Providing for the Royal Australian Air Force in the Defence of Australia 1934-1944

Meeting the political and economic challenges in strengthening Australia's defences

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ABSTRACT

This thesis examines Australia's defence preparedness when Japan threatened its northern shores in 1941-1942. Although according to historian Andrew T. Ross the local industries were producing quantities of ammunition and military equipment at this time, my thesis asks why, when on 19 February 1942 the Japanese launched their air raids on Darwin, defenders were unable to counter the enemy due to a severe lack of machine-gun fire and rifles. In this I draw attention to the massive deficiencies in transport systems, the tyranny of distance and bumpy roads which made delivery of bulk stores to the northern forces a challenge. A positive aspect of this was the emerging need to deploy and sustain forces in northern Australia, which led to a decision to upgrade overland links and infrastructure. While taking a broad view of influences and events relevant to policy development and implementation on Australia's armed services, my thesis focuses closely on the formation, development and role of the RAAF. I also draw upon the difficulties the Air Board experienced in obtaining suitable aircraft for the RAAF at a time when the British Air Ministry was dealing with its own modernisation problems. Australia's cooperation with Britain on Imperial defence policy promoted a false sense of security based on the assumption that Britain would remain the dominant power. Until Curtin became Prime Minister, previous leaders were mostly unclear about the political and strategic path to follow in the pre-war and inter-war periods. The dramatic entry of Japan into the war in December 1941 revealed the risks of a narrowly focused response to defence matters. I argue that the Light Raid policy only delayed the RAAF being equipped with combat aircraft. Finally, from an under-prepared start, despite almost overwhelming logistic problems, bureaucratic inefficiencies and setbacks, by 1944 the RAAF was a functioning and capable body, able to work alongside the USAAF to defend Australia and the Pacific region.

Certification

I certify that the substance of this thesis has not already been submitted for any degree and is not currently being submitted for any other degree or qualification.

I certify that any help received in preparing for this thesis, and all sources used, have been acknowledged in this thesis.

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Signature:

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Glossary of Acronyms

ABA	Air Board Agenda
ABDA	American-British-Dutch-Australian
ABM	Air Board Member
ABO	Air Board Order
ALHQ	Advanced Land Headquarters
AID	Aeronautical Inspection Directorate
AMC	Army Movement Control
AMEM	Air Member for Engineering and Maintenance
AMF	Australian Military Forces
AMP	Air Member for Personnel
AMSE	Air Member for Supply and Equipment
AOB	Advanced Operational Base
APC	Advisory Planning Committee
ARD	Aircraft Repair Depot
ASC	Allied Supply Council
ASP	Air Stores Park
AWA	Amalgamated Wireless (Australasia) Limited
AWC	Allied Works Council
AWM	Australian War Memorial
BBA	Board of Business Administration
CAC	Commonwealth Aircraft Corporation
CAS	Chief of Air Staff
CGS	Chief of General Staff
CNS	Chief of Naval Staff
CLH	Combined Land Headquarters
CO	Commanding Officer
COS	Chief of Staff
DAM	Director of Aircraft Maintenance, overhaul & repair
DAMOE	Directorate of Air Member Organisation & Equipment
DAP	Department of Aircraft Production
DAPLO	Department of Aircraft Production Liaison Officer
DCAS	Deputy Chief of Air Staff

DDCORD	Department of Defence Coordination
DEI	Dutch East Indies
DDST	Deputy Director of Supplies and Transport
DDGAW	Deputy Director General of Allied Works
DHA	de Havilland Aircraft company
DOA	Department of Air
DOE	Director of Equipment
DOO	Director of Operations
DSS	Defence Signal Staff
DGES	Director-General of Engineering Services
DGSAP	Director-General of Supply and Production
DOD	Department of Defence
DOI	Department of the Interior
DOMF	Darwin Overland Maintenance Force
DOSAD	Department of Supply and Development
DOS	Director of Supply
DST	Director of Supply and Training
DWB	Director of Works and Buildings
EATS	Empire Air Training Scheme
FBRD	Flying Boat Repair Depots
FM	Finance Member – Air Board
FPMC	Federal Parliamentary Manpower Committee
FTS	Flying Training School
GMH	General Motors Holden
GHQ-USAAF	General Headquarters US Army Air Force
GOC	General Officer Commanding
GP	General Purpose aircraft
GR	General Reconnaissance aircraft
IAFDS	Inland Aircraft Fuel Depot
IRPS	Isolated Repair Parties
LHQ	Land Headquarters
LL	Lend Lease
LOFC	Line of Communication
MSB	Munitions Supply Board
MWS	Mobile Works Squadron

MCOC	Munitions Coordinating Committee
MGO	Master General of Ordinance
NC	New Caledonia
NAAC	North American Aircraft Corporation
NEA	Northeastern Area
NWA	Northwestern Area
NEI	Netherlands East Indies
PAC	Planning Administration Committee
PNG	Papua New Guinea
PSOC	Principal Supply Officers' Committee
QEA	Qantas Empire Airways
QMG	Quarter Master General
RAAFHQ	Royal Australian Air Force Headquarters
RAF	Royal Air Force
RAN	Royal Australian Navy
RDF	Radio Direction Finding
RN	Royal Navy
RSU	Repair Salvage Unit
SFTS	Service Flying Training School
SUPP-P	Supply and Production
SWPA	Southwest Pacific Area
TRW	Twin Row Wasp engine
UAP	United Australia Party
USAAC	United States Army Air Corps
USAAF	United States Army Air Forces
USAFIA	United States Army Forces in Australia

Imperial – Metric Conversion Factors

1 gallon	4.547 litres
1 yard	3 feet = 0.9144 metres
1 acre	0.40468 hectares
1 square mile	2.590 sq km or 259 hectares
1 mile	1.609344 kms
700 miles	1,100 kms
1000 miles	1,600 kms
1 pound (lb)	0.4536 kg
1 mile per hour (mph)	1.61 kilometres per hour (km/h)
1 nautical mile (mm)	1,852 metres

£1 in 1939 terms is equivalent to $86 in 2017.[1]

Vocabulary

For convenience, specific terminology from World War II such as aerodrome: airfield; runway; airstrip, trucks and automobile are used. Because of the complexity of Japanese aircraft names, by mid-1942, the Allied used code-names. For example, the Mitsubishi A6M2 type 'Zeke' was identified as the 'Zero', the Mitsubishi G4M1 was 'Betty' to the Allied and the Nakajima Ki-49 was nick-named 'Helen'. Wartime terms such as aeroplane, airplane and aircraft in RAAF instructions, servicing reports, minutes and various other documents are followed. Similarly, radar was mostly defined as Radio Direction Finding or Wireless Direction Finding.

[1] Reserve Bank of Australia, 'Pre-Decimal Inflation Calculator', *Reserve Bank of Australia*, https://www.rba.gov.au/calculator/annualPreDecimal.html, URL retrieved on 21 February 2018.

Introduction

Providing for the Royal Australian Air Force in the defence of Australia, 1934-1944 traces the development of Australia's air force from its inception in 1921. The Royal Australian Air Force (RAAF) went through an extended period of immaturity with a limited role in national defence that persisted until the early 1930s. Eventually, better economic conditions, advances in technology and the threat and the actuality of World War II saw the RAAF evolve into a major force in the air war of the Pacific region by 1944.

Most military historians have characterised Australia's defence preparedness between 1939 and 1942 as poor, providing a remarkably consistent picture of a lack of critical forethought in defence planning that was fully exposed when the Japanese launched their first air-attack on Darwin on 19 February 1942. However, a vocal minority exemplified by Andrew T. Ross in his book *Armed and Ready*, have argued that in fact Australia was well-equipped to defend itself by the end of February 1942. But, as Peter Ewer stated, on 19 February 1942, Australian-built Wirraway was no match for Japanese fighters and there was no radar to warn of air raids. In 1938, Air Marshal Richard Williams had tried to develop a fighter aircraft from the Wirraway but it 'slipped from policy view with his political demise' influenced by British efforts to thwart such a national proposal.[2] This thesis demonstrates that Ross' position is unsustainable. I provide a detailed examination of the nature of Australia's preparedness prior to Japan's air raids on Darwin and its capacity to defend the homeland in 1942.

The thesis examines in nine chapters most of the initiatives, responses and constraints of the Australian government and industrial

[2] Peter Ewer, 'Servants of the National Interest? Conservatives and Aviation Policy-making in the 1930s', (52-70), *Australian Historical Studies,* vol. 129, (2007), pp.53, 69.

leaders, including political events driving Australia's forces in the years up to 1944. It questions the reason why in 1942 the RAAF was poorly equipped to deal with contingencies against Japanese air power. The RAAF could not equal the range, speed or weapon power of the more modern aircraft from overseas. I also question the initiative of successive Australian governments and some of their defence advisers who appear to have displayed tunnel vision with regard to tracking developments in military aviation and planning Australian strategic and the tactical response needed to secure the nation. Government attempts to build up defence capability were either a case of too little, or too late, and were not always targeted to Australia's real needs. But this thesis also shows that since the Depression leaders were constrained by budgetary limitations which led them to work around shortages of resources of all kinds, including the limited capacity and capability of construction and manufacturing industry. After the Japanese attack on Pearl Harbor on 8 December 1941, Australia could no longer afford to wait for Britain to provide functional defence support, especially as Britain was requiring all of its resources to defend itself. Australia needed to develop a self-reliant strategy and to produce an effective air force. Also, critically needed in the remote and under-developed Northern regions of Australia was the building up of infrastructure, notably rail, port, air infrastructure and the administrative machinery behind these.

How strategically prepared was Australia to defend itself in 1942?

Andrew T. Ross has invested a great deal of effort to convince his readers that local industries had been producing an abundance of munitions, weapons, ammunitions, anti-aircraft guns, machine guns and field artillery since the 1920s.[3] My thesis questions Ross' assertion that Australia was not defenceless in 1942 and was not saved by America but rather saved itself. Ross argues that in the 1920s and 1930s, the

[3] Andrew T. Ross, *Armed and Ready: The Industrial Development & Defence of Australia, 1900-1945,* (Turton & Armstrong, Sydney, 1995), p. xvi.

Dominion was in a position to defend itself due to the support of successive Australian governments who encouraged the development of secondary industry through tariffs and bounties and increased its scientific and industrial capacity which Ross labels the *Self-Containment policy*. Ross maintains that had it not been for the local industries which in 1941 were producing quantities of munitions, the nation would not have been ready to repel a Japanese invasion after the raids on Darwin on 19 February 1942. Furthermore, he suggests that such industrial capacity would have saved thousands of Australian lives.[4]

My thesis argues that, on the contrary, the defenders were unable to counter the Japanese air attacks on Darwin, and also on Broome, WA, on 3 March 1942, due to a severe lack of weapons. In fact, Darwin's defenders were using an anti-aircraft battery of 12.6-inch anti-aircraft guns on loan from the United States Army. Air combat was done by USAAF pilots, who happened to be in Darwin on that day.[5] This raises serious questions about the adequacy of Australia's defences at a time of great urgency and contradicts Ross's claim that Australia was well equipped and prepared to take on a Japanese invasion.

Meaher maintains that Australia's inability to defend Darwin against Japanese air attack on 19 February 1942 or Sydney and Newcastle against Japanese submarine attack in mid-1942, is plainly indicative that Australia was neither armed nor ready for the European war or later on for the Pacific War.[6] On 19 February, Darwin defenders only had few rifles which were often subject to malfunction due to the humidity. This puts into question Ross' assertion that:

> a huge industrial juggernaut was created, and by the time the Japanese were able to begin preparations to invade in early 1942, so much equipment and supplies had been manufactured that an

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[4] *Ibid*., pp.xvi, 285.

[5] Douglas Gillison, *Royal Australian Air Force, 1939-1942*, (Australian War Memorial, Canberra, 1962), p.425.

[6] Augustine Meaher IV, *The Australian Road to Singapore. The myth of British betrayal*, (Australian Scholarly Publishing, Melbourne, 2010), p.xxxi.

> enormous Australian military force was capable of being placed in the field in Australia.[7]

Considering the lack of defensive weapons at Darwin, Ross' argument that Australia was prepared to repulse an invasion towards the end of February 1942 is unconvincing. From the evidence gathered, my thesis argues that Australia was seriously unprepared to meet Japanese aggression. The acquisition of weapons, aircraft and raw materials was a major undertaking that required cautious political *modus operandi* to deal with procurement. Because transport deliveries to forward bases were impeded by long distances and by impassable roads during the wet season, Australia's initiatives could only progress slowly.

After Pearl Harbor on 8 December 1941, the federal government and its Chiefs of Staff were acutely aware of Japanese military action and expansion to Southeast Asia and alert to the need to secure Australia against this threat, but they were forced into an impossible situation. Most of the Army had been sent to fight abroad in support of Britain against Germany, the RAN was depleted of its vessels and the RAAF did not have suitable fighter aircraft and long-range bombers to counter a Japanese attack. The Japanese invasion of Singapore followed by the loss of Australia's 8th Division on 15 February 1942 left the defence of Australia's northern shores in the hands of a small local militia that would have encountered great difficulties in repulsing a battle-hardened Japanese force, had they decided to invade. Japan's unprecedented aggression at Pearl Harbor, the invasion of Malaya (8 December 1941) and Singapore (15 February 1942) stimulated War Cabinet to rush its defence preparations by moving its military forces to northern areas, establishing aircraft repair depots and building a vast array of additional infrastructure, such as runways, roads, bridges, and so on. That is indicative of the tardy state of Australia's preparedness.[8]

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[7] Ross, *Armed and Ready*, p.xv.

[8] NAA: A705, 171/6/53. Roads, paths and general civil engineering services. RAAF Station, Darwin; AWM80, 11/432-438. Infrastructure development.

When Japan launched its first air raids on Darwin on 19 February 1942,[9] much of the previously planned defence upgrades in the north remained mostly incomplete. Following the air raids, the number of defence-related projects increased but implementation became an overwhelming task as the post-raid situation generated increased demand and more competition for resources. On 27 December 1941 Curtin declared: 'Without any inhibitions of any kind, I make it quite clear that Australia looks to America, free of any pangs as to our traditional links or kinship with the United Kingdom'.[10] This important message highlighted a turning point in Australian history. At the outbreak of war against Japan, Australia challenged the principle of 'Imperial defence and assumed a more independent path in world affairs'.[11]

But above all it showed that Australia was defenceless against a major Japanese contingency. Taking this into account, in a cable to Churchill on 16 January 1942 Prime Minister John Curtin declared that:

> It is clearly beyond our capacity to meet an attack of the weight that the Japanese would launch. At the same time, our limitations in both manpower and equipment deny us the capacity to increase our land forces to an appreciable extent. Any reinforcement, provided it is adequately trained and equipped, must increase our security by providing a greater deterrent to attack.[12]

Australia was not in a position to repel a determined Japanese force. The danger of Australia's situation was again emphasised by Curtin on

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[9] Colin M. King*, Song of the Beauforts, No. 100 Squadron RAAF and Beaufort Bomber Operations*, (Air Power Development Centre, 2nd ed. 2008), p.14. NB: the RAAF and Allied air forces code-named the Mitsubishi G4M1, 'Betty' and the Nakajima Ki-49, 'Helen'.

[10] Albert Palazzo,'The Overlooked Mission: Australia and Home Defence', (53-69), *Australia 1942: In the Shadow of War*, (Peter J. Dean, ed., Cambridge University Press, Port Melbourne, Victoria, 2013), p.59.

[11] Lachlan Grant, *Australian soldiers in Asia-Pacific in World War II*, (New South Publishing, Sydney, 2014), p.3.

[12] NAA: A554/4, Defence of Australia – Appreciation of immediate danger of invasion in force, January 1942; Reinforcements of Home Defence Force by US troops; Agendum No. 32/1942. Chiefs' opinions regarding the danger of invasion unless secured supremacy over the Japanese fleet approving USA forces, 8 December 1941- 8 April 1942.

24 February 1942 when he bravely demanded Churchill return Australia's 6th and 7th Divisions.[13] Subsequent to Curtin's move, the 6th Division disembarked at Fremantle on 10 March while the bulk of the 7th Division arrived in Adelaide during mid-March.[14]

While taking a broad view of influences and events relevant to policy development and implementation on Australia's armed services, my thesis focuses closely on the formation, development and role of the RAAF which grew from a fledging air arm dependent on imperial policy and resources. I explore the difficulties and the tensions which developed between the British Air Ministry and the Australian Air Board which sought to equip the RAAF with modern aircraft suitable for the Australian environment. The Air Ministry's meddling was often iniquitous and uncompromising, as they used their power of persuasion to convince Australia's Air Board to select a British aircraft instead of an American aircraft to equip the RAAF.

The new European conflict in September 1939 found Australia's three services were able to quickly recruit to the ranks but lacked war material and resources to operate as a self-contained force. From the air force aspect, both the RAF and the RAAF should have taken heed from 'strategic intelligence' that Japanese technology had turned out aircraft which were superior to theirs and that Japanese pilots had trained fighting over China.[15] Inherent in this was Japanese pilots were subject to the racial slur of having 'poor eyesight' and as such they were viewed as 'a second-rate air force and not a threat'.[16] This weak point of view

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[13] David M. Horner, 'Australia 1942: A Pivotal Year' (11-29), *In the Shadow of War,* (Peter J. Dean, ed., Cambridge University Press, Port Melbourne, Victoria, 2013), p.18.

[14] Mark Johnston, *The Proud 6th: An Illustrated History of the 6th Australian Division 1939-1945*, (Cambridge University Press Port Melbourne, Victoria, 2008), p.125; Mark Johnston, *The Silent 7th: An Illustrated History of the 7th Division 1940-46*, (Allen & Unwin, Crows Nest, NSW, 2005), p.79.

[15] Ewer, 'Servants of the National Interest?*'* p.65.

[16] C.D. Coulthard-Clark, *The Third Brother. The Royal Australian Air Force 1921-39*, (Allen & Unwin Australia Pty. Ltd, 1991), pp.447-448.

became painfully obvious when the Japanese triumphed over Pearl Harbor on 8 December 1941, Singapore on 15 February 1942 and attacked Darwin four days later. Darwin was quite unprepared for this emergency. The RAAF aircraft inventory was so hopelessly equipped with obsolescent aircraft that it was outclassed by Japanese aerial power.

When in September 1939 the Menzies' government tried to repair its economic problems by exporting to Britain large quantities of munitions and ammunitions, it also had to deal with acute general shortages and sharply rising costs.[17] Consistent with this since the Depression successive governments were constrained by budgetary limitations which led them to work around shortages of resources of all kinds including the limited capacity and capability of construction and the manufacturing industry. The question why Australia was ill-prepared to defend the nation throughout 1942 is far more difficult to answer. It seems rather that complacency built on the foundation of over-reliance on Britain for defence and as the source of virtually all manufactured goods, determined the pace and direction of Australia's economic, industrial and defence strategies.

Clearly, the biggest failure successive pre-war and wartime governments made was to ignore the warning of their Australian military advisers about Japanese expansionist activities and to appoint British officers in top jobs whose main commitments were to promote British aircraft industry and the Empire Air Training Scheme (EATS).

I also argue that even had Australian leaders succeeded in producing a well-considered forward-looking defence strategy, such development would have fallen short due to the over-riding problem presented by the nation's financial situation. At a more fundamental level, the confused and poorly defined lines of responsibility effectively crippled good governance in areas like defence, foreign affairs, and

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[17] Ross, *Armed and Ready*, p.310.

States' relations in national development and in particular, the precise nature of the division of power and administration between Britain, Australia and the States. As such, Australia entered the war with few resources engaged in manufacturing munitions and armaments or in occupations directly concerned with the war. This presented a severe financial burden to government. Clearly Australia needed to rapidly change its pre-war economy 'to a war economy'. The budget for 1941-43 was expected to reach £350 million and increase to about £95 million over 1940-41. Even with subscriptions to loans, war savings and earnings from existing taxation, there was a gap of approximately £60 million to be financed. The States had a very big part to play in the organisation of Australia's war economy as they controlled a number of facilities of great value to the war effort, such as transport, by building up highly specialised Public Works Departments and also labour training.[19] The states imposed eleven separate taxes on income at widely different rates, and 'consequently the Government's freedom to raise its levies in wartime was severely restricted'.[20]

Supplying the forces – the long route north through bumpy roads

Historians have made little mention of the immense task involved in upgrading the country's defence-related infrastructure, both civil and military, particularly those in the northern regions and the supporting communication lines from the south. Equally, contemporary literature has not dealt in great depth with the problems inherent in supplying the forces. This thesis fills in longstanding gaps in our understanding of the logistic effort carried out across various areas of the homeland as the strategic situation demanded, which proved an enormous drain on

[19] S.G. Butlin, T.K. Critchely, R.B. McMilland and A.H. Tange, *Australia Foots the Bill, War Finance 1939-41*, (Angus and Robertson Ltd. The New South Wales Branch of the Economic Society of Australia and New Zealand, 1941), pp.15, 103, 104.

[20] S.J. Butlin and C.B. Schedvin, *War Economy 1942-1945*, (vol. 4, Australian War Memorial, Canberra, 1977), pp.331.

Australia's resources. The expansion of military activities, particularly in Darwin, generated excessive growth in demands on transport services as the large quantities of materials required for the military, civilians and for various defence works programs was belatedly brought in. The best options for high capacity long distance transport within Australia remained the incomplete and inefficient railway system and the extensive coastal shipping network serving the cities and smaller settlements of the country's southern and eastern seaboard. Overcoming all these impediments demanded effective logistics, finances and faultless strategic thinking that required defence efforts well beyond the country's capabilities when war was declared in September 1939.

The Australian Army was by far the biggest organisation in terms of resources, personnel, transport and experience, providing a strong logistic supporting role to the RAAF. The RAAF, compared to the Army, had markedly different infrastructure and material requirements. These differences embraced a host of force specific factors, such as aircraft, aircrew, aircraft engineering and technical specialists, hangars, aviation fuel supply, repair and maintenance operations depots, stores and similar infrastructure. As the RAAF evolved over its first ten years, it harnessed the basic resources required by military aviation by relying on the numerous procedures, instructions and manuals of the British Royal Air Force (RAF). Its expansion was paralleled by a similar expansion of related civilian departmental organisations bringing increased levels of bureaucratic red tape. The cumbersome bureaucracy led to huge delays and there is no doubt that simplification of the administrative machinery would have sped up development during wartime.

My thesis argues that based on Australia's logistical capabilities in 1940-1941, full self-reliance was a long way off. Major highways in the nation's populated regions had not been built to handle heavy-duty or long-distance road transportation, at least in part due to State Government policies that sought to protect rail revenue. Inadequate transport systems made it impossible to move large army convoys or re-position RAAF squadrons quickly to remote areas of Australia. The

inadequacy of wartime transport affected the delivery of equipment and war supplies to the forces, particularly when items came from industrial bases widely dispersed across Australia. The huge distances involved required adequate planning, but instead there were enormous problems in determining the deployment of soldiers, military equipment, usage and means of transport, indicating a lack of foresight in planning and failure at a more strategic level.

Between 1940 and 1944, construction of the north-south overland road took considerable time to carve through the bush. Dock facilities for the RAN and merchant ships, all-weather airfields, the inadequate state of the railways, and supporting logistics commitments were steadily growing more complex with the massive deployment of forces in Australia. Although the Australian government was conversant with these issues they were powerless to quicken development. Providing public funds for substantial road-works or improvement to the railway systems was not a profitable venture given the small returns on investment in a nation with a low population and so much empty territory.[21]

In sum, specialised industrial support from government factories and dockyards and private enterprises is a protracted process, taking some years to bear fruit. The expansion of government owned armament factories benefited private companies, providing them the opportunity to seek government contract work. By September 1939, Australia's industry had acquired factories and personnel with skills in the manufacture of weapons and ammunitions. But the reasons the local forces were under-supplied are harder to decode.

Earlier attempts to promote industry post World War I, for both defence and economic reasons progressed slowly and unsteadily, due firstly to the Governments of the 1920s and 1930s drive to get the budget back into surplus. From this period until mid-1942 only the States had

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[21] S. J. Butlin & C.B. Schedvin, *War Economy 1942-1945*, (Series 4, (Civil), vol. 4, Australian War Memorial, Canberra, 1977), p. 331.

power to raise income taxes, which made it very difficult for the Commonwealth to raise substantial amounts of revenue for large defence and infrastructure projects. The federal government was finally able to collect taxes following the decision of a committee appointed by the Treasurer, Ben Chifley, to give from 1 July 1942 the federal government the sole taxing authority in the field of income tax for the duration of the war.[22]

I have given much emphasis to the Northern Territory and to North Queensland as there were much air force activity and threat of air attack in these areas. The government initiated the construction of air bases, roads and numerous other facilities vital to the operational activities of the RAAF. The findings presented here also concentrate on the administrative and technical aspects of aircraft acquisition programs. I evaluate how these were planned and managed at the government and military levels. The investigation on the inner workings of the RAAF's management system and how problems were resolved fills a gap in our knowledge of Australia's defence in World War II. Some significant events of 1920s and 1930s that support this are discussed throughout this thesis. Certainly, the evidence gathered offers compelling confirmation that building up the national infrastructure and its defence capability was an ambitious plan that required intellectual capital, effective organisation, funds, huge quantities of equipment and supplies and enormous amounts of resolve and persistence.[23] But as money was limited, only projects deemed absolutely essential were recommended. Other projects, although recognised as necessary, were only agreed in principle. With such policy in place and with the government pushing to new levels of commitments, the ability of committees to make difficult decisions on what was actually required and to reshuffle defence

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[22] *Ibid.*, p.332.

[23] NAA: A816, 11/301/387. Works Priority Sub-Committee. Conference related to procedure. Summary of discussions and conclusions by members, W.E. Dunk, Treasury Liaison Officer, T.H.E. Heyes of DOD, H.F. Yoxon, Secretary of Allied Works Council, 20 May 1942.

programs by priority caused much frustration to those requesting work to be done. As the RAAF expanded, an important administrative topic not previously explored focuses on the day-to-day minutiae of providing for the RAAF wartime operations in northern Australia. This primary source research fills an important gap in Australian military history as it deals with mundane yet necessary details that underpinned success in the South West Pacific for the RAAF in World War II. As such there was a strong case for further study to fill part of this important historical gap.

Literature review

The Official Histories of Paul Hasluck (1952) on *The Government and the People,* S. J. Butlin, on *War Economy 1939-1942*, (1955), Douglas Gillison (1962) on *The Royal Australian Air Force*, Gavin Long (1963) on the *Australian Army,* S.J. Butlin & P.M. Schedvin (1977) on *War Economy,* 1942-1945, have each provided useful background coverage. Gavin Long as well as Butlin and Hasluck had little to say about RAAF logistics. Long discussed logistical and administrative matters only briefly, when 'they directly affected the fighting man or were a subject of discussion between soldiers and statesmen'.[24] Gillison's narrative on the operational and administrative tasks of the RAAF and on many general aspects of RAAF's chain of command was a good guide.[25] Ross, in concentrating on the state of Australia's industries in his book *Armed and Ready*, only describes a small part of the logistic development of the RAAF, which I am presenting at its lowest levels.[26]

Warren Denning (1982) provides a vivid account of James Scullin's government, arguing that when the Labor Party came into power, Scullin 'had to face the full crisis of the 1930s Depression and although it had within its ranks a treasurer who might have handled it – Edward

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[24] Gavin Long, *Australia in the War of 1939-1945: The Final Campaigns,* (vol. 7, Australian War Memorial, Canberra, 1963)*,* p. xv.

[25] Gillison, *Royal Australian Air Force*, p.159.

[26] Ross, *Armed and Ready*, pp.70, 125.

Theodore – it failed to listen to him'. Lacking business and banking acumen, the Scullin government discovered an antidote to the economic situation by handing out huge tariff increases to manufacturing firms.[27] When during 1930-1931 the banks were 'perilously close to collapse' Scullin's response was to wait 'until prosperity returned to Australia'.[28]

In terms of defence expenditure, this was a naïve assumption given the low population base that could only provide limited tax revenue. In the 1930s the RAAF operated a variety of different types of aircraft to useful to train aircrews. What the RAAF needed was an efficient air force equipped with modern aircraft. In this John McCarthy's (1974) provides a perceptive account of EATS. With its introduction Menzies' assertion that EATS 'would provide a powerful addition to Australian air power, as well as encouraging local production' did in fact only encourage the manufacture of training machines. Obviously, the rapidity with which aircrews could be trained depended on the number of aircraft available, the quality of the instruction and efficient use of resources.[29] As McCarthy points out by April 1940 EATS had become so successful that the number of aircraft needed to train future aircrew was insufficient to meet EATS objectives.[30]

Was the Menzies government's willingness to assist Britain in every possible way so deficient in vision as to weaken the defence of the homeland? Opinion differs on this possibility. Air-Vice Marshal Brian Weston (2003) took the view that the creation of EATS was potentially damaging because the RAAF and the Australian government had

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[27] Warren Denning, *James Scullin, Prime Minister of Australia 1929 1932: The rise and fall of the Scullin Government*, (Hale and Iremonger, Sydney, NSW, 1982), pp.10, 64.

[28] *Ibid*., p.67.

[29] John McCarthy, 'The Defence of Australia and the Empire Air Training Scheme: 1939-1942', (326-334), *Australian Journal of Politics and History*, vol. 20, no. 3, (December 1974), p. 333.

[30] *Ibid*.

focused it to the exclusion of other issues.[31] On this point, McCarthy alleged that Australia should have considered the advice of Australia's acting Chief of Air Staff, Air Vice-Marshal S. J. Goble, who had shown little enthusiasm to Menzies' ready acceptance of EATS.[32] This thesis supports Sebastian Cox (2003) who claims that EATS became the means by which Australian aircrews acquired flying experience, producing 'extremely high quality personnel who were fed into the two air forces'.[33]

As Norman Ashworth (2003) states, EATS did not detract from Australia's ability to meet the threat posed by Japan. The real problem for the RAAF was the lack of fighters which Australia had acquired. Availability of aircrew and control over EATS were merely personnel matters.[34] I maintain that without EATS, the accompanying development of the RAAF organisation and related logistics infrastructure would have been in worse shape in 1942. Chris D. Coulthard-Clark's (1991) impressive work on the RAAF followed the story of Australia's third armed force from its humble beginning providing important details on how the RAAF struggled to survive the Depression years and in particular its fight for recognition as it faced the threat of abolition and a hostile resentment by the Army and the Navy who wanted the new force be graded as 'an arm and not a separate service'.[35] Coulthard-Clark shows that the acquisition of the North American NA-16 trainer was no small affair involving months of preparatory administrative details.[36] In

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[31] Air-Vice Marshal Brian Weston, (Rt'd), 'The Australian Aviation Industry: History and Achievements guiding defence and Aviation Industry Policy, *100 Years of Aviation,* (39-159). *The Australian Military Experience' in the Proceedings of the 2003 RAAF History Conference*, Canberra on 4-5 August 2003. Published by Aerospace Centre Defence Establishment, Fairbairn, ACT, p.71.

[32] McCarthy, p.329.

[33] Sebastian Cox, 'The RAF and RAAF. A close association in war and peace' in *The Proceedings of the 2003 RAAF History Conference*, p.127.

[34] Norman Ashworth, '*Panel discussion'* in *The Proceedings of the 2003 RAAF History Conference*, p.127.

[35] Coulthard-Clark, *The Third Brother,* p.279.

[36] *Ibid*.

selecting the NA-16, Peter Ewer (2009) correctly maintains that most of the British objections to the type rested on the harm it would do to equipment standardisation within the military services of the Empire'.[37]

John McCarthy (1976) explained how an Australian syndicate, with government support, established a local aircraft industry in 1936 in the face of opposition from Britain Air Ministry and a hostile British aircraft industry. Both Lyons and Menzies refused to yield to British pressure when asked to exclude General Motors Holden from the then forming CAC which went on to manufacture the Wirraway advanced trainer, Wackett trainers and carried on to support the Bristol Beaufort torpedo bombers and other types of aircraft.[38]

Meaher (2010) reflected that Australian leaders were swinging between drive and indecision. 'Australia's unpreparedness at the commencement of the Pacific War was the product not of British perfidy but of an internal failure to recognise and address the nation's vulnerabilities'.[39] In terms of materiel at all levels except for the heaviest equipment, Australia's industrial base required long-term planning which was still unrealised by 1941. When the Pacific War started, 'Australia was incapable of producing the arms, ammunition or support equipment necessary to equip the 25 Divisions the Government believed necessary'.[40] Britain's promise to develop a naval base in Singapore had an ongoing negative influence on defence preparedness that lingered on until the Darwin raids.[41] Australian governments of the 1920s and the 1930s had based their entire trust on the Singapore strategy, despite numerous warnings from the British government and the Admiralty that a fleet might not be on hand or might not arrive in time to prevent a

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[37] Peter Ewer, *Wounded Eagle. The bombing of Darwin and the Australia's air scandal,* (New Holland Publishers (Australia) Pty. Ltd, 2009), p.99.

[38] John McCarthy, *Australia and Imperial Defence 1918--1939: A study in air and sea power,* (University of Queensland Press, St. Lucia, 1976), p.120.

[39] Meaher, The Australian Road to Singapore, p.25.

[40] *Ibid.*, p.15.

[41] Palazzo, 'The overlooked mission: *Australia and home defence',* p.66.

Japanese attack.[42] Another unduly optimistic idea was offered in 1921 by the Committee of Imperial Defence, which in examining Australia's defence planning argued that they 'could not envisage any defence contingency more serious for Australia than small raids from parties of less than two hundred men, landed from Japanese cruisers'.[43]

In *A military history of Australia*, Jeffrey Grey (2008) describes this as a 'depressing [interwar] period' when 'little or nothing was done to increase the Government's ability to carry out its military responsibilities'.[44] Albert Palazzo (2013) states that defence requirements were neglected throughout the inter-war years and that re-armament commenced far too late.[45] Meaher says that Australian leaders took refuge under the umbrella of the Imperial defence and the Singapore strategy, neglecting to secure their own defensive position.[46] In examining Australia's role in British policy of appeasement from 1933 through September 1939 Christopher Waters (2012) determined that Australia accepted the principle that the Empire must speak with *one voice* on foreign policy and Australian political leaders were therefore intimately involved in the decisions taken in London.[47]

The nuts and bolts of military logistics

The treatment of logistics in military textbooks serves as a useful guide for the student as well as a useful handbook for practitioners, but in the real world the needs of delivering and managing the requirements of a

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[42] Meaher, *The Australian Road to Singapore*, p.106.

[43] Andrew T. Ross, 'The Economics of Rearmament 1933-39', (35-43), *Journal of the War Memorial*, no.7, (October 1985), p.36, (See also chapter 2)

[44] Jeffrey Grey, *A military history of Australia*, (3rd ed.), Cambridge University Press, Port Melbourne, Victoria, 2008), p.125.

[45] Palazzo, 'The overlooked mission: Australia and home defence', p.58.

[46] Meaher, p.xxxiii.

[47] Christopher Waters, *Australia & Appeasement, Imperial Foreign Policy & the Origins of WW II*, (I.B. Tauris & Co. Ltd, New York, 2012), p.44.

military organisation, particularly in wartime, is always complex, multi-faceted and rarely free of unwelcomed complication.[48] However, logistics is just as important as tactics.[49] Each result from a different focus and have different objectives but are nevertheless inter-related and interdependent.[50] From the wider perspective of strategy, effective tactics are necessary to win a battle, while logistics are the sinew connecting strategy with its implementation. Logistics is therefore the enabler of operational effectiveness. Thus my research on the RAAF involves evaluating elements pertaining to the selection, acquisition, manufacture and maintenance of RAAF squadrons, including engineering, technical, aircraft servicing, maintenance, manpower, transport and Australia's state of infrastructure.[51]

As Osgood suggests 'military strategy must now be understood as nothing less than the overall plan for utilising the capacity for armed coercion - in conjunction with the economic, diplomatic, and psychological instruments of power, to support foreign policy most effectively by overt, covert, and tacit means'.[52] Thus the inclusion of a political component is a natural extension and part of a government's responsibility to produce a workable defence policy.[53] The central purpose of logistics is to enable military action to proceed by organising, movement and sustenance to forces while also supplying materiel support for current and future operations in the right quantity, at the right place, at the right time and in the most efficient and effective manner. According to Julian Thompson logistics tends to be undervalued in

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[48] *The Condensed Air Power Manual*, DI (AF), AAP 1001, (2nd ed.), AGPS, Canberra, ACT, 1994), p.149.

[49] *Ibid.*

[50] *Ibid.*

[51] David Horner, *Making the Australian Defence Force*, (vol. 4, Oxford University Press, Melbourne, Victoria, 2001), p.257.

[52] R.E. Osgood, *NATO: The Entangling Alliance*, (Chicago University Press, Chicago, USA, 1962), p.5.

[53] *Ibid.*

military history relative 'to the more glamorous tactics and strategy'.[54]

Methodology

There is some documentary coverage on the RAAF during the period covered in this thesis in popular books, magazines and television programs. Although this pictorial evidence is significant, it provides no more than incidental accounts of the running of the RAAF which is insufficient to test or adjust our understanding of the magnitude and value of these activities in the overall context of the war. Judging the number of university theses which deal with strategy, tactics and logistics of the Australian Army, operations overseas appears to remain a productive topic for authors and students of military history.[55] However, these scholarly studies have created a gap with respect to the RAAF, which this thesis will fill.

This thesis describes the 1930s and 1940s technology and weapons systems and increasingly complex logistic requirements during wartime Australia. It demonstrates the long lead times and large costs involved in establishing and maintaining an air force capability, establishing the necessary supply methods, including many of the broad principles in acquisition and sustainment logistics. It also illustrates the initial infrastructure and resources available for a new or replacement operational capability (e.g. usage of fuel, spare parts, and ammunition in contingency operations). It was impracticable to deal in equal measure with all sections of the RAAF wartime operations. This is why I have concentrated on the RAAF forward bases, many of which were

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[54] Julian Thompson, *The Lifeblood of War: Logistics in Armed* Conflict, (Brassey, London, 1991), pp.3, 8.

[55] For example, Ross A. Mallett, 'Australian *Army Logistics in the South West Pacific 1943-1945'* (Ph.D. Thesis), Australian Defence Force Academy, University of New South Wales, School of History, Canberra, ACT, 2007; John Clifford Moremon, *A triumph of improvisation, Australian Army operational logistics and the campaign in Papua, July 1942 to January 1943* (Ph.D. thesis), Australian Defence Force Academy, University of New South Wales, University College, Canberra, ACT, 2000.

established soon after Japan's first air raids in February 1942 on Darwin. This by no means undervalues the importance of southern aircraft depots such as those at Laverton (Victoria) and Richmond (NSW).

Although welcomed by the War Cabinet, the arrival of US troops created a number of logistical problems. Due to the limited scope of pre-war planning, there was insufficient capacity to accommodate or attend to the operational needs of the United States Armed Forces in Australia (USAFIA). The buildup of US Forces accelerated a multitude of independent ongoing projects, creating an increasingly complex environment that affected outcomes by over-extension of resources. USAFIA's need of ground support facilities overwhelmed RAAF resources which were already less than adequate for their own requirements. US forces needed land to establish bases, inland ferry routes and storage in addition to camp accommodation, catering, transportation and equipment. One of their most vital needs was aircraft depots and freight terminals.[56] Until the establishment of their own facilities in early 1942, they were dependent on the aviation staff of Laverton Depot (1AD) who overhauled, tested and calibrated huge numbers of US aircraft. Finding adequate tooling and experienced personnel for the maintenance of American Pratt & Whitney Twin Row Wasp engines was complex. This led War Cabinet on 15 July 1942 to immediately approve the release of additional buildings and facilities in Queensland, New South Wales and in Victoria.[57]

As little has been written on how the RAAF was equipped, on aircraft manufacture and particularly on aircraft repair depots and types of maintenance, the documents held at the National Archives of Australia were extremely useful. Documenting the mechanics of cooperation

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[56] NAA: A9186, 288, RAAF History Sheets (Form A50), Operations Record Book, No. 1 AD, Laverton, Victoria, 1920-1942, Squadron Leader's report, April 1942.

[57] NAA: A2684, 987, pt. 1, Repair and maintenance facilities for US aircraft in Australia, War Cabinet's agreement to provide facilities to USAFIA, 15 July 1942.

between the RAAF, the Australian Army, the USAFIA, governmental agencies and civilian organisations helped to identify performance issues which reduced the effectiveness of providing for the Australian services during this critical period of Australia's military history.

To achieve its objective this thesis is presented in chronological form whenever possible and addresses specific questions pointing out the many problems that impacted the development of the RAAF and demonstrating how the inflexible structure of bureaucratic governance and control remained almost entirely unchanged during wartime. As a result, the building up of Australia's infrastructure developed in fits and starts. Approval for projects were deferred consistently. Given these obstacles, the defence of Australia may have turned hopeless had it not been for the tremendous efforts of all those men and women involved in providing the capabilities needed to solve problems and achieve positive objectives. These issues form a general background to this study and will be considered at appropriate points throughout.

An important source for my research were the numerous Agendas and Minutes of War Cabinet level meetings and also records generated by various committees, sub-committees and by the departmental administrative processes. Although some of the minutes, cablegrams, and other documents related to various administrative and defence matters were at times lacking in dates, names and positions of authors, addressees, and explanatory detail on abbreviations, I was, nevertheless able to construct a reasonable picture of the logistic developments. A number of documents relating to defence procurement and infrastructure projects indicate the many challenges encountered. Using these documents, I argue that while the establishment of factories was approved in different areas of the country, the key problem was supplying the forces based in the north, which involved transport over long-distance.

I am particularly interested in the strong participation of the Australian Army in supplying the RAAF and the role of commercial organisations in supporting RAAF operations. The confidential dossiers

and working documents of the Department of Munitions (DOM) and the Department of Supply and Development (DOSAD) provide an understanding of this aspect of defence functions. Most important were the Department of Defence's correspondence files (1939-1944) which contain a wealth of technical information regarding armaments, manpower and deployment of service personnel in northern Australia. I also consulted the correspondence files of the DOM relating to RAAF Aircraft Depots (RD) (1940-1947) and the files of DOSAD, (1939-1945), regarding the supply of munitions, manufacture and assembly of aircraft components and the acquisition of weapons.

The Department of Works' correspondence files (1939-1944) provided detailed information on construction projects. Also useful were the Prime Minister Department's correspondence files. These documents provide a deeper view of defence preparations. The usual limitation imposed on archival records with a 'not yet examined' marking required special clearance to enable access. Much of this evidence was not readily available at the time when I was asked by the logistic branch of the Royal Australian Air Force in Canberra to carry out research on the RAAF's logistic operations during World War II.[58] The record of Parliamentary Question Time provided many leads and assisted me to direct my research further. I have drawn on some Commonwealth Parliamentary Debates from the 1920s, 1930s and 1940s as these provide important indications of contemporary thoughts and opinions on Australia's planning efforts before and during the period of interest.

Most of the working documents and files I reviewed originated at quite low levels in the organisational hierarchy of various administrative, supply, maintenance, construction and manufacturing organisations, in both the military and public service relating to RAAF, aircraft production and munitions industries. As in any large establishment, a sound

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[58] Myriam S. Amar, *The logistic support of the RAAF and associated activities in the northern area of operations during World War II – 1939 to 1945,* (Canberra, August 1993, unpublished monograph).

managerial structure could not achieve its full potential and be operational without the complement of systems and processes. In this, RAAF Headquarters, units' commanders and the Air Board were constantly reminding personnel to provide general service information for later inclusion in the official history. My thesis identifes the problems encountered at various levels in the process of planning, implementation and administration, particularly where the causes can be attributed to shortcomings in strategic thinking or inadequate organisational planning. Because planning cannot be realised without the sustained contribution of human effort, I believe that behavioral traits are important in understanding why some personnel managed to come to grips with their allocated tasks, while others did not.

It has to be recognised that many of problems uncovered result from the views of Commanding Officers as reflected in their reports, log books and general correspondence, and this no doubt introduced certain biases to my investigation. Highlighted are some of the administrative problems encountered in logistics, mostly due to a general lack of resources and worsened by the ever present challenges of distance, harsh terrain and climate. In selecting archival records related to the supply of services, equipment and transport to the RAAF, the records enabled me to identify the major events involved in building defence capability, as well as the difficulties encountered in executing strategies not yet tested in wartime. These sources provide ample examples of logistic failure and success as the RAAF, Army and Navy strived to build effective lines of communication and control from a zero base.

This thesis addresses the many complications in supplying the RAAF and USAAF, the politics involved in acquiring a suitable aircraft for the RAAF and the range of operating procedures which developed in the various repair depots. Each chapter retraces the decision-making processes behind various colossal logistical endeavours. I show that attempts to build up the northern defences and expand military capability were hampered by the magnitude of the tasks consistent with the capacity of organisational and resource aspects of war production. In

addition to identifying the positive achievements of logistics, I note some failures and inefficiencies, particularly in planning. All chapters deal with details of planning processes at the highest levels of government, the various Departments of State, the leaders of industry and the Chiefs of the armed forces. Included also are first-hand accounts by military and civilian organisations of subsequent phases of implementation, the establishment of aircraft production and the role of the RAAF in Aircraft Maintenance, Stores and Ordnance Depots. These activities were amply recorded in the records of Australia National Archives at Canberra and Melbourne and at the Australian War Memorial in Canberra, but in many cases, not in a structured and easily accessible form.

On 2 June 1944, the Air Board asked all RAAF units to write down events that had taken place 'whilst memory was still fresh on the minds of members'.[59]

> it cannot be too strongly impressed on all concerned that the contents of the history of the RAAF will depend solely on the material supplied by formations and units. No effort, therefore, should be spared to make units ''history-minded''; no documents, photo, map, sketch or relic should be overlooked which may provide some line which will assist in the ultimate chronicling of the part played by the RAAF.[60]

Likewise, the aim of this thesis is to understand the activities of the RAAF from its creation until the start of the Pacific War when Australian pilots made good use of the experience they had gained overseas, when they engaged in air battles against the Japanese.

Chapter summaries

Chapter one shows that Australia was far from self-reliant in the 1920s due to its lack of general resources the development of military

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[59] NAA: A705, 180/1/198, DWB [Director of Works and Buildings] – W2 Section – History. Air Board memorandum to all units, 2 June 1944.

[60] NAA: AA1969/100, 109/1/AIR, 29 Air Stores Park. Unit History Sheets, A50: Official History of the RAAF. Memorandum from Group Captain of No. 10 (Operational) Group to personnel, on 2 June 1944.

commitments could not be achieved. Prior to the war, a severe economic depression constrained revenue, forcing a marked reduction in defence spending. Between 1939 and 1940, funds were injected into war-related production. Lines of communication were gradually improved to meet the demands of Australia's military forces. Infrastructures were expanded to include a much wider range of functions to support increasingly complex operations overseas. This chapter details the strategic situation when Darwin was attacked by Japanese fighters and accounts for the appalling state of Darwin's defence.

