually all munitions listed exhibited the same pattern of costs. As production effort began to reach high levels in late 1941, early 1942, costs tended to decline. During the later years of the war, all costs showed a tendency to rise slowly. By 1945, nearly all munitions cost more than they did in 1941. The explanation for this is probably that production was declining-increasing unit costs, and that raw materials and labour cost more because of wartime inflation of prices and wages.

Australian unit costs for particular munitions sometimes compared well with costs of production overseas. For example, in June 1942, Australian costs for major ammunition items were similar to British costs, when the cost of transport to Australia was taken into account.

TABLE O-1 :COMPARISON OF COSTS FOR PARTICULAR MUNITIONS 1941-45

MUNITION	JUN 1941	JUN 1942	JUN 1943	JUN 1944	JUN 1945
	£	£	£	£	£
M.G. CARRIER LP2	2000	1500	1500	1500	-
2 Pdr AT GUN	2100	1750	1750	1750	-
17 Pdr AT GUN	-	-	-	-	4000
3.7" AA GUN	8000	6000	6000	6000	-
25 Pdr FIELD GUN	5000	4500	4500	4500	-
25 Pdr PACK HOW.	-	-	-	3300	-
4" NAVAL GUN + MOUNTING	-	-	6800	5750	5661
3" MORTAR	?	?	?	150	-
VICKERS M.G.MK 1	125	109	130	165	173
BREN GUN	200	150	146	170	175
OWEN GUN	-	-	11.5	14	-
AUSTEN	-	-	12.5	14	-
RIFLE	12	13	13	13	16
SAA BALL MK VII	9.4	9.9	11.3	12.1	13.1
PER THOUSAND					
SAA TRACER	24	19	24.1	24.5	30.4
PER THOUSAND					
SAA 9mm	-	?	?	?	7
PER THOUSAND					
BOMB 250lb	25	24	27	27	-
ANTI SUB					
COMPLETE DEPTH	43	35	36	37	37
CHARGE-FILLED					
COMPLETE 3.7"	7.7	7.5	7.1	7.8	-
SHELL-FILLED					
COMPLETE 25 Pdr	4.1	3.9	4	4.2	4.2
SHELL-FILLED					
COMPLETE 4.5"	5.5	4.7	4	-	-
SHELL-FILLED					
COMPLETE 4"	?	?	?	?	12.5
SHELL-FILLED					
COMPLETE 6"	?	?	?	?	25.7
SHELL-FILLED					

Table O-2 :A Comparison of Costs of British and Australian Munitions

AMMUNITION	COST OF AUSTRALIAN MUNITIONS £	COST OF BR MUNITIONS LANDED IN AUST £
SAA BALL(per thous)	9.9	10.6
SAA AR PIERC (per thous)	14.7	15.9
25PDR SHELL (complete)	3.9	3.7
3.7" AA SHELL (complete)	7.5	6.2
4.5" SHELL (complete)	3.7	5.9
6" SHELL (unfilled)	7.8	6.8

Source — AA MP956 S2 Box14 item87 'Summary of Comparative Cost Statements of Ammunition produced in Australia'.

Of course, it would not have mattered whether these Australian munitions costs were comparative or not, because for the critical part of the war, the only source of supply was from Australia itself. Such munitions would have been cheap at almost any price of production within Australia, when balanced against the prospect of no supply at all from other sources overseas. Nevertheless, the munitions for which Australia gained equivalent or lower costs of production than Britain, were also the same munitions for which Australian demand was very high, ie measured in the hundreds of thousands or millions of rounds. This meant that economies of scale could be achieved.

For munitions other than ammunition, eg guns, economies of scale were not

achieved because Australian demand was measured for each munition in the hundreds rather than the thousands. But the capital costs of tooling up for an item such as the 3.7" AA gun was virtually the same for Australia as it was for Britain. British demand was many times higher than Australian for the same munition[1], allowing high rates of production to offset capital costs resulting in a cheaper munition.

One way to have resolved this problem was to have increased orders for Australian made guns or other munitions by selling them to allied governments. This was done, but demand for Australian munitions in the main supply area for Australia, the Eastern Supply Group, was only high enough to support extended production runs rather than allow high volumes of production.

An arrangement such as existed between Canada and Britain was not possible. Canada and Britain pooled their total demands for particular munitions, and then assigned production to one or the other of the two countries. This close co-operation was possible because of similar strategic perspectives of the enemy, and that Britain was using Canada as a munitions base beyond the reach of enemy action, to back its own munitions production. Australia's strategic perspective tended to be the Pacific rather than Europe, and its lines of communication to Britain were too long to compare to those of Canada. There were other factors, but the arrangement between Canada and Britain meant for example, that Canada made over 4000 6Pdr A T guns, whereas Australia satisfied her own requirements and made only a few hundred. The latter

1. See M.M. Postan, *British War Production*, *op.cit.*

was too large for a tool room job, but too small for genuine high volume mass production[2].

2. See L J Hartnett, *Big Wheels and Little Wheels*, *op.cit.*, pp124,161.

RECORD OF THESIS USE

[illegible]