Chapter two examines the light raids policy and the Singapore strategy. As Australia was culturally and sentimentally bonded to Britain, Australia assumed that Britain would defend Australian shores if there was ever a major threat to sovereignty. Both Lyons and Menzies supported the light raids contingency reinforced by the fact that the Navy was considered as Australia's frontline of defence. In fact, in 1925, the RAAF was confident that they would be able to control Australia's sea communications and that regular patrols would provide sufficient protection to coastal traffic. They did not consider more distant threats to trade or other interests.[61] However, in practice, allegiance to Britain made it difficult to reject the notion of a British rescue, but by 1940 some military strategists and politicians began to believe that the Singapore strategy was inducing a false sense of security.

Chapter three argues that even as an integral part of the British Empire, Australia could no longer stand alone without a well-established and efficiently run munitions and aircraft manufacturing industry.[62] The difficulty in the 1930s was finding technical experts and skilled manpower. The outbreak of war in Europe exposed the limitation of Australia's dependence on overseas supply of military equipment as Britain was hard pressed to equip its own forces. This chapter considers

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[61] Cox, 'The RAF and RAAF. A close association in war and peace', p.152.

[62] George Odgers, *Air Force Australia*, (National Book Distributors, Brookvale, NSW, 1989), p.51.

wartime demands for essential munitions and equipment materials, such as metal, magnesium, aluminium and nickel, and demonstrates how Australia met these demands. Uncertainty as to what might happen in the Far East led Australia to stop Japanese companies acquiring nickel from New Caledonia, showing the increasing and strategic importance of raw material for the manufacture of aircraft and munitions. That also showed an increasing decisiveness in attaining Australia's objectives.

Chapter four addresses the reasons for the creation of an Australian air force. There were many factors affecting the decision. The new air arm faced bitter opposition from the Army and the Navy, both fighting for funding and unwilling to see the utility of the new service. As a result, the new air arm struggled to survive financially, and was further frustrated on what role would be assigned to it.

Chapter five explores the problem the Air Board had in selecting a suitable aircraft for the RAAF and the politics involved in acquiring aircraft. With the worsening political situation in Europe and the likelihood of a new war with Germany threatening Britain, Australia's key strategic policy was to ensure its armed forces had a good supply of weapons and equipment. To achieve this, a mutually beneficial partnership was formed. Most weapons and equipment were at this time (pre-1937) imported from Britain incurring long-lead times for delivery, imposing risks associated with acts of war affected supply.[63]

Chapter six argues that the quest to acquire the American NA-16, which was a modern all-metal advanced aircraft trainer, developed into a laborious affair between the Air Ministry and Australia's Air Board. The Board was interested in acquiring a general purpose reconnaissance aircraft to support naval operations in coastal waters, eventually leading to the decision to acquire the Bristol Beaufort and to construct those machines in Australia. This chapter explains why CAC was unable to take charge of its manufacture because of vested interests in Britain's

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[63] Gillison, *Royal Australian Air Force*, p.70.

aircraft monopoly in Australia. As a result of British interference serious discord occurred between CAC who had acquired experience in building the Wirraway and wished to carry on building other aircraft.

Chapter seven details work performance in various aircraft repair and maintenance depots and the role of ground staff in maintaining aircraft capability. For the first time, I describe the work carried out in aircraft depots and the ingenuity displayed by technicians who maintained a high standard of skill in seeking to improve serviceability and render aircraft operational. In view of the large number of grounded aircraft caused by a substantial shortage of spare parts at repair depots during the war years, this chapter asks what caused such shortages. What steps were taken to secure requirements? Would an estimated requirement be sufficient to maintain servicing? The major causes of low serviceability were due to the difficulty of obtaining spare parts from overseas but also by reason of Britain's own acute general shortages of material, which naturally led her to place an embargo in 1940.

Chapter eight fills in a gap in the literature by including the clerical support activities that tend to be glossed over in preference for, the more glamorous activities of a pilot. As this chapter shows existing directions set out in various RAAF Instructions, Air Board Orders and various other documents, clearly and concisely indicate the apparent failure on the part of some personnel to comply with instructions. It records instances of bureaucratic inefficiency and oversight, and numerous other difficulties that had detrimental effects on programs or personnel.

Chapter nine redresses the lack of attention paid by military historians to the Army's role in providing logistical support to the RAAF. As a small organization, from its foundation the RAAF depended on the Army for essential logistics, in terms of vehicles, drivers and organisational experience. The fact that drivers had to negotiate their ways in mostly rough terrain to reach industrial plants dispersed in 16 locations across Australia made delivery a challenge to be reckoned with. The inference here is that while this level of operational detail may seem unimportant in the grand scheme, small details cannot be ignored, having

real impacts on final outcomes. Without the support delivered by the Army, major logistic endeavours would almost certainly have failed.

The conclusion is a review of the multitude of logistical problems related to the strengthening of Australia's northern regions and how these were addressed. During the Depression years, providing the resources needed to the armed forces depended on the capacity of the local industries but also on the availability of finances. The magnitude of the response required from the Australian military forces, industry and the civil population was unprecedented in Australia's history. Upgrading Australia's defence and industrial capabilities on this scale presented many new challenges, requiring solutions that could not rely on prior experience alone.

Chapter One: The defence capability question and political complacency

The aim of this chapter is to examine Australia's military defence capability in the 1920s and 1930s through the development of defence strategy and the underlying policy decisions. One important determinant of defence policy since Federation was the generally accepted idea that belligerent actions by foreign powers could at some future time challenge the nations' security.[1] By concentrating its efforts in providing support for a centralised British Empire plan, Australia could not appropriately respond to the Japanese threat. Overall, even with the benefit of a flexible defence strategic policy, the many political and economic issues and unforeseen circumstances made planning a complicated issue. To cite one example, what happened at Pearl Harbor and Singapore in December 1941 was beyond the imagination of loyal British subjects, including many defence strategists.

In the early twentieth century, the majority of Australians traced their historical, cultural and ideological roots to Britain. This heritage was reinforced by common legal, political and religious systems with the mother country guaranteeing enduring bonds of 'national feelings and identity'.[2] As such, most Australians were confident that Britain would provide for their security and without much effort as expected of a leading nation of the world. They were obviously blind to the fact that the Imperial policy was by design 'good for Britain' but not necessarily good

[1] Ross, 'The Economics of Rearmament 1933-39', p.36.

[2] Neville Meaney, *Australia and the Wilder World, Selected essays of Neville Meaney,* James Curran and Stuart Ward, (eds.), (University Press, Sydney, 2013), p.143.

for Australia.[3]

Australians' consciousness of their national identity was a rather complex issue.[4] The mother country was so fundamentally embedded in their mindset that government action for Australia to stand on its own was not widely canvassed by the Australian public or included in the political leaders' agenda. As Coral Bell points out, such a commitment to Britain had become 'a persistent national addiction to a usually comfortable dependency … the easiest and least costly way out of assumed strategic dilemmas'.[5]

Australia's approach was of one mind in matters relating to Britain. According to Peter Stanley, 'Constitutional, economic, political, sporting and kinship ties linked Australia intimately to the Empire'.[6] When war broke out in Europe even the Labor Party, with its 'strident pacifism and neutralism',[7] were talking about defending 'seven million British subjects, but also three million square miles of British territory, and one thousand million of British investments'.[8]

The political changes that occurred at the outbreak of World War II saw government making every effort to assist Britain until Japan chose to flex its imperial might and enter in the war on the Axis side. This great moment in history dislocated Australia's strategic basis. Having significantly contributed to Britain's struggle in World War I, and although concerned about its vulnerability, Australia was still prepared to delegate responsibility for the defence of Britain and committed RAN ships which

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[3] Weston, 'The Australian Aviation Industry', p.70.

[4] Philip Payton, *Australia in the Great War*, (Robert Hale, London, 2015), p.15.

[5] Coral Bell cited in Carl Bridge & Bernard Attard's 'Introduction', *Between Empire and Nation: Australia's External relations from Federation to the Second World War,* (1-31), Carl Bridge & Bernard Attard, (eds.) Australian Scholarly Publishing, Melbourne, 2000, p.2.

[6] Peter Stanley, *Invading Australia: Japan and the battle for Australia, 1942*, (Penguin Group, Camperwell, Victoria, *2008), p.67.*

[7] *Meaher, The* Australian Road to Singapore, p.65.

[8] Stanley, p.67.

were placed under the command of the Admiralty. The Government focal point was to recruit another Army and send another Australian Imperial Force to join the ground war and comply with EATS, which introduced on 17 September 1939 had become operational in April 1940.[9] Part of the reason for this lay in her subservient attitude to Britain which clearly discouraged the emergence of independent thinking on defence matters at many levels of government and military. This in effect created a situation where both parties operated from different assumed positions, and failed to recognise the need for proper negotiation and clarification of the underlying reality. Australia's participation in Imperial Conferences showed that she had little decision-making power. This was apparent in the Australian delegation at the Geneva Disarmament Conference of 1932. Held under Scullin (1929-1932), the delegation had actively participated in all the discussion associated with the reduction and limitation of armament proposed by the British delegation. Australia's contribution to its own safety was totally disregarded when a proposal applicable to her defence interests was under discussion.[10]

Australia's prospects of rearmament, 1920s

Maintaining and developing Australia's military capability required appropriate resources. Primarily as historian Augustine Meaher argues, 'rearmament was not a profitable enterprise for most of the inter-war period because of the small size of the Australian market and had little attraction to an industrial elite focused on profit'.[11] Australia's industrial base which began in the early 1900s took many years to develop. In the 1920s, the manufacture of large quantities of weapons and munitions would have involved the investment of large sums, money that Australia

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[9] David M. Horner, *High Command, Australia & Allied Strategy 1939-1945*, (George Allen & Unwin, Sydney, NSW, 1982), p. xix.

[10] NAA: A664, 404/401/134; Lyons' government administration during 1932, Statement on Review of activities sent by the Minister of Defence, Sir George Pearce to Prime Minister J. A. Lyons, 12 December 1932.

[11] Meaher, *The Australian Road to Singapore*, p.1.

just did not have due to the pervading influence of repaying its huge World War I debts.[12] Between 1921 and 1924, Australia's financial problems limited defence expenditure on ships and aircraft. Coupled with this was the belief that Britain would defend Australia, Cabinet reduced the Naval Board's budget of £4.2 million for 1920-21 by £1 million. As a result there were insufficient funds to maintain the existing naval fleet. Many destroyers were paid off during 1922 and naval personnel were reduced by thirty per cent. To save on coal, the ships were restricted to harbor. In late 1920s the RAN still lacked modern destroyers to defend Australia and patrol the surrounding seas.[13] The logical answer for the Australian government was to get the economy back to normal as fast as possible and obtain the needed 'additional finance by raising taxes and/or local loans, or to engage in deficit funding'.[14] However, if these measures were carried out, the likelihood of reviving the economy would diminish leading to a recession or depression, that would destroy the revenue base needed to finance upgrading defence forces and worse, would result in the complete collapse of the nation's economy.[15]

In the interim, the exploits of aviators such as Charles Kingsford Smith, Bert Hinkler and others entered the consciousness of the Australian public to become national icons of the 1920s and 1930s.[16] But in evoking this sense of patriotism, Billy Hughes and George Foster Pearce's efforts to restore Australia's aviation played a vital role to the

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[12] Ross, 'The Economics of Rearmament 1933-39', p.37.

[13] Ray Jones, *Seagulls cruisers and catapults, Australian Naval Aviation, 1913-1944*, (Pelorus Publications, Hobart, Tasmania, 1989), p.20, 29, 53.

[14] Ross, *Armed and Ready*, p.113.

[15] Bernard Attard, 'Australia as a Dependent Dominion, 1901-1939', (1-31), in *Working Papers, Australian Studies,* no. 115, (Sir Robert Menzies Centre for Australian Studies, Institute of Commonwealth Studies, University of London, 1999), pp.12, 17. (n.p).

[16] Leigh Edmonds, 'Edgar Johnston and the Empire Men: Commonwealth Government Control of Aviation in Australia during the 1930s', (261-280), William M. Leary, ed., *From Airships to Airbus: The History of Civil and Commercial Aviation*, (Smithsonian Institution Press, Washington DC, 1995), p.263.

future of aviation, especially in wartime.[17] Behind the scenes, Edmonds shows that battles were fought in boardrooms with Commonwealth bureaucrats taking control of civil aviation legislation and administration in December 1920. However, most pilots and local aviation company gave support to this arrangement as they did not want 'six separate sets of state aviation regulations that might replace unified control'.[18]

Situational changes in the 1930s

The Depression also heavily impacted on Australian exports and as Australia's primary economic interests were linked to Britain, restoration of world trade was critical for Australia's economy.[19] As trading was vitally important to Australia, appeasement of their second largest trading partner, Japan, took precedence. The Lyons government continued to trade with Japan while meeting Australian and Empire trade requirements.[20] During the financial year of 1932-33, a surplus of several million pounds was achieved.[21] On 1 July 1932 Cabinet allocated funds to the Navy, the Army and the RAAF.[22] At the time the RAN only had four ships in commission and the nearest substantial Royal Navy (RN) fleet was stationed 10,000 kilometers away in Chinese waters, and it only had one carrier and no battleships.[23] As Stanley remarked, Australia's forces were 'quite unequal to the task of defending even a fractional part of the country against an invader'.[24] In 1934, *The Herald* warned the Australian public to reflect on the establishment of huge

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[17] *Ibid.*, p.264.

[18] *Ibid.,* p.266.

[19] Waters, *Australia and Appeasement*, p.6.

[20] *Ibid*., p.376.

[21] Ross, 'The Economics of Rearmament 1933-39', p.37.

[22] Coulthard-Clark, *The Third Brother, The RAAF 1921-39,* p.97.

[23] S. Svonavec, 'The Royal Navy 1932', *Fleet Organization Website*, http://www.fleetorganization.com/1932rnforeign.html, URL retrieved on URL retrieved 13 February 2018.

[24] Stanley, *Invading Australia*, p.44.

naval bases, of great aviation activity and storage of supplies by various powers increasingly nearer to Australia than they had dreamed of before. The newspaper also informed the Australian public on Japanese activities in Manchuria and spoke of Australia's vulnerability if future events forced action upon its shores.[25] Comments like these made defence preparedness and self-defence initiatives major issues in the September-October 1937 Federal election.[26]

During June 1937, due to the increase of Australia's commodities' exports and with general economic conditions improving, the wheels of industry and commerce accelerated. With caution, defence spending could be increased. In delivering his budget speech in June 1937, Treasurer R.G. Casey announced that since the Lyons government assumed office, Australia 'from the valley of despair (had) emerged into the sunlight' from the economic and financial point of view' as the Commonwealth Public Debt (as distinct to that the States) which amounted to £398 million had been reduced to £11 million.[27] At the 1937 Imperial conference the Australian government learnt details of the German and Japanese rearmament and was informed by the British government that it would take both nations' years to rearm.[28] In the meantime, Australia was advised to provide its Empire a measure of security.[29]

Instead, the Government failed to implement a strategic policy of building up the defence forces. In 1938, the Lyons government had encouraged London to take a soft line towards Japan and her interests in

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[25] NAA: A981, CHN 165, pt. 2, China-Manchuria – Japanese policy, 1932. Memorandum from W.R. Hodgson, Assistant Secretary of DOD commenting *The Herald*'s warning to the Intelligence Section of the General Staff of DOD, 26 July 1934.

[26] Paul Burns, *Brisbane Line* Controversy. *Political opportunism versus national security, 1942-45*, (Allen & Unwin, St Leonards, NSW, 1998), p.15.

[27] NAA: A4311, 365/12. Budget Speech 1937 - 1938 delivered by the Honourable R.G. Casey, Treasurer in Parliament, p.20.

[28] *Ibid*.

[29] Ross, 'The Economics of Rearmament 1933-39', p.39.

China, despite widespread criticism from the Australian media.[30] On foreign policy, Sir George Pearce, Robert G. Menzies and Stanley Bruce also favoured Britain's position on appeasement.[31] Sir Earle Page, founder and leader of the Australian Country Party, supported Neville Chamberlain's appeasement of Germany because the Country Party was attracted to the opportunities to expand trade in commodities, as was the United Australia Party. The veteran United Australia Party minister William (Billy) M. Hughes was an exception. He embarrassed the government with his 1935 book *Australia and the War Today*, which exposed a lack of preparation in Australia for what he accurately believed to be a coming war.[32]

Any unease about Japan's emergence as a military power following the Russo-Japanese conflict (1904-1905) was not well reflected in federal government policy. According to the Director of Intelligence (1916-1919) and head of the Pacific Branch and Foreign Affairs Sections of the Prime Minister's Department (1919-1923). Edmund L. Piesse, Australians had no reasonable grounds to fear Japan. Basing his view on conversations with some of the British and Americans in Japan, Piesse reported that 'expansion for expansion's sake was not a significant item in Japan's foreign policy'. Japan's territorial expansion could best be explained by its desire for economic growth and resource needs, as well as prudent security against overseas attack, rather than a desire for imperial conquest. Apparently, Japan was somewhat disturbed by America's naval build up in 1919 and consequently wished to prepare themselves for 'a war of defence in home waters'.[33] By 1922 Piesse had changed his tune, warning that should Japan get hold of Chinese

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[30] *Ibid*., p.27.

[31] Carl Bridge 'Appeasement and After: Towards a Reassessment of the Lyons and Menzies Governments, Defence and Foreign Policies, 1931-41', (372-379), *Australian Journal of Politics and History*, vol. 51, (2005), pp.373-374.

[32] Brian Carroll, *From Barton to Fraser*, (Cassell Australia Limited, 1978), p.65.

[33] Neville Meaney, *Fears & Phobias E.L. Piesse and the Problem of Japan 1909-39,* (National Library of Australia, Occasional Papers, Series, no. 1, Canberra, ACT, 1996), pp.1, 24.

resources the world would be endangered.[34] In 1929, the Depression badly affected Japan's economy. Unable to either sell its manufactured products on the world market or afford to import raw materials and food, Japan found itself in a very precarious situation. Many Japanese saw the release from their predicament in territorial expansion.[35]

By late 1931, the Japanese Army conquered the whole of the Chinese province of Manchuria with its rich coal and iron resources. In 1937, Japan swept into eastern China. In May 1940 France was invaded by Germany and by September Japan invaded Indo-China, providing the opportunity to finish off its war with China.[36] Roosevelt, in reprisal, cut off the supply of oil to Japan. Japan's urgent imperative was to find another source, and the most attractive oil reserves lay in DEI, south of Britain's colonial territory of Malaya and east of the American controlled Philippines.[37] In seeking the rich natural resources of DEI, the more aggressive elements in Japan, including the military, believed that Japan was entitled to the resources that were essential to acquiring a colonial empire of their own.[38] Japan was faced with the decision of acquiescing to America's demands to withdraw from the territories it was occupying, or eventually going to war against America.[39]

Australia's political and defence posture, 1920s-1940s

At the Imperial Conferences of Prime Ministers in 1923 and 1926 the value of establishing a chain of aircraft refueling stations at appropriate points around Australia was endorsed in principle and was recognised as essential to the RAN's role in maritime surveillance. At the 1923 Imperial

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[34] Meaher, *The Australian Road to Singapore*, p.72.

[35] *Ibid.*, pp.7,8.

[36] *Ibid*., pp. 9,12.

[37] Peter Chrisp, *The war in the Pacific*, (White-Thomson Publishing Ltd, 2003), pp. 6, 8-9, 12, 32-33.

[38] *Ibid.*

[39] *Ibid.*

Conference, Britain recommended that Australia acquire additional naval vessels. They were in effect for the protection of the routes and waterways the Empire needed for their armed forces and trade to pass.[40] Likewise British keenness to see Australia achieve a minimum standard of naval vessels and to attain a high level of operational compatibility with the RN is obviously indicative of Britain's desire to maintain a pre-imminent position and an expectation that the Dominions achieve a higher level of self-defence.[41]

By 1934, progress on formulating an adequate defence strategy had reached a deadlock in which successive governments struggled to convert ideas into practical plans. For example, Scullin's decision-making on defence was dictated by his views of economic necessity, but he was incapable of coping with the lingering effect of the Depression. He had a ready-made excuse to exit from his responsibility by declaring to Parliament that 'Australia should concentrate upon purely defensive, non-aggressive equipment that will not be provocative, but will emphasise [Australia's desire] to live at peace'.[42]

Meaher suggests that in the 1920s and 1930s the nation was governed by a group of elites who did not have the education or military knowledge to fully comprehend what was required of them. Incapable of reaching an agreement on the Japanese threat, they blocked political representatives from presenting a realistic defence policy. However, Meaher simplified Australia's dilemma. Certainly, most Australian politicians would have appreciated that the nation needed to prepare its defences for an eventual conflict. But the severe economic downturn made successive governments focus on financial and economic survival. As such, they could not respond positively to any threat due to

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[40] The Parliament of the Commonwealth of Australia, Imperial Conference, 1923: Summary of Proceedings, (Government Printer for the State of Victoria, 27 March 1924), p.8.

[41] *Ibid*.

[42] Meaher, *The Australian Road to Singapore*, pp. xxi, 2.

lack of general resources. Of course, as Meaher rightly points out, Australia's political system was to blame, because 'rearmament required bipartisan agreement'.[43] Personal beliefs and petty point scoring hindered the development of coherent policies for the common good, on defence or national development.

Labor's victory in the national ballot on 12 October 1929 almost coincided with a great stock market crash in the United States. In the following two years imports fell by two thirds. Unable to pay the money back, the Government needed to roll over the existing loans. To pay the bills as tax revenue fell and spending increased, governments needed to continue borrowing. A vicious cycle unfolded as borrowing more funds delay economic recovery making the difficulty of repaying borrowed funds plus mounting interest was unlikely to be achieved for decades.[44]

The financial situation affected the Chiefs of Staff to the point that getting funds from government had become a struggle and part of their daily occupation. Of course the Chiefs should have worked together to provide coordinated advice to their respective ministers. Instead, the only issue on which the Army and the RAN agreed was their aversion for the air force. Not that Cabinet had much prospect of strengthening the nation's economic base. Solving the problem of World War I debt to Britain required long-term planning and was too challenging for the political leadership in economic and political climate at that time. For example, Scullin by encouraging a policy of non-violence naturally led to the abolition of conscription and in turn a significant reduction in defence funding.[45] Successful defence programs whether for short or long term require good planning and clear objectives. As early as 1925 the Committee for Defence forewarned that Darwin if in a war with Japan would be of a considerable importance if seized by Japan who would use

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[43] *Ibid*., pp.19, 56, 84.

[44] John Edwards, *Curtin's Gift. Reinterpreting Australia's greatest Prime Minister,* (Allen & Unwin, St Leonards, NSW, 2005), pp.97-98.

[45] Meaher, *The Australian Road to Singapore*, pp. xvii, xxi, 115.

it as a land base to attack other northerly bases.[46] Part of the problem is as Meaher suggests that Australia's national leaders failed to agree over the nature or even likelihood of threats Australia, might encounter. Also, the nation was unprepared for war because of the inability of politicians, military and industrial leaders to outline a strategic plan. This inadequacy was excused by the argument that Australia's small industrial market attracted few industrial leaders sufficiently 'focused on profit'. This failure to reach consensus meant that by early 1942, Australia's technology was far behind that of Japan, and the nation lacked the ability to assert local command of the air or sea.[47] Meaher's assertion is complicated by the fact that Australia had to make do with restricted defence budgets since the Depression which resulted in substantial time-gaps between planning and building.[48]

Australia's defence, 1938-1942

The three services capabilities were reviewed by the Minister for Defence, Sir Archdale Parkhill at the Imperial Conference program of 1937-38. The RAN received a major portion of the new funding to enhance its blue water squadron. The Army acquired the next largest share for coastal artillery batteries, anti-aircraft defences for major cities and the development of a mobile force and a token contribution maintaining the skeleton seven division home defence force. The RAAF received a very modest increase to its budget to develop its support responsibilities to the two other services.[49]

At the Military Board meeting in February 1939 members proposed

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[46] NAA: A2694, vol. 3, Lyons and Page Ministries, Folders and bundles of minutes and submissions, 1932-1939. Cablegram from the Department of External Affairs to the Australian Minister, Washington. Notes on Chiefs of Staff Committee Agenda: Defence situation at Broome and Northwest coast, 9 March 1942. Copies to the Ministers for External Affairs and for the Army; Departments of the Army and of Defence Coordination.

[47] Meaher, pp.1, 2.

[48] Ross, *Armed and Ready*, pp. 4, 7, 10.

[49] *Ibid*., pp.111-114.

to create a minimum number of Army units as a starting point.[50] This peacetime proposal, detailing locations, accommodation associated work projects and estimated costs, was forwarded through to E.K. Squires, Inspector General for the Army for ministerial consideration. The inspector noted the units would be 'thin' if they had to mobilise in the next two or three years. In the case of the First Field Ambulance it could be made up to war establishment rapidly by calling up reservists.[51] In terms of encouraging men to join the local defence forces, there was no shortage of volunteers. As a result of the War Cabinet decision, fifteen Garrison Battalions numbering 13,500 men and inclusive of those already enlisted were raised.[52] This greatly increased local militia was still inadequate as a national defence force and would have stood little chance of defending the north against well-equipped, experienced and disciplined Japanese forces. To counter the Japanese, Australia needed aircraft carriers, up-to-date combat aircraft, and an abundance of weapons and ammunitions. As will be seen in the next chapters, these were sadly lacking. Following Japanese territorial expansion, on 9 March 1939, and advice from the Secretary of the Naval Board to DOD, Australia's three services were each tasked to defend Australia's ports. The Navy was to coordinate ships at sea, signal stations and coast watching. The Army's task was to handle anti-aircraft, other units and military reporting, while the RAAF was responsible in air patrols.[53] The Australian government also approved several moves to strengthen its northern borders. By September 1939, No.12 Squadron was deployed to

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[50] NAA: A4311, 365/12. Budget Speech 1937 - 1938 delivered by the Honourable R.G. Casey, Treasurer to Parliament, p.20.

[51] NAA: A2653, vol. 5, Military Board Proceedings W(ithout) N(notice) Matters. Minute from E.K. Squires, Inspector General for the Army, to the Minister for the Army, February 1939.

[52] NAA: A2684/3, pt. 1, Operations Record book. Minute of War Cabinet meeting, Canberra 28 May 1940; Agendum No. 11/1940, Australian air cooperation with the United Kingdom Government.

[53] NAA: A5799, 14/1939. Coordination of defence at defended ports, 2nd report of Sub-Committee. Agenda No 14/1939, March 1939. Report issued by the Secretary of the Sub-Committee, D. Chapman, 26 January 1939 and signed by J.A. Collins, Assistant Chief of the Naval Staff.

Darwin for general reconnaissance and anti-submarine duties. A number of infantry detachments, anti-aircraft batteries including the 7th Fortress Company, Australian Engineers were also deployed in the area.[54]

Why Cabinet decided to build a naval base at Darwin

Endorsed at the Council of Defence meeting on 24 August 1936, the naval base at Darwin was built on the understanding that it would provide back-up support to the RN fleet base in Singapore. The naval fuel oil supplies and ship repair facilities would be available if the Singapore base was attacked. Government had also envisaged that a Darwin-based RAAF squadron would maintain a link with the British Royal Air Force (RAF) base at Singapore.[55] As a first step, increasing the capacity of the Darwin naval re-fuelling station, which Parliament had first approved in 1924, led to the construction of four 8,000-ton oil tanks at Stokes Hill. This location was seen as first-rate, being protected from enemy ships attack by the yet to be constructed fixed defences of the harbour.[56] On 28 January 1942, the Business Manager (Navy) to the Naval Board submitted a proposal to increase storage capacity for naval fuel oil by 84,000 tons. Sydney Melbourne and Fremantle were each allocated 24,000 tons and Port Moresby was to receive 12,000 tons, at an estimated cost of £264,000.[57]

Also, during the late 1930s DOD in cooperation with state governments approved plans for additional operational airfields and related infrastructure. However, due to the large amounts of funds

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[54] Richard Reid, *Australia under Attack, Darwin and the Northern Territory,* (Department of Veteran's Affairs, Canberra, 2007), p.4.

[55] NAA: A2694, vol. 3, Lyons and Page Ministries, Folders and bundles of minutes and submissions, 1932-1939.

[56] Robert J. Rayner, *Darwin Detachment, A military and social history*, (Rudder Press, Wollongong, NSW, 2002), p.10.

[57] NAA: A649, 224/601/207, Agendum No 47/1942 from G.P.N. Watt, Assistant Secretary, Treasury Department, Defence Coordination Division, Melbourne, 10/2/1942, to the BBA Agenda: Additional storage of naval oil in Australia. Oil increased storage facilities for the Dept. of the Navy.

involved, Cabinet sought the views of the Defence Committee and the Council of Defence. Both advised to keep very careful scrutiny on cost. The committees decided to complete a chain of aircraft stations at suitable points round the Australian coast. To protect naval oil at Darwin, a RAAF Squadron was to maintain a link with RAF Squadrons at the Singapore base. Having reviewed their local defence, in December 1940, War Cabinet estimated that in the event of regional hostilities, the RAAF would use 15½ million gallons of aviation spirit (including for training requirements) in six months. The greatest consumption would occur in the first few weeks when wastage of machines would be higher.[58]

Meanwhile, the concerns brought about by Japan's continuous aggression led RAN to launch a series of naval exercises 'to locate, and destroy or repel a 'raider' and to employ 'fixed defences firing at a high speed target' which somewhat expunged the light 'raid' theory'.[59] The capability and general readiness of Australia's defences were severely tested by an enemy reporting exercise held on 24 May 1940 to coincide with the return of HMAS *Westralia* from a short cruise in Northern Territory waters. The following is indicative of the problem:[60]

> intelligence spotted at 1724 on the 13 May 1940 an armed raider located at 1700 to which an aircraft took off to locate the enemy. At 0630 an unidentified vessel, bearing 315º from Port War Signal Station was sighted and challenged. An unintelligible reply was received and the vessel was assumed to be hostile. Only one aircraft was available to shadow the 'enemy' but (was unable to

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[58] NAA: A9791, 13 Council of Defence meeting of 24/8/1936 presided by Sir G. Pearce, Sir A. Parkhill, Minister for Defence, Major-General J.D. Lavarack, General Sir H. Chauvel. Memorandum, Secretary of Council of Defence to CAS, AVM R. Williams advising Cabinet a review on finance, coastal defences, standardisation of railway gauges, composition of RAAF units and Australia's PSOs' Committee (Minutes Nos. 2, 3, 4, 5 & 6/1936). Minute No. 2/1936 in which the Council technical advisers proposed creating a chain of aircraft stations around the Australian coast to protect naval oil fuel tanks.

[59] NAA: A4311, 70/4, Department of Supply and Development, Notes on supplies (other than munitions), 31 December 1940.

[60] NAA: A816, 37/301/40. 23rd report of Darwin Defence Coordination Committee signed by Captain, President of Darwin Defence Coordination Committee to the Secretary of DOD regarding local defence exercises of 13 and 16 May 1940, p.72.

spot it) owing to adverse weather conditions.[61]

Establishing a RAAF Station at Darwin and aerodromes across Australia

In reassessing its defence capability, government took the important decision to build up air defence related infrastructure across Australia. However, the limited funds and general resources available reduced what could be achieved. One such case was the building of a RAAF base at Darwin which took nearly three years to complete. The project was slowed by administrative difficulties caused largely by overly bureaucratic management.[62] In March 1938, tenders were called for the clearing of 400 acres and the removal of tree roots to a depth of 12 inches. Following the tender evaluation by the Department of Works (DOW) and the Department of the Interior (DOI), the lowest cost proposal at £20 per acre was accepted and a contract was awarded in December. Concerns about costs led government to instruct DOW to exercise every possible economy and monitor the high cost of material.[63]

By 1939 conditions at the Darwin RAAF Station made it necessary to review the state of runways and taxiways, roads and pavements. Civil engineers had planned to limit traffic to pneumatic-tyred vehicles not exceeding six tons to 15 mph but this precaution did not accommodate maintenance costs. The level of degradation now evident made operations intrinsically dangerous due to severe seasonal conditions such as high temperature and heavy rain which restrictied flying operations.[64] During the dry season the airfield was windswept and dust

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[61] *Ibid*.

[62] NAA: A705, 171/6/84 pt.1, Aerodrome works, letter from P.A. Gourgaud, Secretary of the Department of the Interior to the Secretary of DOD, 25 March 1938.

[63] *Ibid.* G.A. Street's Minute of 20 December 1938 to the Minister for Works and Civil Aviation.

[64] NAA: A705, 171/6/84. RAAF Station Darwin – Aerodrome Works, 1938-1942; Minute, Secretary of the Air Board to the Secretary of DOD regarding effecting maximum economies in all projects, 19 July 1939.

reduced visibility. During the wet season mud caused aircraft to become bogged.[65]

Proposed repair work complied with Air Board recommendations, which stipulated that the width and section of roads be reduced to the minimum compatible with essential requirements to reduce construction costs. The budget for the refurbishment was cut from £56,500 to £36,200, the minimum needed to allow the RAAF Station to function in all weather conditions.[66] On 31 May 1939 the Air Board finally allocated the fund but two months later the Minister for DOI requested the Air Board reconsider the proposal due to the large sum involved and to certify that each of the items included in the requisition was absolutely essential.[67] In response to Japan's territorial expansion, on 4 November 1941 funds were provided for the sealing of two runways which was now considered as a matter of extreme urgency.[68]

With the introduction of new and different aircraft, upgrade of the quality of aviation fuels became necessary. US restrictions on the export of aviation spirit forced the government to increase fuel storage. The Air Board appointed a committee to investigate the requirements for aviation fuels and oils for operational and training purposes. By 1941, 31 RAAF Inland Fuel Depots were established at strategic points across Australia. The sites were placed some distance inland, close to railway lines but out of the range of naval bombardment and attack by aircraft.[69] Where possible the depots were sited partially dug into hillsides or covered with earth, and maximum use was made of the surrounding terrain to provide protection and natural camouflage. At the Air Board's request, the

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[65] *Ibid*. Letter from Wing Commander, Officer Commanding RAAF Station, Darwin to the Secretary of the Air Board, 1 February 1941.

[66] *Ibid*.

[67] *Ibid*.

[68] *Ibid*. The Air Board and Minister for Defence approving the finance to have work done on the RAAF Darwin Station. War Cabinet Minute No. 803 of 1941.

[69] AWM123, 562, Department of Munitions and Department of Supply and Development, 11 November 1940. Report, p. 2.

Minister for DOSAD required contracting oil companies (Shell and Vacuum) to progressively increase their holdings of aviation spirit in Australia to 5,500,000 gallons without cost to government. This was an ambitious request as the RAAF had been unable to achieve government's 1940 proposal to expand the RAAF from 19 to 32 squadrons due to the few aircraft available to equip new squadrons.[70]

In October 1940, in light of the deteriorating strategic position, the Department of Air, acting on government recommendation, purchased three million gallons of aviation spirit at an estimated of £137,500 to boost existing stocks. However, the deal was pending construction of storage tanks at inland centers estimated within 5 to 6 months. For the time being major oil companies storage facilities were the only option available.[71]

Initiating Plan B2, 1940-1941

Between May 1939 and June 1940 RAAF Plan B2 was initiated to provide additional security in the event of an attack on Darwin. This resulted in the deployment of several operational squadrons stationed in various regions of Australia. The problems encountered in moving the squadrons to Darwin illustrate the primitive state of the supporting logistics at that critical time. The same criticism, slightly muted, could be applied to the entire nation. Measures to strengthen the defences of Darwin and beyond with additional troops, provide housing and funds were planned to occur in three stages during 1940-1941.[72] Just prior to

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[70] NAA: A705, 231/9/1183, RAAF Headquarters. CAS (Organisation) Establishment, Inland Aircraft Fuel Depots; NAA: A11083, 1/71/IR, North Eastern Headquarters, Organisation, RAAF Inland Fuel Depots.

[71] NAA: A1196, 23/50/83, Policy of reserve of aviation gasoline. Three million gallons of Octane 73 bought from Vacuum Oil Pty. Ltd & the Shell Co. of Australia Ltd, Secretary of the Department of Air, M.C. Langslow's letter to the Secretary of the Contract Board, 22 October 1940.

[72] NAA: A1196, 36/501/95, Plan B "2" - Plan for Reinforcement of Darwin by I G.R (General Reconnaissance) and 2 G.P (General Purpose) Squadrons, during May 1940.

the move on 10 May 1939, an officer of the Works and Buildings Directorate arrived in Darwin to prepare for the relocation of No.12 GR Squadron to find temporary accommodation for both men and aircraft. Work commenced with the deployment of support units followed by building up supplies of reserves: food, water, clothing, fuel and oil for aircraft, coal and water for ships and goods-trains.[73]

The next phase added another 4,700 servicemen, to be quartered at Darwin and Adelaide River. Immediate reinforcement could not be met as the task involved in planning and implementing the Darwin upgrade was particularly difficult. From the time Plan B2 was devised in May 1940, planning had to be revised several times and was finalised by early December 1941. Tasks usually took longer than the time allowed due to the primitive conditions, harsh climate and the remoteness of the location.[74] Other issues were lack of transport, limited manpower, shortage of materials, lack of facilities at Darwin to house personnel. By April 1939, 12 GP Squadron arrived in Darwin with Anson and Wirraway aircraft. While waiting to be housed, the squadron operated from the civil aerodrome and used temporary hangars to shelter their aircraft, pending the completion of buildings at the RAAF Station. By 1940, Plan B2 called for the additional reinforcement of Darwin with 21 Hudsons and 23 Wirraways comprising 70 wireless operators, airframe and electrical mechanics, 19 air observers and 28 ground aircrews.[75]

Commanding officers at Darwin and Pearce RAAF Stations finalised details of the proposed transit route for No. 25 Squadron from Pearce via Carnarvon, Port Hedland or Broome and Hall's Creek in Western Australia and Daly Waters in Northern Territory. There were

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[73] *Ibid*. BBA Agenda No.285/1940, Supplement No.2, Northern Territory, 7th Military District – additional living accommodation to be planned in three stages by A.J. Wilson, Joint Secretary of BBA, 18 December 1940.

[74] NAA: A11297, 27/4. Air, pt. 1, No. 24 Squadron, Plan B2, 1940. Letter from Group Captain, Officer Commanding RAAF Station, Darwin, to the Secretary of the Air Board, 18 October 1940.

[75] *Ibid.* Minute from the Air Board to the Secretary of DOD, 12 September 1939.

concerns about the pioneering nature of the route given the distances involved, the condition of some airfields and the scarce refueling facilities. The minimum time taken to refuel three aircraft on the journey to Darwin was calculated as 45 minutes. RAAFHQ decided that No 14 Squadron would be routed in three steps: Pearce to Port Hedland, after an overnight at Port Hedland proceed to Darwin. Ground inspection of the aerodromes at Port Hedland and Broome found that Broome would be difficult for pilots as runway extensions were still under way and would not be completed before the wet season.[76]

Port Hedland was satisfactory for Hudson aircraft, already having two 1,200-yard runways completed and a third under construction. Civil aircraft were also to be used to transport some personnel and equipment with one Empire Flying Boat and one Lockheed Electra which had been made available from the allotment of civil aircraft assigned to the RAAF. One factor which significantly limited air transportation was that early airplanes could not take off with excessive loads. For example, the largest transport aircraft available, the DC-3, with full fuel tanks could carry a load of only 2800 lbs (1303 kg or 1.3 tons).[77]

A heavier load could be carried, but only with less fuel, requiring more fuel stops. Space and weight problems compelled maintenance personnel to board their aircraft by reducing their equipment to 2,100 lbs.[78] The Darwin civil aerodrome had serious deficiencies and was used on a limited basis. Its single runway was suitable for Wirraway operations but dangerously short for a fully laden Hudson. During 1940, Treasury

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[76] NAA: A1196, 36/501/95, Plan B "2" - Plan for Reinforcement of Darwin by I G.R (General Reconnaissance) and 2 G.P (General Purpose) Squadrons; Memorandum from Group Captain Commanding RAAF Station, Pearce, WA to the Secretary of the Air Board, 3 November 1940.

[77] Smith, 'The Intercontinental Airliner and the Essence of Airplane Performance, 1929-1939', p.449.

[78] NAA: A1196, 36/501/95, Plan B "2". Air Commodore, Commanding Central Area to Air Board regarding moving 23 Squadrons, 13 December 1940.

increased funding for the work in Darwin.[79]

During November 1940 designs were prepared for four runways at the Darwin RAAF Station including 2 gravel-based sealed runways 1200 yards long by 50 yards wide, with drainage designed to accommodate future extensions.[80] By August 1941 the Darwin runways were still not sealed with bitumen. Instead, gravel alone was used, justified on the basis that it worked successfully for road works and remote airstrips.[81] However, on 6 January 1942, 95 percent of runway was completed including 90 percent of taxiway.[82]

In Melbourne, RAAF headquarters was concerned that with the possibility of Darwin being used for heavy bomber aircraft and recommended an increased thickness of 12 inches in lieu of 9 inches, at an additional cost £3,200. Work on sealing the Darwin runways became a protracted issue continuing through December 1941. In fact, the Works Department was still working on resurfacing the Darwin runways when the Japanese attacked on 19 February 1942.[83] Funding cuts and administrative delays proved to be a false economy. Construction work on the runways was delayed and flying operations were curtailed as soaked runways caused high numbers of bogged aircraft.[84]

Safeguarding Australia's lines of communication was not trouble-

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[79] NAA: A705, 171/6/84, pt. 1, RAAF Station Darwin, Aerodrome Works 1938-1942; CO's report to the Air Board, 1940.

[80] NAA: A5954, 320/9, BBA. War Cabinet Minute no 1359.Criticism of BBA by the Advisory Works Panel, 4 September 1941. War Cabinet Minute 1359 regarding considerable delay in authorising the treatment of runways at the Darwin aerodrome with bitumen, signed by F. Shedden, October 1941.

[81] NAA: A816, 32/301/225, Darwin Area Combined Headquarters. Instructions, Control of Movement to and from N.T by overland route via Alice Springs. Memo from Combined Headquarters, Melbourne, 19 November 1941.

[82] NAA: A705, 171/6/84, pt 1, RAAF Station Darwin – Aerodrome works. Signal from the Senior Administrative Staff Officer, Darwin to Headquarters, Northern Area, RAAF, Townsville, January 1942.

[83] NAA: A816, 32/301/225, Darwin Area Combined Headquarters. Instructions, 19 November 1941.

[84] NAA: A705, 171/6/84, pt. 1, RAAF Station Darwin, Aerodrome Works 1938-1942; CO's report to the Air Board, 1941.

free as Gill illustrates. In 1939, although a number of submarines were 'sighted' it would seem unlikely that German submarines or U-Boats would have ventured as far as Australia. However, in October 1940 a German cruiser *Pinguin* laid a number of minefields off the eastern and southern coasts of Australia sinking the British cargo ship *Cambridge* off Wilson's Promontory on 7 November and on the next day, the US merchant ship *City of Rayville* off Cape Otway.[85]

During 1941, RAAF Home Defence Units worked cooperatively with the RAN to patrol sea-lanes. By the end of February 1942, in an obvious attempt to further strengthen coastal defence, John Curtin decided to re-organise the RAAF by establishing Eastern Area Headquarters in Sydney to control operational squadrons in New South Wales and South Queensland. This move had the effect of reducing responsibilities of Southern Area Headquarters to controlling RAAF operations in Victoria, South Australia and Tasmania. The RAAF was deployed at strategic points around Australia with base support units such as aircraft repair depots and stores established in several areas of northern Australia. The RAN operated from bases in Australia's main seaports, and by 1942, the Army had small establishments placed in various areas with lines of communications spread out in each state.[86]

Australia established efficient management, administration and communication systems to oversee developments. Australia's Joint Planning Committee divided the Australian air Force into two separate operational and training units. RAAF Headquarters was established in Melbourne, and RAAF operational units were partitioned into Areas: Southeastern Area (Melbourne); Southwestern Area (Perth) and the Northern Areas (Brisbane and Townsville). RAAF permanent stations expanded in each Australian State and an Area Combined Headquarters

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[85] G. Hermon Gill, *Australia in the War of 1939-45, Royal Australian Navy 1942-1945*, (Australian War Memorial, Canberra, 1968), pp.271-276.

[86] AWM54, 213/3/1, Joint Planning Committee: Navy, Army, Air Force, 1941, Papers dealing with the coordinated control of operations and intelligence.

(ACH) was set up for the defence of vulnerable ports, each operated under naval and air force commanders appointed to provide information on merchant ships' movements and their identification. Passive defence measures such as camouflage, control of lighting and blackouts, air raid warnings, etc., were recommended.[87]

The failure of Darwin's defence on 19 February 1942

Aboriginal Australians reported observing 'sticks moving in the water' around the Cape York coastline as early as 1939. That these were Japanese activities in the areas is not implausible. In any case, their sightings were discounted by the local authority.[88] However, in September 1940, as a measure of precaution, the defence committee recommended that the anti-sub boom defence be further extended at an estimated cost of £413,500 and with an annual maintenance of £25, 700.[89] Evaluating the defence preparations in Darwin, Jack Mulholland drawing on his wartime reminiscences as an A.A. gunner, acknowledged the absurdity of trying to defend the town with a handful of anti-aircraft guns and a collection of small arms.[90] The recognition of the strategic value of Darwin as a supply base appeared in correspondence exchanged between Winston Churchill, General Wavell and Prime Minister Curtin. The Chiefs of Staff had evaluated Darwin as a forward base from which Australian and American forces would set off to Papua New Guinea and the DEI to fight the Japanese. The RAAF and Army

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[87] AWM70, 164, Commonwealth of Australia, Department of the Interior, Works and Services Branch, General report on activities during the war period, particularly during the financial year 1940-1941, pp.12-14, 31.

[88] Heather Brown, 'Australia 1942: The most dangerous year. What we didn't know*', (*6-13), *The Australian magazine of the Australian newspaper,* Surrey Hills, NSW, (January 25-26 1992), p.10.

[89] NAA: A2653, 1940, vol. 2, Military Board Proceedings Agenda 101-250. Agendum No.189/1940, review of the strategic and operational importance of Darwin and scale of defences, signed by R. Menzies, Minister for Defence Coordination, 20 September 1940.

[90] Mullholand, *Darwin Bombed. The Unit History of 14th heavy anti-aircraft battery*, pp. 80, 88, 112.

deployments were too small and were not protected by A.A equipment that was readily available in southern areas. During a visit to Darwin in mid 1941, the Governor-General, Lord Gowrie was made aware of the situation, but nothing constructive developed from his visit.[91]

On 4 December 1941, Australian code-breakers successfully read the instruction to the Japanese Consul-General in Washington, DC to destroy 'all their codes and ciphers'.[92] This order was an indication that Japan was up to something big.[93] Perry claims that despite Australian military leaders' earlier recommendations to government to prepare 'a far stronger forward defence in the islands to Australia's north', their warnings were ignored as was the implied assessment of Japan's capability.[94] Even allowing for the fact that Australia's boom in the production of armament was yet to take full effect Darwin's defence was in a remarkably poor shape. Given Ross' assurance of the existence of a profusion of weapons in early 1942, it is difficult to explain why Darwin's defences were so inadequate to fend off Japanese air attacks.[96]

The Commission of Inquiry noted that on 19 February 1942, the RAAF Darwin Station only had 63 rifles, 257 revolvers and 10 twin Vickers machine guns, many of which were in the hands of inexperienced personnel.[97] Heavy weapons included 18 heavy anti-aircraft guns, one machine gun company equipped for use in ground warfare but seconded in an anti-aircraft role and an anti-aircraft artillery battery of 12 guns on loan from the US Army.[98] The Inquiry also took

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[91] Jack Mulholland, *Darwin Bombed. An A.A gunner's reflections*, (published by J. Mulholland, Wyoming, NSW, 2006), pp.55, 103.

[92] John Blaxland, 'Intelligence and Special Operations in the Southwest Pacific, 1942-45', (145-168), in *Australia 1944-45: Victory in the Pacific*, (Peter J. Dean, ed., Cambridge University Press, Port Melbourne, 2016), p.147.

[93] Horner, *Crisis of Command*, pp.77, 91.

[94] Roland Perry, *Pacific 360º*, (Hachette, Sydney, 2012), p.110.

[96] Mullholand, *Darwin Bombed.The Unit History of 14th heavy anti-aircraft battery*, pp. 80, 88, 112.

[97] *Amar, The* Logistic Support of the RAAF, p.77.

[98] Gillison, *Royal Australian Air Force*, p.425.

note that personnel at the RAAF Darwin Station had few weapons to train with. Significantly the Station had been manned by numerous non-flying personnel, such as cipher and equipment officers, engineers and others, who had been selected due to their technical experience and promoted on that basis.[99] Mulholland recalled that the unsuitability and quality of weapons meant that they were of little use against the enemy. There was no intermediate firepower between a .303" Lewis gun and the 3.7" heavy guns. Rifles and light machine guns were ineffectual and the heavy anti-aircraft artillery was cumbersome and ineffective against the enemies' low-level fighters and strafing fighters. Defenders had to contend with the uncertainty of using unfamiliar weapons against fast moving targets. As well as a severe shortage of A.A guns and machine guns, prior to the raids soldiers could not waste ammunition on practice shoots as there was none to spare.[100] The Lewis guns were subject to frequent stoppages due to overheating which was placing Darwin defence force in a precarious situation. During the first raids, Darwin had no Bofors A.A guns (40 mm) which could have been used against low flying fast targets.[101] These arrived with the 2/1st A.A Regiment on its return to Darwin at a later date.[102]

Attempting to stop Japanese aircraft with such limited firepower was futile and pathetic.[103] Even after the first Japanese raids on Darwin, the defence forces lacked sufficient firearms and ammunition for training or defending their positions. During 1942, this situation was reported by the Minister for the Army who stated that due to a severe shortage of firearms 18,000 troops could not be equipped with rifles. In Western Australia, as a temporary measure, trainees were given broomsticks for

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[99] Amar, p.91.

[100] Mullholand, *Darwin Bombed.The Unit History of 14th heavy anti-aircraft battery*, p. 79.

[101] Ray H. Buttery, *Legion of the Lost: 'Home Defence'*, (14-18), (Ray H. Buttery, Mardin, South Australia, 1985), p.17.

[102] Mulholland, *Darwin Bombed. An A.A gunner's reflections*, p.104.

[103] Buttery, *Legion of the Lost*, p.17.

drills and World War I weapons were serviced and recycled.[104]

As decision-makers, the Defence Committee ought to have been thoroughly prepared to take swift action and understand and investigate all factors causing difficulty and undue delay. Unfortunately, they failed to meet this expectation. Apart from the decision to further extend the anti-sub boom defence at Darwin, on 31 May 1940, the Defence Committee also considered increasing the fixed coastal defences at Darwin with two 9.2'' and two 6'' guns. As four 6'' guns were already installed, the committee could not see the value of adding two 6'' guns. Instead, they opted for two 9.2'' guns, pending availability.[105] In January 1941, in view of the increased importance of Darwin, the committee recommended the 9.2'' guns, but as they were still unavailable, they proposed that two additional 6'' guns be installed. To add to the delay in possessing adequate defences, Britain advised that the committee could have two 9.2'' guns shipped to Australia by October or November.[106] When the time taken to build the emplacements for these two guns and ready them for use was considered, the committee estimated that it would be unlikely that the two guns would be ready for action for at least 9 months. This resulted in two 6'' guns being installed.[107] The ten 6" naval guns positioned to cover the approaches to Darwin Harbour could fire on approaching ships along a defined route but were not adaptable to firing on other targets.[108]

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[104] Bob Wurth, *1942 - Australia's Greatest Peril*, (Pan Macmillan, Australia, 2008), pp. 104,105.

[105] NAA: A2671, War Cabinet Agenda No. 75/1941 and supplement 1, Darwin fixed defences. Review of position from the Minister for the Army, P.C. Spender, 3 June 1941 to the Secretary of DOD Coordination, with copies to the Ministers of the Navy, Army, Air and the Treasurer.

[106] NAA: A2671, War Cabinet Agenda No. 75/1941 and supplement 1, Darwin fixed defences. The Defence Committee recommendation was approved in War Cabinet Minute No. 850, 27 February 1941.

[107] *Ibid.* The Defence Committee recommendation was approved by P.C. Spender, Minister for the Army, 3 June 1941.

[108] NAA: A1196, 15/501/107, Fortress Combined Operational Headquarters, Darwin 1940-1941; NAA: A1196, 15/501/246, report of The Commission of Inquiry in Enemy Air Attacks, Darwin Area, p. 8.

A report dated 15 December 1941 confirms that the Chiefs of Staff had assumed that Darwin was vulnerable to attack and were particularly concerned to give industrial centres in the southeast the highest priorities for added protection. The chiefs assumed that if Japan were to invade, they would most likely move southwards from DEI with the objective of taking Darwin or somewhere closer to the main population. They even recommended that some forces be withdrawn from Darwin for deployment in the industrial heartland, believing that Darwin's existing A.A defences were sufficient to protect Darwin, giving the town a rating of low-level risk. In their view Darwin's value as a bare Allied fleet base at the eastern end of the Malay Barrier was low and better protection 'could not be achieved except at the expense of the vital industrial area in New South Wales'.[109]

That meant that Darwin and its land installations were at great risk. Despite the decision to build the Darwin base and despite the effort put into making it, it was practically not defended at all. At the time of the first raids on Darwin, the Australian Army's A.A defences comprised 16 QF 3.7" A.A guns and two 3" A.A. guns to counter aircraft flying at high altitude and a small number of Lewis guns for use against low flying raiders. Weighting significantly in their defence position was the fact that the crews had had little recent training due to ammunition shortages.[110] The air forces stationed in and near the town comprised No. 12 Squadron which was equipped with Wirraway advanced trainers, pressed into service as fighters, and No. 13 Squadron which operated Lockheed Hudsons.[111] Six Hudsons, 3 from No. 2 Squadron and 3 from No. 13 Squadron also arrived at Darwin on 19 February after having been evacuated from Timor. None of the 6 Wirraways at Darwin on the

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[109] Gillison, *Royal Australian Air Force*, pp. 239, 424.

[110] Peter Grose, *An Awkward Truth: The Bombing of Darwin, February 1942,* (Allen & Unwin, Sydney, 2009*),* pp.49-50.

[111] *Ibid*., p.51.

day of the raids were operational.[112]

On 16 December 1941, John Curtin in the House of Representatives addressed the complicated business of convincing members on the issue of equipping Australia's armed forces. He declared that a huge program of equipment and munitions acquisition, including the production of Wirraway aircraft advanced trainer, had been under way for some time, leading the nation towards self-sufficiency.[113] Considering the severe lack of weapons in Darwin and Broome to counter the Japanese air raids just a few weeks later, Curtin may have been trying to reassure his audience or simply was misinformed on the parlous state of defence. At the Commission of Inquiry led by Justice Charles Lowe into questions on the Army's defence capability, the CGS replied that the A.A gun density at Darwin was not as high as it should have been. The reference to the 35-gun density shown in British A.A manuals was intended to apply only to vital areas such as dock and industrial complexes in Britain liable to receive concentrated attacks by waves of high-flying aircraft.[114]

At no place in Australia would such density be attained for some considerable time. At the time of the raids, Darwin had 10 x 3.7'' and 2 x 3'' guns in operation, these being the maximum available given other urgent needs in Australia. But in Malaya it had been found necessary to install 8 to 12 Bofors guns for aerodrome protection, and since these were unprocurable in Australia, it became necessary to implement other measures of protection.[115] For example, in Broome, WA, during the

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[112] Chris D. Coulthard-Clark, *The Encyclopaedia of Australia's Battles*, (Allen & Unwin, Sydney, 2001), p.204.

[113] Perry, *Pacific 360º*, p.45.

[114] NAA: A816, 37/301/293, Inquiry in relation to attack made by enemy aircraft on Darwin on 19/2/1942. Justice Charles Lowe, Commissioner, Melbourne, 24 March 1942, p.174. The CGS reply to the Inquiry. Memorandum from the secretary of DOA, P.R. Sinclair to the Secretary of DOD, Frederick Shedden, 22 April 1942.

[115] NAA: A816, 37/301/293, Statement by the Director of Intelligence to the Inquiry in relation to attack made by enemy aircraft on Darwin on 19 February 1942.

Japanese air raids on 3 March 1942, there were no A.A guns. A makeshift defence was hastily mounted with machine gun fire from some berthed flying boats and rifle fire by several members of the Broome Volunteer Defence Corps.[116]

Following the Japanese invasion of Malaya and the Pearl Harbor disastrous Japanese air attacks, Curtin and his Chiefs of Staff knew that Australia would soon be vulnerable to attack.[117] The Curtin government and the Australian War Council unanimously supported the view that Australia was 'an admirable base for reinforcements for offensive action against the Japanese in the Southwest Pacific Area'.[118] On 14 February 1942, the Deputy Prime Minister, Frank Forde was confident that 100,000 well-equipped troops would arrive as soon as possible, stating 'if we succeed in getting these men with the necessary equipment, it would be a wonderful tonic to the morale of the Australian people and it would be a very effective deterrent against a Japanese invasion'.[119]

Clearly the government's insistence on expecting US forces bound for Australia to be well-equipped implies that on 14 February 1942 government munitions factories had not reached a high level of munitions and weapons. On 17 February 1942, Sir Archibald Wavell, Commander-in-Chief, ABDA cabled the Curtin government expressing concern over Burma, suggesting that the country be reinforced to keep open the Burma Road. This information led Curtin to finally settle the fate of Australian troops overseas.[120] In view of the possibility of Burma being

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[116] Jonathan Ford, 'The First Japanese Air Raid on Broome', (14-18), *Sabretache*, vol. 26, (July/September 1985), pp. 14-15.

[117] *Ibid*.

[118] *Ibid*. Chiefs' opinions regarding danger of invasion by Japanese forces and appreciation of having Australia reinforced by US troops, 17 January 1942.

[119] NAA: A5954, 554/4, Defence of Australia. Appreciation on immediate danger of an invasion force, January 1942. Reinforcement of Home Defence Forces by USA troops, 8 December 1941 – 8 April 1942.

[120] NAA: A5954, 1326/1, The return of the AIF from the Middle East. General Sir Archibald Wavell, Commander-in-Chief, ABDA's cable of 17 February 1942 to John Curtin expressing concern over Burma, suggesting that the country be reinforced to keep open the Burma Road.

invaded by Japan, reinforcing Burma with fresh troops became a matter of strategic importance and would ensure that India would serve for future offensive operations by land and air. As Australia's north could hardly be described as secured, a reticent Curtin decided that the return of the AIF to Australia was far more imperative than dissipating it in the jungles of Burma.[121] As far as he was concerned Australia had made the maximum contribution of which it was capable in reinforcing ABDA. This was a decision supported by General Lavarack who believed that the 6th and 7th Divisions would be lost if sent to DEI. At first Curtin agreed to the transfer of the two divisions from the Middle East to DEI, including corps troops, maintenance and base organisations on condition that Britain provided naval escorts for the convoys to the SWPA. As Britain could not guarantee their safe conduct, Curtin had to temporarily abandon his plan.[122] After the first raids on Darwin on 19 February, the Chiefs of Staff met to discuss the now urgent need for greater protection of the homeland as Darwin remained dangerously open to a full-scale attack, with few additional resources provided to counter on-going air raids.[123]

By April 1942, the strategic situation was considered extremely acute. Many assumptions were made, questions asked and views expressed at the highest level of the Government and the military. One proposal which later formed the basis for the supposed 'Brisbane Line' concept was proposed by Major General Iven Mackay in a memorandum to War Cabinet. He wrote that the five divisions presently in Townsville and Tasmania were insufficient to defend these areas, stating: 'It may be necessary to submit to the occupation of certain areas of Australia

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[121] NAA: A5954, 1326/1, Advisory War Council Minute, 11 June 1942, Reports by the Chiefs of Staff on operations, War Cabinet Agendum No. 258/1942. The Chiefs' weekly progress reports, No. 123, 6 June 1942.

[122] NAA: A5954, 554/4, Defence of Australia. Appreciation on immediate danger of an invasion force, January 1942. Reinforcement of Home Defence Forces by USA troops, 8 December 1941 – 8 April 1942.

[123] Paul Hasluck, *The Government and the People 1939-1941*, (vol. 1, Australian War Memorial, Canberra), p.80.

should local forces be overcome'.[124] Mackay suggested that 'seven-eights of the continent would capitulate to the enemy to protect the south-east sliver between Brisbane and Melbourne, considered of most military, economic and social importance'.[125]

In any case, the Minister for the Army, Frank Forde, dismissed McKay's appreciation. The Curtin government informed the CGS, Lieutenant General Sir Vernon A.H. Sturdee, that they wanted the whole of Australia protected, which as Burns said was 'a strategically impossible task'.[126] In fact, this was a point made in July 1928 by Salmond when he inspected the whole RAAF establishments, training and equipment.[127] Government's view on this defensive aspect assumed that the whole of the Australian coastlines would have to be under close surveillance which was a demanding task requiring trained men, arms and equipment.[128] With this strategic picture in mind, the chiefs advised the War Cabinet that if a major threat developed quickly the prospect of holding isolated assets in the north was poor and the only viable strategy was to abandon the north and concentrate defending the vital south-east industrial region.[129]

Conclusion

It is a sad reflection of the time that cost and the politics involved in acquiring suitable aircraft reduced Australia's ability to defend the Northern Territory and by extension, the whole country. According to Perry, Churchill's concentration on defeating Hitler led to the fall of

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[124] Brown, 'Australia 1942: The most dangerous year', p. 9.

[125] Burns, Brisbane Line Controversy, p.80.

[126] *Ibid.,* pp. 200, 203.

[127] NAA: A5954, 1939/1, report by Air Marshal Sir John Salmond on the organisation, administration, training and general policy of the development of the RAAF, Part 1, 20 September 1928.

[128] Burns, *Brisbane Line Controversy*, p.202.

[129] Hasluck, *The Government and the People 1942-1945*, pp.94-95.

Singapore and gambled greatly on his belief that the Japanese would not enter the war. Within the context of implementing a strategic policy, most federal governments had not taken heed of the professional military advice that Australia should prepare its own forward defences, instead relying far too heavily on a British naval rescue.[130]

For example, during 1937 to 1939, in response to the crisis in China and Manchuria, Joseph Lyons, Robert Menzies, Frederick Shedden and the Chiefs of Staff pressed Britain to send a naval fleet to Singapore. With no uncommitted naval resources at its disposal in 1939, Britain did not agree.[131] While these high-level discussions were taking place, Japan envisaged an occupation of northern Australia. After the war, Australia's survey maps were found in Tokyo, revealing that Japan had specific details on the country's road conditions, water storage, areas impassable in the wet, and other useful information.[132] In exploring the issue of British-American deliberations regarding grand strategy, with the entry of America in the war in 1941, Australia had little say in the higher direction of the war.[133] In this atmosphere of great insecurity, Australian politicians and its military being colonials, were expected to follow British advice and direction at all times, 'no matter how flawed and dangerous to Australia's national interest',[134] effectively stifling Australian national interests and aspirations in the process. Australia with its main military strength fighting overseas was an alarming reminder of a distant Dominion's nationwide fragility against an enemy.

Certainly by providing various infrastructures show government's determination to minimise risk factors by setting up establishments to

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[130] Perry, *Pacific 360º*, p.110

[131] Horner, *High Command, Australia & Allied Strategy 1939-1945*, p.xix.

[132] Brown, 'Australia 1942: The most dangerous year', p. 9.

[133] D. M. Horner, 'Advancing National Interests: Deciding Australia's War Strategy, 1944-45', *Australia 1944-45: Victory in the Pacific,* (9-27), (Peter J. Dean, ed., Cambridge University Press, Port Melbourne, Victoria, 2016), p.10.

[134] Bob Wurth, *The Battle for Australia's nation and its leader under siege*, (Pan MacMillan Australia, 2013), p.3.

support its operational capability and move to an operational war footing. Despite these undertakings, many defence needs remained unfunded due to severe budgetary limitations. Moreover Australia's political system of the 1920s and 1930s was fragmented and undermining the credibility of the nation's leadership was its support for appeasement which showed little promise of strengthening Australia's defence.

Unquestionably, successive governments followed Japan's developing aggression but it was difficult during the 1930s to justify investing in developing the largely unpopulated north. Limited resources could not be dissipated in the north without an effective long-term defence plan for the future of this vast region. Nor could the maximum coordination of public and private enterprises to promote economic viability and growth be achieved. Solid progress in this regard could only come from decades of effort and certainly, and not as a desperate measure within a restricted time frame. The Japanese air raids on Darwin exposed not only the incredibly inadequate state of the RAAF but also the run down condition of the home defence structure and capability. Ross' claim is less than convincing in the light of the severe lack of effective weapons and ammunitions for Darwin defence and the fact that the RAAF operated trainers and outdated aircraft unsuitable to counter Japanese superior aircraft in combat. In fact when Darwin was attacked in February 1942, the number of first-rate aircraft the RAAF had was so negligible that it was the US air force pilots, equipped with fighter aircraft, who provided 'the only or main defence of the NT'.[135]

This chapter concludes that Australia's strategic posture and ambition to reach a minimal functional level of self-sufficiency for supporting offensive against Japanese forces to the north of Australia became more achievable in early 1943 as industrial development gathered pace.

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[135] Mark Johnston, 'Vanquished but defiant, victorious but divided. The RAAF in the Pacific, 1942', (161-178), *Australia 1942: In the Shadow of War,* (Peter J. Dean, ed., Cambridge University Press, Port Melbourne, Victoria, 2013), p.173.

Chapter Two: The light raids policy and the Singapore strategy as Australia's main defence

In 1921, the so-called 'light raids theory' was devised by the Committee of Imperial Defence who predicted the contingencies that would shape Australia's defence planning. The committee reassured the Australian government that it needed not fear for its security, confident that coastal Australia would only be raided by a couple of hundred men disembarking from Japanese cruisers. As such the Royal Australian Navy (RAN) was placed as the frontline of defence to counter these small raids.[1] The Singapore strategy remained the cornerstone of British Imperial defence policy in the Far East. A British naval fleet based at Singapore was expected to intercept and stop a Japanese naval offensive on its way south towards Australia. Meanwhile, in the absence of an immediate threat, isolation from the political crises unfolding in Europe gave Australians a sense of security, comforted by feelings of belonging to the British Empire. This feeling of security led policy-makers to unreasonably down-play defence preparations. Of course, the Singapore strategy and the light raids policy were over-simplified, inadequate and naïve. Both were based on a string of hypotheses and planning combinations. The Singapore strategy allowed successive Australian governments to avoid prudent defence policies, discharging Britain with that responsibility. In this chapter I show that Australia's attempts during the 1920s and the 1930s to develop the north, both economically and militarily, were linked to the immediate dictates of British strategy and to the belief that the RN's dominance of the sea would safeguard Australia from the threat of attack.[2]

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[1] Ross, 'The economics of Rearmament 1933-39', p.35.

[2] Chris D. Coulthard-Clark, *Breaking Free, Transforming Australia's Defence Industry*, (Scholarly Publishing Pty. Ltd., Kew, Victoria, 1999), p.72.

The light raids theory and the RAAF

Japan's rising influence led Britain to begin building a naval base at Singapore in 1923 to protect British investments in Malaya. Australia's part was to establish a refueling station for the Navy and merchant ships at the port of Darwin.[3] These concerns were acknowledged by the Australian government and gained much attention in the context of the 1920-21 budgets which provided £500,000 for the development of the RAAF and another £500,000 for civil aviation. In presenting the budget, Treasurer Sir Joseph Cook stated that the experience of war had shown that 'the air force must now be regarded as a vital necessity to both arms of defence'.[4] In the Senate, the Minister for Defence, George Pearce attempted to highlight the importance of this new commitment, stating: 'The funds required had been largely reduced by the gift of 128 aeroplanes with equipment of all kinds by Britain'.[5] Even so, the new air force was hardly in a position to take a major responsibility for national defence. It is worth noting that adopting such an attitude towards funding hugely overvalued the Imperial Gift. It also down-graded the importance and necessity of ensuring financial provision for the ongoing development of Australia's air force.

While some politicians may have been unclear in managing the nation's affairs, it would be wrong to assume that they confined themselves to discounting Japanese expansionism. Australia did have some competent political and military advisers. The problem was that they were not always given the credence they deserved. For example, in 1923, the newly appointed Inspector General, Lieutenant General Chauvel, was skeptical of both the Singapore strategy and the light raids theory, suggested that Australia should prepare for a full-scale invasion,

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[3] Ross, 'The Economics of Rearmament 1933-39', p.36.

[4] Gillison, *Royal Australian Air Force*, p.14.

[5] *Ibid*.

and not to rely on a British fleet. His warning was not taken seriously.[6]

In September 1934 John Curtin regained the seat of Fremantle and was elected as Leader of the Opposition in October 1935.[8] He strongly supported the RAAF, arguing that placing total reliance on the Army and Navy to defend Australia's coastline from invasion seriously devalued the potential usefulness of the RAAF.[8] His alternative was 'that aircraft stationed at strategic coastal points could keep a watchful eye on the surrounding seas and report the sighting of [suspect} movements to a bomber defence base'.[9]

In a briefing paper prepared by the Air Staff in London for a meeting scheduled with Sir Archdale Parkhill at the 1937 Imperial Conference. The British Air Ministry argued that Australia had no reason to worry because Singapore would remain available for a RN fleet. The RAAF would be particularly valuable both for local defence purposes and as potential Imperial air reinforcement.[10] As far as the Air Staff was concerned, the RAAF was equipped with a great diversity of aircraft types and with squadrons primarily trained for tasks ancillary to surface operations. Stating the obvious, the RAAF needed to be equipped with 'modern multi-engine medium bomber types suitable for overseas operations and reconnaissance tasks'.[11]

Australia's security and the Singapore naval base

The heavy reliance that was placed on Britain's promise to send a battle fleet to the Singapore Naval Base to counter any emerging threat was a

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[6] Lt. General Chauvel's reports of 1923, 1924, 1926, 1927, 1930 cited *in Horner, High command. Australia & Allied Strategy 1939-1945*, p.3.

[7] National Archives' Fact Sheet, In September 1934, John Curtin regained the seat of Fremantle, which he held until his death, and became the Leader of the Opposition on 1 October 1935.

[8] Coulthard-Clark*, The Third Brother,* p. 73.

[9] *Ibid.,* p. 74.

[10] *Ibid.,* p.443

[11] *Ibid*.

rather narrow line of thinking which successive Australian governments of the 1920s and 1930s used to minimise defence spending.[12] However, always lurking tacitly in the background of any discussion of Australia's defence policy was the significant risk that Britain may not have the capability to deliver on its promise.[15] And as Horner points out, it would have been pointless as well as expensive for Britain, with its already stretched resources, to provide guaranteed security to a distant Dominion.[14] In fact, as early as 1921, a British Admiral felt that the plan contained a major flaw: 'if the East Coast of Australia had to be defended by a naval base, it made much more sense to establish one at Sydney rather than thousands of miles away at Singapore'.[15]

In his autobiography, Sir Richard Williams, a strong supporter of air defence, wrote that during the thirties senior government ministers and defence chiefs did not always agree on all aspects of defence policy. Yet Williams was disturbed by the government's lack of interest in the Air Force which he believed was 'inconsistent with modern theories of warfare'.[16] On one occasion, Williams was rebuked by PM Lyons for having declared at the Royal St Kilda Yacht Club 'that it was essential that an aircraft industry be established behind the Air Force and that it was within Australia's capacity to do so'.[17]

After the Japanese invasion of Manchuria in 1931, former Prime Minister Billy Hughes stated, in 1934, that Australia needed to strengthen its defence. In an article titled *The Price of Peace,* he warned

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[12] *Ibid.*, p.96.

[13] David Day, 'A great and impotent friend: the Singapore strategy', *The Great Mistakes of Australian History,* (123-138), (Martin Crotty & David A. Roberts, eds., University of New South Wales Press, Sydney, 2006), p.125.

[14] Horner, 'Australia in 1942: A pivotal year', pp. 11-29.

[15] *Ibid*., p. 89.

[16] Alan Stephens, *The Royal Australian Air Force: A History*, (Oxford University Press, London, 2001), p.43.

[17] Richard Williams, *These are Facts. The autobiography of Air Marshal Sir Richard Williams, KBE, CB. DSO, (*The Australian War Memorial and the Australian Government Publishing Service, Canberra, 1977), p.225.

that Australia was vulnerable to attack. In explaining that Russia was fully armed and the US and Japan had also launched great naval programs, Hughes urged that instead of relying on the British Navy, Australia should secure her own future through the development of self-defence capabilities.[18] He gave his overwhelming support for an air force armed with up-to-date aircraft able to defend Australia.[19] He was challenged to resign from his post as Federal Minister for Health in 1935 by Prime Minister Lyons on the grounds that his concepts were beyond Australia's capacity and against Imperial defence naval strategy.[20]

Current world events did cause political decisions to spend more on defence, but Australia's defence continued to revolve around the Singapore strategy. In 1933, Lieutenant General Sturdee had forecast that if Japanese forces planned to land in Australia, the military would only 'have seven weeks warning of invasion if it were lucky'.[21] Australian troops would stand little chance of defending the country with raw troops, lacking in weapons, artillery, guns and ammunition, against 'three divisions (30,000 men) of fanatics who like dying in battle' and are 'fully equipped and trained for operations'. Sturdee's report was sent to the Chief of the Imperial General Staff, Montgomery-Massingberd in London. His response was even more pessimistic. He expected a Japanese Army arriving on Australian shores to be twice the force estimated by Sturdee.[22]

By the mid-1930s Colonel H. D. Wynter of the General staff was so disturbed by government defence priorities that in his address to the United Services Institution in Melbourne August 1935, he stated that Japan would certainly attack Australia when Britain was engaged

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[18] L.F. Fitzhardinge, *The Little Digger 1914-1952. William Morris Hughes: A political biography*, (vol. 2, Angus & Robertson publishers, Australia, 1979), p.625.

[19] *Ibid*., p.626.

[20] *Ibid*., pp.639, 649.

[21] Coulthard-Clark, *Breaking Free*, p.9.

[22] *Ibid.*, p.11.

elsewhere. A meeting held by Australian Army senior officers, Generals Chauvel, Bruche, Lavarack and Colonel Wynter questioned the likelihood of Japanese attack on Australia.[23] They debated the questions whether Britain would be able to fulfil her promise and whether the size of the non-resident battle fleet that would rush to Singapore would be sufficient to counter a powerful foe like Japan. Doubtful about the Singapore strategy, the officers questioned the relevance of Singapore given it was located far from the direct line between Japan and Australia, and wondered whether the garrison at the base itself would be able to hold out until relieved.[24] Reflecting on the wisdom of relying on the Singapore strategy, they suggested that if Australia was in danger of being invaded, the best course of action for Australia was to become 'self-reliant and make its own provisions against such circumstances'.[25]

In truth the Singapore Strategy came perilously close to being exposed as an absurdity. Disillusioned, the Army senior officers commented that the Singapore strategy was used to justify the Government policy of investing scarce annual defence funds in RAN warships to help defend Britain, instead of expanding the Army and the RAAF to meet Australian needs.[26]

Could Britain control how, when and where it fought?

David Edgerton gave a very reassuring view of Britain's response to the increasing risk of war. Paying tribute to Britain's' industrial and military superiority which he asserts would made it possible to win a new conflict. Exploring the issue of RAF capability, he wrote that in 1940 'Britain was a first-class power', confident, with good reason, in its capacity to unleash a devastating war of machines. It had resources to spare, and

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[23] *Ibid.*, p.13.

[24] Coulthard-Clark*, The Third Brother,* p.96.

[25] *Ibid*.

[26] *Ibid.,* p.97.

was wealthy enough to recover from errors or switch to alternatives, and hence could fight in a manner and time of its choosing rather than being forced to respond to opponents' initiatives. By 1942 Britain's forces were greater than those of the US, turning out more arms, but with the fall of Singapore the British Empire was definitely weakened. During 1943 America 'had twice the UK total in arms production'. Considering that 'the US had the people and resources to spare on a gigantic scale', as such 'could fight and win the war making itself richer and more successful in the process'.[27]

However, Gavin Bailey doubts whether Britain could have sustained itself without US assistance as he points out that closely related to Britain's survival was its relationship with America. Formerly, Britain relied on its navy to secure her territory and dominance of global maritime trade, jointly with partners which provided the majority of military means to defeat its enemies. With the new conflict Britain needed to acquire extensive munitions and supply acquisition program in the US whereby Britain had to trade its financial exchange means to meet the huge industrial resources of the United States against the Central Powers.[28] Whereas Britain had gone through the Great War to the point of economic decline, with the onset of World War II, America had become 'the arsenal for democracy', and had developed into a great power with huge resources capable of transporting large numbers of personnel and war equipment over thousands of miles by air, land and sea.[29] Hence acquiring US support through financial, economic and political was axiomatic to Britain. In this, Churchill's special diplomacy with Roosevelt culminated in the development of Lend Lease during 1941 which enabled Britain to a 'level of war production which would

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[27] David Edgerton, *Britain's War Machine, Weapons, Resources and Experts in the Second World War*, (Penguin Books, London, Britain, 2012), pp.2, 14, 47, 74, 296.

[28] Gavin J. Bailey, The Arsenal of Democracy. Aircraft supply and the Anglo-American Alliance, 1938-1942, (Edinburgh University Press, 2013), pp.5, 8.

[29] *Ibid.*

never have been achievable without enormous external aid'.[30] This arrangement was especially advantageous to the RAF which needed aircraft and was never able to rely upon promises of aircraft production and delivery from British industry.[31]

Analysts had floated the opinion that in the event of Britain and Germany going to war, Japan would further its imperial expansionist policy. At the Imperial Conference in 1937, Australian delegates were warned that the British Main Fleet may not be dispatched to the Far East and advised to be prepared for such circumstances.[32] This issue and others of vital importance to defence planning may have been underestimated, as at the 1937 Federal Election. The Labor Party strongly promoted the concept that Australia's defence capability must be strengthened in response to the world situation.[33] Ross felt that the United Australia Party, by clinging to the Singapore strategy and the strength of British Navy, was not sufficiently concerned to carry out a wide-ranging review of its defence policy.[34] For Australia, the prime objective of the 1937 Imperial Conference was to secure the country against a possible attack. This was assured by the construction of the Singapore naval base and the assumed rapid response of the British Navy, which Australia was relying on, would arrive in time to give substance to a very flimsy concept.[35]

Concerns about the effectiveness of Singapore to safeguard Australia caused the Labor Party, various senior Army officers and public commentators to entertain misgivings about Australia's reliance on the Singapore strategy. Several parliamentarians recognised that something

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[30] *Ibid*., p.11.

[31] *Ibid*., p.18.

[32] Ross, 'The Economics of Rearmament', p.36.

[33] NAA: A5954, 827/1, Imperial Conference 1937, Paper No. 13, Minister for Defence's speech on local aircraft manufacturing, 8 March 1937, p.14.

[34] Ross, p.36

[35] John Robertson, *Australia Goes to War 1939-1945*, (Doubleday, Sydney, NSW, 1984), p.12.

was seriously lacking in British promises on the defence of Australia, particularly that Britain could only fight one front at the time.[36] In theory Britain wanted to give the Far East a high priority in its defence plans.[37] This was an ambitious decision given at a time when Britain's economy was weak and British naval power was facing increasing challenges.[38] Construction of the Singapore naval base began in 1923 and was near completion in 1939, at the very large cost of £60 million. In 1937 Britain gave assurances on its defence commitment in Singapore, stating that the integrity of the Commonwealth relied on her ability to project naval power to the Far East and her involvement in the Mediterranean would not reduce the ability to send a battle fleet to Singapore.[39]

But as McCarthy points out by 1938 the British fleet was vastly over-committed.[40] By 1939 the Singapore plan was already beginning to fail as relations with Italy worsened and was scaled back with the response time to relieve the base growing to six months and the number of ships to be sent reduced.[41] In April 1939 a sub-committee of the Committee for Imperial Defence practically abandoned the plan, indicating that the delay to send a naval fleet could not be pinned down nor the size of any fleet be quantified. The committee's decision was obviously important but the brutal result was that Australia and New Zealand were not thoroughly briefed.[42]

The Far Eastern Defence Conference held at Singapore in October 1940 was attended by representatives from Australia, Britain and New

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[36] Day, *The Politics of War*, p.126.

[37] Clive Ponting, *1940 Myths and Reality*, (Ivan R. Dee, Chicago, USA, 1991), pp.33-34.

[38] John McCarthy, *Australian and Imperial defence 1918-39: A Study in Air and Sea Power*, (University of Queensland Press, St. Lucia, 1976), p.136.

[39] Ponting, pp.33-34.

[40] John McCarthy, 'Air Power and Australian Defence 1923-1939', (618-631), *Victorian Historical Magazine*, vol. 42, no.3, (August 1971), p.622.

[41] *Ibid*.

[42] Ponting, pp.33-34.

Zealand. The conclusions reached by the Australian delegation and the Chiefs of Staff were unanimous. The naval base would not offer serious resistance against a Japanese attack, being alarmingly deficient in weapons and aircraft.[43] Between 1939 and 1941 Britain only provided sufficient intelligence to soothe Australia's concerns.[44] On 13 January 1941, Menzies went to London to discuss with Churchill and his ministers issues 'related to Empire policy and co-operation between Great Britain and Australia in the conduct of the war'.[45] A Minute dated 5 February 1941 indicated that Britain's ability to provide added security for Australia was limited. The Council decided that the War Cabinet should keep the matter under frequent review. The Chiefs of Staff would appraise and report on the strategic position on a more regular basis.[46]

The conference had placed great emphasis on the importance of maintaining the lines of approach to Singapore. Preventing the Japanese gaining a foothold across New Guinea, New Hebrides, New Caledonia and Fiji was seen as a necessary precondition for the passage of American reinforcements. But obviously, as the Secretary of State for Dominion Affairs put it, the Government needed to acquire adequate naval and air forces in these areas and strengthen all ports and bases.

The strategic utility of Australia's northern regions as a defence buffer zone that offered no worthwhile benefit to an invader was recognised by Australia's Chiefs of Staff.[47] Not that the Government paid

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[43] NAA: A1308, 730/1/99. Report of the Chiefs of Staff on the Singapore defence conference held between 22 October and 31 October 1940. War Cabinet Agendum No 254/1940 and Minute No. 7, Forde to Shedden of 12 November 1940.

[44] Blaxland, 'Intelligence and Special Operations in The Southwest Pacific, 1942-45', p.147.

[45] David Day, *Menzies & Churchill at war,* (Oxford University Press, Melbourne, Victoria, 1993), p.39.

[46] NAA: A2684, 135. Singapore Defence Conference, October 1940. Advisory War Council Minute No.135. Record of the decision of the Council at the Singapore Conference, Melbourne, 5 February 1941, chaired by Acting Prime Minister A.W. Fadden.

[47] NAA: A1196, 12/501/58. Far Eastern Defence Conference at Singapore, October 1940. Cablegram No. 50, 28 January 1941 by the Secretary of State for Dominion Affairs, London to PM Menzies proposed by the Chiefs of Staff.

much attention to their advice. The Chiefs could do little against Scullin's, Lyons' and Bruce's firm stance to cling on to a national strategic policy centered on the Singapore strategy and placing the RAN as the first line of defence.[48]

Australia's strategic stance and political ramifications

Although there were rising doubts about the ability of the British Navy to deliver timely support to Australia, PM Lyons preferred to believe that reliance on 'an effective preparation against such raids over any ineffective preparation against a larger-scale invasion' was a good policy.[49] Lyons stood by his judgment, although advisors in the Australian service tried to persuade him to change his views. The Lyons government had taken full account of the prospect of a future conflict in the Pacific region and Japan was the only likely regional aggressor.[50]

While the Japanese threat was worrisome, Prime Minister Menzies informed Australia's representative in London, Stanley Bruce that he wanted to be perfectly clear about Japan's intentions before committing to sending an expeditionary force overseas. Menzies knew the threat Japan posed was potentially serious. However, as a loyal imperialist, his priority lay in supporting Britain in the Middle East. On 13 November 1939, the Defence Committee, in reply to an enquiry by the War Cabinet recommended that the first contingent of the 6th Division be sent overseas to complete its training in Egypt or Palestine.[51] As a gesture of goodwill, Menzies sent the 8th Division to Singapore to defend Malaya

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[48] Ross, 'The Economics of Rearmament', p.37.

[49] David S. Bird*, Joseph Lyon – The 'Tame Tasmanian' - Appeasement and Rearmament in Australia, 1932-39,* (Australian Scholarly Publishing Pty. Ltd, North Melbourne, 2008), p.53.

[50] *Ibid.*

[51] NAA: A2653, vol. 5, Department of the Army Proceedings. War Cabinet Agendum No. 22/1940 and supplements. Raising the 2nd Division Corps troops and the despatch of Army cooperation RAAF Squadrons for service overseas to cooperate with British forces. Minister for the Army, G.A. Street statement, 13 February 1940.

and the naval base.[52]

Australia's Chiefs of Staff at the 1940 Defence Conference in Singapore did not support the Singapore strategy, believing that the absence of a main fleet stationed in the Far East, meant that the forces and equipment available in Singapore would be unable to repel a major attack by Japan. The Conference also considered the question of the possibility of a US naval reinforcement to defend Singapore, but realised that the US Navy would have to navigate the entire Pacific Ocean to exercise the necessary pressure on Japan.[53]

As Meaher appropriately asserts, the Singapore strategy provided Australia with grounds of feeling secured and protected but events proved how futile such hope was. It should have been obvious that it would have required at the very least one month for a British Naval fleet to arrive at Singapore, during which time Australia would have been left unprotected and on its own resources.[54]

The Australian government still wavers indecisively

On 5 November 1936, the Leader of the Opposition, John Curtin gave a speech in the House of Parliament warning about the nation's vulnerability. He recommended that Australia's military infrastructure be increased with docks, aerodromes, oil reserves, air bases and to expand the RAAF. It was evident that self-defence had now become the ALP's key to preparedness.[55] Not everyone shared Curtin's opinion. The United Australia Party rejected Curtin's view vigorously, invoking the cause of Imperial defence and readily accepted 'the Home Fleet steaming to

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[52] Horner, 'Australia in 1942: A pivotal year', p.15.

[53] A1196, 12/501/58. Far Eastern Defence Conference at Singapore, October 1940. Chiefs of Staff report regarding the Singapore Defence Conference held between 22 October and 31 October 1940, p.3.

[54] Meaher, *The Australian Road to Singapore*, p.4.

[55] *Ibid*., p.94.

Singapore with Imperial defence'.[56] In fact, when Sir Archdale Parkhill, Minister for Defence in the Lyons UAP government from 1934-37 had declared: 'The strength of the British Commonwealth is the strength of one Dominion' and as such, 'A manifestation of solidarity is of itself a deterrent to aggression'.[57] In other words, Australia was not ready to stand alone but needed Britain's protection. Certainly, Frank Brennan, ALP MP's view of November 1936 that 'This country has never been threatened with attack',[58] points to the naïve assumption that Australia was safe from attacks or invasion.

As Meaher said 'Labor's policy was one of isolationism, pure and simple'.[59] However, Meaher's opinion of John Curtin that as late as 1938, he was more worried about an embargo on trade with Japan which would affect Western Australia's economy than he was about the defence of China,[60] is purely speculative. Curtin was a highly respected member of the ALP and held in high regard by the UAP.[61] Even when faced with these conflicting political pressures, Curtin always placed Australia and his own party above everything else. According to Horner, Curtin was not a man who could be dominated and was a busy politician. Curtin possessed limited knowledge of Defence policy matters and was probably grateful to allow Sir Frederick Shedden, the Secretary of DOD to seize the occasion by becoming his chief political adviser.[62]

A Japanese invasion in Australia's north was seen as improbable by Billy Hughes who believed that an enemy landing a force in such remote and mostly uninhabited area of 'the empty north' was too

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[56] *Ibid*., p.60.

[57] *Ibid*., p.55.

[58] *Ibid*., p.108.

[59] *Ibid*.

[60] *Ibid*., p.75.

[61] Stanley, *Invading Australia*, p.89.

[62] Horner, *Inside the War Cabinet: Directing Australia's War Effort 1939-45*, pp.5, 76-80.

ridiculous to contemplate.[63] The irony was both Lyons and Menzies, while expressing publicly their faith in Britain, held private reservations on the ability of the Royal Navy to deliver the level of force in a timely manner.[64] However, given they had neither the military nor the financial resources to secure Australia it would have been unwise to openly air concern about the Singapore strategy.[65] As McCarthy reflected 'Australia needed to strengthen its local forces, to engender American-British co-operation and to strengthen ties with Japan. And obviously, any criticism of Britain or Empire had to be avoided'.[66]

The RAN's ability to deal with a sizeable attacking force was completely inadequate and with Britain stretched to its limits organising to defend itself against potential enemies close to home, the potential risk to Australia was high. Britain simply no longer could defend its far flung Empire. Australia's security should have been subject of continual review and refinement leading to a set of defence capabilities that could be realistically achieved. Instead an enduring feature of the colonial mindset was the inability to imagine that at some future time Britain may become unable to guarantee Empire's security.[67]

Prior to the air raids on Darwin in February 1942 numerous conferences and Cabinet meetings sought to clarify issues affecting Australia's defence posture. These strategic assessments revealed an increasing level of concern regarding the ongoing Japanese aggression. Although future contingencies to counter possible Japanese actions were proposed by military experts, the degree of urgency they engendered was not sufficiently influential to prompt War Cabinet to deal with Japan's hostilities. Japan's preemptive attack against Pearl Harbor and invasion of Malaya became the wake-up call for taking appropriate steps to

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[63] Stanley, p.44.

[64] Ross, 'The economics of rearmament', p.37.

[65] *Ibid*.

[66] McCarthy, *Australian and Imperial defence 1918-39*, p.29.

[67] *Ibid*.

secure the country, however tardily. With Japan's raids over Darwin, the extent of the country's predicament was immediately apparent as Darwin was poorly equipped to meet the new reality of a powerful military aggressor sweeping unopposed across Southeast Asia and the western Pacific.

Horner rightly claims that in the month following the fall of Singapore, strong leadership was still lacking in Australia.[68] Financial stringency led the Army and the RAAF to invest great effort in acquiring funds and equipment. This preoccupation did not augur well for future defence planning. The RAN naturally stressed the important role British naval power had in preserving Australia's safety.[69] The unexpected and grim reality of the loss of Singapore was a blow to morale.

In 1942 when the Chiefs of Staff provided the War Cabinet with a number of appreciations detailing probable or possible Japanese plans, they expected a prompt response from War Cabinet. However, painting such gloomy picture created too many problems for politicians to absorb let alone to solve. As Horner said in time of war politicians must remain calm and deal with issues but some 'tended to panic'.[70] By not taking a more responsible and statesman-like role in national security Australia's leaders failed to such an extent that with expanding Japanese military power threatening the mainland, it was too late to place great expectations on a quick fix after years of procrastination and neglect.[71]

Conclusion

Early in 1940, the War Cabinet had based its defence upon plans and capabilities which were gradually introducing a self-reliance policy. Its principal aim was to watch the sea and air space to the north for an

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[68] Horner, *High Command Australia and Allied Strategy 1939-1945*, p.437.

[69] Meaher, *The Australian Road to Singapore*, pp.106, 143.

[70] Horner, p.437.

[71] McCarthy, *Australian and Imperial defence 1918-39*, p.29.

approaching enemy, to intercept the enemy should it reach and invade Australia's northern shores, and then to contain the invasion to the north. No doubt the Singapore Strategy and the emerging economic recovery in the 1930s played a central role in Australian defence policy. But putting too much emphasis on domestic policy political debate and too little effort into achieving a balanced view of Australia's place in the British Empire and the changing world, both prevented any real improvement on Australia's potential risk. The pervasive influence of the light raid scenario significantly distracted from the development of an adequate rearmament policy during the interwar-period.[72] By remaining subservient to Britain's defence planning, Australia was content to conjecture, comment and speculate on the possibility of what may or may not happen. While defence preparation and implementation required significant funds, it also required capable politicians and administrators to address often complex development issues. This was belatedly forced on government under a united War Cabinet and the proximity of the war in the Asia-Pacific region.

[72] Ross, '*The economic of rearmament*', p.36.

Chapter Three: Australia's defence preparedness – re-shaping Australian industry, 1937-1943

The previous chapters discussed the problems encountered by a small, remote, ill-prepared, British Dominion in developing an Australian defence strategy. Australia's over-reliance on Britain played a major role in the inertia and obstructions experienced post-World War I. This chapter maintains that earlier attempts to promote industry for both defence and economic reasons, progressed slowly and unsteadily, hampered and limited by the determination of the federal governments of the 1920s and 1930s to pay off War World I debt. Australia's industrial base was small. The few local businesses in the engineering and metal fabrication industries produced only 40 percent of domestic requirements and did not operate on a scale large enough to make a significant contribution in producing implements of war.[1]

This chapter argues that Ross' optimistic assertion that Australia was armed and ready is not sustainable. At best, Australia was armed to some degree but was not ready in any substantial way to defend the homeland. For example, towards the end of February 1942, Bren guns were provided to units 'on a priority basis direct from the small arms factories'.[2] This does not sit well with Ross' statement that 'in early 1942, so much equipment and supplies had been manufactured that an enormous Australian military force was capable of being placed in the field in Australia'.[3] In reality Ross' analysis relates to the beginning of 1943 when government factories and private industries were producing rifles, machine guns, anti-aircraft guns, artillery, tools, gauges, jigs and

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[1] Ross, 'The economics of rearmament', pp.37, 41.

[2] *Ibid*.

[3] Ross, *Armed and Ready*, p.15.

fixtures, according to their level of skills and capacity in greater quantity.[4] By 1943 following government calls to increase the manufacture of weapons, there was indeed a surplus in production.[5] Belatedly, Australia pulled itself into better shape for its national defence.

The Age of 9 November 1939 reported that on a visit by Robert Menzies to the Olympic Tyre & Rubber Co. Ltd, at West Footscray, Victoria, that the best way to assist Britain was for Australia to become self-sufficient in industry and to produce war materials. Menzies claimed these were 'two ends which the federal government was doing its utmost to achieve'.[6] Menzies did not trouble his listeners by admitting that achieving such a goal, especially at this time, was an arduous process requiring much determination. Strategic materials such as chromium, nickel and mercury had to be imported,[7] and the use of magnesium and high strength aluminium alloys essential for aircraft manufacturing, only became possible in the summer of 1941 when the Broken Hill Proprietary Co. Ltd., (BHP) built their plant at Newcastle (NSW).[8]

Fulfilling future munitions programs that would deliver vast quantities for the war effort required skilled manpower such as production engineers, machine tool operators and gauge makers. Also, small firms did not have the means to buy essential tool and gauge manufacturing machines, nor did they have any use for them in their

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[4] NAA: A3095, 32/1/3. DOM & DOSAD, Confidential dossiers, Report pp.63, 86; Butlin & Schedvin*, War Economy 1942-1945*, p.48.

[5] Horner, Advancing National Interests: Deciding Australia's War Strategy, 1944-45, p.12.

[6] NAA: A5954, 102/2. Defence policy. Australia's war effort, Press cuttings only. Under the title 'How Australia can help the Empire', Robert Menzies, restated the recommendations of the Imperial Conference of 1937, telling shareholders that Australia should aim to be self-sufficient in industry and produce weapons, ammunitions, etc., to assist Britain. *The Age*, 9 November 1939.

[7] D.P. Mellor, *The Role of Science and Industry, Australia in the War of 1939-1945,* (vol. 5, 1st ed., Australian War Memorial, Canberra, 1958), p.99.

[8] *Minerals Yearbook of 1941*, 1943, pp.754-755.

daily commercial business.[10]

The difficulty posed by shortages of raw materials, funds and general resources was immense. Because Australia relied heavily on Britain for its defence during the 1920s and 1930s, it had no other supply channels in place. As war loomed in Europe, the problems of supply and delivery of essential war equipment increased as major European powers expanded their defence programs and needed raw materials and manufactured goods for themselves. In drawing up a detailed background of the local industries of the 1920s to 1940s, this chapter demonstrates how government dealt with the problem of securing raw materials to kick-start fledging and local industries, and how through compromise and negotiations they eventually succeeded.

The lack of an economic basis for defence self-sufficiency

In Australia, money to produce defence equipment was scarce. An exception was funding of some government owned small arms and munitions factories.[11] Australia had access to very few oil deposits but had huge coal reserves. It had few good roads and heavy capacity bridges. It had however a number of second-level shipyards which could manufacture in steel and wood and had the ability to build marine steam and automotive engines, and even some aircraft engines.[12] While by 1939 the Government had established basic munitions production across the country, self-reliance lay far in the future. The greatest problem was that an integrated plan was required to expand and fully equip the services. Developing and implementing such a broad, multifaceted plan was not quickly achievable even if the principal parameters could be identified, agreed and put into action.[13]

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[10] *Ibid*.

[11] Meaher, *The Australian Road to Singapore*, p.115.

[12] Coulthard-Clark, *Breaking Free*, pp.32-34.

[13] Meaher, p.115.

During this period, long-standing structural inefficiencies in the national economy came into focus. Government planners had to continuously maneuver around problems caused by the inadequacies of the lines of communication, the availability of manpower and material resources. Strengthening both the military forces and the nation's infrastructure were constrained by financial limitations. The difficulty of maintaining supplies for war production was heightened by scarcity of raw materials, costs and delivery delays at a time when Australia sought to promote its own local munitions and aircraft manufacturing industries.

The amount of defence related work needed to adequately respond to a Japanese threat was colossal. Australia's defence was critically dependent on its small industrial base and overseas supply sources, which hindered self-sufficiency in munitions and military equipment. During the Great War, Australia was subjected to the blocking of imports from enemy nations and British export embargoes on any munitions-related materials. This created a shortage of vital raw materials, tools and components. Further, the manufacture of weapons ranging from rifles to artillery pieces and associated munitions required a reasonable supply of locally mined and manufactured mineral resources, but while rich in some minerals (gold, lead, zinc and copper), the full scale of Australia's mineral wealth had not yet been discovered.[15] To keep such a project on course was impossible as Russia had cut off its exports to preserve its own supplies. In July 1941, the Minister for Aircraft Production, Senator Donald Cameron stated that Australia would not be able to secure the 2,500 - 3,000 tons per annum of aluminium ingot required to meet its total local aircraft production program.[16]

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[15] NAA: A1831, 1939/588*, Geological and Geophysical survey of Northern Australia, 1935-1940.*

[16] NAA: A5954, 223/7, Conference regarding aircraft manufacturing development in Australia, 14 July1941, Report, p.4. Programme for future aircraft construction in Australia. Notes on proceedings of conference held in Canberra, 3 October 1941, attended by R.G. Menzies, Minister for Defence Coordination; J. McEwen, Minister for Air; J.W. Leckie, Minister for Aircraft Production; Harold Clapp, Chairman of Aircraft Production; John Storey, member of Aircraft Production Commission and

Australia's defence and preparedness, 1920s and 1930s

Industrial development in Australia before -World War II era was slow, apart a few notable exceptions like BHP, the Sunshine Harvester Works and the extractive mining industries.[17] Local entrepreneurs wishing to enter into any sort of industrial specialisation, such as motorcar, ship or aircraft construction, struggled financially even with tariff protection.[18] Part of the problem was that the value of defence and commercial orders was too small and spasmodic to sustain entrepreneurial development.[19] Australian firms were also isolated from the world of high technology and science and so were more inclined to be passive observers rather than leaders in new technology.[20] Without a strong impetus, local firms missed out on acquiring technical expertise and developing a supporting industrial base. They had few financial resources to produce the specialised materials and systems used in complex manufacture. The major manufacturers in Europe and America, on the other hand, had acquired knowledge, capability and wealth with helped them to generate novel, high-quality products.[21]

Australian aircraft engineering manufacturing organisations were few in number and generally under-financed, but they nevertheless provided valuable first steps in supporting the introduction and operation of pioneering aviation support services in Australia.[22] In 1927 it was government policy to place orders for equipment locally wherever

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F.G. Shedden, Secretary of the Department of Defence Coordination.

[17] J. Lack, 'Hugh McKay', B. Nairn and G. Serle (eds.), *Australian Dictionary of Biography*, (Melbourne University Press, 1986), pp.1-3.

[18] Ross, *Armed and Ready*, p.4.

[19] *Ibid*., p.10.

[20] *Ibid*., p.30.

[21] *Ibid*.

[22] NAA: A3095, 32/1/3, Attachment to 32/1/3A. The Department of Munitions (DOM) and the Department of Supply and Development (DOSAD), Confidential Dossiers. Aircraft construction in Australia, pt 2, 1940-43, p.55.

possible and to call for public tenders for the supply of such equipment.[23]

The long lead time for the supply of items from overseas was particularly severe for aircraft. This led the Government to inquire whether a license to manufacture aircraft in Australia could be obtained from the British firm, A.V. Roe & Company, and whether a commercial arrangement could be reached with a local firm.[24] In early 1927, the Larkin Aircraft Company which manufactured Avro passenger aircraft in Australia came to an arrangement with A.V. Roe, which supplied drawings and specifications and received royalties for each machine made locally. To get production started the Air Board ordered six Avro 504Ks and a large stock of spares. At about the same time another British firm, de Havilland, established a factory in Melbourne to assemble Cirrus Moths.[25] Although A.V. Roe supplied the professional services of its Chief Designer and Engineer, H.E. Broadsmith, the local firm ran into financial trouble immediately because the few commercial orders and those of the Air Board were insufficient to keep the firm operating.[26]

Another order consisting of 504Ns aircraft placed with A.V. Roe & Co. Limited became the subject of several discussions due to the suitability of the aircraft for Australian conditions.[27] On 23 July 1927, in a letter to the Secretary of the Air Board, Cabinet made it clear that service aircraft used by the RAAF should follow the types in use by the RAF but could, if necessary, be modified to suit local conditions.[28] On 5 August, the Air Board agreed, believing that there were advantages to be gained in equipping the RAAF with the same aircraft and engine types employed

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[23] NAA: A705, 121/1/249, Manufacture of Aircraft in Australia. The Secretary of the Air Board's letter to the Secretary of DOD, 5 August 1927.

[24] *Ibid*.

[25] Ross, *Armed and Ready*, p.33.

[26] *Ibid.*, p.33.

[27] *Ibid.*

[28] NAA: A705/1, 121/1/249, Manufacture of Aircraft in Australia, training landplanes, February 1927- November 1929. Cabinet's letter to the Secretary of the Air Board (P.E. Coleman), 23 July 1927.

by the RAF 'so that close cooperation in personnel and equipment could be attained in time of war'.[29] In March 1929 James Scullin, then Labor Leader, argued forcefully in parliament that Australia should determine its own future: 'Whether or not it is wise to establish aircraft construction in Australia, without consulting any authority in England, however high, because opinion in England is bound to be prejudiced against such an enterprise'.[30]

With the exception of small arms and munitions, there was a scarcity of experts in the local production of the technically advanced equipment and supplies needed for modern warfare. And there were few organisations able or motivated to design, develop and manufacture sophisticated equipment in the high cost and low-volume sector of the Australian market.[31] The precision and accuracy so important in many areas of defence production required special capabilities that were not easy to find. However, this situation gradually changed as many private companies joined the war effort in 1939, contracted to upgrade production methods to manufacture supplies and munitions components.[32] The Advisory Accountancy Panel (AAP) was created in 1939 to ensure their profit or management charges were held to a reasonable level. AAP operated under the Supply and Development Act of 1939, in conjunction with DOSAD and DOM in 1940.[33] From July 1940 the Government sought to increase munitions production by providing loans to companies able to produce the quantity or the kind of munitions required and whose financial resources were insufficient to acquire adequate equipment. This enabled a contractor to convert, expand or

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[29] *Ibid*.

[30] E. G. Theodore, MP, Commonwealth of Australia, Parliamentary Debates, 6 February 1929 to 22 March 1929, vol. 170, pp.1-1771, pp.231-232.

[31] Robertson, *Australia at War 1939-1945*, p.185.

[32] AWM123, 562, DOM & DOSAD, Confidential dossiers; Outline of progress of the production of Beaufort aircraft in Australia, Proper utilisation of available skilled labour, 11 November 1940, pp.16, 99,100.

[33] *Ibid.*, p.14.

erect a new plant to manufacture a product, urgently required for the war effort.[34] For example, the Lithgow small arms factories (NSW) made rifles and barrels for rifle clubs and a new heavy barrel intended to improve the effective range of Vickers machine-guns (Army and RAAF patterns).[35]

It took time for factories to convert from peace-time production to wartime products, as the time required to prepare a factory for mass production of a shell was six months; twelve months for a rifle or machine-gun and at least two years for an anti-aircraft gun.[36] Much of the pre-World War II discussions were based on speculation, resulting in plans which were not always realistically achievable. Government's aspiration to reduce dependence on imported items for aircraft manufacturing and parts did not grow to the extent expected. In the 1920s, much of the production machinery, such as lathes, boring, milling machines, thread-cutting, etc., used in overall manufacturing, were for the most part imported at excessive cost.[37] A ray of light appeared in the financial year 1932-33. With the dire effects of the Depression lifting, the Lyons government was able to begin building up Australia's defences by providing ships for the Navy, weapons for the Army and new squadrons and aircraft for the RAAF.[38] A surplus of several million pounds of revenue was achieved during that period, and this steadily grew until 1937-38.[39] In 1933 Cabinet and members unanimously acknowledged the need to establish a local aircraft industry for defence purposes. Since the creation of the RAAF, the Air Board had been concerned with local

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[34] NAA: A5954, 477/2, Supply, Munitions Department, Production of munitions; Government financial assistance to private companies, Annexes for munitions, aircraft production, etc., July 1940 to October 1941, p.1.

[35] NAA: A5954, 1057/9, Imperial Conference 1937, Paper No. 2, Sir A. Parkhill speech: Cooperation in Imperial defence, 8 March 1937, p.8.

[36] Mellor, *The Role of Science and Industry*, p.34.

[37] Coulthard-Clark, *Breaking Free*, p.32.

[38] *Ibid*.

[39] Ross, 'The economics of rearmament', p.37.

ability to build aircraft and engines to meet wastage in time of war.[40] During that year, the Army complained that they were unable to main a level of capability because they only had six anti-aircraft guns. In fact two years later the Army was still undersupplied and seriously questioned the adequacy of the Munitions Supply Board's production.[41] As Meaher observed, the Munitions Board's capacity program had underestimated the increased intensity of modern warfare which was driving much higher wastage of equipment and consumption of ammunition.[42]

Despite Australia's own precarious munitions situation, in May 1940 the War Cabinet responded to Britain's formal request for urgent assistance by providing them with Mark VII 0.303 ammunition from Australia's own production.[43] This resulted in the transfer of 35 million rounds from the 90 million rounds of Australian Army reserve stock. By late 1940 Britain received 30,000 rifles and 6 heavy anti-aircraft guns. By June 1940, with the war in progress, this depletion of weapons led the Army to take their case to War Cabinet, complaining that they only had a few 16-pounder field guns, 4.5-inch howitzers and a few 60-pounder and 6-inch guns and anti-tank rifles and no anti-tank guns or 25-pounder field guns. Ignoring Army's complaint, in June 1941, the Menzies' government sent 100,000,000 rounds of small arms ammunition, 36,000 filled and 146,000 unfilled mortar bombs to Britain.[44] Menzies' donations resulted in the Australia's Army, Navy and Air Force reporting shortages of weapons and ammunitions.[45] At the outbreak of the Pacific War the

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[40] NAA: A705, 44/1/320, Construction – General – Production of metal aircraft in Australia. Report from Wing Commander, Air Member for Supply to the Secretary of the Air Board, 26 April 1933, pp.5, 9.

[41] Bird, *Joseph Lyons, The 'Tame Tasmanian'*, p.12.

[42] Meaher, *The Australian Road to Singapore*, p.17.

[43] NAA: A2674, 43/1/557, vol 1, Small Arms Ammunition Conference; no. 6, Weekly Progress report by the Chief of General Staff, 1940.

[44] Mellor, *The Role of Science and Industry*, p.35.

[45] NAA: A5954, 726/2, vol. ii, War Cabinet Minutes; NAA: A2670, 44/1940, War Cabinet Agendum No. 44/1940, Weekly Progress reports by Chiefs of Staff, No. 6, Week ended 23 February 1940.

Army's five infantry divisions were still short by 50 percent of anti-tank and 30 percent of field guns.[46] An acute shortage of machine tools arose in 1941 due to the world wide strong demand for munitions and aircraft, which subsequently caused production delays.[47] By 1942, Australia was still far from self-sufficient in special components and accessories and had to import flight instruments, generators, magnetos, fuel pumps, carburettors and many other complex sub-system items.[48] A committee brought some order to the machine tools requested by government and private manufacturing organisations and, to the extent possible, forecast future requirements.[49]

A realistic and balanced appreciation of Australia's economic capacity and defence capability in the 1920s concludes that government policy-makers had limited options while the nations' finances were still carrying the burden of World War I debt. Australia's war cost in the current year (1940) was estimated well over £75 million, a portion of which was expected to be raised by public borrowing. As the war lengthened, and disbursements multiplied, it was anticipated that a greater call would be made on national earnings and the country should be prepared for these sacrifices. As means had to be found to finance the high purchase cost of aircraft, ships and various essential war materials from overseas, some curtailment of customary spending would

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[46] Bird, *Joseph A. Lyons - 'The 'Tame Tasmanian'*, p.12.

[47] NAA: B3229, 9, Personal papers of Prime Minister Holt, Department of Supply and Development. General matters and correspondence, 15 April 1939 to 4 March 1940, pp.1-5. Report issued by Mr. Brigden, Secretary of the Department of Supply and Development and copies to John Storey, DG of Industries, R.G. Casey, Minister for Supply and Development, H.E Holt, Assistant Minister for Supply, F.B. Clapp of the Australian General Electric Company, 22 February 1940.

[48] NAA: A3095, 32/1/3, Attachment to 32/1/3A, DOM & DOSAD, Aircraft construction in Australia, pt. 2, 1942-43, p.72. Australian Munitions Digest, 31 August 1941 prepared for R.G. Menzies during his visit to Britain early 1941.

[49] NAA: B3229, 9, Personal papers of Prime Minister Holt, Department of Supply and Development. General matters and correspondence, 15 April 1939 to 4 March 1940, pp.1-5. Report by Brigden, Secretary of DOSAD, John Storey, DG of Industries, R.G. Casey, Minister for Supply and Development, H.E Holt, Assistant Minister for Supply, F.B. Clapp of the Australian General Electric Company, 22 February 1940.

prove unavoidable.[50]

The government decided to meet war costs from on-going government income rather than resort to massive borrowing. Commercial enterprises, through company taxes, helped fund government war costs and reduced debt to the British government. Commonwealth collections from companies in the financial year 1938-39 totaled £4,300,000.[51] Bank loans enabled a buildup of the defence program. *The Age* of 23 February 1940, reported that by reliance on bank loans and a first installment of taxation, official policy hoped to mitigate war effects on the private sector.[52]

The Munitions Supply Board's efforts to ramp up production over 1936-1939 resulted in additional capabilities and large increases of rifle and machine gun ammunition. In 1940 the Government resolved to increase munitions production by providing loans to companies able to produce the quantity or the kind of munitions required and whose financial resources were insufficient to acquire adequate equipment. This enabled a contractor to convert, expand its plant or erect a new plant to manufacture a product, urgently required for the war effort.[53]

As the war took hold, the demand for equipment and ammunitions continued to grow. However, production was still well below the level and diversity needed to equip the forces. On 21 May 1940 the government moved to approve the expansion of the three services and to accelerate the defence support program.[54] The Military Board, in agreeing to

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[50] NAA: A5954, 102/2. Defence policy. Australia's war effort. Press cuttings only. Clipping from *The Age*, 23 February 1940.

[51] *Official Year Book of the Commonwealth of Australia,* (Government Printer, Canberra, no.33, 1940), p.874.

[52] NAA: A5954, 102/2. Defence policy. Australia's war effort. Press cuttings only. Clipping from *The Age*, 23 February 1940.

[53] NAA: A5954, 477/2, Supply, Munitions Department, Production of munitions; Government financial assistance to private companies, Annexes for munitions, aircraft production, etc., July 1940 to October 1941, pp.1-2.

[54] NAA: A2670, 112/1940, International situation and Australia's War Effort, Memorandum from the Secretary of the Army, Agendum No. 112/1940.

stimulate recruitment, recommended that special and urgent efforts be made towards the manufacture of Bren guns, Vickers guns, 2-pounder anti-tank guns and 3.7" anti-aircraft (A.A) gun ammunition. Treasury allocated £2 million to build up manufacturing capacity. One million pounds was added later, thus increasing by 50 percent the authorised expenditure upon munitions factories, including additional establishment of armament annexes. The total expenditure approved for government munitions factories since its pre-war program amounted to £17 million.[55]

Availability of strategic materials to build war equipment, 1940-1941

With the outbreak of war, the higher consumption of raw materials and the lack of strategic reserves at a time of increased industrial production had major implications for national self-sufficiency. An unresolved matter for concern was the supply of aluminium to produce munitions, weapons, aircraft and wireless station equipment, seriously undermined production.[56] By October 1940, secondary industries making all manner of finished goods were still lacking many raw and refined materials. Materials in short supply included copper, aluminium and magnesium, all essential to the manufacture of components. This left Australia dependent on overseas sources.[57] Even the availability of crude cotton required to make explosives was quite inadequate. The problem was settled by importing cotton waste from India. However, Australia's mineral resources provided ample supplies of base metals such as iron, zinc and lead and many more specialised commodities such as, gold, silver, tin, tungsten and manganese.[58]

While Australia was not short of iron and steel, despite the

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[55] *Ibid*.

[56] NAA: A3095, 32/1/3, Attachment, pt.1, Munitions, Australian Departments, 1940-1947, DOM and DOASD, Confidential dossiers. Introductory notes on materials supply, October 1940, p.96.

[57] *Ibid*.

[58] *Ibid*.

extensions of plant and capacity production, production in various forms could not fully cope with the enormous demand. BHP felt that 2 million tons per year was a reasonable assessment.[59] This situation exposed another problem, the lack of skilled workers to handle much of the imported material. The processes involved special equipment and extreme accuracy which could only be attained after years of experience.[60]

To overcome the shortage of magnesium, the Minister for Munitions reported that an additional 60 tons would be required by 1941. At the time, Australia's annual production was 200 metric tons, and existing stocks were predicted to run out by August 1942.[61] When War Cabinet cabled London's High Commissioner to seek Britain's assistance to obtain magnesium, the response brought little joy. Britain suggested using ordinary commercial channels to source magnesium on the world metal market. Aluminium, another strategic metal, was also in short supply. The local industries had sent numerous cables to British commercial firms with whom the industries had placed orders but as none replied, the assistance of the War Cabinet was sought to resolve the issue.[62]

The High Commissioner's Office and the Controller of aluminium both handled the release of the material. To avoid further delays, the High Commissioner in London was asked to call on the controlling authority to expedite matters.[63] Short of the metal, Australia also

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[59] NAA: A2694, vol. 17, pt. 3, Lyons and Page Ministries. Folders and bundles of minutes and submissions. Essington Lewis, Managing Director of Broken Hill's statement to the Acting Secretary of the Prime Minister's Department, 23 July 1937.

[60] Mellor, *The Role of Science and Industry*, p.99.

[61] *Minerals Yearbook* of 1941, p.754.

[62] NAA: A3095, 32/1/3, DOM & DOSAD, Confidential dossiers. Attachment pt.1. Letter addressed to War Cabinet by Essington Lewis, Managing Director of BHP and L. Bradford, General Manager of Broken Hill. (n.d).

[63] NAA: A2671, War Cabinet Agendum No. 495/1940, Department of Supply and Development, Sixth weekly progress reports by the CGS, 1940 at War Cabinet Meetings.

approached the United States to supply 20,000 aluminium ingots.[64] However, during late 1941 as America began to prepare for war, aluminium was now reserved for US war use, that meant that the Aluminium Company of America could no longer supply Australia.[65] The Canadian Reynolds Metal Company was willing to produce the metal but lacked the required expertise to produce it. This difficulty would not have occurred had the American company been prepared to assist Reynolds.[66] Finally the Canadian government's legal branch was able to negotiate a contract for Australia with the Aluminium Company of Canada.[67]

Nickel, a metal used in the production of special steels, and widely used in defence production including aircraft engines, became hard to obtain. In 1940 the Free French authorities criticised the New Caledonian authorities for having allowed 5,000 tons of paid and licenced nickel to go to Japan.[68] The possibility of another Japanese ship being loaded with a consignment of nickel from one of New Caledonia's mining companies prompted a formal request to the governor (Henri Sautot) to immediately impose a total embargo on nickel to Japan. To prevent Japan from accumulating stocks of strategic raw materials, a meeting of

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[64] NAA: A2676/1 - War Cabinet Minute No. 598A - Raw materials (steel, magnesium and aluminium) for aircraft manufacture, Melbourne, 31 October 1940. DG of Munitions' statement to the War Cabinet regarding the state of raw materials for aircraft manufacture.

[65] NAA: MP287/1, 1289, CAC Supply of aluminium sheets from America, 1941. Letter from the British Purchasing Commission, Sir William Glasgow to Robert G. Menzies, 11 July 1941.

[66] NAA: A3095, 1/10. Aluminium. Letter from the Department of Munitions and Supply, Ottawa, Ontario, to the Australian High Commissioner Office, Ottawa, 18 August 1941.

[67] NAA: MP287/1, 1289, CAC Supply of aluminium sheets from America, 1941; Letter from Sir Harold Clapp, Chairman of APC to British Purchasing Commission, Sir William Glasgow, 7 August 1941.

[68] NAA: A5959, 367/4, Finance, New Caledonian nickel, financial arrangements with Canadian company with subsidiaries in the US and in the UK, September 1940 to February 1943. Cablegram from the Prime Minister's Department to the Secretary of State for Dominion Affairs, London, with copies to the Economic Cabinet, Defence Coordination, External Affairs, Treasurer and Commerce, 23 August 1941.

the Full Cabinet decided to impose throughout the Empire an export prohibition, subject to licence, on scrap, iron and steel.[69] In July 1941, in order to obtain some security of supply and also to prevent nickel from falling into Japanese hands, Australia agreed to purchase 5,400 tons of nickel matte from New Caledonia during the ensuing 12 months. Early in November 1940 this amount was increased by 1,200 tons at the request of the Nickel Company whose production using 2 furnaces (out of a total of 4) was running at 6,600 tons per annum. The company wanted to sell the remaining 1,200 tons to meet local taxation. In addition, 600 tons of nickel matte, not included in the agreement, was unloaded at Sydney. Australia negotiated to sell this shipment to Canada. The Nickel Company also reached a deal with some of the independent mines in New Caledonia to produce 11,000 tons of ore monthly.[70]

DOM: too little and way behind schedule

Created in 1940 under the direction of Essington Lewis, managing director of BHP, DOM was heavily involved with the production of aircraft trainers for the RAAF. While the output of trainers was significant, much other production was influenced by the course of the war and the increasing difficulties in getting materials and components from overseas.[71] DOM also had a huge munitions production program, made difficult by a lack of manufacturing expertise in many specialised or advanced areas. The acquisition of production capability for arms and munitions required acquiring suitable high-precision tooling and following precisely British specifications, manufacturing techniques and quality

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[69] NAA: A5954, 724/1, vol. 4, Minute No. 594 'Commercial relations to Japan'; Record of decisions by the Full Cabinet, Melbourne, 5 November 1940.

[70] NAA: A981, 326/7, New Caledonia, pt.6. General, March 1941 - August 1942. The governor of New Caledonia's letter to the Secretary of State for Dominion Affairs, London with copy to the Minister for External Affairs, 25 November 1940, p.1.

[71] Mellor, *The Role of Science and Industry*, p.308.

control methodology.[72] It required DOM and the supervising engineers in the various government factories and annexes have technical experts to supervise production, maintain tight control over production accuracy and to investigate and solve complex technical issues of concern.[73]

Prior to the war with Japan, DOM had managed satisfactorily with a small workforce that was well acquainted with the department's work. While DOM was able to extend the scale and scope of its operations, production of small arms and ammunition, many of the expanding industries experienced a manpower crisis. This situation became critical to war production and the home economy. It created a dilemma: while there was an increased need for factory manpower, workers were being diverted from these industry jobs to the armed forces.[74]

Replacement of staff of military age across all areas of civilian employment became a critical problem, which DOM managed by encouraging seniors and school leavers to fill vacant positions in their clerical areas and by placing considerable effort into in-house-training. However, some younger employees either left to join the armed forces or took up opportunities created elsewhere. This left DOM to struggle on with falling numbers and falling levels of experienced staff. Those remaining encountered difficulties with increasing workload with some pushed beyond their level of competence.[75] DOM's Stores Branch became the main centre for filling requests for the purchase and dispatch of all manner of raw and manufactured goods needed by the military and war production industry. In the initial phase DOM proceeded without full knowledge of the final cost involved in the purchase of equipment, the size of the forces to be equipped or the expected delivery time. This created an imbalance between production output, supply requests and

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[72] *Ibid*.

[73] Mellor, *The Role of Science and Industry*, p.308.

[74] *Ibid*.

[75] AWM68, 3DRL 8052/269 - 419/45/13, Sir Paul Hasluck, Official Historian, 1940, p.8.

supply delivery. In the first weeks after war broke out some munitions factories, already geared up for continuous production, were able to complete existing orders for small arms ammunition more quickly than anticipated. They were then left idle, awaiting new orders.[76] To add further difficulties upon the local aircraft and munitions industries, most tools and specialised equipment used in manufacturing, such as the many metal working machines and hand tools used in the production and repair of aircraft were still sourced from Britain. The impact of the Blitz and the German bombing of British centres of industry meant Australia could no longer be guaranteed an ongoing supply.[77]

At the Advisory War Council meeting of 15 November 1940, CAS revealed that the Beaufort program was plagued by delays in delivery of machine tools and equipment from Britain and America.[78] In addition, the rising demand for raw materials by the munitions factories affected other lower priority industries. In fact the scarcity of building materials affected construction everywhere.[79] In August 1940, just when Australia's manufacturing industries were making an important contribution to Britain's war effort, the British Minister of Aircraft Production, Lord Beaverbrook, introduced wartime measures preventing the supply of several hundred essential tools and gauges to Australia. This decision, followed by the US embargo on military hardware in 1941, meant the prospect of quickly equipping the RAAF receded, leaving Australia to rethink its acquisition strategies.[80] It was no longer a matter of negotiating appropriate supply channels with Britain, as goods now

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[76] Mellor, *The Role of Science and Industry*, p.34.

[77] NAA: A2676, 1503, War Cabinet Minute No. 1503, Aircraft construction in Australia. Meeting review progress of Beaufort aircraft production in Australia as outlined in report of 7 October 1940 submitted by the Aircraft Production Commission to War Cabinet.

[78] *Ibid*.

[79] NAA: A705/1, 109/3/262. Works and Buildings, the RAAF Station Darwin, 11 March 1940.

[80] NAA: A3095, 32/1/3, DOM & DOSAD, Confidential dossiers. United Kingdom Air Mission, A.F. Bennell, British Aeroplane Company. Outline of progress of the production of Beaufort aircraft in Australia as at 7 October 1940, p.64.

arrived with increased irregularity due to changing British priorities. Also, the increasing risk of shipments being lost at sea due to enemy action further exacerbated the situation.[81]

The government realised early that war conditions would create a demand for tradesmen in metal industries difficult to meet. As it happened, the shortage of skilled men for engineering was due to several factors: Australia's small population; a large EATS program which was underway; and the enlistment of men deployed overseas. At this time the government factories at Lithgow, Maribyrnong and Footscray were finding the going tough. Although reasonably well equipped they were unable to use their resources to full capacity because the number of skilled toolmakers working in metal industries had declined. A committee composed of technical officers of DOSAD, Civil Aviation and the Treasury estimated that 2,500 additional workers at various skill levels would be urgently needed to build aircraft, to work in munitions factories and annexes, to support RAAF operations, for naval building and for the possible development of munitions manufacture in Empire countries.[82]

The committee announced that 4,500 tradesmen would be required to be trained in highly skilled areas. The committee proposed to train 500 toolmakers, instrument makers, gauge and pattern-makers. Less skilled men required at least six months intensive training to bring them up to useful standards. However, in NSW and Victoria, the Amalgamated Engineering Union objected to engineer trainees being employed in tool-rooms. Toolmakers enlistment in the forces had created a serious problem. If they were refused permission because they were in reserved positions, they resigned and enlisted under an assumed name. To

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[81] Robertson, *Australia at War*, p.24.

[82] NAA: A2671, 24/1939, War Cabinet Agendum No. 24/1939. Shortage of skilled artisans for defence needs, signed by Essington Lewis, business consultant for consideration and advice from the Full Cabinet; Minute from the manager of Ordnance factory, Melbourne to Sir William Glasgow regarding technical training, 10 July 1941.

overcome shortage a solution was proposed to train skilled workmen in munitions work. By arrangements with State authorities concerned, the facilities and staffs of technical colleges and schools organised a scheme to train men for a period of 4 to 6 months in technical schools. Many trainees had had no previous experience in engineering, but by July 1941, 500 trainees were manufacturing guns.[83]

The shortage of manpower, as *The Age* of 15 and 19 December 1941 reported, was considered by the government to be of almost equal importance to the call up of additional men by the services. There was no shortage of goodwill, plans and policies to resolve this problem. As Senator Donald J. Cameron, Minister for Aircraft Production, confidently reported, aircraft production was ahead of schedule and future progress depended on manpower and the supply of materials.[84] Stressing the importance of maintaining administrative efficiency, he said that top-level management should be maintained at the highest calibre possible. With aircraft production recognised as imperative, Cameron proposed to establish factories in Victoria, New South Wales, Western Australia and South Australia. However, because these developments generated requests from regional towns in various parts of Australia, anxious to have some aircraft production work to support the local economy, the delicate nature of selection took time.[85]

DOM dealt with urgent requirements for munitions and equipment on a priority basis. In this context, a Defence Committee arbitrated between DOM, the Chiefs of Staff and the War Cabinet in the examination of all production priorities at their monthly meetings. A typical example was when the land pattern Vickers machine gun, previously given lesser importance, was now given higher priority.

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[83] NAA: A3095, 32/1/3, DOM & DOSAD, Confidential dossiers. Agenda Nos. 309/1941 and 354/1941 refer to shortage of toolmakers, signed by the DG of Munitions, August and September 1941, pp.13, and 106.

[84] NAA: A5954, 102/2. Defence policy. Australia's War Effort. Press cuttings only, 1939-42. Clipping from *The Age*, 20 December 1941

[85] *Ibid*.

However, altering production priorities was frequently cost inefficient.[86]

A conference held in 1942 to discuss the production of various types of small arms ammunitions (SAA) revealed problems related to the timely delivery of ammunition required by the services. While the factories were striving to increase production, output continued below quotas, with supply increases typically lagging demand by six to eight months. The conference considered depressing production of SAA types where stocks had reached saturation points and to increase the manufacture of types where capacity was still short of requirements.[87] Although Ross firmly believed that Australia had produced an abundance of weapons by early 1942, it is evident that Australia's production of rifles and machine guns was only gradually increasing by that stage. It was only in 1943 that output finally reached a level where local supply could meet demand as indicated in the table below.

Production of Small Arms and Machine-Guns

	1940	1941	1942	1943
Rifles .303-inch	3,480	35,040	82,098	136,262
Vickers Machine Guns .303-inch	735	1,791	2,748	2,679
Bren Guns .303-inch	-	186	3,081	6,848[88]

Unfortunately, War Cabinet assistance to Britain made Australia's self-reliance targets less achievable. On 8 December 1941, for example, the War Cabinet decided to send much of this small arms and machine-gun output to aid British forces in DEI instead of using it to protect aircraft

[86] NAA: A705, 43/1/557, Minute No. 93/1942, committees, conferences and conventions. General – RAAF, Small arms ammunition Conference, 10 July 1942, attended by CGS, CAS, Second Naval member, Assistant DG of Munitions, Assistant Secretary of DOD and USAFIA.

[87] *Ibid*.

[88] Ross, *Armed and Ready*, p.15.

and airfield installations at home.[89] Just three months prior to the raids on Darwin, the forces assigned to defend the north knew that the existing A.A aircraft batteries and their supplies of ammunition were totally inadequate to ward off large formations of attackers. This of course left aircraft and installations on the ground vulnerable to air attacks.[90] Taking Rabaul as an example, because many aircraft had been lost to Japanese aerial forces when they bombarded the town on 4 January 1942, this led the Air Board to suggest that there was inadequate protection to shelter aircraft from high level bombing and aerial attack at Darwin. Commanding officers of AOB RAAF Stations were advised to do everything possible to protect aircraft with splinter proof protection. The Air Officer Commanding North Eastern Area stated the obvious: 'the only reasonable means of protecting aircraft and installations in this area without a great deal of work and time is through the provision of fighters and providing heavy and light A.A guns in large quantities'.[91] Believing that Newcastle, Sydney and Canberra would be given fighter protection before the northern areas, he recommended the construction of splinter-proof pens at northern bases as a matter of immediate and urgent priority.[92] This was hardly an adequate or timely protection.

While long overdue, the goal was for Australia to develop a more self-reliant and effective defence capability. DOM and other government departments associated with military production were assigned the task of identifying the means to equip the armed services to meet the immediate threat and to pinpoint valuable items requiring urgent repair, modification or variation and all items requiring work that could be

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[89] NAA: A2673, vol. 9, (Minutes of War Cabinet meeting Nos. 1456 - 1643), Minute No. 1557, 8 December 1941, p.3.

[90] Mullholand, *Darwin Bombed,* pp.55, 64, 79, 87.

[91] NAA: A1196, 15/501/195, Passive defence measures, RAAF stations, Policy 1941-1943, Air Officer commanding North Eastern Area to the Air Board, 7 February 1942.

[92] *Ibid;* Air Commodore Air Officer Commanding North Eastern Area to the Secretary of the Air Board, 7 February 1942.

postponed.[93] Another aim was to streamline administrative procedures and processes involved in local manufacture and overseas acquisition. All programs were expected to immediately contribute to the nation's defence. The ability to adapt to the rapidly changing strategic circumstances and to manage the ongoing financial stringency required close scrutiny and continuous review. Curtin also highlighted the need for ruthless management of resources in situations where some objectives that would take longer to achieve may have to be put aside at least temporarily. He believed that it was better to put all resources into the immediate needs of Australian defence.[94]

Lend Lease and Australia

When towards the end of 1941 Australia became host to US forces, negotiation of the Lend Lease (LL) arrangement was still in progress. Australia became a party to the Allied Lend Lease scheme following an agreement on funding arrangements on 3 September 1942.[95] This gave Australia access to much needed equipment and supplies at almost no capital cost, provided the items were for war use only.[96] Department of Munitions (DOM) orders were put through the British Purchasing Commission in the US and, through LL, was able to acquire specialised equipment and materials only available from the US.[97] In March 1942, Roosevelt responded rapidly to urgent Australian requests by appointing an Australian LL expediter into the Office of LL Administration in Washington, with direct access to the White House.[98] Although well represented in the US, Australia's requirements were subject to priorities

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[93] Commonwealth of Australia, Parliamentary Debates, vol. 59, p.1071.

[94] *Ibid*.

[95] http://abmm.org/australia-wwii-lend-lease-program, Lend Lease equipment disposal procedure in Australia, p.4, URL retrieved 12 November 2018

[96] *Ibid*.

[97] S.J. Butlin, *War Economy 1939-1942*, (Series 4 (Civil), vol.3, Australian War Memorial, Canberra, ACT, 1955), p.460.

[98] Butlin & Schedvin, *War Economy 1942-1945*, p.121.

determined by the US authorities and the British Purchasing Mission procedures which somewhat hampered the program.[99]

Estimating munitions and weapons: an exercise in deduction and faith

Following the 1926 and 1930 Imperial Conferences which recommended that the Dominions should establish a supply structure, the Principal Supply Officers Committees (PSOC) were established in Australia, copied on the British procurement system.[100] Approved by the Minister for Defence in March 1933, PSOC set out to establish stocks of strategic materials required by the services, public service departments and civilian sector to manufacture essential goods. Information was collected on sources of raw materials and manufactured goods and the agents involved in importing supplies into Australia.[101]

The role of PSOC was to monitor current and projected usage of defence material, requirements for spares and consumables and to identify and remedy any likely shortages. Analysis of this information was expected to lead to streamlining of procurement processes.[102] However, forecasting accurately the quantities of munitions, supplies and equipment the three services would need resulting from high intensity operations in a future war was difficult. PSOC soon realised that even the services were unsure of what was required to prepare for a future so full of uncertainty. By 1935, PSOC concluded that any management framework would have to be based purely on estimates of quantities for each individual item, which could be grouped into broad categories and, with some added consideration of priorities, be developed into a database to provide the best available knowledge for meeting future

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[99] NAA: A3095, 32/1/3, pt. 2, Munitions, Australian Departments, 1939-1942, p.7.

[100] Butlin, *War Economy 1939-1942*, p.13.

[101] *Ibid*.

[102] *Ibid*.

needs.[103] Estimating wastage and replacement requirements for equipment was complex and often unreliable.[104] This became an ongoing problem that proved hard to solve, as oceanic supply routes were disrupted and shipping schedules became chaotic. The latencies involved in acquiring military hardware required determining requirements early.[105]

Approval of procurement schedules was a competitive process involving assessment of relative priorities and costs. Prior approval required the allocation of capital outlay for factory buildings, equipment and the cost of recruiting and training the labour force. This process had become a source of friction between the services and DOM because e it did not clearly specify 'the relation between Service orders [both in timing and their amount] and the production capacity to meet those orders.'[106] These factors combined necessitated a huge amount of time and *savoir-faire* to get schedules through the military and administrative machinery. As it was more cost-effective to manufacture weapons in large production runs, it was essential to maximise predictability of future requirements to properly manage production scheduling.[107]

The problem of estimating wartime munitions requirements

As noted above, forecasting munitions requirements was difficult at best. When US troops arrived in Australia they were heavily reliant on its Australian counterpart, especially for food and fuel. Similarly, in 1942, Australian troops moved into New Guinea they required huge numbers of weapons of all kinds. While Australia's factories and commercial annexes were manufacturing a broad variety of ammunitions, there were

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[103] *Ibid*.

[104] *Ibid*.

[105] Mellor, *The Role of Science and Industry*, p.34.

[106] *Ibid.*, p.307.

[107] Butlin & Schedvin, *War Economy 1942-1945*, p.52.

great difficulties in coordinating and controlling the flow of components with the inevitable consequence that some components were always in short supply while others were accumulating in store. This lack of coordination meant that productive equipment often operated below capacity.[108] Understandably forecasting operational requirements during wartime 'could only be imperfectly done and (could) change rapidly'.[109]

During 1942 also, equipping additional battalions led to a severe shortage of weapons and ammunition that forced government to expand Australia's defence munitions program. Linked to the defence expansion program was the fundamental need for more tools and gauges. Shortages were prolonged by the need to meet rigorous standards. For instance, in the manufacture of Bren guns, high-grade steel parts finished to a precision of one-thousandth of an inch were specified, requiring sophisticated machinery and gauging equipment.[110] By mid 1942 continuing shortages caused the War Cabinet to put pressure on the US Army to obtain these items under Lend Lease.[111]

Like the other two services, the Australian Army followed established British specifications long after these had been surpassed by technology. However, technical improvement was slow and promising developments often took too much time to gain momentum. Industrial attempts to develop munitions and manufacturing was reported by *The Age* of 3 November 1941 which wrote that a number of Australian industries were now making different types of specialised steels and producing steel wire for aircraft aerials and control cables.[112]

Three different types of variable pitch metal propellers and a

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[108] *Ibid*., p.58.

[109] *Ibid.*, p.52.

[110] NAA: A3095, 32/1/3. DOM & DOSAD, Confidential dossiers, Report titled 'difficulties of supply', June – October 1940, p.111.

[111] Butlin & Schedvin, *War Economy 1942-1945,* p.59.

[112] NAA: A5954, 102/2. Defence policy. Australia's war effort. Press cuttings only 1939-1942. Clipping from *The Age*, November and December 1941-1942.

diverse range of fixed pitch wood propellers were now locally manufactured.[113] These included the two and three-bladed hydraulically operated Hamilton propellers for the Wirraway trainer and the Beaufort torpedo bombers, and two-bladed wood propellers for Tiger Moth trainers. On 2 December 1941 it was reported that the Minister of Aircraft Productions Senator Cameron had stated that a newly created factory in NSW was using a 35,000-lb drop forging hammer of US design capable of making very large aluminium forgings, yet made.[114] Australia had also successfully negotiated with the US and Canadian governments for the import of rolling plant and a large quantity of aluminium ingots.[115]

During 1942 the War Cabinet, noting the extended lead time involved in meeting arms requirements, instructed all services to follow new guidelines. For planning purposes each service was to indicate their total requirements for all items, with quantities indicated and the appropriate supply channels identified. The provision of items and quantities anticipated in the months ahead was always difficult, often producing results no better than guesses. Before translating estimated requirements into purchase orders, the data was passed to Army headquarters for scrutiny and consultation with the appropriate supply departments.[116] At this time all economic activity was controlled or scheduled by government, but nevertheless progress remained highly dependent on unexpected external events, often resulting in forced changes in direction or long delays waiting for pertinent feedback necessary for critical operational planning. In this situation it was not possible to determine with any precision future material requirements for operations or for scoping supply projects.[117]

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[113] *Ibid.*

[114] *Ibid*.

[115] *You, Me--and This War: A critical account of some problems in Australia's organisation for defence*, (Compiled by a special research staff of the Sydney Daily Telegraph, Sydney Consolidated Press, 26 October, 1941), p.44.

[116] Butlin & Schedvin, *War Economy 1942-1945,* p.53.

[117] *Ibid*.

Planning and scheduling became devoid of substance. Sir Laurence J. Harnett of the Ordnance Production Directorate came to the rescue by exposing the lengthy and highly complicated ordering system and its inherent deficiencies. He recommended a revision to Army procedures, suggesting a drastic cut in the steps involved from 23 to 6. Designs and specifications were placed under DOM control with the agreement of the Army munitions directors. DOM's responsibility was to determine production rates, regardless of current orders. The influence of the Army in the production process was much reduced under the umbrella of the Munitions Coordinating Committee. From this point on, one committee was appointed to oversee the demands of the three services, under the chairmanship of the director general of DOM. This was a novel situation for the three services, now forced to submit their schedules to the new committee for intensive investigation rather than simply manage their own affairs as previously. The fact that the new committee exercised authority was perceived as an affront that transposed the services into 'clients rather than masters'.[118]

Due to their loss of total control the services were alleged to be taking their time to present information required by the committee. Many months passed before the committee held its first meeting in August 1942. By then the entire munitions plan was found to be over-ambitious, due mainly to the scarcity of labour. After all the effort of setting up the Munitions Coordinating Committee to oversee production and priorities, the committee's role quickly faded and by the end of 1943 became unimportant.[119]

With so many construction projects linked with the expansion of military production and the development of military infrastructure, Australia's industries absorbed all available building material and

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[118] *Ibid*., pp.51, 53-54.

[119] *Ibid*. NB: Although this principle would apply under most circumstances, there remained the possibility that disagreements over pool policy, in this case nations could be referred upward to the Supreme Command or even to Heads of Governments' level.

manpower. A report covering February 1942 to June 1943 from the Department of Interior's Works and Services' activities shows that 932 projects were completed during these years with another 1,300 in hand.[120] The investment of so much of Australia's economic and financial capacity in its numerous war projects was pushing the nation's resources to their limit. It is no exaggeration to say that 1942 was the critical year, one that served as a severe test for government.[121]

Conclusion

Towards the end of 1930s, as the possibility of another major world war became a certainty, European countries were increasingly placing importance on the advanced capabilities of aircraft in both military and civilian applications. The pace and direction of Australia's economic and industrial development and defence strategy suffered from an over-reliance on Britain for virtually all manufactured goods, both civilian and military. In 1938, Lyons had conceded that 'rearmament is a long process' and as Meaher said such a goal was not easy to achieve given the nation's small industrial base.[122]

By 1940 the increased sense of wartime urgency focused War Cabinet effort on boosting weapons and munitions production to the maximum rate possible to contribute to Britain's war effort. This was to the detriment of Australia's fighting forces, leaving it a dangerously short of military equipment, an especially alarming situation after September 1940 when the Japanese Army occupation of Indochina signaled a possible attack on Malaya. By December 1941, the shock of Japan's decisive entry into the war brought the inherent risks into sharp and

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[120] *Australia* - Monthly Bulletin, Australian News and Information Bureau, New York, (November 1943), p.5.

[121] NAA: A5954, 745/3, general activities of works and service branch of the Department of the Interior, during the war period and particularly during the financial year, 30 June 1941 – 3 September 1941. Report stating the number of projects concluded during February 1942 to June 1943.

[122] Meaher, *The Australian road to Singapore*, p.15.

shocking focus. Local demands for manufactured war supplies were never enough to justify the development of local production. Australia's wartime industrial manpower problems were simply a reflection of the response to a multitude of urgent needs.[123]

The Australian Army was dependent on the RAAF and USAAF for transport aircraft and increasingly on the RAN and USN for amphibious lift. Construction projects often involved personnel from two or three services. Coordination and cooperation between the allies and the different services was necessary.

For security reasons, war industries were dispersed and often duplicated in regional centres throughout Australia where it was thought they were less vulnerable to air raids.[124] The notable lack of infrastructure development in roads, as most roads could not be used for high-intensity heavy transport after heavy rain, made delivery to the north a predicament.[125] This chapter provided an overview of the capability and growth of Australian industry since the outbreak of war and refutes Ross' notion that 'MacArthur did not save Australia'. Rather it was saved by the deliberate development of secondary industry by the captains of industry and Australian governments'.[126]

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[123] Butlin & Schedvin, *War Economy 1942-1945,* p.2.

[124] NAA: A5954, 745/3, general activities of works and service branch of the Department of the Interior, during the war period and particularly during the financial year, 30 June 1941 – 3 September 1941.

[125] Butlin & Schedvin, p.2.

[126] Ross, *Armed and Ready*, p.15.

Chapter Four: Preparing the RAAF for war, 1921-1939

The significance of aircraft for fleet reconnaissance and coastal patrol led to aerodromes being built after World War I. In a 1921 report the Civil Aviation Branch's Superintendent of Aerodromes, Captain Edgar Johnston recommended to set up Mascot in Sydney, Albert Park in Adelaide, Essendon in Melbourne, Maylands in Perth and Eagle Farm in Brisbane.[1] These included the military Flying School at Point Cook, Victoria and the Government's School at Richmond, NSW. At the time the only pilots and ground staff recruited came almost entirely from the military flying services who had acquired valuable experience in World War I.[2] The next step was to find suitable aircraft to equip civilian flying schools as well as the nascent Australian air force to allow both to play a key role in providing regular air services and keeping the nation's lines of communication open. However, developing these foundations required government financial backing as well as fighting general public apathy and disbelief in air transport.[3] Obviously, even under the optimistic assumption that passengers could buy an expensive airline ticket, boarding an aeroplane for both pilots and passengers was risky as most of the early craft used for air services were not equipped with radio and there were no air traffic control system. Pilots had difficulties finding their way back to base.[4] Attracting passengers to fly in dangerous, cramped and cold planes which were unable to keep reliable schedules was rather challenging. Nonetheless, air transport was useful in providing mail

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[1] Robert Lee*, Transport*. *An Australian History*, (University of New South Wales Press Ltd., Sydney, 2010), p.290.

[2] Leigh Edmonds, 'Value for Money? Civil aviation and defence between the wars, 1920-1939', (26-33), *Journal of the Australian War Memorial*, no.15, (October 1989), p.26.

[3] *Ibid*., p.27.

[4] Peter Yule, *The Forgotten Giant of Australian Aviation: Australian National Airways*, (Hyland House Publishing Pty.Ltd., Victoria, 2001), p.6.

services to remote outback settlements. Gradually the air transport system scene changed from a kind of civil version of wartime flying into a professional public transport and airmail service between Australian cities and overseas.[5]

Following World War I, with the use of aircraft in warfare amply demonstrated, future advances in aviation technology inevitably increased the impact of aircraft in warfare and civilian transport.[6] In fact, compared to the limited effectiveness of the Army and the Navy in protecting Australia's vast coastal territory, aircraft could cover great distances and attack an enemy at seas long before it reached the coast.[7] This chapter argues that Menzies and Australia's Air Board's efforts to equip the RAAF with modern aircraft suitable for the Australian environment were compromised when negotiating with an adamant British Air Ministry keen on promoting the British aircraft industry as the prime supplier of aircraft to the Dominions.

Despite the economic crisis still exerting a slowing influence on developments, the early 1930s was marked by notable commitments including the expansion of the RAAF. This chapter examines the important period commencing in 1934 when funds became available to permit the Government to act on Salmond's recommendations to expand the RAAF. It argues that combat aircraft were not part of government's agenda at that time. The Air Board's strong effort to equip the RAAF led to the acquisition of the NA-16, an advanced aircraft trainer, while a forward-looking move, the aircraft was only suitable for the training of aircrews for the EATS. The development of the RAAF was guided by the light raid policy which led to the search for a general reconnaissance aircraft to detect enemy warships in Australian waters. Both projects led

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[5] Lee, *Transport. An Australian History*, p.277.

[6] John W.R. Taylor and Kenneth Munson, *History of Aviation*, (Octopus Books Ltd, London, 1975), p161.

[7] Alan Stephens, *Power Plus Attitude: Ideas, Strategy and Doctrine in the Royal Australian Air Force 1921-1991*, (Australian Government Publication Service, Canberra, 1992), pp.16-19, 53-54, 64.

to a protracted search and acquisition process.[8]

The making of the Royal Australian Air Force

The RAAF's initial tasks grew out from making use of the British Imperial Gift but any more ambitious activities were restricted by the need for economy.[9] The RAN, viewed as the leading service, was allocated the largest proportion of defence funds.[10] Suffering from a lack of a well-defined purpose, the RAAF faced difficulties developing a role in conjunction with the other two armed services. Its only immediate task was to watch over the RAN patrolling of seaways. Constituting a significant permanent status was the introduction of the Air Force Act 1923, which was planned as a starting-point pending the preparation of a proper Bill outlining the constitution of the RAAF as a separate service. This legal framework gave the RAAF the authority to promulgate numerous regulations on organisation, administration, pay, discipline and conditions of service.[11]

While the establishment of aerodromes and landing grounds in various parts of Australia was to encourage both civil and military aviation, which numbered 120 by the end of 1924.[12] From the perspective of the RAAF which only operated one station during that time, this initiative may appears uneconomic and irrational given that the RAAF only had few aeroplanes able to make good use of these widely distributed facilities.[13] However, the government was also trying to promote civil aviation, which required a network of good aerodromes and aerial post routes. During 1925-1926, Australia approved the establishment of additional bases, one at Richmond, NSW and another

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[8] NAA: A1194, 20/15/16803, report by Air Marshal John Salmond, pt. 1, 1928, p.14.

[9] Stephens, *The RAAF: A History*, p.30.

[10] *Ibid*., p.46.

[11] *Ibid*., p.29.

[12] Coulthard-Clark, *The Third Brother*, p.119.

[13] *Ibid*.

at Laverton, Victoria. For more than a decade these two bases became the RAAF's important major permanent airfields.[14]

Salmond's recommendations to expand the RAAF

On 5 May 1928, as part of a long tradition stretching back to the colonial period, British experts visited Australia to counsel government on defence preparedness.[15] The Bruce government requested the British send an experienced air force officer to inspect RAAF's establishments, organisation, training and equipment, believing such advice 'would prove of inestimable advantage' to DOD.[16] Air Marshal Sir John Salmond arrived in Melbourne in July 1928. His report to Cabinet was that the RAAF was lacking in equipment, training, and had no well-defined role.[17] He pointed out that Australia's large continent would make its defence 'at all points simultaneously' very difficult, suggesting that the speed and mobility of aircraft could provide the basis for providing cover for widely separated localities that would otherwise remain undefended.[18]

Salmond also made the important point that a great deal of time was being used to keep old aircraft serviceable, and that obsolete equipment was reducing the efficiency of the RAAF.[19] He recommended additional squadrons and additional air bases at key locations, based on a three-year development program.[20] Salmond was particularly unimpressed by the low standard of training of the Citizen Air Force

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[14] Taylor and Munson, *History of Aviation*, pp.105-106.

[15] NAA: A1606/1, 140/1, Attachment – Air Marshal Sir John M. Salmond, 1928

[16] *Ibid*.

[17] NAA: A1194, 20/15/16803, Air Marshal Sir John M. Salmond, RAF. Report pt.1, The Organisation, Administration, Training and General Policy of the Development of the RAAF, 1928, pp.7-9.

[18] *Ibid.*, p.19.

[19] George Jones, *From Private to Air Marshal. The autobiography of Air Marshal Sir George* Jones, (Greenhouse Publications, Richmond, Victoria, 1988), p.35.

[20] NAA: A1194, 20/15/16803, Air Marshal Sir John M. Salmond, RAF, Report pt.1.The Organisation, Administration, Training and General Policy of the Development of the RAAF, 1928, pp.7-9.

units, believing they had not been given enough flying time to maintain their proficiency. He was concerned by the high-flying accident rates which resulted in many crashes and deaths.[21]

Economic conditions made Salmond's proposal difficult for Cabinet to act on immediately. Assuming that the whole 12,000 miles coastline was to be under frequent surveillance, and the resources required for such an enormous task could not be realistically funded. Australia was faced with the question on how to balance scarce resources between defending the major population centres in the south against the possible but unlikely need to defend a huge and largely deserted north-western perimeter.[22] The prospect for rapid improvement in the economic situation was expected to remain remote for some years to come. Due to the 1929 defence cuts and subsequent budget deficits, which continued under the leadership of James Scullin, the prospect for rapid improvement in the economic situation was expected to remain remote for some years.[23] As Bird said:

> The pressures of the slump ensured that these cuts continued into 1930, reducing the services to a state in which further diminishment seemed barely possible – the state of affairs suited many in Labor who harboured intense anti-militaristic grievances nursed since World War One.[24]

The RAN and seaplanes, 1920s and early 1930s

Another sticking point was the federal governments of the 1920s had directed that the Navy was the front-line of defence. That of course meant that the role of float-planes and seaplanes took precedence over providing the RAAF with front-line aircraft. In 1925, the Air Board ordered 6 Supermarine Seagulls Mk III, modified with a more powerful engine (Napier Lion V) to replace the Fairey IIID which had been in service since

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[21] Grey, A Military history of Australia, p.134.

[22] NAA: A1194, 20/15/16803, Air Marshal Sir John M. Salmond. Report, pt. 1, 1928.

[23] Bird, Joseph A. Lyons - 'The 'Tame Tasmanian', p.37.

[24] *Ibid.*, p.52.

1921. The Seagulls Mk III arrived in Australia in 1926 and in June 1926, No.101 Fleet Co-Operation Flight (FCF) was created at Point Cook, Victoria, moving to Richmond, NSW in August.[25] By January 1929, the Australian-built seaplane carrier, HMAS *Albatross* joined the Australian fleet, but because the Seagull Mk III was built mostly of wood it could not withstand the shock of launching by catapult. The Air Board who had acquired naval aircraft for the RAAF (as was the case in UK) looked to replace the craft.[26]

In early 1933, Air Commodore R. Williams who was searching for a suitable aircraft to equip No. 101 FCF visited the Supermarine's Southampton factory and took a keen interest in a single-engine amphibian they were developing (the Supermarine Seagull Mk V). To meet the RAAF's commitment of providing the RAN with reconnaissance and gunnery spotting with a Seagull aircraft required modification to the catapult device on the *Albatross*.[27]

Williams drew up a requirement for a metal amphibian capable of launch by catapult with a crew of pilot, observer and wireless operator/gunner. His specifications included retractable undercarriage able to carry a full military load within the maximum of 3,410 kg capacity of the ships' catapult. It had a range of 960 kms with 4-hour endurance, a maximum speed of 117 knots (approx. 216 kp/h) capable of operating in open seas with waves up to 1.8 metres in height.[28] Williams also included folding wings to all the Seagulls to fit through the *Albatross*' aircraft hatch and a pusher propeller installation to ensure safe operation with crane hooks on the upper wing.[29]

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[25] Owen Thetford, *British Naval Aircraft, 1912-58*, (London Putnam Aeronautical Books, 1958), p.319.

[26] Vince Fazio, *The last of a legendary aeroplane. A story of the Supermarine Type 236. Seagull V and Walrus survivors,* (Drawquick printing, Sydney, 2006), p.7.

[27] Ewer, *Wounded Eagle,* p.35.

[28] Fazio, p.8.

[29] Ray Jones, *Seagulls cruisers and catapults, Australian Naval Aviation, 1913-1944*, (Pelorus Publications, Hobart, Tasmania, 1989), p.70.

British aircraft manufacturers did not have a seaplane that met William's specifications and were not keen on designing a craft to these specifications. This task was seen as impossibly demanding, and there were serious doubts whether the craft would ever be marketable.[30] However, Vickers, which had a long history in shipbuilding and hydrodynamic research, and had by then absorbed Supermarine, took on Williams' specifications.[31] By mid-1934, after several tests and trials the Supermarine Division of Vickers (Aviation) at Woolston and under the supervision of Reginald Joseph Mitchell, engineer and chief designer at Supermarine, the Seagull V (registered as Type 236) was produced.[32] The Air Board contracted 24 Seagulls for the RAN to specification 6/34.[33] On 27 August 1934, Seagull V was fitted with a 775 HP Bristol Pegasus engine.[34]

The three-year expansion plan: reassessing Salmond's proposals

Having considered but deferred the expansion of the RAAF in terms of funds, force size and base structure and concentrating instead of providing the Navy with seaplanes, the Government now attempted to do something about the RAAF's strategic role and the acquisition of modern aircraft to perform the various tasks proposed for the RAAF. In February 1930, eight single-seat Bristol Bulldog fighter aircraft arrived in Australia. These became the core fighter squadron based at Point Cook, Victoria in March 1932.[35] For economic and practical reasons, virtually all organisational aspects of the RAAF were copied from the RAF including training syllabuses and publications.[36] This was the accepted standard

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[30] Fazio, *The last of a legendary aeroplane*, p.9.

[31] *Ibid*.

[32] *Ibid.,* p.8.

[33] *Ibid.*, p.9.

[34] *Ibid*.

[35] Jones, *From Private to Air Marshal*, p.48.

[36] Cox, 'The RAF and RAAF', p.118.

operating procedure for the RAAF in its early years. The Air Board felt that this policy should be followed as long as Australia did not have an established aircraft industry able to manufacture aircraft with the characteristics sought for the RAAF. The Board debated the viability of using Australian companies to manufacture or modify RAF aircraft locally, and whether a small local factory would enable the RAAF to be less dependent on aircraft not designed for the Australian environment.[37]

The fact that 'aircraft were assembled largely from imported parts'[38] made forward planning difficult.[39] By 1932, aircraft construction became viable for a few selected firms. DOD secured the right to manufacture Gipsy Moths for pilot training and contracted the Larkin Aircraft Company to build 32 DH.60 Moths (129km/h) for the RAAF. The Munitions Supply Branch at Maribyrnong in Victoria also built 6 Gipsy Moths.[40]

Although there was no real evidence of any military challenge or threats against Australia, Salmond's proposition was revisited in October 1934, after a slight improvement to the budget position and amid growing concern regarding Japan's aggressive expansion in Asia. An allocation of £4,157,000 in the 1933-34 Estimates was provided to proceed with a three-year expansion program as recommended by Salmond.[41] In 1935 the Council of Defence suggested the purchase of a suitable multi-role general reconnaissance aircraft for the RAAF.[42]

The interchange of views which took place in the course of defence discussions culminated on 24 August 1936 to the Defence Committee recommendation to expand the RAAF with new squadrons.[43] The

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[37] NAA: A705/1, 121/1/249. Manufacture of aircraft in Australia, training landplanes, February 1927- November 1929.

[38] Ross, *Armed and Ready*, p.33.

[39] *Ibid*., p.34.

[40] Robertson, *Australia Goes to War*, p.16.

[41] Hasluck, *The Government and the People, 1939-1942*, p.41

[42] McCarthy, *Australian and Imperial Defence 1918-1939*, p.43.

[43] NAA: A5799, 294, Defence Committee Agendum No.33/1936 and Supplement,

proposition was endorsed by the Council of Defence but, as the Secretary of DOD, Frederick Shedden pointed out, prior to the plan being put into effect, it was essential to allocate additional funds and select a suitable aircraft for the new squadrons. By October, after considering a note from the CAS on the priority of the proposal, the Defence Committee and the Air Board agreed to proceed with parts of the Salmond plan and to base squadrons in all States.[44]

Funding for the three-year expansion plan was conditional on other priorities. In considering the plan, Stanley Bruce's priority was to ensure that economic stability was finally achieved. He was not prepared to provide finance to expand the RAAF, making it quite clear that 'the government had to be content with maintaining what it had'.[45] This meant continuing with a policy where the Navy would provide Australia's first and only line of defence.[46] Although his viewpoint was not shared by Treasurer E.G. Theodore whose view was that Australia could build an aeroplane and compete 'on equal terms with any other country'.[47] In reply, Bruce pointed out that Australia had not yet been able to build the aircraft it needed nor had it even been able to manufacture a motor-car engine.[48] Other 'great nations were spending millions of pounds in developing aviation and Australia could not hope to keep abreast, let alone ahead of these developments'.[49]

Equipping the RAAF, 1935 - 1939

There was growing unease that another protracted war in Europe would

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Air force policy signed by the Secretary of the Department of Defence, Frederick Shedden, 30 September, 1936.

[44] *Ibid*.

[45] Gillison, *Royal Australian Air Force*, p.34.

[46] Grey, *A Military history of Australia*, p.130.

[47] Gillison, *Royal Australian Air Force*, p.34.

[48] *Ibid*., p.35.

[49] *Ibid*.

cause British aircraft manufacturers' to downgrade or curtail the supply of aircraft to Australia.[50] These recognised risks caused reflection on how to reduce dependence on overseas sources for aircraft. The problem led Parkhill, on succeeding George Pearce as Minister for Defence in October 1934, to review Australia's defence program and introduce a new rearmament program that advocated building up the RAAF with additional purchases of aircraft and engines.[51] On 15 October 1935, Parkhill announced a plan for the introduction of a percentage of locally-made components and a proportion of imported components that could not be made in Australia. He envisaged a time when the raw materials and aircraft, engines and possibly instruments would no longer be required to be imported. Some two years later the government approached several local commercial and industrial groups about the joint development of a local aircraft industry.[52] This led to the creation of the Department of Supply and Development (DOSAD) in July 1939.[53]

Australia's initiative was highly criticised by British commercial interests who strongly opposed the idea of a Dominion developing independent defence and industrial capabilities. They used their influence to attract both British and Australian political support. How could Australia achieve a level of independence without offending British aircraft suppliers and their supporters in both countries? A new approach was needed to achieve cooperation with the Air Ministry and British commercial interests while ensuring that Australia's defence needs were the prime consideration. Parkhill's address to Cabinet on 31 October 1935 points directly to the question. It had become necessary to urgently

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[50] NAA: A3095, 32/1/3, Attachment to 32/1/3A. DOM & DOSAD, Confidential dossiers; Aircraft construction in Australia, 1940-43, pt 2, report, p.55-56.

[51] NAA: A664, 534/401/79, Speech by Sir A. Parkhill, Minister for Defence on the manufacture of aircraft in Australia, 4 February 1937 to the Warringah Electoral Conference, Mosman Town Hall, Sydney.

[52] NAA: A5954, 873/7, A. Parkhill's letter of 15 October 1935 to the Chairman of Directors, H.G. Darling, based in Melbourne, regarding establishing a local manufacture of aircraft and engines in Australia. Formation of CAC, 1935-1936.

[53] *Ibid*.

re-evaluate Australia's dependence on Britain for supply. The call for a self-reliant industry was not new, but the difficulties had to be accessed realistically. At a time of war there was no way of removing the inefficiency or risk linked to being totally dependent on overseas sources of supply. It seemed prudent to plan for a twofold contingency in a time of national emergency.

The supply problem was compounded by the fact that European countries were buying armaments from Britain.[54] A key issue which greatly annoyed Parkhill was that preferential treatment was being given by the Air Ministry to orders placed by other nations. In 1938 and 1939 Turkey and Finland were supplied with Blenheims. In June 1939 the Air Ministry had promised Roumania 126 Hurricanes for delivery between June 1940 and May 1941. Greece was promised 24 Spitfires to be delivered in December 1939 and June 1940. Turkey was also given assurance of another 60 Blenheims and 60 Spitfires**.** To be fair these countries were in the middle of political turmoil and in great need of aircraft and this is probably why the Air Ministry prioritised their orders.[55] This concern was tabled by the Australian delegation at the 1937 Imperial Conference. A memorandum outlining Australia's position and views in connection with delays in delivery of RAAF aircraft, was submitted, suggesting that in principle Dominion requirements should be given priority over those of foreign countries.[56]

As Parkhill was particularly keen on promoting a local aircraft industry, on 23 January 1937 he warned of the danger of depending solely on imported aircraft for the RAAF, stating that even in peacetime delays extended on some orders to over two years. During wartime greater demands placed on British aircraft companies would make

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[54] McCarthy, *Australian and Imperial Defence 1918-1939*, p.109.

[55] *Ibid.*

[56] NAA: A664, 534/401/92, Speeches by the Minister for Defence: (1) Imperial Conference 1937. Defence aspect (2).Some impression abroad (3) Empire Civil Aviation and aircraft manufacture.

Australia's position 'immeasurably worse'. As a starting point Parkhill envisaged 'a light two-seater aircraft of simple straight forward construction on the stressed-skin principle',[57] pointing out that such a type was not available from England. However, Parkhill diplomatically took the opportunity to stress ongoing support of Australia's policy to standardise RAAF equipment with the RAF wherever possible.[58]

The creation of the Commonwealth Aircraft Corporation, 1936

Following a tour of Europe during 1935, Essington Lewis, General Manager of the Broken Hill Proprietary Limited (BHP), returned to Australia with the firm conviction that war was unavoidable and went on to advocate this view through government channels. He warned that Australia needed to act immediately to upgrade its defence. Subsequent to his successful lobbying, the Government convened a conference in 1935 to consider the steps that should be taken in order to manufacture aircraft and aero-engines locally to bypass future overseas supply obstacles.[59] During the same year, a technical evaluation mission under the leadership of Wing Commander Lawrence Wackett was tasked by the Air Board to select an advanced training aircraft suitable for local mass production. After detailed investigation of manufacturer facilities in France, Italy, Holland, Germany, Britain and USA, the mission selected the NA-16 produced by the North American Aircraft Corporation (NAAC) as the most suitable for Australia's needs.[60]

While overseas Wackett had acquired the unshakeable view that British industry did not display the range of modern technologies that were being employed in America. To Wackett these technologies were

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[57] NAA: A5954, 827/17, Imperial Conference 1937, Paper No. 13, Sir A. Parkhill, Minister for Defence. Speech on The manufacture of aircraft in Australia, 8 March 1937, pp.1-2.

[58] *Ibid*.

[59] *Ibid*.

[60] George Odgers, *The Royal Australian Air Force: An illustrated history*, (Child & Henry, Brookvale, NSW, 1984), p.52.

the most attractive features of the NA-16 and its single row Wasp radial engine. In comparison, British aircraft makers continued to stay with traditional production techniques and appeared to show little inclination to follow the leading innovations being adopted in two countries, USA and Germany.[61] Also both the American aircraft and its Pratt & Whitney R-1340 nine cylinder single row wasp radial engines was their suitability for mass production.[62]

National interest and a strong commitment to Australia's defence saw the nation's industrial resources and intellectual capacity used in a concerted way by commercial entities for the first time in 1936 to produce aircraft and weapons for the three Services. Aircraft manufacture draws on a base of scientific research, engineering design and development work, laboratory investigations, advanced manufacturing systems, factories and skilled manpower. For this, BHP was the most adequately equipped company in Australia. Expressions of interest were sought from Britain's leading manufacturers to join in local production.[63] The Orient Steam Navigation Co. Ltd and the Electrolytic Zinc Co. of Australasia Ltd subsequently expressed interested.[64] On 25 January 1936 a syndicate was formed involving the combined resources of leading Australian companies 'to develop Australian resources with the object of being able to build a complete war machine in Australia from, as far as possible, from Australian materials'.[65]

On 17 September 1936 Parkhill as Minister for Defence, announced the establishment of an Australian aviation industry and by October the Commonwealth Aircraft Corporation (CAC) was created.[66] With a capital

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[61] Ross, *Armed and Ready*, pp.98-99.

[62] *Ibid*.

[63] NAA: A3095, 32/1/3, Attachment to 32/1/3A, DOM and DOSAD, Confidential dossiers. Aircraft construction in Australia, 1940-1943, report, pt. 2, pp.49-50.

[64] *Ibid.*, p.56.

[65] *Ibid*.

[66] *Ibid*.

of £600,000, subscribed for by Broken Hill Pty. Ltd, (£240,000); Broken Hill Associated Smelters Pty. Ltd, (£200,000); Imperial Chemicals Industries and other British interests, (£100,000) and General Motors Holden Ltd (GMH), (£60,000). GMH, a fully-owned subsidiary of General Motors Corporation of America, was allocated approximately 10 percent of CAC shares, and investment that was approved by the Lyons government. Lyons had assured Britain that the foreign capital of GMH would not exceed ten percent and no representative of the foreign interests would hold a higher executive position, such as Managing Director.[67] The photograph below shows the size of CAC which was to become the only private entity with the resources to manufacture aircraft and high-powered aero-engines.

Figure 1. Aerial view of the Commonwealth Aircraft Corporation, 1941.
Source: The National Library of Australia, Canberra: NLA ref.113727

The North American Aviation Corporation NA-16 advanced trainer

When CAC sought Cabinet's approval in December 1936 to build 40 NA-

[67] NAA: A5954, 827/17, Imperial Conference 1937, Paper No. 13, Sir A. Parkhill's speech on the manufacture of aircraft in Australia, 8 March 1937 and statement in Pamphlet of 23 January 1937, pp.1-2.

16,[68] Britain applied considerable pressure on Australia to reconsider its decision. In an obvious effort to appease British sensitivity, Lyons cabled Britain's Prime Minister Stanley Baldwin on 1 June 1936, advising that prior to the selection of the NA-16 the syndicate had acquired a mass of technical information from the world's aircraft manufacturing centres and had recommended the American aircraft for practical reasons, indicating that he was desirous to launch the syndicate's project as soon as possible.[69] The NA-16 advanced trainer was preferred also for reasons of time and cost. The airframe and engines were relatively simple presenting no great construction problem.[70] The NA-16 embodied advanced features such as stressed-skin construction, a variable pitch propeller and a retractable undercarriage. Both NAAC and Pratt & Whitney were using production line techniques to produce the aircraft and engine respectively in a very efficient manner.[71]

In an effort to persuade the Government to choose one of their aircraft Britain proposed the Westland Lysander A39/34 as a type of aircraft suitable for manufacture in Australia. However, the Lysander was purpose-built for an Army communication role and as such, was comparably different to the NA-16. As the RAAF needed a trainer, the NA-16 was the clear leader. Most importantly, what CAC needed was a proven aircraft suitable for mass production using modern assembly methods. A more complex aircraft would have been beyond the capability of Australia's fledging industry. The Lysander powered by a Mercury engine was a high-wing monoplane with good short-field

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[68] David Vincent, *The RAAF Hudson Story*, (Published by D. Vincent, Highbury, South Australia, 1999), p.4.

[69] NAA: CP4/2, 41, Manufacture of aircraft, Cablegram from Lyons to the British Prime Minister, Stanley Baldwin, 1 June 1936, p1, copy to the Minister for Defence; Geoffrey Whiskard's letter to the Deputy PM Earle Page, 1 October 1936. Cabinet approved the construction of 40 NA-16 on 7 January 1937.

[70] Gillison, *Royal Australian Air Force*, p.46.

[71] NAA: A5954, 827/17, Imperial Conference 1937, Paper No. 13, Sir A. Parkhill's speech on the manufacture of aircraft in Australia, 8 March 1937 and statement in Pamphlet of 23 January 1937, p1.

performance, and low speed maneuverability could land or take off from a reasonably flat area of about 550m long and 365m wide.[72] However, cost was also an issue. The cost of the Lysander was £12,900 compared to the NA-16 costing £9,365.[73] In August 1936, the Air Board presented details of a comparison with the NA-16 to the Department of Air. The British aircraft was close to the NA-16 in maximum weight (2,877kg versus 2,991kg), and significantly larger in wingspan. Powered by the Bristol Mercury radial engine (649kW), its cruise and maximum speed was comparable to the NA-16 (max. speed 354 kp/h at 10,000 feet versus 341kp/h at 7,000 ft).[74]

The Lysander was rejected by the Air Board on the grounds that its engine would not suit Australian conditions and was too complex for local manufacture. While cost was a factor, the Board's decision was influenced by the Lysander's construction based on an old-fashioned steel tube frame covered by doped linen cloth. The NA-16 wings were of stressed skin construction, which had the advantage of providing CAC with an engineering skills base for later developments.[75] On 12 October 1936, Lyons wrote to the High Commissioner for the United Kingdom, Sir Geoffrey Whiskard, assuring him 'that it has been the policy of the Commonwealth government to adhere to British service types of aircraft and all warlike stores and services, and its selection 'would conform to the general Imperial Strategic air plan under which it was understood that Dominion air forces would use the same type of machines as the RAF'.[76] This led Lyons, on 25 November 1936, to reassure Sir Stanley Baldwin that Australia had 'no desire to evade its undertaking that British types of service aircraft only would be ordered'.[77] However, after vigorous checks

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[72] Taylor and Munson, *History of Aviation*, pp.318-319.

[73] Ewer, *Wounded Eagle*, pp.101-102.

[74] *Ibid.*, p.169.

[75] *Ibid.,* pp.101-102.

[76] NAA: CP4/2, 41, Manufacture of aircraft, Cablegram from Joseph Lyons to the British Prime Minister, Stanley Baldwin, 1 June 1936.

[77] NAA: CP4/2, 41, Manufacture of aircraft, Minute from Prime Minister Joseph

on different British types, none were found suitable for both Air Board needs and the requirements of the manufacturing company for a basis initial type to found the industry'.[78]

Giving the Air Board his unstinting support, Lyons stated that the RAAF needed a conventional type of engine immediately but would keep open 'the prospect of a complete change over to the (British) sleeve valve in the near future'.[79] As Chief of Air Staff, Williams was able to convince the Defence Minister to uphold the NA-16 decision. An order was placed with CAC for 40 NA-16 aircraft and 50 engines in January 1937. Despite the strong case for the sleeve valve engines currently under development by the Bristol Aircraft Company, the Air Board felt it too risky and costly to build a plant for the manufacture of engines based on such new technology, given the small quantities needed.[80]

The NA-16 needed some modifications to meet RAAF requirements. The Australian version, renamed as the Wirraway, looked set for a bright future.[81] The Air Board thought it not only suitable as an advanced trainer but also adaptable as a two-seater fighter, a light bomber and a utility aircraft for Army cooperation work. The Wirraway specification provided for a slightly less powerful engine, but gave it a twenty percent improvement in speed and cruising range over the Hawker Demon, which was the RAAF's frontline fighter aircraft at the time.[82] The contracted price for the Wirraway - £8,144 per aircraft - exceeded the cost given in the 1936 tender by almost 70 percent.[83] The

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Lyons to Britain's High Commissioner, Sir Geoffrey Whiskard, 12 October 1936.

[78] *Ibid.* Cablegram from PM Joseph Lyons to PM Stanley Baldwyn and to the Secretary of State for Dominion Affairs, the British High Commissioner, London, with copies to the Governor-General of Australia and the Minister for Defence, 25 November 1936, p.1.

[79] *Ibid*.

[80] Weston, 'The Australian Aviation Industry', p.43.

[81] *Ibid*.

[82] Geoffrey Pentland and Peter Malone, *Aircraft of the RAAF 1921-78,* (Kookaburra Technical Publications Pty. Ltd, Melbourne, 1971), p.37.

[83] NAA: A1196, 1/502/5. Manufacture of aircraft and engines in Australia.

Air Board disputed the additional charge of £3,366 per aircraft, even though the contract included provisions for variations to the original specification to be charged as 'extras'. Although on 21 June 1939 the Air Board stated that the increase was a surprise, NAAC were in a strong position because they were asked to incorporate many changes, and it was clear, therefore, that the production of the present type of aircraft bore significant differences to what was specified in the 1936 tender.[84]

Arrangements between the federal government and CAC were based on the production of one Wirraway per week, employing 600 to 700 workers.[85] Having regard to the materials and extensive tooling involved, local contractors in various Australian states were encouraged to participate in the manufacture of aircraft parts and specific components. The final assembly was to be done in Australia and, as the program progressed, CAC also projected using advanced machine tool equipment that would allow CAC to make other classes of aircraft engines.[86]

By virtue of their commitment to build engines for the Wirraway, CAC had become well-placed in 1939 to oversee the entire project, progressively acquiring invaluable experience in modern mass production line techniques for the assembly and testing of aero-engines, airframe sub-assemblies and the final assembly of complete aircraft. Later in the year CAC was requested to step up production to four aircraft per week, then a further increase to six per week, for which £125,000 was provided.[87] In 1939, CAC now had some 2,000 employees on their payroll and were consequently faced with a weekly wage bill of

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Memorandum regarding a meeting including the Crown Solicitor, the Minister for Defence, NAAC, CAC, the Air Board and their legal advisers from the Secretary of the Department of Defence to the Secretary of the Air Board, 6 April 1939.

[84] McCarthy, *Australia and Imperial Defence 1918-1939*, p.34.

[85] Wilson, *Wirraway, Boomerang & CA-15 in Australian Service*, pp.94, 96.

[86] NAA: CP4/2, 41. Manufacture of aircraft. Minute from Prime Minister Lyons to the Secretary of State for Dominion Affairs, London, 25 November 1936.

[87] Wilson, pp.94, 96.

approximately £10,000. Without financial assistance, the increase in production rate compelled CAC to secure additional working capital by commercial means.[88] The Air Board had hoped that Britain would recognise the manufacture of the Wirraway and the Wasp engine in Australia as an additional source of Empire supply and left open the possibility of switching on the sleeve valve engine about to enter service in the Bristol Aircraft Company's Beaufort and Beaufighter aircraft.[89]

In order to understand the time-frame involved in complex airframe development projects, it is worth noting that in Britain Roy Fedden, chief engine designer, had commenced work on sleeve valve engine in 1927. Bristol's first sleeve valve engine, the Perseus was introduced in 1936.[90] With further improvements that included increasing its capacity to 1635 cu. inches, the Perseus-100 developed 1200 hp. The company was eventually successful in mastering the complications of sleeve valve designs, which led to the future construction of the Taurus, Hercules and Centaurus engines.[91] The picture below shows a Centaurus engine with cylinders removed exposing the moving sleeves and their ports.

Figure 2. Example of a Centaurus engine (Source: Bill Gunston, 1989)

[88] *Ibid*.

[89] Weston,'The Australian Aviation Industry', p.43.

[90] Stewart Wilson, *Beaufort, Beaufighter and Mosquito in Australian Service*, (Aerospace Publications, Weston Creek, ACT, 1990), p.23.

[91] *Ibid*.

The Centaurus was the final development of the Bristol Engine Company's series of sleeve valve radial aircraft engines, and 18-cylinder two-row design that was produced in 34 variants ranging from the 2000 hp (1490 kW) Centaurus I to increasingly more powerful aircraft piston engines introduced into service towards the end of World War II.[92]

British Air Ministry and aircraft production, 1934-1938

Since the Great War orders for aircraft manufacture had declined as the depressed market forced some companies to abandon production. Aircraft companies such as the Supermarine's Design Department began to clear their way back from the early 1920s, albeit in tight financial conditions.[93] British aviation benefited through the ingenuity of men such as Mitchell and his team who later on created the Spitfire, the Southampton, the Walrus and other impressive aircraft. The future of British aircraft technology looked even brighter when a number of firms sent technical teams to America to learn American techniques in aircraft manufacture.[94] In October 1932 after Vickers had designed and built a medium bomber to the British Air Ministry specification B.9/32, it substantially revised the design to meet changes introduced by the British Air Ministry, specification B.9/35. The bomb-load was significantly upgraded. From 1000lb to a range of 720 miles (approx. 1,159kms), in 1934 the new specification was 4,500 lb and a range of 1,200 lb.[95]

On 2 August 1932, the British Air Ministry awarded a contract to Mitchell to build a single seated monoplane fighter (type 224). Mitchell

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[92] Bill Gunston, *World Encyclopedia of Aero Engines*, (Patrick Stephens Ltd., Cambridge, Britain, 1989), p.33.

[93] Sebastian Ritchie, *Industry and Air Power. The Expansion of British Aircraft Production, 1935-1941*, (Frank Cass, London, 1997), p.9.

[94] Ralph Pegram, *Beyond the Spitfire. The unseen designs of R.J. Mitchell*, (The History Press, Gloucestershire, UK, 2016), pp.12-13, 28-29.

[95] Ritchie, p.34.

was advised to reduce the landing speed, despite the wide track of the undercarriage, because of concern that the aircraft would prove difficult to land safely at night. During 1833 the aircraft was totally redesigned. Among the many new alterations, the rudder and elevators were fitted with horn balances and the wings were swept back from 3.5 to 5.5 degrees on the leading edge. However, type 224 proved to be a problematic aircraft due to insurmountable problems with the engine cooling system. As its performance failed to live-up to specification, on 1 March 1934, Mitchell's team designed Type 300, better known as the Spitfire, an aircraft that became 'the epitome of fighter development' when it was first flown on 5 March 1936.[96]

Mitchell's team thorough work coincided with the need to expand and provide the RAF with combat aircraft. At the House of Commons in July 1934, Churchill who was at the time a back-bench MP, informed his colleagues of the news that Hitler was secretly building an air force that within two years could overwhelm the RAF unless Britain acted to rapidly expand the RAF.[97] Exposure of this situation by the British press in 1935 produced much public interest and concern.[98] By 1936 Britain's Expansion Plan A rearmament scheme made it possible for British air defences to be reconstructed to include RAF Fighter Command, RAF Bomber Command, RAF Coastal Command and the Fleet Air Arm.[99] RAF Volunteer Reserve was particularly attractive as it offered air training to men without prejudice to their social class.[100]

With the rising conviction of another major conflict looming, the

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[96] Pegram, *Beyond the Spitfire,* pp.150-151, 156-157, 160.

[97] Barker, *The RAF at War*, p.6.

[98] Brett Holman*,* 'The Air Panic of 1935: British Press. Opinion between Disarmament and Rearmament', (288–307), *Journal of Contemporary History*, vol. 46 (2), (2011), p.290.

[99] R.J. Overy, *The Air War 1939-1945*, (Europa Publications Limited, London, 1980), pp.16, 37, 39.

[100] John Terraine, *The Right of the Line, The RAF in the European War 1939-1945,* (Sceptre, New York, 1985), pp.111-112.

British Air Ministry began steps to accelerate the development of a new generation of warplanes by replacing older aircraft with modern types.[101] But as Overy observed: 'Air rearmament was, however, a more complicated affair than simply expanding squadron numbers'.[102] As he said, the numbers of aircraft to be built had to match the capability of the aircraft, necessitating a balance 'between quantity and quality'.[103] While a welcome development, it became a more difficult and time consuming task considering that aircraft manufacturing had increased in complexity and made more use of exotic materials, which inevitably drove up costs and increased lead times for design, development and manufacture.[104]

During the mid-1930s, aviation technology attained a critical phase with the 'switch from biplanes to monoplanes'.[105] Notwithstanding, such technological innovation took inevitably years to bear fruits. Further, many British aircraft companies were under-capitalised to a level which had almost stopped the research and development work now so critically needed. While aircraft designers were treated like royalty and were considered 'the key men of all aviation, civil and military', they were nevertheless starved of funds to the point of enforced idleness.[106]

By taking a coordinating role, the British Air Ministry helped breed a new generation of modern military aircraft. In 1938 a new factory was created for the manufacture of the Supermarine Spitfire. A Hurricane group was also created that included Hawker, Gloster aircraft and two Scottish engineering firms and the Canadian Car and Foundry Company in Montréal.[107] Also in 1938, as part of the urgent restructure of its aircraft industry, Britain instigated a production program that used the

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[101] Barker, *The RAF at War*, p.21.

[102] Overy, The Air War 1939-1945, p.20.

[103] *Ibid*.

[104] Taylor and Munson, *History of Aviation*, p.133.

[105] Overy, p.20.

[106] Terraine, The Right of the Line, p.28.

[107] Ritchie, *Industry and Air Power*, pp.55-56.

capacity of Britain's automobile-makers and other producers. Factories and workshops, from furniture makers to boat builders, were enlisted to make components such as fuselage sub-assemblies, wing, wooden parts and simple metal and electrical components. During that year, British manufacturers built 2,827 military aircraft.[108]

But between January and March 1940, the rate of production outstripped the availability of spare parts, which led to a workforce standstill. And as many employees enlisted it further reduced work output. Vickers lost 8 per cent of its manpower to the armed services.[109] By February these problems forced management to stand-down some of their operatives. Another issue that affected production occurred when factories moved to new types of aircraft and had to reconfigure production lines. Worse was to befall the British industry during February with weather conditions delaying flight tests and an outbreak of influenza that caused a high level of absenteeism.[110]

The Empire Air Training Scheme (EATS) in Australia

At the outbreak of war in September 1939, Britain officially proposed the formation of EATS. Under this scheme, pilots, observers and navigators, wireless operators and air gunners were trained in the Dominions for service in RAF squadrons in Europe, the Middle East, Australia, New Zealand, Canada and South Africa. The scheme became the means by which RAAF recruits were involved in the air war in Europe and other theatres.[111] According to McCarthy, EATS diminished military effectiveness. He maintains that the demands EATS placed on Australia's local aircraft industry had no long-term benefit and that the RAAF 'almost ceased to exist as a fighting organization for the first two

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[108] Barker, *The RAF at War*, p.21.

[109] *Ibid.*, p.221.

[110] *Ibid.*, p.222.

[111] Weston, 'The Australian Aviation Industry', p.49.

years of war'.[112] On the contrary, had it not been for EATS, fewer men would have been trained as aircrew. If EATS had not been formed very little else would have been achieved in terms of RAAF operational capability. This would have seriously undermined Australia's defence in the long-term. In reality, by working to service the operational, training, maintenance and organisational needs of EATS, both the local industries and the RAAF grew and benefited, particularly in the engineering and technical support field. That Australia was insufficiently prepared in 1939 and even more seriously in 1942, should not be attributed to the advent of EATS.

At least in providing for the scheme, the RAAF had established bases, training schools, maintenance depots and, equally important, new aerodromes, runways and related facilities in support of aircraft engineering and operations, including new roadwork. EATS did not diminish Australia's air power. Rather the problem was the long delays in approving and funding the expansion of the RAAF with new squadrons, together with the time taken to select and obtain suitable aircraft for the RAAF. The missing ingredient was as Ashworth affirmed combat aircraft.[113] Grey's argument that the RAAF has lost thousands of 'potential aircrews' which could have been returned to defend Australia in her time of need is to say the least, interesting.[114]

In 1939-1940 it was entirely reasonable to send aircrew to Britain. After all Australia had no way of using them at home. If statistics can be trusted as late as June 1940, Australia's frontline aircraft position was far from satisfactory. The RAAF assets totaled 204 operational aircraft, supplemented by an assortment of about 523 trainers and transport types.[115] As such, the useful employment of additional aircrew would

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[112] McCarthy, 'The defence of Australia and the Empire Air Training Scheme: 1939-1942', p.333.

[113] Ashworth, 'Panel discussion' in The Proceedings of the 2003 RAAF History Conference', p.127.

[114] Grey, A military of Australia, p.142.

[115] NAA: A5954, 230/3, Statement of numbers and types of aircraft available, 1940.

have required large numbers of aircraft which simply did not exist. Meaher suggestion that 'large purchases of aircraft should have been made from the mid-1930s as the threat of war increased markedly' was simply unrealisable at the time.[116]

Multi-purpose aircraft, engine technology and standardisation

From April 1934 to March 1940, British and German investment in aviation research and development increased significantly, totaling £16.7 million by Britain and £30 million by Germany.[117] However, according to Lund, 'the British air sector was more flexible, technologically sophisticated, and effective than those of America or Germany'.[118] The role of the British Air Ministry in steering Britain's aircraft industry was important in engineering this transformation. In the early 1930s, modern aircraft were monoplane designs using all metal construction with smooth wing surfaces to decrease aerodynamic drag and stressed skin construction where the outer envelope was part of the load bearing structure.[119] Variable pitch propellers and retractable undercarriages were now commonplace and engines used super chargers or turbo

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[116] Meaher, *The Australian Road to Singapore*, p.171.

[117] Erik Lund, 'The Industrial History of Strategy: re-evaluating the wartime record of the British aviation industry: Comparative perspective, 1919-1945', (75-99), *The Journal of Military History*, no. 62, (January 1998), p.76.

[118] *Ibid*., p.75.

[119] George Odgers, *Pictorial History of the RAAF*, (Paul Hamlyn, Dee Why West, NSW, 1977), p.36.

[120] George Odgers, *Air Force Australia*, (National Book Distributors, French's Forest, NSW, 1996), pp.222, 224, 228.

[121] Taylor and Munson, *History of Aviation*, p.133.

[122] Price, *Supermarine Spitfire*, p.18.

[123] Terraine, *The Right of the Line,* pp.17- 20, 29.

charges to maintain engine power at higher operating altitude.[120] Rolls-Royce and Bristol and Napier, the leading designers and manufacturers of aero-engines provided valuable contributions to designs and building techniques. By then the Supermarine Spitfire, designed in 1934 and first flown in 1936, showed greater performance in speed and maneuverability and was ready to enter production.[121]

The picture below shows a Spitfire's Merlin engine which was a liquid-cooled, 27 litre (1,650 cu. in) capacity V-12 piston aeroengine designed and built by Rolls Royce Limited. It was first run in 1933. Known as PV12 it was upgraded many times through its service life. The power and reliability of the engine improved markedly, notably in the area of supercharging with the introduction of the Two-Stage, two-speed unit which was first seen in the Spitfire Mk IX which was the most successful of the Spitfire variants. The sophisticated Spitfire was more complex to build and the cost and time involved in construction was a concern in spite of its performance and elegant appearance.[122]

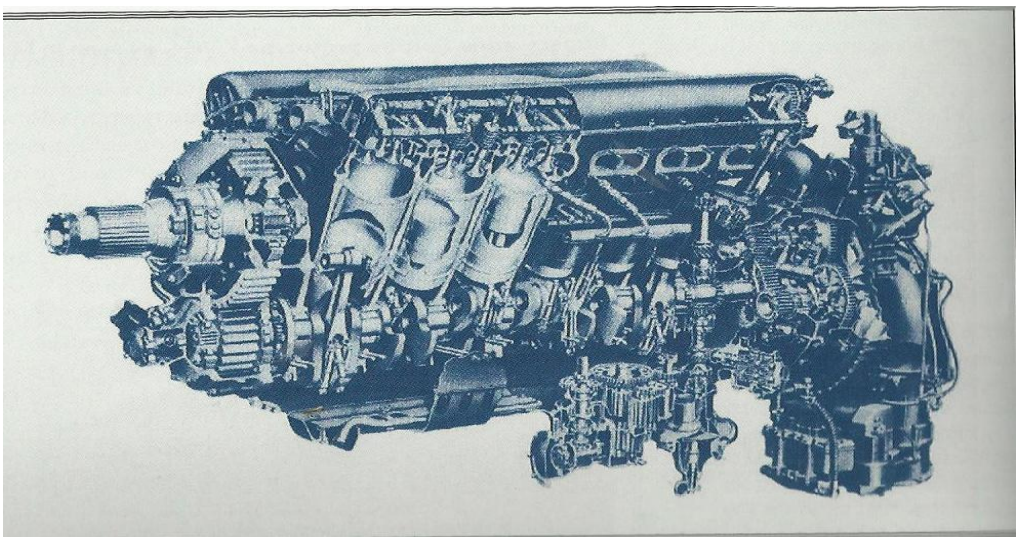

Figure 3. Source: The Rolls-Royce Merlin *in Alfred Price*, *Supermarine Spitfire*, (Midland Publishing, Hersham, Surrey, Britain), 2010.

These successful airframe and engine developments were due to Britain two prominent chief aircraft engineers and designers, R. Mitchell, at Supermarine and Sydney Camm at Hawker. They produced designs for new high performance aircraft that rapidly evolved through several experimental versions that led directly to aircraft used as fighters and bombers during World War Two. In 1937 Mitchell's Supermarine Spitfire Mark I (355 mph at 19,000 feet) was able to fly at much higher speed when a much improved Rolls Royce Merlin-engine was installed in 1943.[123] The Hawker factory's competitor to the Spitfire was ready, slightly earlier with their single-seat fighter the Hurricane, powered by a 1030 hp of the Rolls-Royce Merlin III providing a top speed of 328 mph (528 kmh). The Hawker Hurricane was first flown on 6 November 1935 and, although considered something of an ugly duckling compared to the Spitfire, it was produced in larger numbers and became the backbone of the RAF during the Battle of Britain.[124]

By the late 1930s Avro, Bristol, Hawker and Short, Britain's leading aircraft manufacturers, had attained superiority in the design of aero-engines, displaceding German products in markets such as Finland, Yugoslavia and Sweden. British aero-engines were being built under licence around the world to leading industrial nations, each license bringing tens of thousands of pounds to Bristol and Armstrong-Siddeley.[125]

The Air Board's quest to equip the RAAF with modern aircraft

In view of the above, equipping the RAAF with modern aircraft was a

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[124] Taylor and Munson*, History of Aviation,* p.295.

[125] *Ibid*., p.79.

complex and protracted exercise, particularly in relation to the much discussed general purpose machine. Finding or building a machine that could satisfactorily perform multiple roles such as maritime reconnaissance, conventional high-level bomber, torpedo bomber and long-range heavy fighter attack was difficult or impossible depending on exactly what these various missions could entail. Arguing this point, Parkhill issued a statement to the press on 22 January 1937 emphasising that no reference had been made to the existence of one such machine. Rather, the RAAF operated many types of aircraft that used a number of engine types ranging from 100 hp to 1000 hp, making standardisation impossible.[126] Some aircraft met technical specifications making them adaptable for use in more than one phase of Air Force work. For example, the Hawker Hind light bomber, which first flew on 12 September 1934, was developed from the Hawker Hart day-bomber and was redesigned to meet RAF's requirements for reconnaissance, ground support of Army operations and a two-seater fighter.[127] McCarthy asserts that the British aircraft industry was using the needs of defence standardisation to prevent American companies from competition. This is significant given their opposition to the purchase of the Wirraway.[128] The standardisation of airframes and/or engines throughout the Empire would have been of great advantage in wartime. At the 1926 Imperial Conference, PM Stanley Bruce supported uniformity 'in all forms as an admirable goal … whether for the Sea, the Land, or the Air Force'.[129]

Standardisation of military equipment generally should be a beneficial arrangement and for many items such as the use of the same type of cartridge in all light weapons, is readily achievable. However, as soon as some form of specialisation is introduced, unexpected difficulties

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[126] NAA: A705, 16/1/1, Manufacture of aircraft in Australia, 1936-1937, Sir Archdale Parkhill, Minister for Defence's press statement, 25 January 1937.

[127] NAA: A5954, 217/2, War Cabinet Agendum No.53/1939. Manufacture of Wirraway by the Commonwealth Aircraft Corporation, *1939.*

[128] McCarthy, *Australia and Imperial Defence 1918-1939*, pp.114 -115.

[129] *Ibid.*, p.104.

or dependencies are discovered and the idea has to be delayed or abandoned. For example, the Australian production of communications and signaling equipment adhered to British designs as far as possible, but it proved difficult to fully achieve.[130]

Pre-war manufacturing of telecommunication was on equipment that mainly came from America. Local manufacturers of electronic components made American-style parts and many of their machines could not make British types of vacuum valves for example. Equally firms could not use the Corps of Signals equipment as models as these were either old or worn. Using or adapting British designs would usually involve modification to use readily available components. Sizeable modifications could easily defeat the benefit of standardisation.[131] There was some support for greater industrial development in Australia for economic, defence, political as well as diplomatic reasons. In 1936, as the Secretary of DOD, H. L. Shepherd expressed it, 'Australia must retain for itself the responsibility for examination of available aircraft and decisions as to the best to suit local requirements'.[132]

But it was not to be as simple as that. The Air Board in selecting modern aircraft for the RAAF, in defiance of a long-standing arrangement with Britain's Air Ministry and its aircraft's manufacturers was confronted by a number of challenges. In the field of human endeavour, Lawrence Wackett built up a reputation as an aircraft designer and engineer which Peter Ewer designates as a 'wizard' from World War I, which became a 'bete noir' to the British.[133] In his autobiography, Wackett expressed his dissatisfaction of the way the British Air Ministry and the Trade Commissioner handled him, which was far from ideal, but also to the short-sightedness of his government, which was not altogether surprising. As Ewer said 'loyalty to Empire was a powerful political theme

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[130] *Mellor, The* Role of Science and Industry, pp.494-495.

[131] *Ibid*.

[132] McCarthy, *Australia & Imperial defence 1918-1939*, p.108.

[133] Ewer, *Wounded Eagle*, p.67. NB: correct grammar: 'bête noire'.

in the 1930s'.[134] Wackett's engineering ability led him to question the strategies used by Britain against Australia's endeavours to manufacture aircraft locally.[135] Wackett's efforts in setting up an Experimental Station at Randwick in 1924 to initiate an aircraft construction came to an end when he was told to close the Station on the recommendation of Salmond[136] who had been able to convince a low-key government that building aircraft in Australia was an uneconomic venture and that 'if Australia wanted to reduce defence expenditure, all aircraft should be bought in Britain'.[137]

Wackett was clearly fighting a losing battle against his government. He was especially critical of Australia's lack of foresight, believeing a local aircraft industry should have been developed earlier. In selecting the American NA-33 advanced trainer, Wackett was contested by the British Trade Commissioner in Australia who insisted on the acquisition of British machine tools. The Australian Customs Department was just as difficult, refusing 'to grant any concession of duty on American machine tools if there was a British alternative'.[138] As Wackett wrote, 'this obliged us to devise means for using many British machines, often with a risk that they might prove unsuitable'.[139] Wackett argued for weeks with petty officials of the Customs Department in Canberra in order to get permits to import essential machinery.[140] To prevent further delay, the team was forced to compromise by acquiring a substantial percentage of machine tools from England, some from Germany and Switzerland.[141]

New types of aircraft were entering production in Britain, many of

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[134] *Ibid.*, p.94.

[135] *Ibi*d., p.24.

[136] Williams, *These are Facts*, p.93.

[137] *Ibid.,* p.102.

[138] *Ibid*., p.137

[139] *Ibid*.

[140] *Ibid.*

[141] *Ibid*.

which were of potential interest to Australia. The Bristol Blenheim (type 149), was developed in response to the latest British Air Ministry specification for a general reconnaissance aircraft, incorporating many improvements over the previous machines including better navigational instruments and automatic pilot. Fitted with a Bristol Mercury engine, it was faster than the Anson, with twice the range and twice the bomb load.[142] The photograph below shows the complexity of fitting a cylinder in a Bristol Mercury.

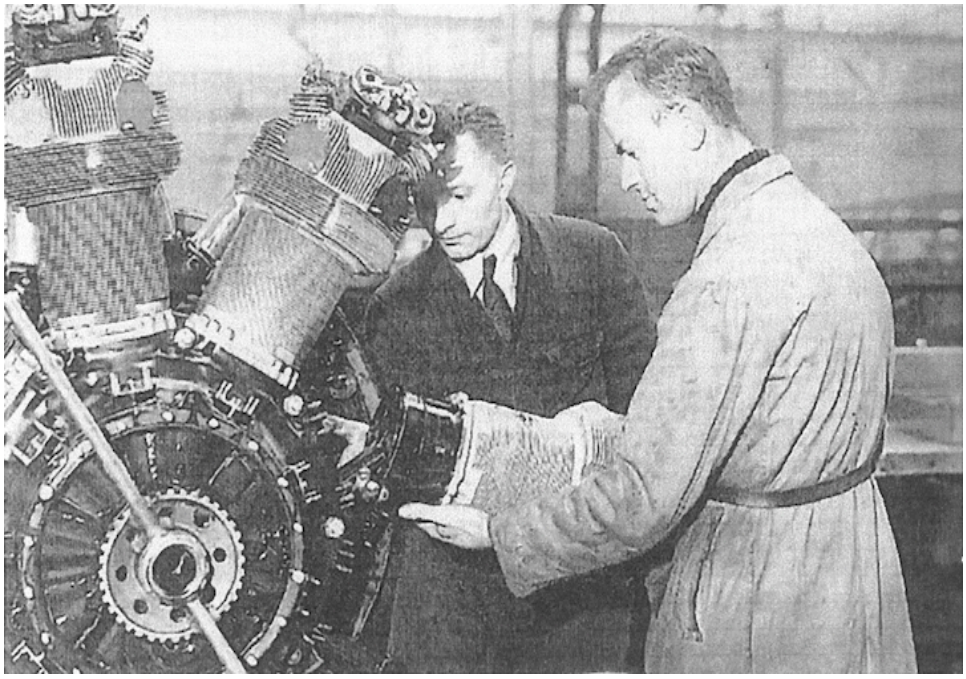

Figure 4. Source: Alec S.C. Lumsden, *British Piston Aero-Engines and their aircraft.*

The Bristol Blenheim aircraft was capable of carrying an 1800 kg load and although reasonably fast at 428 km/h, it would have trouble surviving against German fighters. By the time the first 149 were delivered to the RAF in May 1937[143] it was already outperformed by the

[142] NAA: A705, 9/18/15, Overseas Indents 550 and 591, Bristol Beaufort aircraft and Taurus engines; Minute from the Secretary of the Air Board (P.E. Coleman) at a meeting attended by CAS, AMP, AMSE and the Air Board, 17 February 1937.

[143] Barker, *The RAF at War*, p.42.

next generation designs such as the Bristol Beaufort (type 152) which first flew on 15 October 1938 and the Beaufighter (type 156) first flown on 17 July 1939.[144]

There were two main reasons for fitting more than one engine to an aircraft: to obtain greater power and to increase the margin of safety in the event of an engine failure. In May 1938 the feasibility of manufacturing a medium twin engine aircraft in Australia was investigated by the Government. This led to the recommendation by August to build the Bristol Beaufort, then within weeks of its first flight in Britain.[145] As an interim step the Air Board proposed that 40 upgraded Bristol Bleinheims, including 10 spare Mercury XI engines be bought.[146]

In the context of the disarmament policy implemented which Australia officially supported. The importance given in the budget to long-term infrastructure projects over short term proposals would not have permitted the purchase of modern aircraft. Although advances in aircraft technology occasionally resulted from major innovation, much of the improvement was continuous and evolutionary, as successful designs were refined and upgraded over a period of years. In addition, in the 1930s, expertise in the manufacture of complex types of aircraft was practically non-existent in Australia. In this context, the difficulties encountered by the Air Board and Prime Minister Menzies in acquiring new aircraft for the RAAF are later detailed in this thesis.

The appointment of a British officer as CAS

Certainly the Government's practice of appointing British senior officers

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[144] Christopher H. Barnes*, Bristol Aircraft since 1910*, (London Putnam Aeronautical Books, 3rd revised edition, 1988), p.283.

[145] Wilson, *Beaufort, Beaufighter and Mosquito in Australian Service*, p.27.

[146] NAA: A705, 9/18/15, Overseas Indents 550 and 591, Bristol Beaufort aircraft and Taurus engines. Letter from M. L. Shepherd, Secretary of DOD commenting that it would be unlikely that the Bristol 149 aircraft would be built in Australia to the Official Secretary (Air Liaison), London, 5 April 1937 and Group Captain, AMSE's memorandum to the CO of No. 2 AD, Richmond, NSW, 19 April 1937.

and in relying on their advices, instead of drawing on Australian capability, assumed that British officers were 'superior to their Australian counterparts',[147] and would have been particularly vexing to Australian officers. These appointments were promoted by Menzies, by Richard Casey, Minister for DOSAD, and Viscount Stanley Bruce, High Commissioner for Australia in London from 1933.[148]

In September and October 1939, Air Vice-Marshal Goble warned War Cabinet that its first priority was to secure its own defence against the Japanese threat instead of concentrating its efforts on EATS, which promised to become the most demanding open-ended project. However, the Cabinet ignored Goble's warning. In December, he was replaced by Air Chief Marshal Sir Charles Burnett.[149] Goble had advocated the development of a twin engine reconnaissance aircraft with bomber capacity based on the technology used in the production of the Wirraway. Work towards this could have commenced as soon as the aircraft design was finalised. This did not happen, although this approach was used later to streamline the local development of the Boomerang aircraft when it was needed to counter Japanese Zeros.[150]

In appointing Burnett as CAS on 11 February 1940, the Minister for Air, J. V. Fairbairn told *The Herald* on 8 January 1940 that 'there was no one in Australia with experience of large-scale flying training such as the Commonwealth was about to undertake under EATS.[151] Burnett displayed little of the superior quality expected of him. Stephens describes him as an 'uninspiring, undistinguished retired British officer'.[152] Burnett's effort in building up the number of aircraft in the

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[147] Stephens, *The RAAF: A History*, p.57.

[148] Gillison, *Royal Australian Air Force*, p.24.

[149] McCarthy, 'The Defence of Australia and the Empire Air Training Scheme', p.333.

[150] Cox, 'The RAF and RAAF', p.127.

[151] NAA: MP146/1, 2707, Press cuttings, All States, pt 2, 1939 - 1942.

[152] Stephens, *The RAAF: A History,* p.57.

RAAF did not significantly contribute to Australia's defensive capability. He paid little attention to acquiring combat aircraft for the RAAF as his main concerns were training and patrol of the maritime zone to detect naval intrusions.[153] Burnett was strongly committed to meeting Britain objectives and directed his attention to using EATS as a 'feeder service to the RAF'.[154] Burnett did make some strategic decisions with regard to the RAAF's future role, even though he was not easily persuaded to reconsider his plans even when questions were raised.[155] Influenced by his RAF background he soon pushed for the expansion of the RAAF, creating three new squadrons in 1940 and another in 1941.[156]

In late 1940 War Cabinet had hoped to obtain B-17 heavy bombers from the US, but Burnett was determined 'to keep Australia as a market for British aircraft than by any strategic considerations.[157] Subsequent representations to the RAF and the USAAF were invariably rejected'.[158] Having passed on the B-17 offer, Burnett was left waiting to receive twin engined Beaufighters on condition that 22 British-based squadrons were fully equipped and production reached 150 aircraft monthly. With British towns under constant attack, and U-boats about to complete a blockade of the British Isles, Britain's need was legitimate. However, by late 1942, the RAAF did receive 12 Beaufighters.[159] The photograph below shows a B-17C, the latest development from the Boeing 17 Flying Fortress which carried a crew of seven to nine.

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[153] *Ibid.,* pp.116-119.

[154] Weston, 'The Australian Aviation Industry', pp.47, 75.

[155] Robertson, *Australia Goes to War*, p.60.

[156] *Ibid*.

[157] *Ibid*.

[158] Gillison, *Royal Australian Air Force*, p.77.

[159] Ewer, *Wounded Eagle*, pp.175, 181, 205.

Figure 5. A B-17 Flying Fortress.[160]

Source: Australian War Memorial, ref. 32369.

Conclusion

This chapter argued that in the twenties and early thirties, the capabilities of aircraft had not advanced much beyond World War I. Technological development was a gradual process, held back by a general lack of risk capital. For the first decade of its existence the RAAF struggled to find a significant role in Australia's defence and had to compete with the Navy and the Army for limited funds available. The RAAF was preoccupied with self-preservation and its future was uncertain. Other than taking over the Navy's seaplane activity, the RAAF's role was limited to cooperation with the Navy. The major theme was the problems encountered in expanding the RAAF and equipping it with aircraft in the mid-1930s. This period was impacted by poor economic conditions which meant that re-equipping the services against the possibility of an enemy attack or invasion, was given low priority.

By the mid-thirties the era of the biplane was over, as designers moved beyond the limits of World War I technology. In their quest for speed, designers developed more powerful engines and more streamlined airframes. Salmond's recommendations on the RAAF's future role were sound enough, but even if financial obstacles were

[160] The B-17 bomber's length was 22.6M with a wingspan of 31.62M. Its maximum take-off weight was 29,700kg, maximum speed was 293kph and it had a range of 3,210km with a 2,700kg bomb load.

removed there remained a fundamental mismatch between the capabilities of current aircraft (speed, range and useful load), the huge size of Australia and the severe lack of supporting infrastructure. The future of the RAAF was bound by these three dilemmas. Both the military advisers and statesmen would have appreciated that opportunities and technological changes would eventually overcome these barriers, just as changes in the economic climate would in time ease the financial problems. Such reflection should have been part of the role of progressive leaders.

How does one go about assessing an opponent's motivations? What are the proper strategies and tactics? In this study Britain's continuous meddling in its Dominion's endeavours showed that most Australian politicians suffered from a lack of foresight in the defence services and planning failure at a more strategic level. Wackett's autobiography shows the kind of institutional inertia he experienced and the growth of discontentment he felt with various public organisations. As shown the Air Board's determination to purchase a non-British aircraft engendered bitter dissension with the British Air Ministry. This led into lengthy negotiations steadily growing more complex as Australia was determined to build the Wirraway advanced trainer locally. However, as a Dominion, Australia had no recourse but to assure Britain that this was a one-off case and in future it would maintain the common equipment policy. Having regard to Australia's minor local aircraft industry and the lack of technical expertise, Australia needed Britain to co-operate technically, commercially and financially so that Australia would receive enough orders to make its fledging aircraft industry viable. Also the need for Australia to upgrade its security with suitable military aircraft was driven by the rising pressure of political events and the nation's geographic location, which isolated Australia from her main sources of supply - Britain and to a lesser extent the United States. In so doing it linked defence expenditure to the level of economic recovery, thereby down-playing the assessed level of threat as a prime determinant.

Chapter Five: balancing the political, commercial and technical aspects of aircraft acquisition, 1936-1942

The preceding chapters showed that the worrisome political developments in Europe in the 1930s forced the Australian Government and leaders in defence and industry to examine Australia's future aircraft and munitions needs. This appraisal culminated in the establishment of CAC in 1936 to ensure the timely supply of new or replacement equipment. CAC built what the Air Board required, a pilot training aircraft that could be suitable for Army co-operation and reconnaissance duties and possibly for some close support roles. While, the Government had hoped that CAC would build a first-line aircraft in less than five years, in the meantime reliance on overseas supply continued.

This chapter goes a step further. During 1939 and 1941 with Japanese aggression steadily moving forward, the Air Board had examined a string of machines with the aim of acquiring a high-performance combat aircraft which could also fulfil a reconnaissance role. The accelerative thrust of technical innovation made this difficult as some civilian aircraft could outperform high performance military aircraft. This led the Air Board to look into acquiring a similar aircraft for the RAAF. I argue that the increasing danger that Japanese military might presented to the Far East and to Australia led a gravely concerned Menzies government to reflect that in the absence of a British main fleet, the forces and equipment available for the defence of Malaya and Singapore, vital to the security of Australia, would be totally inadequate to meet a major attack by Japan.

Genuinely concerned over the Far East as were his Chiefs of Staff,[1] Menzies and Shedden spent considerable time trying to obtain aircraft.[2] On 20 February 1941 during Menzies' fourth visit to Britain in six years, he appealed to Churchill for more aircraft to strengthen the RAAF, but was turned down by the Air Ministry and the British Cabinet. As far as they were concerned, strengthening the Far East was not a priority. Their major objective was to defeat Germany first and confronting Japan without American assistance was unthinkable. This was a decision that Menzies understood as did Roosevelt when America entered the war after Pearl Harbor.[3] Menzies was not naïve to the point of not appreciating Britain's position and the weakness of Australia's case.

This chapter argues that because during the period leading up to World War II, much of Australia's military equipment and supplies was sourced from overseas, the risks of relying on import increased as European powers expanded their defence capabilities. This chapter further contends that the British Air Ministry's hardening attitude on Menzies relentless demands for modern aircraft led it to offer unsuitable aircraft types that the RAF had no use for, as an expedient to dismiss Menzies demands at a time when Britain was fighting for its own survival. The problem of equipping the RAAF was complicated as the Air Board did not settle with the types offered by Britain. Another root cause which had a considerable bearing on selection was aircraft were becoming rapidly obsolete as aircraft designers were designing newer and faster aircraft powered with powerful engines.

The means to protect Australia was addressed at the Mosman Town Hall on 4 February 1937 by the Minister for Defence, Sir Archdale Parkhill who stated that £9,000,000 would be allocated to protect the Australian continent. Australian taxpayers not keenly interested in

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[1] Stanley, *Invading Australia*, p.68.

[2] David Horner, *Defence Supremo. Sir Frederick Shedden and the making of Australian defence policy*, (Allen & Unwin, St Leonards, NSW, 2000), p.106.

[3] Day, *Menzies & Churchill at war*, pp.22, 23, 39, 59.

aviation, still needed to be convinced of the validity of any new government undertaking in this field. The Minister's address was an opportunity to entice the public to accept the heavy financial burden incurred in improving Australia's defences. This was the largest amount allocated for a single purpose in the Commonwealth budget for defence.[4] Coming so soon after the combined effects of World War One debts and the Depression, the Minister reminded Australians that their vast continent with its small and dispersed population and minimal lines of communications presented great problems for defence, and that an 'Air Force, by reason of its great mobility, would be of outstanding importance in Australia's defence preparations'.[5]

CAC: weighing up aircraft manufacturing in Australia

John McCarthy asserts that the media had speculated that CAC would be subjected to foreign control due to the involvement of GMH, and this gave rise to some public concerns. The British Board of Trade objected to the establishment of an expensive high technology secondary industry in the Dominion and did its best to obstruct the project. Sir Archdale Parkhill appropriately maintained that CAC would 'remain entirely British and the control shall not be subject either directly or indirectly to any foreign interests'.[6]

The Imperial Economic Conference held at Ottawa between 21 July and 20 August 1932 had established a low tariff zone within the Empire with the aim of promoting British manufacturers.[7] By November 1935 a certificate of airworthiness was required by Australia to import aircraft

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[4] NAA: A664, 534/401/79, The Manufacture of aircraft in Australia. Minister for Defence, Sir Archdale Parkhill's speech to the Warringah Electoral Conference at the Mosman Town Hall, Sydney, 4 February 1937, p.1.

[5] *Ibid*.

[6] McCarthy, *Australia and Imperial Defence 1918-1939,* pp.114, 118.

[7] Alan P. Dobson, 'Economic Diplomacy at the Atlantic Conference'. (143-163), in *Review of International Studies,* vol. 10, no. 2, Cambridge University Press, (April 1984), p.143.

into Australia, issued by a country which was a signatory to the 1919 International Convention of Aerial Navigation. If Australia was to manufacture aircraft, the impacts of tariffs had to be considered, especially if exports were contemplated. The Ottawa tariff gave British aircraft a 15 percent preference and restricted the selection of aircraft from other nations such as Germany and America.[8] The Board of Trade, citing Article Nine of the Ottawa Tariff Agreement, pointed out that any products of an aircraft manufacturing industry could not be afforded tariff protection. It also put forward the view that equivalent 'aircraft could be imported more cheaply from the UK' anyway.[9] However, the Australia/UK Trade Agreement which was the outcome of an 1832 Commonwealth Economic Conference accorded free admission of goods on a temporary basis to Commonwealths' importers requiring vital raw materials or machinery.[10] With regard to imports from non-Empire nations Australia therefore took the position that it was clear that any legal impediment under the Tariff Agreement could be bypassed if the project was declared vital to defence.[11]

It would seem that the case against the establishment of an Australian aircraft industry was in reality linked to commercial concerns about the possible loss of a profitable export business by British manufacturers. No doubt the most imporant and lasting objection was to the inclusion of GMH. After this interference, alternative measures were taken by Britain to neutralise this foreign influence. As shown in chapter four, at the 1926 Imperial Conference, Prime Minister Stanley Bruce had declared that uniformity was desirable and practical for all branches of the military.[12] This does make sense but, as McCarthy suggests that in

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[8] McCarthy, *Australia and Imperial Defence 1918-1939*, p.105.

[9] *Ibid.*, p.114.

[10] R.W.C. Anderson, Assistant Director of the Associated Chambers of Manufactures of Australia, Industry House, Canberra, ACT, 26 April 1956. Report, pp.1, 47.

[11] McCarthy, p.118.

[12] *Ibid.*, p.104.

1936, the concept of commonality and inter-changeability of equipment and components was being used to protect a lagging British aviation industry.[13] Clearly the British Air Minister used coercive negotiating techniques to promote uniformity of equipment of service aircraft across Britain and its Dominions. He warned that he would find it difficult to cooperate with Australia unless 'the concern was entirely British'.[14]

According to Air Ministry policy, defence secrets could not be disclosed 'to any undertaking, which contained a foreign element'.[15] The activation of this secrecy provision was not surprising considering that all foreign countries followed similar policies in sensitive industries. The call to rid a foreign influence from Australian concerns was nothing new, but as McCarthy argued the possibility of such influence could not be admitted in discussion which made negotiation somewhat difficult. Politically, it seems, the Government had stirred up an ants' nest. By assuring the public that it would be out of the question for GMH to have undue influence over the other members of the CAC Syndicate. A shrewd way to decrease its role as a partner without compromising the collaboration was to simply reduce the size of GMH's share in the syndicate. On 17 March 1936, the Dominions Office was informed that GMH had reduced their share to ten percent.[16]

McCarthy alleged the principal cause of the Air Ministry's disapproval of GMH was their 'considerable experience in body-building engineering'.[17] Such capability would enable GMH to become leader in the Australian motor vehicle trade, at the expense of British exporters. As McCarthy put it, the secrecy card was simply a device used to guard against 'the more serious danger of the exploitation of the Australian motorcar [market]' at the expense of British car makers. It was a claim

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[13] Ibid.

[14] *Ibid.,* pp.114-115.

[15] *Ibid*.

[16] *Ibid.*, p.116.

[17] *Ibid*., p.115.

credible enough as towards the end of May 1936 strained relations between Australia and Britain were due to Britain's opposition to GMH's involvement. However, there is no doubt that the matter was neutralised when GMH's holding was reduced. It would seem as McCarthy's suggests that this course of action was taken to avoid upsetting Britain's expectations, which had for years developed hand-in-hand with a policy of 'uniformity of armaments',[18] and which as Ross says 'had for years ensured that only British aircraft equipped the RAAF'.[19]

McCarthy asserts that the Dominions Office supported the Board of Trade's view that 'the establishment of an aircraft factory must be opposed as [it would also inevitably] lead to the extinction of the UK motor trade in Australia'.[20] It would seem that there were good reasons for Britain to be wary of GMH's world-class engineering record, which they used as an excuse to raise concerns about secrecy. Thus, the British suddenly expressed a concern that the technical information they had passed on to the CAS and the RAAF in the manufacturing of aircraft 'might find its way to foreign countries through any foreign affiliation the local company might have'.[21] However, it was precisely because of the company's position in automotive engineering that GMH was invited to join CAC to manufacture wings for the advanced trainer.[22]

As the biggest producers of transport equipment in Australia, GMH was well positioned to assist CAC. Later, at its Woodville factory in South Australia, aircraft production in Australia reached its peak as the techniques GMH used to produce metal pressings for motorcar bodies were employed to make 13,600 separate pressed items for the Beaufort

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[18] McCarthy, *Australia and Imperial Defence 1918-1939*, pp.117.

[19] Ross, *Armed and Ready*, p.99.

[20] McCarthy, pp.114-115.

[21] NAA: A705, 16/1/1. Manufacture of Aircraft in Australia, 1936-1937. Report from the Secretary of the Air Board to Cabinet, 20 December 1937, p.1.

[22] NAA: A1608, 017/1/1; War 1939. Manufacture of aircraft. Use of motor body works. Letter to the Premier of South Australia, Adelaide, signed by Herbert B. Collett on behalf of the PM, 10 October 1940.

bomber.[23] In all, about 9,590,000 parts were made at Woodville, providing 1,694,000 sub-assemblies and 25,670 main assemblies for the Beaufort. At Pagewood, NSW, GMH built parts of all types for subsequent Australian production of aircraft, such as the Mosquito, Boomerang and Beaufighter. The company also built the Gipsy Major engine for Tiger Moths, and fuselages and wings for the Mosquito.[24]

Despite the Air Board's assurance to the contrary, the British government still maintained that CAS and the RAAF were not adequately safeguarding technical information.[25] A compromise was finally reached that all future contracts for the manufacture of engines would include a clause that 'only employees actually working on the job should be allowed in the factory'. Outsiders wishing to inspect the factory would be permitted to do so pending approval from the Air Board.[26] McCarthy noted the comments by the Secretary of the Department of Defence, H. L. Shepherd, who indicated that Australia had become quite aware that the secrecy element was 'an obstacle invented by the UK government for tactical reasons in an endeavor to get their own way'.[27]

However, it seems probable that this issue had more to do with the fall-out from one isolated event. According to an Air Board Memorandum, the fuss followed the visit by 'a well-known foreign pilot'.[28] This pilot, known to the Air Ministry through intelligence channels, was allowed to view intricate details connected with the Wirraway project during a visit to the factory. Regarded as a dubious character, he was suspected of having passed on technical information to other countries. A Memorandum recorded two days after his visit suggested that the visitor

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[23] McCarthy, pp.114-115.

[24] Mellor, *The Role of Science and Technology*, p.394.

[25] McCarthy, p.38.

[26] NAA: A5954, 873/3, Manufacture of Aircraft by CAC. Air Board memorandum on the security of technical information to all personnel, 20 December 1937.

[27] McCarthy, p.119.

[28] NAA: A5954, 873/3, Manufacture of Aircraft by CAC. Air Board memorandum on the security of technical information, 20 December 1937.

may have departed Melbourne for Sydney en route to Japan. Consequently, the Air Board prohibited anyone not connected with the Wirraway gaining access to the premises.[29]

On 8 August 1939, R. G. Casey, then Minister for DOSAD, declared the Wirraway venture 'a great industrial achievement, which made its impression on the Air Ministry and other British authorities'.[30] He was particularly interested in promoting the benefits Britain would derive from the Australian aircraft industry. Recalling the 1937 Imperial Conference, where self-sufficiency and decentralisation had been among the main themes, he asserted that, ultimately, the Australian industry would 'take its place alongside that of Britain as a component part of the Empire's productive resources'.[31]

The flying accidents' issue

Since its formation the RAAF suffered a number of serious flying accidents. By 1938, these issues were brought to Parliament and reported by the media. Without consultation with the Air Board[32], the Government, the Minister of Defence (G. A. Street) and the Secretary of Defence invited the RAF Inspector-General, Sir Edward Ellington to report on the RAAF and on flight safety. Following Ellington's report in January 1939, while he was impressed by officers and ranks including the organisation and development of the air force, he was less impressed by the accident record believing that they were caused by a general lack of discipline and inadequate training. In his opinion, many accidents were attributable to pilot errors including a failure to follow

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[29] NAA: A705, 16/1/1. Manufacture of aircraft in Australia. Letter from the Secretary of the Air Board to the Secretary of the Department of Defence, 20 December 1937.

[30] *Ibid.*

[31] NAA: A5954, 883/2, Manufacture of aircraft in Australia, No 2, 8 August 1939. R. G. Casey to L. J. Hartnett, Director of Ordnance Production.

[32] C.D. Coulthard-Clark, 'A Damnable Thing': The 1938 Ellington Report and the Sacking of Australia's Chief of the Air Staff', (307-323), in *The Journal of Military History*, vol. 54, no. 3, (July 1990), p.307-8.

regulations. He thought the RAAF accident rate much higher than that of the RAF and recommended officers abide to Air Force Order 10/B/15, paragraph 8, which prohibited aerobatics below 2,000 feet.[33]

Ellington's report hit unexpected turbulence when the most senior officer and member of the Air Board, Air Commodore Goble, wrote directly to Minister Street distancing 'himself from responsibility for the flight safety problems'.[34] Ellington blamed the Air Board and the Chief of Air Staff (R. Williams) convinced that they were the controlling influence for all the problems he had identified, and criticised the selection of an advanced trainer, the Wirraway. Irritated by these accusations, the Air Board replied that RAAF discipline was similar to the RAF and the aircraft 'was the best available of its class'.[35]

There has been a clear cleavage of opinion on this point. Why Street chose to act on Goble's accusation and how the matter was dealt with between Street and Ellington is not clear. Possibly Street too readily supported Ellington's findings as criticism of the Chief of Air Staff.[36] According to Stephens, Williams had a domineering personality and a fascination with administrative minutiae.[37] Williams' great determination in campaigning for the RAAF as an independent service may have made him unpopular.[38] Street decided to get rid of Williams. He requested the British Air Ministry provide Williams 'experience in a high RAF Command' and to select another senior officer, Air Vice-Marshal or an Air Commodore as Air Member for Personnel on exchange for a period

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[33] NAA: A816, 37/301/360, Ellington's report, p.5 and most confidential note in relation thereto by G.A. Street, 19 December 1938; Coulthard-Clark, 'A Damnable Thing', p.312.

[34] Cox, 'The RAF and RAAF', p.121.

[35] George Odgers, *The Royal Australian Air Force: an illustrated history*, (Child & Henry, Brookvale, NSW, 1984), p.53.

[36] Cox, 'The RAF and RAAF', p.121.

[37] Stephens, *The RAAF: A History*, pp.26-31.

[38] *Ibid.*, pp.55, 57.

of two years.[39] As Sebastian Cox concluded 'the lack of solidarity between the two most senior officers in the Service cannot have escaped ministerial attention and must surely have contributed to the increasing suspicion that all was not well at the top'.[40]

It is worth noting that when George Jones was appointed Chief Flying Instructor at Point Cook in 1930, his opinion was that the numbers of fatal accidents were no greater than those in Britain and other countries.[41] In Australia, before a trainee could fly solo he had to master a series of 'S' turns 'on the downwind side of the landing area, with the object of bringing the plane closer to the point of landing, and at lower height, with each turn. This flying technique caused many accidents. Also, landing at Laverton was dangerous due to the base lack of 'hard standing or runways'.[42] In heavy rain the landing field became 'a sea of mud'.[43] Collisions in the air were frequent. Jones recommended that a notice be placed in all aircraft cockpits stating in large red letters: 'Avoid Collisions – Look out for other aircraft'.[44] Aircraft losses were also due to 'pilot error and even recklessness'.[45]

That said, with the loss of the strong leadership of Williams and the appointment of Air Commodore Goble as his temporary replacement, no substantial progress was made on setting the future direction of the RAAF. Both Goble and the Air Board were held responsible for this apparent failure in leadership.[46] In Weston's opinion, the Board in its capacity as principal advisor to government on military aircraft had

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[39] NAA: A816, 37/301/360, Ellington Report, p.6.

[40] Cox, p.121.

[41] Jones, *From Private to Air Marshal*, p.49.

[42] *Ibid.*, p.52.

[43] *Ibid*.

[44] *Ibid*., p.67.

[45] Ewer, *Wounded Eagle,* p.115.

[46] Weston, 'The Australian Aviation Industry: History and Achievements guiding defence and Aviation Industry Policy', p.75.

achieved little to contribute to the future of RAAF and the industry. Weston attributes this to the removal of Williams whose influence and strong personality was beneficial to the development of the RAAF.[47] But as Michael Veitch suggests, the Ellington report 'amounted to little more than a thinly attack on Williams personally, which many believed had been the true purpose of the exercise in the first place'.[48]

The role of the Air Board in aircraft selection

As the RAAF was designed to defend Australia's trade and territory against raids, a first-line defence expansion to the RAAF was approved by the Government in the financial years 1937/38 – 1940/41, under which the RAAF strength was planned to increase from 96 to 198 aircraft. After September 1938, the government also approved a further increase of 212 aircraft to form 19 squadrons.[49] On 6 August 1937 the Secretary of the Air Board wrote to the Government describing the difficulty of implementing the three-year program to equip the RAAF with up-to-date equipment and skilled manpower when financing the program through the annual budget cycle made no allowance for cost increases. In 1937 the Air Board had estimated that £2,609,055 would cover the establishment of new air force squadrons. The Air Board was now faced with the prospect of its original estimates only covering one general purpose squadron at Darwin and a cadre squadron at Brisbane.[50]

The following points to the underlying causes that delayed the

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[47] *Ibid*, p.71.

[48] Michael Veitch, *44 Days, 75 Squadron and the fight for Australia*, (Hachette Australia 2016), p.16.

[49] NAA: AA1966/5, 466, RAAF Development Programme 1937, 1939/1940. Minute from the Secretary of the Air Board to Cabinet detailing the problems realising the three-year program: equipping the RAAF with modern aircraft, securing experienced manpower and cost involved.

[50] NAA: A1308, 706/1/185, RAAF development program 1937/1940. Expansion of Home Defence Air Forces from 32 to 73 Squadron basis with ancillary units: aircraft, spare engines and spare parts. War Cabinet The proposal was deferred to June 1940, War Cabinet Agendum No. 151/1940.

expansion of RAAF squadrons. On 22 September 1939, according to the development program of 1937/1940, the Air Board and the Defence Committee had proposed to expand the RAAF from 32 to 73 Squadrons.[51] However, War Cabinet disagreed due to the fact that Australia was not in danger of attack and hence providing aircrews for EATS was more important than the proposed additional squadrons for the RAAF.[52] On 26 June 1940, the expansion program was re-submitted to War Cabinet by the Minister for Air and Civil Aviation, J.V. Fairbairn, and examined by other service ministers, the treasurer and Menzies. The final step was for R. G. Casey in Washington to provide his personal opinion on the viability of the proposal. It was decided to defer the plan until aircraft availability could be assured.[53]

Among the numerous cables exchanged between Australia and Britain, a cablegram dated 13 January 1941 from the Prime Minister's Department to the Secretary of State for Dominion Affairs in London indicated that while War Cabinet understood its commitment to EATS, it considered that strengthening Australia's air force was 'also very urgent'.[54] On 12 February 1941 a cable described the situation in these terms: 'ceaseless and energetic efforts have been made to procure definite promises of allotment of aircraft from both UK and USA production and to this end many cables have passed between the Prime Minister and the High Commissioner in London'.[55] In response, Britain's Ministry of Aircraft Production stated that they could not 'be more precise than that demands will be met if at all possible'. Menzies replied that

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[51] *Ibid*.

[52] Gillison, *Royal Australian Air Force*, p.60.

[53] *Ibid.*, p.104.

[54] NAA: A1308, 706/1/185, Expansion of Home Defence Air Force from 32 to 73 Squadron basis with ancillary units: aircraft, spare engines and spare parts; War Cabinet Agendum No. 113/1942 of 18 February 1942. The Secretary of DOD, F. Shedden to the Secretary of State for Dominion Affairs, London. Copies to the Department of Defence and Coordination, Minister for Munitions and Air Board.

[55] *Ibid.* Supplement no.4 to War Cabinet Agendum No. 151/1940, signed by J. McEwen, Minister for Air, 3 February 1941.

such ‘indefinite advice’ would not permit the organisation, planning for equipment and expansion of their projected squadrons and requested a more definite answer. Finally, in February 1942, approval was given to expand the RAAF Home Defence Force from the ceiling of 32 squadrons to 73 squadrons, plus ancillary units, calculated as costing £112,026,000.[56] This was only approved in principle as the expansion required the Australian High Commissioner, Stanley Bruce, to negotiate with the British Ministry of Aircraft Production regarding the possibility of supplying aircraft from either Britain or America.[57] This ongoing process shows that the Australian government was less than ready for self-sufficiency. The problem was the commitment to a massive expansion of aircraft at a time where there was no control over the source of supply. Even in areas where Australia was in charge, expansion on this scale would have encountered a bottomless range of other problems.

Appraising aircraft suitability

The Air Board’s attempts to modernise the RAAF between 1934 and 1941 were a project that dissipated efforts without significant benefits. It failed to deliver on the country’s need for a defensive capability covering the vast continent. Throughout the 1920s and early 1930s aircraft designs were continuously built to outperform previous types which led to the development of derivative versions.[58] This rapid evolution is well illustrated by considering the development of the Hawker Demon in Australian service. Its origins lie in the RAF Hawker Hind light bomber manufactured by Hawker Aircraft Limited at their Kingston factory in south west London to newer variants. A new variant capable of carrying a bomb load of 500 lb was introduced into service by the RAF in 1932.[59]

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[56] *Ibid.*

[57] *Ibid*.

[58] Pegram, *Beyond the Spitfire*, pp.170, 196.

[59] *Ibid*.

The critical issues discernible in the selection and the acquisition of various types of combat aircraft for the RAAF in the 1930s delivered very little by way of modern aircraft.[60] It also provided no relief from the various purchasing hazards including cancellation of orders by suppliers or escalating prices and the extremely long delivery times, which even prior to the outbreak of war often extended to eighteen or twenty four months.[61] In February 1934 the Air Board ordered 18 modified Hind aircraft for the RAAF to replace their Wapitis. Built to UK specifications and modified to suit Australian requirements, this new variant became known as the Demon II. The aircraft arrived in Australia in late 1934 and was tested in January 1935. During April-May 1935 they were issued to No. 1 and No. 3 squadrons. A further 36 were purchased for Army co-operation and 'modified with a prone bomb aimer's position for the gunner in the lower fuselage and the fitment of bomb carriers'.[62] In 1936, the Air Board placed an order for 10 Mk.II aircraft with dual controls for training and provision for target towing. These arrived during 1937.[63]

Of different design to the RAF versions, as well as being used as army cooperation fighters they were powered with a Rolls-Royce Kestrel Mk V engine re-rated to give 600 bhp, a slightly higher power than the 584 bhp RAF engine. In service the aircraft proved difficult to fly because it delivered a much higher performance compared to previous machines, and required careful handling. Also, the unreliability of the 600hp Kestrel engine made maintenance and serviceability a very demanding task as many aircraft were grounded for a lengthy time while awaiting spares for

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[60] NAA: A1308, 706/1/185. Minute, Air Board to Cabinet, 6 August 1937. Expansion of Home Defence air force, aircraft, engines, spare parts, etc.

[61] *Ibid.*

[62] P. McGuiness, D. Crick, and B. Cowan, 'A1 Hawker Demon Mk.I & Mk.II',*ADF-Serials*, http://www.adf-serials.com.au/2a1.htm,

URL retrieved on 10 February 2018.

[63] NAA: A3095, 32/1/3, Attachment to 32/1/3A, DOM and DOSAD, Confidential dossiers, The history of aircraft construction in Australia, pt 2, 1942-43, report, p.55.

servicing.[64] Britain had hoped to sell the RAAF more Demons for various front-line roles, including fighter and two-man bombers. However, the Demons already in service in Australia were not successful. By late 1936, ten were lost in crashes. The loss of the Demons was attributed to 'the lack of a suitable operational trainer'.[65]

The slow progress of tender evaluation and aircraft selection led to another cycle of delays in negotiating final pricing and delivery.[66] These problems led CAS to warn against an early commitment of funds without a guaranteed timetable for delivery, which was subject to some 18 to 24 months delay. The looming prospect of war increased the cost of labour in Britain, causing instability in prices to the point that it became difficult for the Air Board to obtain updated cost estimates for aircraft quoted up to fifteen months earlier. Also, necessary modifications to any part of an aircraft added to previous cost estimates. For example, a Beaufort aircraft quoted as £29,000 in 1939 was only a tentative figure until the aircraft had been in production. By then the full cost of the aircraft was notably increased.[67]

The US Neutrality Act and the Lockheed Hudson

With little possibility of an order from Britain, the Air Board took the groundbreaking decision to order 100 Lockheed Hudson twin engine medium bombers from America. The first aircraft (model 214) flew on 10 December 1938 and after a series of tests, 50 Hudsons were ordered for Australia in June 1939.[68] The US Neutrality Act which prohibited delivery

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[64] Francis K. Mason, *Hawker aircraft since 1920*, (London Putnam Aeronautical Books, 1961), p.193.

[65] *Ibid*., p.194.

[66] NAA: A5954, 1030/11, Royal Australian Development Program. Minute of the Secretary of the Air Board (P.E. Coleman), 6 August 1937, 1937-40.

[67] NAA: A1196, 1/502/5, Manufacture of aircraft and engines in Australia, 1938-1944; Minute from G. A. Street, Minister for Defence discussing hidden costs relating to the manufacture of an aircraft, 27 March 1939.

[68] Stewart Wilson, *Beaufort, Beaufighter and Mosquito in Australian Service*, (Aerospace Publications Pty. Ltd, Fyshwick, ACT, 1990), p.27.

of combat aeroplanes to a belligerent nation was rather problematic to solve. As the Hudson was derived from the L-14 Super Electra airliner of 1934 and had not been fitted with machine guns in the US, the Air Ministry and the Air Board gambled on the chance that the aircraft would not be classed as instruments of war.[69] As they saw it, the aircraft was basically a commercial aircraft and should hence be approved for export. The application of the Neutrality Act was swiftly dealt with by the Lockheed Corporation towards the end of September 1939 by assigning a new series number 214 to distinguish them from the commercial Super Electras.[70] The Hudson aircraft intended for Britain were flown to Pembina, North Dakota, where mules towed them across the border into Manitoba and sent by ship to Liverpool, Britain.[71] The early series Hudson aircraft were flown to the Canada-US border, landed, and then towed over the border into Canada by tractors or horse drawn teams, before being flown to Royal Canadian Air Force airfields where they were dismantled and prepared for transport as deck cargo. For this 'Lockheed had to resort to some fancy footwork to carry out the order' as the company purchased an airfield that straddled the US-Canadian border.[72] However, circumventing the Neutrality Act no longer became an issue after Hitler broke the deadlock on Neutrality Act on March 1939. On 4 November 1939, Congress repealed the arms' embargo declaring the north Atlantic a combat zone.[73] The Lockheed Electra was converted to military use by the installation of a gun turret mounting and bomb bay.[74]

Australia had also ordered a large batch of Avro Ansons as a

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[69] NAA: A816, 6/301/75, International Crisis, August 1939. Air Force Measures: Supply of Aircraft. Teleprinter message addressed to the Secretary of the PM Department and to the Air Board from the Secretary of DOD, 31 August 1939.

[70] Bill Yenne, *Lockhee*d, (Bison books Ltd, London, Britain, 1987), 32.

[71] *Ibid.* NB*:* the militarised aircraft was named 'Hudson by the British*.*

[72] Yenne, p.47.

[73] Robert A. Divine, *The Reluctant Belligerent, American entry into World War*, (John Wiley & Sons, Inc., Canada, 2nd ed. 1979), pp.59, 71.

[74] Nelmes, *A unique flight. The historic collection of the Australian War Memorial*, p.187*.*

precaution against late delivery of the Hudson aircraft. Ordered in 1938 and 1939 for their role as general reconnaissance aircraft, these Ansons were intended to equip No. 12 Squadron at Laverton, Victoria, and No. 14 Squadron at Pearce, WA and in August 1939 No. 1 Squadron at Darwin, NT. These aircraft were the first large purchase of modern aircraft types for the RAAF to enable them to cooperate with the Navy and Army. [75]

With the outbreak of war, the cost of materials continued to rise, increasing the difficulty of obtaining reasonable deliveries of airframes and engines. One way to circumvent this was to plan requirements well in advance.[76] Among the many Air Board notices promulgated to RAAF units, one pointed out that the Anson was never designed to be subjected to any high structural loading and consequently pilots were told not to submit the aircraft to violent manoeuvres.[77] However, by 1939 the Anson was already considered obsolete, being poorly armed, too slow and inadequate for maritime patrol. As a result most Ansons were used for training. They nevertheless served a useful role, as by 1942, Squadrons 66, 67 and 73 flew Ansons which had been fitted with radar, and performed anti-submarine flights.[78]

Australia's quest for a fighter aircraft was debated by *The Herald* of 3 January 1940 which claimed that both the British and Australian governments were obsessed with the concept of an ideal multi-role design. The race to quickly manufacture 'an efficient aeroplane took precedence over everything else'.[79] However, reaching a common

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[75] Stewart Wilson, *Anson, Hudson & Sunderland in Australian Service*, (Aerospace Publications, Weston Creek, ACT, 1992), pp.26-27.

[76] NAA: A1196, 1/502/5, Manufacture of aircraft and engines in Australia, 1938 - 1944, Secretary of DOD to the secretary of the Air Board, 6 April 1939.

[77] NAA: A7672, Section N/1942. RAAF Air Board Orders Section 'N' Temporary Orders & notices, 1942. N.362. Anson aircraft flying limitations, 8 May 1942.

[78] Ross Gillett, *Australian Air Power*, (The Book Company International Pty. Ltd., Brookvale, NSW, 1996), pp.46-47.

[79] NAA: A5954, 102/2. Press cuttings only. Press clipping from *The Herald*, 3 January 1940, Melbourne. Delays in the manufacture of the Beaufort aircraft, 20

understanding between the governments was particularly difficult. Britain had quantities of aircraft that, while relatively new, had been rendered obsolete by recent developments and the realities of aerial combat. On 17 April 1940, the War Cabinet met to consider selecting a different aircraft, the Fairey Battle and more Avro Ansons for coastal reconnaissance. However, the Battle light bomber powered with a Merlin engine presented problems. Designed in the mid-1930s, the Battles were found to be inadequate in combat roles by mid-1940. The aircraft only had two light machine guns and had limited range and speed to cover the more remote coastline. For this reason the RAAF used both the Avro Ansons and the Fairey Battle as advanced training for EATS.[80] The value of either type to the RAAF was seen as 'partly moral and partly to supplement a striking force against a raiding force already located in close proximity to the coast'.[81]

As illustrated above, because of political and cultural ties between Britain and Australia British manufacturers were the main source of RAAF aircraft. However, in theory the United States aviation companies could have been an alternative source of combat aircraft. The War Cabinet could have approved the acquisition of equipping the RAAF with combat aircraft such as the aircraft designed by NAAC, the B-25 Mitchell and the complex Martin B-26 Marauder which first came off the assembly line in 1939. The Douglas A-20 Boston light bomber, powered with the Twin Row Wasp engine, which first flew in December 1938, proved to be a fine aircraft well suited for combat.[82] The British aircraft industry was also hard-pressed to meet the needs of the RAF let alone the RAAF.[83]

December 1939 – 5 August 1940.

[80] Barker, *The RAAF at War*, p.26.

[81] NAA: A2671, 84/1940, War Cabinet Agendum No. 84/1940. Supply of 31 Lockheed Hudson aircraft and 16 spare engines. Minute from the Secretary of the Defence Committee to CNS, CAS, CGS and F.G. Shedden, Secretary of the DOD Coordination, 17 April 1940.

[82] Peter J. Dean, *'Australia 1943'. The liberation of New Guinea', In The Shadow of War,* (Peter J. Dean, ed., Cambridge University Press, Port Melbourne, 2014), p.45.

[83] Bill Yenne, *The world's worst aircraft,* (Bison books Ltd., London, 1990), pp.54-

On 15 March 1941, Sir Archibald Sinclair, the British Secretary of State for Air, offered the Air Board, 243 outdated Brewster Bermudas, an aircraft that the RAF had little use of because of its teething problems. An approximate delivery date was set for mid-1942.[84]

The Mosquito

The worldwide popularity of Moth types formed the basis of de Havilland's worldwide enterprise, an organisation with had factories set up in Canada, Australia and assembly in India, New Zealand, South Africa and the USA.[85] Following the initial success of the Mosquito in RAF service, de Havilland suggested to build the aircraft in Australia and Canada. At first, the Air Board accepted that the Mosquito was the right aircraft for the RAAF because when first test-flown its speed (380 mph) was faster than the Spitfire. However, it soon became apparent that this speed could only be realised when unencumbered with the weight of a full load of bombs and ammunition. But as de Havilland succinctly argued an unarmed version built for intruder missions would be invincible to enemy fire due to its speed.[86] However, on 18 September 1941, the Air Board reevaluated the Mosquito and rejected it because it did not meet expectations as its fuselage fabric covering did not stand up to tropical conditions; nor did the glue used in its wooden construction, which had to be reformulated to cope with the climate.[87]

The Air Board expressed renewed interest in the Mosquito as a substitute for the Beaufighter. This led de Havilland in March 1942 to dispatch plans and a model aircraft to their subsidiary company in Sydney (DHA). While strong doubts had been previously expressed as to

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[84] Day, *The Politics of War*, pp.122-123.

[85] http://www.dehavillandmuseum.co.uk, URL retrieved December 2017.

[86] Nelmes, *A unique flight. The historic collection of the Australian War Memorial,* p.207.

[87] Taylor and Munson, *History of Aviation*, p.193.

the durability of the wooden plane in tropical environment, DHA advised the Air Board that the airworthiness of the Mosquito was most dependent on the high quality of its manufacturing. On 2 September 1942 the Air Board ordered 150 Mosquitoes Mk VI aircraft including spares, with provision for a further 120. After deliberations over which engine would best fit the plane, it was given the single stage Packard-built Rolls-Royce Merlin V-12 liquid cooled engines from America. In July 1943, the War Cabinet increased the order to 370 aircraft.[88]

However, when the first locally built Mosquito flew on 23 July 1943, it experienced many teething problems.[89] While DHA had manufactured some 1000 Tiger Moths, it had not built combat aircraft and 'the manufacture of the Mosquito, with its novel wooden laminated construction, was a step into the unknown'.[90] DHA had used Australian metals, woods and glues and sub-contracted portions of the aircraft around the Sydney area, with the wings being made by GMH at Pagewood. The final assembly was made by a new Commonwealth-owned plant at Bankstown. Unfortunately, DHA 'had underestimated the complexities of the wooden laminated manufacture and of the problems of achieving quality control over the manufacturing processes'.[91] Glue problems, building standards, shortage of skilled woodworkers and subcontracting quality, caused several fatal accidents. Achieving the required structural standards with the wings became a major difficulty. Geoffrey de Havilland arrived in Australia to investigate these problems. This led DHA to instigate a successful training program with sub-contractors and bring in more manufacture in-house. By 1945, the RAAF had gained an excellent combat aircraft, 'although the durability and longevity of the aircraft meant it would have a short operational life'.[92]

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[88] Weston, 'The Australian aviation industry', p.57.

[89] *Ibid.*

[90] *Ibid*.

[91] *Ibid*., p.58.

[92] *Ibid.,* p.57.

Continuing the search for suitable aircraft for the RAAF, 1930s-1940s

Ross is critical of Australia's apparent neglect that the RAAF should have been equipped with combat aircraft prior to the start of World War II, as he claims that:

> there was no sign that any senior officers of the RAAF had appreciated the Japanese doctrine for the Zero. If they had, they would have realised the urgency of Australia's need for a modern front-line fighter, capable of at least preventing the Zero from gaining complete air superiority'.[93]

Certainly, if in the late 1930s the RAAF had been prepared to involve local firms to build a front-line aircraft, they would have acquired experience and gained valuable skills in aircraft construction. But as noted, in September 1939, aircraft were acquired to train future pilots for EATS. Ross further claimed that the RAAF was 'oblivious at its senior levels to the urgent need for a modern fighter'.[94] However, while Ross was referring to combat aircraft, the mutual decision between Britain and Australia to acquire the Bristol Beaufort twin engine bomber in August 1938 does show that Australia wanted an aircraft of modern design to be locally manufactured.[95] In view of the Air Board relentless efforts to acquire a suitable aircraft to equip the RAAF, Ross' startling claim is difficult to comprehend. Ross argues that after the NA-16 was delivered in 1939 CAC had the capacity to build a more advanced well suited aircraft to Australia's need to protect its maritime trade.[96]

In Australia, the policy and the potential benefits of establishing a

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[93] Ross, *Armed and Ready*, p.315.

[94] *Ibid*.

[95] See chapter six.

[96] Ross, p.316.

local aircraft industry to equip the RAAF had generated a lot of discussion. Australia was bogged down by circumstances beyond its control. Lagging far behind the major industrialised countries, Australia's small manufacturing segment needed protracted investment and training of personnel to catch up on years of engineering and technical knowledge before it could rise to the challenges of making airframes and complex engines.[97]

As the Minister for Air, Arthur Drakeford, stated the prospect of manufacturing locally exhaust-driven turbo super-chargers in Australia was not good as its downside was slow. The conversion of a 1200 hp Pratt & Whitney's Twin Row Wasp engine R-1830 to an R-2000 model would involve new pistons and cylinder assemblies. The change-over to the R-2000 was estimated to take about two years before full production was achieved. As the type was already in production in America, the Department of Aircraft Production instead placed an order for 130 to fit CA-12 Boomerang aircraft.[98]

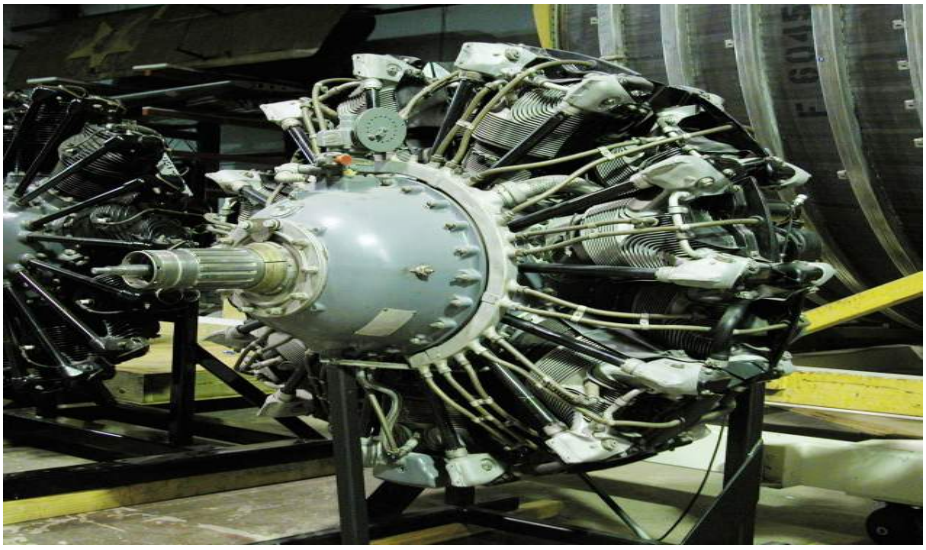

Figure 6. An example of an R-1830 Twin Row Wasp engine on

[97] *Ibid*.

[98] NAA: A5954, 221/8 manufacture of Wright Cyclone R-2600 engines in Australia. War Cabinet Agendum no. 295/1941 by J.W. Leckie, Minister or Aircraft Production, 30 August 1941. Local manufacture of aircraft engines. Advisory War Council Agendum no. 44/1942. Letter from A.S. Drakeford, Minister for Air to F.G. Shedden, Secretary of the Advisory War Council, 10 September 1942.

exhibition at the Smithsonian Institution, National Air and Space Museum, Washington, DC, 2017.[99]

As shown, it also proved difficult for the Air Board to find a high performance type of low and high altitude fighter aircraft and a long-range heavy bomber aircraft to upgrade the RAAF's strike capacity. In January 1938 the Brester Buffalo prototype (XF2A-1) was tested and did not present major problems. This led belligerent nations to place orders for the aircraft. Britain acquired model 340 in July 1940, but its shortcomings soon became apparent. The aircraft with its rotund fuselage and underpowered engine was very sluggish to handle because its small wing area and landing gear could not meet the rigor of aircraft carrier landings.[100] Unfortunately, the Brewster production which was scheduled to start in May 1941 gradually slipped back due to unresolved design and performance flaws.[101] The RAF found the Brewsters too limited for European operations.[102] The aircraft were instead sent to the Far East at the outbreak of Japanese hostilities in December 1941, and were out-classed by the Japanese Navy's Mitsubishi Zero and the Army's Nakajima fighters which 'quickly cut a swathe through the Seversky P-35s, Curtiss Hawks, P-40s of the defending British, Australian, New Zealand, Dutch and American air forces'.[103] However, while the naval Zero fighter had the advantage of manoeuvrability, the US Navy and the United States Marine Corps' Wildcat fighter pilots had overcome this by superior tactics.[104]

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[99] Smithsonian Institution, 'Pratt & Whitney Twin Wasp R-1830-92, Radial Engine', *National Air and Space Museum*, https://airandspace.si.edu/collection-objects/pratt-whitney-twin-wasp-r-1830-92-radial-engine, URL retrieved 10 January 2018.

[100] Yenne, The world's worst aircraft, pp.54-55.

[101] Smit*h, The Vultee Vengeance Dive Bomber*, p.54.

[102] Day, Menzies and Churchill at War, p.122.

[103] Taylor and Munson*, History of Aviation, p.320.*

[104] J.E. Hewitt, *Adversity in Success*, (Langate Publishing, South Yarra, Victoria, 1980), p.43.

Locally designed aircraft

As previously shown the building of aircraft was not unexplored territory given that CAC had produced the Wirraway and Wackett trainers. Of all the factors that went into building a first-line aircraft, engineering expertise and the choice of a suitable engine were most vital. The challenge to design and locally build a ground attack aircraft was a possibility that had been seriously entertained, which coincided with the employment at CAC in 1939 of an exceptionally experienced aircraft design engineer, Fred David as chief engineer. David had worked for Heinkel in pre-Nazi Germany and designed components for the Zero in Japan. As a result, David had an excellent understanding of advanced fighter designs, such as the Heinkel He 112 and the Mitsubishi A6M. He started work on a small fighter using parts from the Wirraway and adding those of the CAC CA4 bomber.[105]

This project resulted in a low-wing monoplane of modest performance powered by a Pratt & Whitney's 1200hp (895kW) air-cooled radial engine.[106] The Boomerang, which incorporated 64 percent of Wirraway parts in order to save time in design 'from a base of assured knowledge',[107] was an attempt to equip the RAAF with a stop-gap fighter. While the Boomerang was a hurried and highly constrained design, it was a timely expedient and its construction represented a low-risk strategy. The RAAF in its haste to acquire a fighter placed an order to CAC for 105 aircraft (A46-1 to 105). Built as CA-12 (Mark I), the remaining 95 (A46-106 to 200) were labeled CA-13s. A marked difference between the two batches was the CA-13 ailerons and fuselage was covered with metal. The Boomerang was first test-flown on 29 May 1942. Its performance and handling was rated favorably below 8,000 feet but the lack of a turbo charger curtailed high level performance. Its maximum speed of 490 km/h was too low to match Japan's highly rated

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[105] Ross, *Armed and Ready*, p.316

[106] Wilson, *Wirraway, Boomerang & CA-15 in Australian Service,* pp.94, 96.

[107] Ross, *Armed and Ready*, p.317.

aircraft, the Zero. The CA-12s suffered propeller failures due to the cracking of the backing plate, requiring the installation of a heavier gauge plate. Some aircraft flying without the spinner suffered reduced performance because the cylinder head temperature was unable to be kept within operational limits unless the cooling gills were kept partly open. Further the guns froze at altitude. That was solved by ducting hot air from the exhaust to the gun bays.[108]

Once inspection reports were received from abroad, a final decision was to be made. CAC took the opportunity to provide positive feedback to the Government and the RAAF on the possibility of developing an air-cooled engine type of either in-line or radial cylinder layout, that could easily meet a range of power output requirements by varying the volume and number of cylinders. As well as reducing development and manufacturing costs, this would enable CAC aircraft designers to meet power requirements without needing a variety of engines.[109]

CAC used this concept with their new fighter aircraft, the Boomerang CA-14 by installing one 1850 hp (1380 W) engine instead of a 1700 horse power (1268 kW) Wright Cyclone R-2600 engine, which were on order from the US but had not yet been delivered as scheduled.[110] CAC was interested in expanding into this field intending to begin operations using a mix of imported and locally made parts. The strategy was to build up skills in aircraft production over a period of time, starting with the construction of simple utility aircraft with an uncomplicated air-cooled engine of modest power output. This would allow good results to be achieved quickly without taking on the full range of technologies involved in the engines and the many ancillary components.[111] In a public show of confidence to the press, the Minister

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[108] Wilson, pp.94, 96.

[109] *Ibid*.

[110] Ross, *Armed and Ready*, pp.315, 321.

[111] NAA: A705, 16/1/1, Manufacture of aircraft in Australia, 1936-1937. H.L. Shepherd, Secretary of the Department of Defence, commenting on the NA-16 aircraft to the Secretary of the Air Board, 12 February 1937.

for Aircraft Production, Senator Donald Cameron claimed that the Boomerang, when 'fitted with a supercharger for the development of maximum power at high altitude' and armed with automatic cannons, would become the RAAF first-line strength.[112] On 2 February 1942, War Cabinet placed an order for 105 Boomerangs.[113]

Menzies' quest for aircraft from the British Air Ministry, 1941

Throughout February and March 1941 Menzies pleaded with Churchill to reinforce the Far East. In tabling this issue at the Admiralty, Menzies informed the First Lord, A.V. Alexander on 8 March 1941 that he hoped for a 'definite promise' of a British fleet to secure Singapore, smaller 'than (Australia) had perhaps, in the past, been led to suppose'.[114] On 24 January 1941, on his way to Britain, Menzies landed at Singapore and was able to see for himself the grossly inadequate state of its defence. The base had no capital ships or aircraft carriers and needed stronger air defences.[115] As Day asserts, Churchill's determination to defeat Germany as his first priority was unfaltering in his decision that he would not be prepared to reduce the strength of the naval fleet or aircraft numbers for the sake of Singapore.[116]

The 1940-41 Blitz had implacably pounded Liverpool and adjoining western port installations across England, sowing fire and destruction which claimed thousands of victims. The effects of the aerial bombardment caused delays in delivery as aerial bombing severely damaged the Hawker factory at Weybridge and the Woolston Supermarine factory. Similar damages also affected Australia's supplier,

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[112] NAA: A5954 166/8, Aircraft Production, Senator D. Cameron, Minister for Aircraft Production to the press, 1942.

[113] Nelmes, *A unique flight. The historic collection of the Australian War Memorial,* pp.133, 177.

[114] Day, *Menzies and Churchill*, 1993, p.85.

[115] *Ibid*., p.45.

[116] *Ibid.*, p.48.

the Bristol Aircraft Company, which killed over 250 employees. [117]

On 7 March 1941, Lord Beaverbrook, Britain's Minister of Aircraft Production, showed the extent of the bombing raids to Menzies. The heavy damage on factories caused significant psychological effects on the workforce as many were reluctant to go back to work, especially night-work, until their confidence could be regained. The toll of factory damage on aircraft production was serious as the roofs of many factories had collapsed; all machinery was wrecked by heavy bombings. Some machine tools had sustained direct hits and were consequently destroyed. The raids caused 'irreparable loss of aircraft on the production line', which was solved by dispersing factories and providing multiple sources of supply for the various components.[121]

Unsurprisingly these important strategic decisions had the effect of downgrading Menzies' request for combat aircraft and his concern on the level of preparedness of the Singapore base. Even with the goodwill created by Australia's 'best forces fighting alongside Britain in the war against Germany and Italy',[122] the huge efforts Menzies made while in London in early 1941 to persuade Churchill to provide Hurricane fighters to strengthen the defence position of Singapore were made in vain. Churchill was not receptive. Unbeknownst to Menzies, Churchill had instructed Sinclair not to raise Menzies' hopes too high. Apparently, Sinclair told Lord Beaverbrook 'that we must ensure that these Dominions do not strip us of everything'.[123]

Yet, Britain's rate of aircraft production had doubled over the past twelve months. Lord Beaverbrook informed Churchill that during March

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[117] Christopher Thorne, *The Issue of War: States, Societies and the Far Eastern Conflict of 1941-1945*, (Hamish Hamilton, London, 1985), p.213.

[121] *Ibid*.

[122] Day, *Menzies and Churchill at War*, pp.81-82, 85, 122.

[123] Day, *The Great Betrayal Britain, Australia and the onset of the Pacific War, 1939-42,* (Angus & Robertson, North Ryde, NSW, 1988, p.129.

1941 British industries had produced 1,853 aircraft,[124] which was twice the production rate of 1940 and had expanded its fighter production three times over the previous year. However, as previously alluded, in 1934 Britain restructured its air defences through its expansion plan A, by getting rid of obsolescent aircraft for modern aircraft. However, full air superiority took some years to achieve and when it finally was, the British Air Ministry's priority was to provide aircraft to its own air squadrons and the EATS program. While Britain would not unconditionally guarantee aircraft deliveries, nevertheless, Australia had a right to expect more. Britain had taken the view that supplying the Royal New Zealand Air Force and the RAAF was not a priority in 1938-1940 as they were not involved in a battle zone.[125]

As Graham Freudenberg alleged: 'Churchill's priority was not saving the British Empire, but using the Empire to save Britain and defeat Hitler'.[126] However, obviously connected to Japan's expansionist policy in Southeast Asia, on 9 April 1941 after Menzies had been in London seven weeks, the Defence Committee of the British War Cabinet, after consultations with Lord Beaverbrook and the Secretary of State for Air, Sir Archibald Sinclair, finally decided to offer twelve Beaufighters to Australia at an agreed delivery date in December 1941, on the condition that Britain's 22 home squadrons be supplied first, by which time production was expected to be running at 150 aircraft per month.[127]

As previously mentioned the Lockheed Hudson was a commercial aircraft which had been converted to military use by installing a gun turret and bomb bay.[128] Sinclair also promised 94 Lockheed Hudsons, which

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[124] Day, *The Politics of War*, p.124; Day, *The Great Betrayal*, p.130.

[125] Day, *Menzies and Churchill at War*, p.81.

[126] Graham Freudenberg*, Churchill and Australia,* (Pan MacMillan Pty. Ltd, Sydney, 2008), p.*7.*

[127] Day, *The Politics of War*, p.122.

[128] Nelmes, *A unique flight. The historic collection of the Australian War Memorial*, p.187*.*

was hardly a generous transaction, as the Hudsons were actually 'an aircraft that Australia had on order from America but had allowed Britain to take over in mid-1940'.[129] On 28 September 1941 Britain telegraphed Australia's Air Board offering instead the US-built Vultee Vengeance dive bomber. This offer was taken up by the Board which decided to cancel the Brewster order in November 1941. However, no matter how hard the Board tried to thwart incoming obstacles, they had no choice by to abide to Britain's decisions. Thus the British Chiefs of Staff elected that the Vengeance dive bomber which was available for shipment to Australia from the US, should be diverted to India which 'had prior claim' to it.[130] The Chiefs concluded that India would have three quarters of the Vengeance bombers with the remainder going to Australia.[131]

On the whole, the Vengeance proved difficult to handle. On test flying the aircraft was found unsafe, requiring various modifications and corrections in design.[132] Production problems and the fact than more than one aircraft producer was involved, coupled with the thorny problem of maintaining interchangeability of components between aircraft built by Vultee Aircraft Company and by a subcontractor, the Northrop plant, caused lengthy delays in delivery. Once again, the RAAF was placed in a difficult position.[133] At any rate, from a promised delivery rate of 20 per month, none arrived.[134]

In the interim, the RAAF decided to deploy Wirraway trainers to operational squadrons. Lack of spare parts and the fact that 56 percent of them were unserviceable, as were 48 percent of Fairey Battles,[135] highlights the pitfalls related to ordering aircraft from overseas sources

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[129] *Ibid*.

[130] Smith, *The Vultee Vengeance Dive Bomber*, p.54.

[131] Day, *The Politics of War*, p.305.

[132] *Ibid*., pp.22-30.

[133] *Ibid.,* p.54.

[134] Gillison, *Royal Australian Air Force*, p.487.

[135] *Ibid*.

and to reasons the RAAF was so under-equipped when Japan first raided Darwin. Finally, from mid 1942, the RAAF took delivery of 342 Vengeance dive bombers to use in part to equip No. 24 Squadron, some of which were used in operations in New Guinea.[136]

Menzies had no choice but to accept whatever the British proposed and wait for what lay ahead. Churchill attempted to prevent the delivery of Brewster Bermudas stating that 'it would be unwise to fritter away aircraft to Australia where they would not come into action against Germany'.[137] His Chief of the Air Staff, Sir Charles Portal intervened by stating that there was insufficient aircrew to operate all the aircraft that were now being produced. Portal astutely added that assenting to Menzies' demand 'would deter a possible Japanese attack, therefore saving Britain from having to send naval forces to the Pacific'.[138] Clearly, the reason Churchill did not heed Menzies' request for aircraft was that Australia was not in a battle zone. Not unreasonably, Churchill took the view that Australia's concerns of a possible enemy invasion, that may or may not eventuate, must have a lower priority. This was a view which Menzies understood.[139]

Apparently, Stanley Bruce Australia's long-serving High Commissioner in London had advised Menzies and Shedden that Britain's requirements, whether in Britain or in the Middle East had to take precedence over Australia's needs. Menzies notified Arthur Fadden, his acting Prime Minister during his four months visits to England, 'that he had secured a categorical assurance that should war occur in the Far East there would be an immediate review of air resources to meet the dangers on all fronts'.[140]

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[136] Francis Crosby, *Bombers. An illustrated history of bomber aircraft, their origins* and evolution, (Lorenz Books, London, 2004), p.148.

[137] Day, *Menzies and Churchill at War*, p.123.

[138] *Ibid*.

[139] *Ibid.,* pp.122-128.

[140] *Ibid*., p.123.

On his return to Australia Menzies told the War Cabinet 'that Britain was sincerely desirous of helping us to the greatest extent possible' may well have been an expression of his belief but it surely glosses over indications to the contrary.[141] Dr H. V. Evatt, newly appointed Minister for External Affairs since October 1941, was keen above all to show his worth where he believed Menzies had failed. In May 1942, in London, he tackled once again the very sensitive issue of obtaining aircraft with Churchill, requesting Supermarine Spitfires and aircrews for the RAAF, as well as an aircraft carrier for the RAN.[142] His requests were met with non-committal responses from the British War Cabinet.[143] Even though Churchill did not warm to either Curtin or Evatt's request, he agreed on 28 May 1942 that three Spitfire squadrons No. 54 (RAF) and Nos. 452 and 457 (EATS squadrons) and aircrew be allotted to Australia.[144] These aircraft arrived in Australia during August 1942 fitted with four 0.50 inch machine guns, two 20mm cannon, plus the capability to carry two 250lbs bombs under the wings. Having made many requests for fighters to the Americans, in January 1942 Curtin turned to Churchill with the request of redirecting some of Britain's US-built aircraft to Australia 'to bolster the RAAF's extremely limited aerial striking and defence force'.[145]

Curtin's efforts resulted in a gradual delivery of 848 Kittyhawks for the RAAF front-line squadrons.[146] The first batch of P-40E Kittyhawk IA (A29-1 to 25) came from USAAF stocks which equipped RAAF squadrons' Nos. 84 and 86 based in Townsville, North Australia.[147] By

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[141] Day, *The Politics of War*, pp.123-124.

[142] Robertson, *Australia goes to War*, pp.78-79; David Day, '*John Joseph Curtin',* (216-237), (Michelle Grattan, ed., *Australian Prime Ministers*, New Holland, French's Forest, NSW, 2000), p.218.

[143] Bauer, *The history of World War II,* p.211

[144] Powell, *Far Country*, p.154.

[145] Gillett, *Australian Air Power*, p.86.

[146] Wilson, *The Royal Air Force in World War II. An aero special commemorative edition,* (Aerospace Publications, Weston Creek, ACT, 2012) p.8.

[147] Wilson, *The Spitfire, Mustang and Kittyhawk in Australian service*, (Aerospace Publications, Weston Creek, ACT, 1988), pp.140, 154, 164.

early 1944, the squadrons were almost exclusively equipped with 77 Kittyhawks, a variant P-40N which also equipped Nos. 80 and 82 squadrons.[148] The general RAAF serial for Kittyhawks (including both IA and III) was the first IA taken on by the RAAF; A29-163 was the last IA.[149] From early 1942 the US 49th Fighter Group's P-40 squadrons defended Darwin from Japanese air raids. By March 1942, the 77 Squadron's Kittyhawks also defended northern Australia.[150]

However, on rare occasions, pure good fortune results in very satisfactory outcomes. In March 1942, the RAAF were delivered 22 US Boston twin engined bomber aircraft (300 mph) used in Europe and the Pacific for low-level strafing and bombing enemy shipping and ground targets. Initially the Boston aircraft had been ordered by the French air force but after the fall of France, were transferred to the RAF. With Japan's entry into the war, the Bostons were diverted to DEI and when the Japanese invaded Java, the Bostons were sent to Australia. By the end of March, the RAAF boasted 69 Bostons which were assembled at No.1 AD, Laverton and No.2 AD, Richmond. The downside of this delivery was the aircraft arrived without spare parts, and few appropriate tools. Another problem was the manual was written in Dutch which made assembly rather laborious.[151]

Conclusion

This chapter showed that the British government influenced control over Australia in a variety of ways, including placing primary importance on defeating Hitler and Italy. Britain was far too involved fighting for its own

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[148] *Ibid.*, p.163.

[149] G. Clarke, G. Birkett, and B. Cowan, 'A29 Curtiss P-40 Tomahawk & Kittyhawk P-40B/E/F/K/L/M/N Tomahawk II.B & Kittyhawk I, IA, II, III & IV', *ADF-Serials*, http://www.adf-serials.com/2a29.htm, URL retrieved December 2018.

[150] Nelmes, *A unique flight. The historic collection of the Australian War Memorial*, p.177.

[151] Penny Matthews, *The Third Brother. A story of family and war*, (Wakefield Press, Mile End, South Australia, 2017), pp.150-151.

survival to respond adequately to Australia's appeal for aircraft to support future operations in the Far East. In considering its own needs Australia placed enormous value on intangible sentiments, its loyalty and respect for Britain, a consequence of long-standing cultural, economic and political links. This led to Britain being and remaining Australia's major and preferred supplier of not only finished goods, but of British cultural norms that were so important in shaping Australia's cultural, economic and political life.

This chapter also argued that the Air Ministry responded to Menzies' requests for fighter aircraft by offering unsuitable options.[152] As Day asserts, both Beaverbrook and Sinclair were determined 'to satisfy Australian demands with the absolute minimum number of mostly unwanted aircraft'.[153] The Chief of Air Staff, Air Chief Marshal, Sir Charles Burnett's great faith in the British aircraft industry took precedence over the needs of the RAAF, actively promoting their cause. Indeed, Australia's ongoing plan for taking delivery of a modern GR aircraft was thwarted by the difficulties in finding a reliable and fast long-range multi-purpose aircraft for coastal patrol tasks that was able to withstand in the tropical conditions. The unfortunate record of failing to meet acquisition targets was in retrospect quite appalling but not unexpected.

By setting aside the need for a thorough and honest evaluation of Australia's unique defence needs, over reliance on Britain became an expensive and delay-prone strategy that produced outcomes not tailored to meet a potential enemy. Summing up this situation, Day stressed that delaying Australia's demands for aircraft impacted a wide spectrum of Australia's defence measures. And 'although the war stimulated the development of its industrial base it still lacked the ability to defend itself

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[152] Day, *The Great Betrayal*, p.128.

[153] *Ibid*.

from serious attack'.[154]

At this juncture it is important to state while major equipment decisions are made by governments, Cabinet could not ignore the recommendations made by the three military boards and industrialists. As Alan Stephens pointed out, the CAS 'did not command his service in the full sense of the word'.[155] He could only suggest some improvement for the RAAF especially in regard to aircraft to the Air Board who would then seek government's approval. In view of the bureaucratic system in place, reaching a satisfactory decision could take a very long time as it involved the British High Commissioner's approval, who then sought the agreement of the British Air Ministry. Whatever the outcome, Australia's High Commissioner in London was notified of the decision, who then passed it on the Australian government.[156]

It would not be practical to analyse every remark made at the time, but given Australia's contribution to Britain's war effort in both wars, one could argue that on the contrary, Australia, after sending 'its best troops overseas' delayed building up 'local defences confident that the British promise to defend Australia would make it good'.[157] By 1941, its three well-trained and skilled AIF divisions 6th, 7th and 9th divisions were in the Middle East, while 2 brigades of the 8th division were in Malaya and the 3rd was in Darwin. Its naval capability in home waters had been much reduced when two of its four light cruisers, and five destroyers had been sent to confront the Italian Navy in Mediterranean waters.[158]

It is not surprising that Australia was not in full control of its defence. But by relying too much on the vision of the RAF and the British Air Ministry and the ability of British industry to meet Australia's needs in

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[154] Day, *The Politics of War*, p.170.

[155] Stephens, *The RAAF: A history*, p.52.

[156] Day, The *Great Betrayal*, p.128.

[157] *Ibid.,* p.111.

[158] Powell, *Far Country*, p.139.

a timely fashion, it placed the RAAF in a difficult position. The saga that commenced with the order for the Bristol Blenheim in 1936 was an example of both technical delays and abandonment or resetting of plans often affected by accelerated obsolescence. These examples demonstrate how risk-prone acquisition of complex defence equipment, especially aircraft, can be. Decisions had to be made rationally, based on the totality of information available at the time, but always with the acceptance of the possibility of failure.

Nevertheless, Australia managed to keep afloat by developing a semi-independent defence strategy, instead of giving way completely to British political and commercial maneuvering. In fact, it served to reinforce Australia's desire to assert its own requirements and maintain self-reliance as an important capability. As chapter six demonstrates two and half years after CAC's plant at Fishermen's Bend was built, the difficulties inherent in implementing the Beaufort project locally were complex and were at times not easy to manage, mainly due to frequent failures in the management of political and commercial interests that frequently sought to influence Australia's decision-making.

Chapter Six: The Beaufort: a challenge successfully completed, 1939-1941

The previous chapters detailed Australia's efforts to expand the RAAF, showing that finding a suitable aircraft took time and involved overcoming numerous difficulties. This chapter illustrates the difficulty in relying on a conceptual model to characterise future requirements when developing the basis of a logistics framework. This is because models are only guides when dealing with the propensity of war to shatter pre-conceptions and reveal the totally unexpected. This can be illustrated through the case of the controversial recommendation in August 1938 to acquire the Bristol Beaufort, a large twin engine torpedo bomber designed by the Bristol Aeroplane Company, which was developed from the earlier Blenheim light bomber.[1]

What became an issue was the transaction not only taxed Australia's already scarce national resources but developed into a bitter conflict between the CAC whom after acquiring expertise in manufacturing the Wirraway sought to continue as the local leader in this field. This chapter argues that Britain's envoys, the British Air Mission, came with a predetermined plan to restore British aircraft monopoly in Australia. The Air Mission played a hard game of self-interest by having nothing to do with CAC and Wackett in particular and not unnaturally recommended a solution that was advantageous to British interests. The Australian government and its advisers were foolish not to anticipate such an outcome.[2] The decision to manufacture the Beaufort in Australia became protracted and subsequent progress was slowed by a series of direction changes by the Bristol Company. This chapter argues that achieving a satisfactory result of providing for the RAAF with a

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[1] Wilson, *Beaufort, Beaufighter and Mosquito in Australian Service*, p.27.

[2] Weston, 'The Australian Aviation Industry', p.49.

contemporary aircraft such as the Beaufort into the RAAF inventory was vital but the process was never clear-cut, as many factors and adverse forces intervened in its introduction. The search for a reconnaissance aircraft may have finally borne fruit, however, its local manufacture led into a vigorous political struggle with strong cultural undertones between the Australian and British governments.

This chapter concludes that when government contemplated building the British Bristol Taurus engine for the Beaufort locally, an attractive option designed to alleviate any potential problem with supply little did they know that delays with the Bristol Company and various technical problems would be sufficiently serious to trigger a search for an alternative engine. Ultimately the engine problem was resolved by switching to the American Pratt & Whitney's Twin Row Wasp engine R-1830.[3] Australia tried to achieve a degree of self-containment by taking control of the aircraft situation. This was a difficult and demanding task centered on the local production of the Bristol Beaufort and the Pratt & Whitney R-1830 engines. Workforce productivity was also hampered by a number of industrial disputes. Government's endeavours eventually paid off. This project was without parallel in Australian industrial history due to the complexity and scale of the manufacturing task.

Aircraft selection and acquisition: a difficult process - the Beaufort

The difficulties associated with purchasing aircraft from Britain were exemplified by the difficult time Australia faced in acquiring a maritime patrol aircraft. In 1934, the Lyons government wanted to obtain a large number of fast twin engined bomber reconnaissance aircraft also 'capable of carrying out strikes against shipping or land targets'.[4]

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[3] NAA: A5954, 221/16, Manufacture of aircraft engines in Australia. Future policy - Historical note on the manufacture of aircraft engines in Australia (1-6). War Cabinet Agendum No. 459/1943, December 1942, signed by A.S. Drakeford, Minister for Air and Senator Donald Cameron, Minister for Aircraft Production, 6 November 1943.

[4] Ross, *Armed and Ready*, p.286.

Guided by the availability and suitability of aircraft under development by British aircraft industries, the Minister for Defence, Sir Archdale Parkhill negotiated with the Air Ministry an order for the Blenheim MkI bomber. This aircraft which had been adapted from a fast civilian transport design was intended to replace the RAF's obsolete Vildebeeste biplanes,[5] was ordered into production in 1935.[6] In November 1936, Britain offered the Bristol Blenheim to Australia and an order was placed with the Air Ministry to equip two RAAF squadrons with deliveries expected in the first half of 1937. Entering into RAF service in March 1937 the aircraft proved unsuitable due to a dramatic loss of speed caused by the weight of military equipment.[7]

Despite Treasury's allocation of funds in 1937-1938, the Blenheim never materialised. After a prolonged delay and an extensive exchange of communication Australia switched to the Bristol Bolingbroke, a derivative of and a successor to the Blenheim.[8] A further setback came in 1938 when Australia received news that British Air Ministry had decided to drop the Bolingbroke from its production plans. In May 1938 in view of the urgency, investigations began into the possibility of building the next generation machine, the Beaufort, in Australia.[9]

The increasing political crisis in Europe, exacerbated by Germany's military strength, meant that Britain along with other countries was under pressure to respond by modernising her military forces. Britain took the safe course of dispersing industrial production around her Empire and decided to use an 'off-shore' aircraft manufacturing plant to backup their aircraft factories with overseas duplicates. The newspapers reporting on German advances in Europe underlined the urgency of Britain's decision.

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[5] Wilson, *Beaufort, Beaufighter and Mosquito in Australian Service*, p.27.

[6] Barker, *The RAF at War*, p.40.

[7] G. Warner, *The forgotten bomber. The story of the restoration of the world's only airworthy Bristol Blenheim*, (Sparkford, UK, Patrick Stephens, 1991), p.29.

[8] Ross, p.286.

[9] NAA: A3095, 32/1/3. Confidential dossiers, Report: Outline of progress of the production of Beaufort aircraft in Australia as at 7 October 1940, p.69.

Australia and Canada were seen as the obvious choices.[10]

The RAF in the Far East was anxious to have an effective air defence and keen to acquire Beaufort aircraft, considered the most suitable current British aircraft and the latest improvement on the Blenheim. The aircraft was delivered to the RAF's Coastal Command and the RN Fleet Air Arm on 1 July 1939. Its comparatively long range and adequate speed, all-up weight, approx. 7,000 kg and maximum speed of 335 mph,[11] was considered by RAAF officers to be the most suitable British plane for Australian conditions.[12] Its suitability lay in the fact that it could patrol Australia's coastal and maritime zone.[13] The Air Board went ahead with the purchase. However, like the Blenheim before it, the Beaufort program encountered development problems leading to time-frame slippage.[14]

On 26 January 1939 under the agreement made by the British Air Mission and the Australian government for the purchase of 90 aircraft each, the Air Ministry directed Bristol to send all technical information and drawings including some 33,000 jigs and tools. On 24 March 1939 a group of British industrial specialists under the leadership of a veteran of similar negotiations, Sir S. Hardman Lever, accompanied by Sir Donald Banks and Air Commodore Arthur Longmore arrived to survey Australia's industrial capabilities and to investigate the practicalities of building under licence British aircraft for the RAF and the RAAF in Australia, forty of which were estimated to cost A$2,096 million.[15]

The deputation met Australia's delegates the Minister for

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[10] Bruce Robertson, *Beaufort special*, (Ian Allan Ltd, Shepperton, Surrey, Britain, 1976), p.4.

[11] Gillett, *Australian Air Pow*er, p.75.

[12] NAA: A5954, 884/7, British Air Mission's statement. Press forecasts, manufacture of aircraft in Australia. Teleprinter press statement sent to PM Lyons, 29 March 1939.

[13] Robertson, *Beaufort special*, p.30.

[14] Robertson, *Australia Goes to War*, pp.17, 347.

[15] Wilson, *Beaufort, Beaufighter and Mosquito in Australian Service*, p.27.

Commerce, Sir Earle Page and the Minister for Defence, Geoffrey Street, Treasurer Richard Casey and leaders of the industry, including the general manager of BHP, Essington Lewis and the major shareholder of CAC Colin Fraser, chairman of Electrolytic Zinc.[16] The nature of the visit was presented as an investigation of Australia's industrial capacity and to consider the possibility of decentralising parts of Britain's manufacturing activities away from German bombing. This strategy had been expressed by Britain at the 1937 Imperial Conference and was possibly also intended to evade the US Neutrality Acts that could prevent Britain obtaining American military aircraft.[17]

The 1939 the Air Mission's agenda included promoting the sale of British aircraft to Australia. The real objective was more nuanced, to restore Britain's dominant position in aviation technology in the Australian market, and to sideline CAC from any significant role, which was a company that in Britain's view had previously committed an infraction in selecting, the NA-16 (later renamed Wirraway) instead of a British aircraft. And much to the discontentment of the Lyons government who was faced to incur British displeasure.[18] Ewer notes that Britain gave much thought to estimating the minimum number of Beaufort need to make Australian production economically viable and also the lesser minimum number to deliver a credible base for future development, even if the Australian Beaufort project failed to assist Australia's needs.[19] Because Australia needed only 90 aircraft, to achieve economic viability 90 aircraft were purchased for the RAF in the Far East. [20]

No doubt, the Bristol proposal provided British aircraft industry with a renewed opportunity of reigning supreme by persuading Australia to commit to British engine and airframe technology, even if that meant

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[16] Ewer, *Wounded Eagle*, p.124

[17] Ross, *Armed and Ready*, pp.286, 287.

[18] Ewer, *Wounded Eagle*, p.99.

[19] Ewer, 'Servants of the National Interest?', p.65.

[20] Ewer, *Wounded Eagle*, p.124.

allowing manufacture to occur in Australia. It was Stanley Bruce who instigated, at least in part, the British Air Mission's decision to entice the Australian government to agree to use Australia as a base to build first-line aircraft.[21] In 1936, Bruce siding with the Air Ministry had been skeptical about the building of American aircraft in Australia by CAC. In his view, such an enterprise was against Empire solidarity and the uniformity of armaments with Britain. Bruce was able to persuade the Air Ministry that CAC could become a manufacturing base to build modern aircraft for the RAF, stating that if the situation was handled wisely, the project could successfully be concluded to restore confidence in the proper quarters. As far as Bruce was concerned, CAC was unique and ideally situated being placed east of Suez 'to develop the air strength of the Empire'.[22] In 1938 Britain began to decentralise its armament and aircraft plants to Canada. Britain's decision 'was taken to circumvent the US Neutrality Act by exploiting the special relationship Canada had with the US'. The establishment of industrial plants in Canada was to ensure a continuing flow of production and armaments from the US to Britain via the Canadian factories. In view of the greater distance separating Britain from Australia, it made more sense to argue for such a facility in Canada which was much closer and not in danger of an attack.[23]

Providing this detail on Britain's objectives allows a better appreciation of the difficulty the Air Board had in facing up to the British defence industrial policy-makers approach to the issues involved in equipping the RAAF. Having failed to move the orientation of Australia's aircraft industry away from US technology and having also witnessed large Australian orders for front-line aircraft going to America. As Weston argues, 'the Air Ministry's main interest was in the re-establishment of British aircraft technology in Australia and they tapped into veins of

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[21] Ross, *Armed and Ready*, p.286.

[22] *Ibid*.

[23] *Ibid*., p.287.

similar thinking in the Australian government and bureaucracy'.[24] It therefore made sense that the British Air Mission saw Bruce's plan as the ideal vehicle to re-establish the primacy of British aero technology in Australia.[25]

Soon after Hardman Lever's visit, A.F. Bennell of Britain's Bristol Aircraft Company came to further investigate Australia's manufacturing facilities. He reported that CAC should not be used as the major coordinator of the Beaufort project because CAC had concentrated on making training aircraft and 'would be overstrained by the Beaufort project'. Obviously, the magnitude of the task was considered too great for CAC, although Bennell thought CAC could be used in making less complex sub-assemblies work for the Beaufort.[26] By offering the lesser prospect of sub-assemblies, the Air Mission simply ignored CAC's engine building experience and its new, well equipped CAC aircraft production facility, as well as its trained workforce.[27] Instead, the Mission recommended a new manufacturing facility in the state railway workshops in Victoria, NSW, Queensland and South Australia to assemble the Beaufort, with the support of the Australian government.[28]

To prepare the ground about a dozen suitable persons were sent to Britain to gain experience on Bristol works.[29] This arrangement was made possible after Parliament passed the Supply and Development Act in June 1939, empowering the Australian government to re-structure its industries and purchase war materials.[30] As the Beaufort was still in the

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[24] Weston, 'The Australian aviation industry', p.50.

[25] Ross, p.287.

[26] *Ibid.*, pp.287-288.

[27] Weston, p.49.

[28] *Ibid.,* p.48.

[29] NAA: A816, 6/301/441. Aeronautical Inspection Directorate (AID) regarding the manufacture of aircraft in Australia. Air Board Minute, No. 2462 of 16 May 1939 to CAS, AMS, FM from the Secretary of the Air Board regarding an A.I.D to be organised on a civilian basis similar to that of the British one.

[30] Mellor, *The Role of Science and Industry*, pp.32-33.

developmental stage in Britain, there remained the certainty that the aircraft would be fraught with technical problems. Obviously, the Air Mission did not want the involvement of companies with American ownership, as they rejected the manufacture of the Beaufort in either the Ford or GMH assembly plants using their light engineering production expertise, including the International Harvester factory at Geelong.[31]

CAC, faced with being idle by mid-1940, sought orders for whole Beauforts. This was denied.[32] The government had decided to hand over the task of manufacturing the Beaufort to a new organisation, the Department of Aircraft Production (DAP), under the wing of DOSAD. H. W. Clapp, the general manager of Aircraft Construction Branch and F.J. Shea, Controller of Production were appointed to oversee the Beaufort project, while the Air Board was responsible for the inspection of all aircraft and aircraft components on order for the RAAF and submitted all proposals related to the Beaufort production to the Aeronautical Inspection Directorate (AID). [33]

As the British High Commissioner Geoffrey Whiskard expressed it in his letter to R.G. Casey, there was a very strong opinion held by the Air Mission and shared by the British government as to the desirability of a British rather than an American engine being manufactured and incorporating the Pratt & Whitney Twin Row Wasp R-1830 engine after a whole series of further trials and tests. Whiskard pointed out that the British government was 'anxious to decentralise aircraft manufacture as soon as possible [believing that] 'a great deal of the value of such decentralisation will be lost if the type of manufacture in Australia [was] dissimilar to the type manufactured at home'.[34] With the commitment to Beaufort production coupled with the uncertain economic, political and

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[31] *Ibid*., p.49.

[32] *Ibid*., p.50.

[33] Ross, *Armed and Ready*, p.285.

[34] NAA: A1196, 1/502/5. Manufacture of aircraft and engines in Australia. G. Whiskard to R.G. Casey, Minister for Supply and Development, 20 May 1939.

strategic climate of the thirties, Prime Minister Lyons could see the value of keeping the British on-side, particularly given the benefits apparent from exporting the aircraft to New Zealand.[35] His prime objective was 'to obviate the possibility of interference with Empire trade routes disrupting the supply of aircraft and parts from Britain during times of emergency'.[36]

CAC management suffered yet another shock. In April 1939 with the passing of Lyons and the appointment of Robert Menzies as Prime Minister, Casey who had become the new Minister of DOSAD, tried in vain to obtain approval from Geoffrey Whiskard for CAC to build the Pratt & Whitney Twin Row Wasp R-1830 engine. Menzies had a responsibility at least, to analyse Casey's proposal from a perspective of Australia's interests.[37] Yet, on 23 May, Menzies and his supporters firmly supported British interests, maintaining that the British Taurus engine would better conform to the pattern of equipment uniformity with the RAF.[38]

The need to keep the Beaufort production costs low played an integral part in the operations. According to Hardman Lever, Britain and Germany made extensive use of sub-contractors as the most effective method of achieving rapid large-scale airframe production and urged Australia to follow suit. By using existing contractor facilities the objective was to cut capital expenditure and overheads by reducing unnecessary duplication including the difficult task of finding additional qualified personnel, and minimising dislocation of production elsewhere in the aircraft building industry.[39] A.F. Bennell recommended the use of existing main railway workshops in Victoria, New South Wales, Queensland and South Australia, as these facilities had ample floor space, were well

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[35] NAA: A6006, 1939/05/23 Lyons' statement regarding Beaufort aircraft, 29 March 1939.

[36] NAA: A2671, 202/1940, War Cabinet Agendum, No.202/1940. Supplement 1, Supply of spare engines, airframe and engine spares for the Beaufort aircraft.

[37] *Ibid*.

[38] Ross, *Armed and Ready*, pp.294, 296.

[39] A1196, 1/502/5. Manufacture of aircraft and engines in Australia, 1938-44, Sir S. Hardman Lever's letter to R.G. Casey, 24 March 1939.

connected to transport, and were suitable for heavy construction.[40] The Beaufort was purposely designed to allow construction in sections. However, this mode of manufacture was heavily dependent on the transport system to bring sub-assemblies together as scheduled. Two special purpose assembly plants were built in Melbourne and Sydney for final completion of the aircraft.[41]

From the aspects of trade and employment, the project was beneficial to Australia and to the expansion of the local industry as some 600 local civil firms were contracted to make components or were involved in work on sub-assemblies and major assemblies.[42] Menzies knew that CAC, as Australia's leading aircraft manufacturer, would have 'explicitly studied Australia's conditions and unique requirements, and sought to utilise sources of indigenous materials'.[43] Ignoring CAC's established record in manufacture by setting up a government-owned aircraft organisation was predicable but giving preference to Bennell's plan meant taking the risk that CAC's technical and production workforce would be put out of action. Contrary to Bennell's belief that CAC were too busy to take on new work, Wackett had pointed out that they would need new work from mid-1939 and 1940. This does make sense; however, as Ross argues Bennell's decision to by-pass CAC was a pay-back for Wackett's criticism in 1936 of the British aircraft he had investigated while in England. Wackett, by praising American aircraft technology 'was seen as aggressively pro-American technology and anti-British'.[44]

However, Wackett at the time was making the most of the feedback he had gained after visiting various overseas aircraft manufacturing industries. If one is to believe Ross's appraisal of the situation, it would

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[40] Ross, p.287.

[41] NAA: A3095, 32/1/3, DOM & DOASD, Confidential dossiers – Setting up a central organisation to control the undertaking of the Beaufort aircraft, p.59.

[42] Wilson, *Beaufort, Beaufighter and Mosquito in Australian Service*, p.31.

[43] Ross, *Armed and Ready*, p.287.

[44] *Ibid*., p.288.

make British disapproval of CAC immature and at the most ridiculous. After the Hardman Lever mission succeeded in getting Australia to select the Bristol Beaufort aircraft, both governments decided to manufacture 180 Beaufort aircraft in Australia, powered by British Taurus engines.[45] The cost of manufacture was shared equally by the two governments. Australia's share of the order, placed in July 1939, was priced as £3,520,000.[46] One reason for this decision was that the order placed with the American Lockheed aircraft company for one hundred Hudsons was still not met.[47] Flight testing in Britain in 1938 showed the Beaufort's general performance met expectation but also revealed an unusually large number of technical problems. The Minister for DOSAD, R.G. Casey, revealed on 5 November 1939 that the British Taurus engine was overheating and this could lead to a critical problem. If not solved quickly the RAF was contemplating a switch from the American Pratt & Whitney R-1830 engine. The work necessitating considerable modifications to the airframe due to the increased weight, power and size of the alternate engine and to production tooling was entrusted to CAC, Lidcombe.[48]

Other technical problems were aircraft poor handling if an engine failed on takeoff and a tendency to ground loop on landing and to swing badly on takeoff.[49] Another known problem area, the Beaufort's retractable landing gear reputedly became the most troublesome part of the aircraft, necessitating modifications and testing, causing more critical

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[45] NAA: A3095, 32/1/3, DOM & DOSAD. Confidential dossiers, Outline of progress of the production of Beaufort aircraft in Australia, 7 October 1940, p.58.

[46] NAA: A2671, 202/1940, War Cabinet Supplement no 1. Supply of spare engines, airframe and engine spares for locally manufactured Beaufort aircraft by A.W. Fadden, Minister for Air, 9 September 1940.

[47] NAA: A2671, 3/1939, War Cabinet Agendum No. 3/1939, Supply of Aircraft. Memorandum, P.E. Coleman, Secretary of the Air Board advising PM Menzies on the non-delivery of the Hudson, 29 August 1939.

[48] NAA: A5954, 221/16 Manufacture of aircraft engines in Australia. Future Policy. Historical note on the manufacture of aircraft engines in Australia, March 1939 - December 1942.

[49] Gunston, *World Encyclopedia of Aero-engines*, p.3.

delays.[50] Most of the design defects were rectified, with the notable exception of landing stability. This problem was finally addressed by Australian engineers who increased the area of the vertical tail surface. By 1942, all Australian-built Beaufort included this modification.[51]

The British Bristol Taurus and the American Pratt & Whitney Twin Row Wasp R-1830 engines

Despite these promising indications, Australia's Beaufort project remained stalled in uncertainties principally related to guaranteeing delivery of Taurus engines for the Australian aircraft. The issue of securing a suitable engine reached crisis proportions that were finally resolved with the decision to switch to the American Pratt & Whitney R-1830 engine towards the end of 1939. The basis for reaching this decision is covered in detail below.[52] On 24 November 1939, R.G. Casey, newly appointed Minister for DOSAD, advised CAC that British Taurus engines would be available to power the 180 Beauforts, gave the go ahead to begin local manufacture because all known technical faults had been addressed.[53] Prior to this development, McVey suggested that given CAC's continued commitment with the Wirraway, it would be unwise to manufacture either the British Taurus or the American Pratt & Whitney R-1830 engines in Australia. Wackett made the case against using a new and untried construction organisation to build the Beauforts arguing it would make more sense to assign the task to CAC and use the Twin Row Wasp R-1830 engine.[54]

CAC was already building a single-row engine and could easily make

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[50] NAA: A2684, 101, Construction of aircraft engine factory at CAC, Lidcombe, NSW. Decision made by the Advisory War Council at its meeting on 14 January 1941.

[51] Wilson, *Beaufort, Beaufighter & Mosquito in Australian Service*, p.20.

[52] NAA: A5954, 221/16, Manufacture of aircraft in Australia - Future policy. Historical note on the manufacture of aircraft engines in Australia December 1942.

[53] NAA: A705, 9/18/49, Beaufort - local manufacture; R.G. Casey teleprinter message to the Secretary of DOD. Copies to the Secretary of the Air Board and the Deputy Chairman of the Aircraft Advisory Committee, McVey.

[54] Ross, *Armed and Ready*, p.291.

the transition to the Twin Row Wasp engine R-1830. Wackett's suggestion stood little chance against Menzies' forceful mindset. Actually, the Air Mission was prepared to allow CAC to manufacture British Taurus engines, although not without the hidden agenda that the undertaking would effectively bring CAC back into the British orbit, instead of America. The Air Board and the Australian government were of course under no illusion about the likely shortage of Taurus engines and associated materials from Britain as war was now imminent. An Air Board progress report of 27 August 1939 stated that the Air Ministry had advised that, due to technical faults with the British Taurus, delivery of the Beaufort was not possible until March 1940. In view of these delays 'and the existing state of tension',[55] the Board sought British Air Ministry advice on the possibility of leasing or buying other twin engine aircraft. The Australian government looked for a compromise solution advising that orders placed with Britain should not be cancelled 'until the international situation is clarified'.[56]

Under the US Neutrality Act, Australian dealings with America were channelled through the British Embassy in Washington and waited for clarification from the Australian Liaison Officer there. On 1 September 1939, in London, Bruce sent a cablegram to Menzies stating that the production of Beaufort airframes in Britain was advancing satisfactorily and advising that the Council foresaw difficulties in moving ahead with Beaufort production in Australia. 'Teething troubles' with the Taurus engine were downplayed as normal in development of any type of engine and would be quickly solved and large scale Taurus production in England would progress without further serious delays.[57]

However, this proved far too optimistic. On 18 September 1939, the Secretary of DOSAD, D. McVey, commented that the Air Ministry had

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[55] NAA: A816, 6/301/75, International crisis, August 1939, Air Force measures, Supply of aircraft. P.E. Coleman, Secretary of the Air Board Minute of 27 August 1939 to Secretary of DOD, F.G. Shedden, p.1.

[56] *Ibid*. Minute F.G. Shedden to the Secretary of the Air Board, 28 August 1939.

[57] NAA: MP287/2 - 205/1451, pt 2, Beaufort Drawings for Taurus and Wasp Engines. Queries & Requisitions on Bristol and USA, 1939-1941.

assured the dispatch of 100 British Taurus engines to Australia upon completion of a first batch of 50 Beaufort airframes. McVey was confident that the British Taurus' development troubles were over and the engines would be available in good time. However, if further delay did occur, Australia would have to either place a hold on production or plan to manufacture British Taurus engines locally or look for alternative engines for the Beaufort aircraft. Subsequently the British Air Minister decided that 'Australia will be asked whether it would be possible to produce American Pratt & Whitney R-1830 engines in Australia for Beaufort, United Kingdom being willing to accept such engines for completion of their order'.[58] However, given that producing an engine of this complexity necessarily required expertise, and involved colossal establishment costs, McVey felt that the alternative for the time being was to continue importing them.[59]

In early October 1939, reports of the Taurus engine overheating and showing other reliability issues continued unresolved. The time for decisive action had arrived. The least disruptive step was to turn to another engine manufacturer. In a Cablegram to Australia's High Commissioner in London on 2 October 1939, War Cabinet asked whether they could buy Pratt and Whitney Twin Row Wasp R-1830 engines from America. with the full understanding that the transaction depended on amending American Neutrality legislation. The Department of Supply was confident that Britain's Bristol Company could complete engineering work to allow the use of the Twin Row Wasp R-1830 engines in the Beaufort aircraft. The Department was anxious for pertinent information, quickly, and reassurance that Bristol would continue providing technical assistance.[60]

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[58] NAA: MP450/1, 52, Department of Supply and Development. Report of meeting held at the Department of Supply on 26 October 1939 regarding the local manufacture of Twin Row Wasp Engines, p.4.

[59] NAA: A5954, 221/16, Manufacture of aircraft engines in Australia. Future policy. Historical note on the manufacture of aircraft engines in Australia, March 1939 - December 1942.

[60] NAA: A816, 6/301/495A, Manufacture of aircraft and engines in Australia. Cablegram from the Deputy Chairman of the Aircraft Advisory Committee, D.

Plans for the local manufacture of engines had to be settled well in advance. Local production was clearly viable, provided a commitment was made. While either strategy may have been acceptable during peacetime, by October 1939 the case for local engine production mounted due to wartime shortage. Now it was the last option. The lead times indicated were realistic and reflected the complexity of manufacturing airframes and engines. In early 1941, John Storey, executive member of the Aircraft Production Commission, accompanied Menzies to Britain to inspect two new aircraft: Bristol Beaufighter and a prototype of the Avro Lancaster, a long-range four-engined bomber which went into production in October 1941. Both machines could carry out long range attack or reconnaissance missions. Storey recommended 'that both be built in government factories as a follow on to the Beaufort program'. In his opinion, the RAAF needed the Beaufighter for reconnaissance and fighter operations to support land forces.[61] The great advantage of these two aircraft was their uniformity of components, some 75 percent, and in production technique, which made the extension from one aircraft to another logical.[62]

In August 1941 John Storey informed the Advisory War Council that it was anticipated that the first Pratt & Whitney Twin Row Wasp R-1830 engine would be produced in September 1941 with a total of 6 in October; 1 a week in November, 3 a week in December, ramping up to 10 to 12 a week by May 1942.[63] However, on 3 October 1941, due to the increased aircraft production in British factories, Australia's plan for the local production of the Beaufighter was deferred.[64] The levels of pressure and frustration Bristol aircraft engineers experienced as they worked to solve the British Taurus engine problems and simultaneously complete the work

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McVey to the High Commissioner, Stanley Bruce in London, 2 October 1939.

[61] Gillison, *Royal Australian Air Force*, p.139.

[62] *Ibid*.

[63] NAA: A705, 9/18/15, Overseas Indents 550 and 591, Bristol Beaufort aircraft and Taurus engines, Group Captain for official history to the Secretary of the Department of Defence, Melbourne, 19 August 1938.

[64] Gillison, *Royal Australian Air Force*, pp.139-40.

required for the American Pratt & Whitney engine conversion were considerable.[65] These and other changes also meant frequent alteration to a multitude of contingent planning details in Britain, to the point that Australian designers and engineers began to wonder where the project was heading. Would it be better to immediately launch production of an aircraft that a few weeks later may need modification, or alternatively wait indefinitely for problems to be solved and the design finalised, however long that might take? As McVey told the High Commissioner, there was no point producing Beaufort airframes without the rock solid assurance that the promised supply of engines would be received.[66]

On 19 October 1939 a telegram from the Air Minister to the Prime Minister's Department indicated that it could not guarantee a delivery date for the Beaufort aircraft because the Bristol Engine Company had become increasingly committed to satisfying requests from European companies for aircraft engines. This meant that the likelihood of receiving Taurus engines from the Bristol Company was becoming less certain and increasingly risky.[67] At a meeting held at the Department of Supply on 26 October, the future of the problematical Taurus engines was thrashed out. Clearly, the local manufacture of the Beaufort could not go ahead until this uncertainty was removed. The content of an important cablegram from the American firm, Pratt and Whitney was crucial at this time. The firm offered CAC a license to build the Pratt & Whitney Twin Row Wasp R-1830 engine, a development, which Essington Lewis strongly supported. He believed that even if engines were readily available from America, the creation of a modern aircraft engine factory was essential. McVey's opinion now was that if Britain could not immediately deliver Taurus engines or provide a firm future delivery date, the American government

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[65] NAA: A5954, 215/2, Delays in the manufacture of Beaufort aircraft, PM Robert Menzies's speech, Canberra, 5 August 1940.

[66] NAA: A816, 6/301/456, Manufacture of aircraft and engines in Australia. Cablegram from the Deputy Chairman of the Aircraft Advisory Committee, D. McVey to Stanley Bruce in London on 2 October 1939.

[67] NAA: MP450/1, 52, Report, pp.1, 3, 22. Meeting held at DOSAD on 26 October 1939 regarding manufacture of Twin Row Wasp (TRW) engines.

should be asked to approve the supply of R-1830 engines.[68] This view favourable to members of the War Cabinet meeting of 26 October 1939 sealed the future of the Twin Row Wasp engines.[69] The manufacture of aero engines was seen to be of greater importance than airframes. In view of the delay that was being experienced by CAC in obtaining the licence to manufacture the Pratt & Whitney Twin Row Wasp R-1830 engine War Cabinet approved their local manufacture and authorised CAC to send three of their staff to America. Two were to examine manufacturing processes and a third assigned to procure machine tools.[70]

A full War Cabinet meeting held on 31 October 1939 concluded that the capacity at Fishermen's Bend, which was already manufacturing the Wirraway's R-1340 engine, would not be able to handle additional commitments and this would necessitate building another factory.[71] Lidcombe a suburb of Sydney was selected in preference to Melbourne because it had a greater pool of industry and labour from which to draw. Announcing this decision Sir Frederick Stewart, Acting Minister for DOSAD, stated that Treasury had released £1 million for the manufacture of the engines.[72] The area was 15 acres and the price quoted is £1,000 per acre, with leveling costing £3,500, totaling approximately £18,500.[73]

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[68] NAA: MP287/2 - 205/1451, pt. 2, Beaufort Drawings for Taurus and Wasp Engines. Queries and Requisitions on Bristol and USA, 1941, pp.2- 3.

[69] NAA: MP450/1, 52, Report, pp.1, 3, 22. Meeting held at DOSAD, 26 October 1939 regarding the local manufacture of TRW engines.

[70] NAA: A2673, vol. 1, War Cabinet Minutes, 27 September 1939 to 6 February 1940. Manufacture of Twin Row wasp engines in Australia, with further references to Full Cabinet Minute No. 4, 31 October 1939.

[71] NAA: A6074, PO-2658, Lidcombe, NSW, proposed acquisition - aircraft engine factory, 1939. Letter from George A. Watson, Deputy Crown Solicitor regarding Notice of Acquisition lodged at the Land Office, Sydney for registration which reached the Land Office on 6 June. A Certificate in the name of the Commonwealth of Australia was done on 2 July 1940. Copy to the Surveyor-General and Chief Property Officer of DOI. The Certificate of Title, 12 July 1940 was filed with the Commonwealth Securities.

[72] NAA: A5954, 215/2, Press extracts. Delays in the manufacture of Beaufort aircraft, PM Robert Menzies' speech, Canberra, 5 August 1940.

[73] NAA: A667, 4, Lidcombe, NSW, proposed acquisition - aircraft engine factory. Notification of the acquisition of land by the Commonwealth was Gazetted (No. 65) on 11 April 1940.

However, there was another reason Sydney was selected. Adelaide in South Australia had been investigated as a possible site for an aircraft factory but was abandoned because some defence officers had objected to being forced to leave their Melbourne homes to work in Adelaide.[74]

From the Air Board's point of view, 'the installation of the Pratt & Whitney engine in the Beaufort would lead to Australia standardising on one type of engine for both aircraft which was desirable'.[75] The conclusion was reached, pending the timely dispatch to Australia of Hudsons and spares from the US, to use (if necessary) spare Pratt & Whitney R-1830 engines from the Lockheed shipment in the initial Beaufort production, provided that large-scale engine production followed. Many of the setbacks still affecting the Beaufort project can be attributed to Bristol's failure to supply the outstanding portion of required tools and fixtures and to meet delivery targets for parts and materials. These deficiencies affected all stages of factory production, maintenance and servicing activities.[76]

Although these difficulties were neither new nor unexpected, it became necessary to take stock of the operational consequences. At this point, as war production was struggling to meet Britain's needs, it was apparent that it might be imprudent to rely solely upon Britain for aircraft and engine procurement. In fact, foreseeing such an occurrence, Prime Minister Lyons on 2 November 1938 announced his government's intention to place an order for 50 Lockheed Hudson bombers, a twin engine bomber and reconnaissance aircraft, with America.[77] Because of Britain's urgent need for aircraft, in 1939 Australia agreed to transfer 49

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[74] NAA: A664/1,415/401/143, Aircraft Manufacture Representations regarding site for factory. Letter from J.A. Lyons to the Premier of South Australia, R.L. Butler, 27 January 1937.

[75] NAA: MP450/1, 52, Report, pp.1, 3, 22. Meeting held at the Department of Supply and Development on 26 October 1939 regarding the manufacture of Twin Row Wasp engines.

[76] NAA: A3095, 32/1/3, DOM & DOSAD, Confidential dossiers, Bristol Aeroplane Company Deficiencies, 4 October 1939, p.61.

[77] Ross, *Armed and Ready*, p.287.

Hudsons from the US production line to Britain under the terms of the Australian Air Cooperation Agreement.[78] This arrangement was made on the basis that Britain's situation was desperate and replacement aircraft from future Lockheed production would be supplied within months. As Britain was still unable to supply suitable aircraft for the GR role, the Air Board placed an order for an additional 30 Hudsons from the Lockheed Aircraft Corporation on 28 August 1939. As delivery of these was months away, orders for Hudson aircraft from Britain were not cancelled until the Air Board was satisfied that the Neutrality Act would not obstruct shipment of aircraft to Australia.[79] The US Company was quick to reply 'that upon an order being received not later than 6 pm (US time) on 29 August 1939, additional Hudsons would be supplied with deliveries on 7 November, 16 December 1939, 20 January 1940 and 10 Hudsons per month thereafter for a period of three months'.[80] The first Lockheed order for 100 Hudsons was fulfiled with deliveries starting on 26 January and ending on 20 June 1940.[81]

After considerable discussion, the Air Board decided to fit the aircraft with British Vickers guns, a decision that required modifications to the dorsal turret and gun mounts. By mid 1939, it was resolved to switch to the British-made Boulton Paul Turret.[82] By August 1940, of the 100 Hudsons being delivered, 10 Hudsons had been lost in training accidents. Of the 90 remaining, 36 were deployed in the Far East leaving 54 in

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[78] Gillison, *Royal Australian Air Force*, p.54.

[79] NAA: A2671, War Cabinet Agendum No. 3/1/1939, Supply of Aircraft. Memo regarding technical fault with the Taurus engine & the Neutrality Act, Secretary of the Air Board to Menzies, 29 August 1939.

[80] NAA: A816, 6/301/75, International crisis, Air force measures, Supply of aircraft. The Secretary of the Air Board (P.E. Coleman), memorandum to the Lockheed Aircraft Company, 29 August 1939.

[81] Gillison, *Royal Australian Air Force*, p.54.

[82] Wilson, *Anson, Hudson & Sunderland, in Australian Service*, pp.86-90;

Royal Australian Air Force, 'The Boulton Paul gun turret', *RAAF Museum*, https://www.airforce.gov.au/raafmuseum, URL retrieved on 6 January 2018.

Australia.[83] Lockheed received a second order for 52 aircraft, followed by a final order for 94. At the very least the RAAF could expect delivery of another 146 Hudsons to counter the Japanese aerial forces in the Pacific war. The aircraft were scheduled to be delivered by May 1942.[84]

Delivery of aircraft parts from overseas

The contract with the Bristol Aeroplane Company called for the delivery of ten sets of pre-fabricated sub-assemblies, ten sets of parts ready for assembly and complete sets of parts and raw materials for the fabrication of another 180 aircraft. Originally scheduled for completion by 31 December 1939, this program became a saga that dragged on well into 1941.[85] The first milestone was delivery to Australia by January 1940 of one complete set of fabricated parts to build one airframe.[86] Some materials were in fact received from Bristol by that date but were insufficient to form one complete set of parts.[87]

According to the details set out in a report issued by DOM and DOSAD, items received in January amounted to a stream of uncoordinated boxes of material, arriving from the workshops of Bristol's sub-contractors scattered throughout England. Bristol had not coordinated these shipments and had also omitted to send a complete and trustworthy Bill of Material.[88] The Company refused to accept any blame but it is clear that they did not appreciate that setting up Australia as a distant shadow

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[83] *Ibid*.

[84] NAA: A5954, 215/6, Supply of spare engines, airframes and engine spares for locally manufactured Beaufort aircraft, 1940-1946. Extract from War Cabinet Minute. Agenda Nos. 365, 375 and 383/1941. Weekly reports by CGS, 17 November 1941.

[85] NAA: A5954, 215/2, Robert Menzies' speech regarding delays in the manufacture of Beaufort aircraft, Canberra, 5 August 1940.

[86] NAA: A2671, 202/1940, War Cabinet Agendum No. 202/1940 and Supplement 1, supply of spare engines, airframe and engine spares for locally manufactured Beaufort aircraft, 1940.

[87] NAA: A3095, 32/1/3, DOM & DOSAD, 7 October 1940, p.61.

[88] *Ibid.,* p.63.

factory for Beaufort manufacture was vastly more difficult than managing production by sub-contractors and shadow factories in Britain.[89]

The new and widely supported manufacture of the Beaufort by the Government and Australia's aircraft industries had fallen into a confusion requiring much co-operation between Australia and Britain, detailed organisational work as well as patience. There was no guarantee that production schedules would be completed on time nor was it possible to foresee and neutralise all possible or probable causes for time-overruns. Unlike the Bennell idealised program, the real complications implicit in the transfer of the Beaufort production to Australia exposed numerous disruptive problems with the accuracy and completeness of documentation supplied. The following gives some flavour of the issues that required rectification and inevitably caused significant delays. A cablegram dated 10 May 1940 sent to A.F. Bennell by the chief engineer of the Beaufort production requested action on 29 urgently needed drawings that were still outstanding in mid 1940.[90] On 23 June, the Chief Engineer sent another cablegram to Bennell stating: 'have recently received British Standard Specification 6A1 and find that revision affects all drawings calling up bolts to old specification 5A1'.[91] This change raised the question whether Bristol would issue a new series of component schedules replacing all existing schedules for the Beaufort.[92]

In a speech reported in the press on 5 August 1940, Robert Menzies summarised the problems causing delays, emphasising that the Beaufort was a large and complex machine in comparison to the Australian-made Wirraway. Wartime conditions and time constraints had made it difficult for the Bristol Company to assemble and deliver all the data needed to manufacture and maintain the aircraft as a complete self-contained

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[89] *Ibid*.

[90] NAA: MP287/2, B1451, pt. 1, Beaufort drawings for Taurus & Wasp engines. Queries and requisitions on Bristol and USA, 1940.

[91] *Ibid*.

[92] *Ibid*.

package. As Bristol could not supply some 26,000 of the 33,000 jigs and tools required DAP to have these manufactured locally. Menzies claimed that the promised twenty sets of fabricated parts and materials for the local assembly of the first twenty Beaufort planes would be available and production would start as soon as practicable. He also stated that achieving full local production would be difficult because the tool-making capacity of CAC was taxed to the limit making the missing tooling and completing the substantial organisation needed to start production.[93]

Summarising the situation, *The Age* of 8 December 1939 wrote: 'Accounts totaling £18,641 had been paid, but the articles (were) now unsuitable for the purposes contemplated'. As most of the work was done from drawings, these had become out of date, due to a mistake 'which the Auditor-General significantly observes may be a costly one'.[94] By February 1941, it had become evident that Bristol had not let the Air Board know the names of vessels in which Beaufort parts were to arrive in Australia and the dates the vessels left Britain. When shipments finally arrived in Australia it was discovered that the documentation package supplied by the British company contained so many errors and gaps that it became necessary to revise the planning and manufacturing programs completely.[95] Project managers, accountants and even the Air Board were never certain what had been shipped until consignments arrived. While the Secretary of the Air Board in Melbourne and the British Purchasing Commission were conversant with these problems little could they do to prevent further occurrences. Australian personnel had to amend completely the plant and manufacturing programs contained in their original Schedules. This action was based on the discovery that much of the technical information provided by Bristol was riddled with

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[93] NAA: A5954, 215/2, Delays in manufacture of Beaufort aircraft, Robert Menzies' speech, Canberra, 5 August 1940.

[94] NAA: A5954, 102/2. Defence policy, Australia's war effort. Press cuttings only; Clipping from *The Age*, 8 December 1939.

[95] NAA: A3095, 32/1/3, DOM & DOSAD, Confidential dossiers. Outline of progress of the production of Beaufort aircraft in Australia as at 7 October 1940, pp.63-64.

omissions, errors and confusing misinformation. Redressing the numerous deficiencies was painstaking work and extended well into 1941. It also necessitated the reworking of Schedules to update technical data before production of the first aircraft could begin.[96]

The Bristol promise was to have Beaufort production in Britain underway during 1940 and to be in a position to provide Australia with parts for the first 20 aircraft in early 1941. Eight British built Beaufort MkI were shipped to Australia for trials. The 1000 hp British Taurus engines were replaced with a Pratt & Whitney R-1830 engine on a single Beaufort. This prototype was test-flown extensively with performance exceeding expectations. Australia's production planning anticipated assembly of the ten Beaufort by 30 April 1941, delivery of the next 140 by 31 December and completion of the balance of 30 aircraft by early in 1942. This schedule turned out to be overly optimistic. In reality the first DAP Beaufort was test flown in May 1941 and handed over to the RAAF in August, with only 8 aircraft completed by January 1942. Six of the long-awaited Australian-made aircraft were flown to Singapore in December 1941. Expectation was dashed after discovering that the aircraft were not only unarmed but the aircrews were totally untrained for operations. The RAF Air-Vice Marshal C.W.H. Pulford of the Far East Air Force decided to use one aircraft for photo-reconnaissance tasks. On this task the Beaufort encountered Japanese fighters and badly shot-up was written off on landing. Air Chief Marshal Sir H.R. Brooke-Popham who was in charge of all British forces in Malaya and Singapore had the remaining Beauforts sent back to Australia.[97]

The 1940 British and US embargoes and associated delays

To add to her numerous supply problems Australia suffered a shock in May 1940 when Lord Beaverbrook, the British Minister of Aircraft

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[96] *Ibid.*, p.63.

[97] Gillison, *Royal Australian Air Force*, p.199.

Production, ordered an embargo on the export of aircraft and their components, including Taurus engines.[98] As the British export embargo took immediate effect, fortunately Australian aircraft production programs had already been initiated as 73 aircraft of various types were 'on water' bound to Australia from Britain and the US.[99]

As delays prevented the RAAF receiving Beaufort aircraft prior to the embargo, the delivery of the first batch of Hudson bombers from the US Lockheed Aircraft Corporation during 1940 finally filled the gap.[100] The embargo immediately focused attention on the viability of using Pratt & Whitney engines, threatening further delays to the Beaufort project.[101] With German raids causing widespread damage, Britain faced various severe infrastructure and resource problems and found it hard to meet its own desperate needs. Advice was cabled to Australia on 7 October 1940 that Britain could only deliver 100 Taurus engines of a previously agreed 250.[102] Another aircraft, the CA-4 twin engine Wackett dive bomber, failed due to the RAAF lack of control over aeronautical engineer and designer, Wing Commander Laurence Wackett's passion for his new and novel design, most of which could not be technically achieved and added 'little to the features of the aircraft which the RAAF required most'.[103]

In these worrying and uncertain circumstances important gains were nevertheless made when Prime Minister Menzies turned to the United States for defence equipment. It was hoped that American aircraft engines would be available in sufficient quantities to allow Australian

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[98] NAA: A3095, 32/1/3, DOM & DOSAD, Confidential dossiers. Outline of progress of the production of Beaufort aircraft in Australia as at 7 October 1940, p.64.

[99] John Storey, Director of Beaufort Division, Department of Aircraft Production: 'An address on the organisation behind torpedo bomber manufacture in Australia' *delivered to the members of the Institute Management, Australia*, (Kelvin Hall, Melbourne, 4 May 1943, published by the RAAF), pp.1-2.

[100] NAA: A2671, 3/1939. Cabinet Agendum No. 3/1939, Supply of Aircraft.

[101] NAA: A3095, 32/1/3, DOM & DOSAD, Confidential dossiers, p.64.

[102] *Ibid*.

[103] Ross, *Armed and Ready*, p.307.

factories to start the Beaufort production. In this regard, F. J. Shea, a Commissioner of Aircraft Production Commission (APC) who was then in a supply liaison role in the UK, was sent to the US to develop American supply channels for strategic materials. Australia also sent an expert on engineering specifications and government purchasing procedures to consult with the US with a view to coordinating British and US standards to expedite the purchasing process.[104]

At this stage of the negotiation there was no certainty that the US would agree to supply Australia directly. A major breakthrough was achieved when the US agreed to supply sixty Pratt & Whitney R-1830 engines. After extensive negotiation, the British Purchasing Mission that oversaw the acquisition of war equipment produced in America gave permission for 100 Pratt & Whitney engines and 100 hydromatic airscrews to be drawn of stocks taken over from uncompleted French contracts in the United States.[105] This did not immediately solve the wider supply problem. By February 1940, the US government advised Australia that it would not authorise export all of the spare engines included in the purchase of the Hudson aircraft, cutting the quantity of engines to 15 percent of the number of complete aircraft. This decision was based on the need to maintain critical supplies for its own forces.[106]

Problems with documents relating to a shipment of spares for Hudson aircraft in December 1940 caused considerable confusion. Details of parts shipped on the *Hauraki* and *Parrakoola* did not match Air Board records. Again the Board had not been informed of consignment details. Investigation showed that the Lockheed Corporation had also not complied with the Australian government Trade Commissioner's request

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[104] NAA: A3095, 32/1/3, DOM & DOSAD, Confidential dossiers. Outline of progress of the production of Beaufort aircraft in Australia as at 7 October 1940, p.65.

[105] *Ibid*., p.64.

[106] NAA: A705, 9/19/103, Overseas Indent 731, Spare parts, Overhaul tools, instruments, etc., for Lockheed B-14, Hudson aircraft. Shipment of spares, letter from British Purchasing Commission, Australian Division, signed by P.J. Winspur, 7 February 1941 to the Secretary of the Air Board, Melbourne.

to send all invoices and shipping documents directly to the Secretary of the Air Board in Melbourne. In view of the consistent lack of communication which existed during the war years, no one was to blame or accepted to be blamed.[107]

These facts certainly demonstrate some of the many deficiencies in acquisition procedures, which were complex, bureaucratic in the level of detail and subject to uncontrollable time-overruns. In this case regardless wartime strategic circumstances the US Company should have taken more care, at least in following the most important instructions regarding shipping documentation.

The politics involved in local aircraft production

A number of urgent War Cabinet discussions were held from January to December 1941 with CAC and APC executives on accelerated aircraft production. Cabinet proposed drastic measures related to reducing the time and physical effort required to perform tasks and to fully use the capacity of every available machine. Government factories were required to work non-stop and workers' holidays would be cancelled. All essential factories and supplies of materials were to be placed under government control to increase operational efficiency and production. The Cabinet's objectives were to eliminate bottlenecks and wastage of effort, and private interests were to be over-ruled if they were detrimental to expanding output.[108] Australia was also handicapped by a lack of experienced technicians, engineers and scientists in key areas of aero-engineering. Manufacture of aircraft also called for highly trained tradesmen and semi-skilled workers of a higher calibre than those employed in other sectors of industry. Much attention was given to the training of process workers and other operators in the machining of light

[107] *Ibid*.

[108] NAA: A5954, 102/2. Defence policy, Australia's war effort. Press cuttings only, 1939-42. Clipping from *The Age*, 15 and 19 December 1941.

alloys. Some 10,000 employees had no previous factory experience.[109] Workforce training became an essential element of the production: some 80 specially selected technicians, from NSW, Victoria and SA, were sent to the Bristol Aeroplane Company in Britain to undertake three months instruction in manufacturing techniques.[110]

During 1940, following consultation with state authorities, Technical Colleges, selected schools and teachers, the Government moved to increase the numbers of tool-makers and skilled metal workers by offering more places in relevant technical training. The scheme turned out significant numbers qualified to a base level of skill. They still, however, required months or years of on-the-job training to master the tasks involved in the production of modern aircraft and munitions.[111]

One critical area coming to the fore in enabling mass production processes was in the design construction, use and management of jigs, patterns and gauges used in conjunction with machine tools, and checking the dimensional accuracy of all manner of parts feeding into the assembly line. Unskilled workers still had a significant role in the manufacture and assembly process, once they had been given sufficient training to perform any particular controlled task, be it fabrication, checking or assembly. Keeping the whole process operating efficiently required a large team of professional engineers and trade-based craftsmen.[112] *The Sydney Morning Herald* of 18 February 1942 and 5 March placed advertisements for fitters for employment on engines and airframes.[113] Aircraft production could not progress unless 1,000 trained

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[109] NAA: A3095, 32/1/3, DOM & DOSAD. Confidential dossiers, Outline of progress of the Beaufort aircraft in Australia, 7 October 1940, pp.63, 103.

[110] NAA: A5954, 215/2, Delays in manufacture of Beaufort aircraft. Robert Menzies' speech, Canberra, 5 August 1940.

[111] AWM123, 562, DOM & DOSAD, Confidential dossiers. Outline of progress of the production of Beaufort aircraft in Australia. Proper utilisation of available skilled labour, pp.99-101, 11 November 1940.

[112] *Ibid*.

[113] NAA: A5954, 401/10, Industry in war. General. Press Cuttings. Clipping from *The Sydney Morning Herald*, 18 February and 5 March 1942

personnel aged from 21 to 40 were found to work, or be trained while on an allowance equal to the Federal Arbitration Court's basic wage.[114]

The Beaufort project gave many women work opportunities as machine operators, assemblers, riveters, welders, wood and fabric workers, technical writers, examiners, secretaries, stenographers, clerks, accounting machine and duplicator operators, tracers, drafts women, technical artists, and purchasing officers.[115]

Industrial disputes at CAC

The increasing climate of distrust between management and labour was becoming an impediment that was particularly undesirable when the country was at war. A review of CAC management practices and the influence of trade unions and industrial disputes in 1942 shows that industrial harmony was not always present within Australia's industry. It is clear that for many workers the question of motivation and values needed to be overcome. On 11 and 12 January the media devoted a great deal of space to an industrial dispute at CAC which culminated with the dismissal of two of CAC's non-British aero-engineers.[116] Making frontpage news were CAC's Chief Engineer at Lidcombe Aircraft Engine factory, E.H. Fenn, the managing director of CAC Lidcombe factory, J.N. Kirby Engineering Superintendent; and two Dutch nationals, P.W. Schipper, Superintendent of Engine Assembly and Testing and engineer P. Schelling. The *Sydney Daily Telegraph* of 12 January ran the headline 'Aircraft Hold-up,' reporting that two leading American aero-engineers brought to Australia by CAC were to return home because they had

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[114] NAA: A5954, 221/7, Lidcombe aircraft engine factory, Investigation by Queensland Country Member for Darling Downs, Hon. A.W. Fadden, 19 January 1942.

[115] NAA: A5954, 166/8, Aircraft Production. Press cuttings. Clipping from *The Sydney Morning Herald*, 25 January 1944.

[116] NAA: A2671, War Cabinet Agendum No. 53/1942 and Supplement 1, Lidcombe aircraft engine factory - Enquiries into complaints regarding CAC management, January 1942.

submitted adverse reports to government detailing poor management practices at CAC.[117] Some of their comments were on inefficiency and lack of proper direction in CAC's management. The *Age* wrote that the Dutch engineer, P. Schelling, considered 'the greatest aero-engine authority ever to come to Australia' was 'at present on indefinite leave'. Brought to the notice of the War Cabinet, the matter was dealt with at the highest level with Curtin, ministers and high-level CAC executives indicating the seriousness of the affair.[118]

The inevitable outcome was a messy political fix by government. Of the many instances of industrial unrest of wartime period this particular CAC dispute stood out as potentially the most disturbing and damaging, at a time in which the RAAF urgently required up-to-date aircraft.[119] In January 1942 the RAAF was so rundown that when it was needed to defend Australia, New Guinea and New Britain, it 'could muster only forty three operational aircraft' for the vital task.[120] For some observers the CAC situation was explained as simply symptomatic of the difficulties expected in the early stages of establishing a complex manufacturing operation where scheduling and control of work-flow could be upset by delays at any point in the system. In his report, Arthur Fadden placed emphasis on CAC's excellent productivity record. By 1941, management boasted of having attained an impressive level of production, with staff increased from 700 to 1,400 and output from 9,500 parts in July to 77,000 in December.[121] However, assessing the depth of the industrial unrest and determining exactly why management was accused of

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[117] NAA: A5954, 401/10. Industry in war; General; Press Cuttings. Clipping from *The Daily Telegraph*, 12 January 1942.

[118] NAA: A5954, 221/7, War Cabinet Agendum No. 53/1942. Lidcombe aircraft engine factory. Investigation by Hon. A.W. Fadden, January 1942.

[119] *Ibid*.

[120] McCarthy*, The defence of Australia and the Empire Air Training Scheme,* p.333.

[121] NAA: A5954, 221/7. Summary of points by A.W. Fadden's report, p.1 regarding Lidcombe Aircraft engine factory to PM Curtin, 24 January 1942, p.1.

incompetence was more difficult.[122]

Production at CAC was greatly affected by a lack of tool room capacity and shortage of essential equipment. A particular issue was CAC's decision for toolmakers working shift-work to register their twelve-hour shift, clocking on and off by means of a Bundy clock. With two twelve-hour shifts operating, employment in this critical area was still limited by equipment and space to 200 to 250 men. The factory had begun operations much later than planned because factory equipment, machine tools and raw materials had not been delivered until mid-1941.[123] Owing to the comparatively long period required for the deliveries of raw materials, which often took some six months to arrive from the time orders were placed, CAC suggested to immediately lodge orders for aircraft and engines for future requirements.[124]

As the workload increased the tool room could not operate efficiently for both maintenance and for tool-making. To be better equipped to handle the work was of course a long-term objective of CAC, but the immediate problem was the backlog of three-hundred jobs which had accumulated over the past six weeks and which could not be progressed due to a shortage of gauges. To increase productivity and remove the bottleneck, management approved the purchase of a specialised machine tool, which in agreement with the Department of Supply, was to be installed in one of the department's sections. Another corrective action was to use BHP, railway workshops, Rylands and other firms for special jig works.[125] CAC also ordered the construction of a new tool room to make, house and maintain thousands of tools and to employ

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[122] NAA: A2684, Advisory War Council Agendum 10/1942; NAA: A5954, 221/7, War Cabinet Agendum No. 53/1942 and Supplement 1, Lidcombe aircraft engine factory. Enquiries into complaints regarding CAC management.

[123] NAA: A5954, 221/7, War Cabinet Agendum no. 53/1942. Lidcombe aircraft engine factory. Investigation by Hon. A.W. Fadden, 19 January 1942.

[124] NAA: A5954, 217/2. Manufacture of Wirraways by CAC. War Cabinet Agendum No. 53/1939. The Secretary of the Department of Air, M.C. Langslow, to the Minister for Air, H.E. Holt, 22 December 1939.

[125] *Ibid*.

contractors to do the work. This action caused intense frustration among trained staff that could not exercise their skills gainfully and suspected the corporation was planning to sideline them. An event further increasing tension occurred when an extremely expensive engine pipe bending machine, which had been imported to Australia after serious delays in shipment, was loaned to a contractor, W.C. Stevens & Sons.[126] The machine reportedly sat idle in the tube bending and oxy-welding section of the contractor for days, until CAC removed the machine from the contractor's premises. Curiously, the machine was not reassembled and used but was stored by CAC for many months. It is difficult to explain the rationale behind CAC management‘s actions other than to offer the view that the trouble was either due to a lack of technical know-how or mismanagement through incompetence or both.[127]

To Kirby, unrest among factory employees was due to the factory being relatively new. Management had in a very short period recruited up to one thousand men which had to adjust to their new working conditions. Seventy percent were unskilled labour, recruited from taxi drivers, poultry farmers and many other occupations. This mixed background coupled with a shortage of trained machinists exacerbated by a climate of distrust affected the quality of work, evidenced by a rejection rate of approximately thirty percent faulty parts produced.[128] A report on the incident stated that allowing this circumstance to develop led to the oxy-welding and tube bending section of CAC, which could have used this machine, being abolished. Instead, a great number of engineering jobs, which could easily have been done at the factory, were sent out to contractors.[129]

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[126] NAA: A5459, 221/7, War Cabinet Agendum No. 53/1942 and Supplement 1, Lidcombe aircraft engine factory - Enquiries into complaints regarding CAC management, 1941-1942; Investigation by Hon. A.W. Fadden, 19 January 1942, p.9.

[127] *Ibid*.

[128] *Ibid,* Kirby’s letter to CAC executives Melbourne, 12 November 1941.

[129] *Ibid.* Investigation by Hon. A.W. Fadden, 19 January 1942, p.9.

Further compounding frustration among workers was CAC management's attitude that wear and tear on gauges was abnormally high. Gauges had been worn .001" to .002" on one shift apparently caused by untrained or carelessness operators. Matters came to a head when some 140 men, mostly trained machinists, were seen walking about the floor 'with pencils and paper checking the errors of trainees and acting as chasers'.[130] When a foreman complained about this waste of trained men's time, he was reprimanded. Asked to provide an explanation, Kirby stated 'there's been a great deal of white-anting going on. I am not prepared to comment on the strike or the men's grievances. Both are too ridiculous'.[131] Kirby's level of management ability is evident by his comments. Asked whether it was true that employees paid £7 and more per week were 'idle for hours-on-end,' Kirby replied, 'I agree that many are idle – idle because they won't work, idle because they choose to be so'. Asked whether there was sufficient work for them, his answer was, 'what do you think? Of course there's work there and no reason why they should be idle.' When told that the men had complained that he had disappeared and could not be contacted over the weekend, Kirby said, 'I am not bound to tell them what I'm doing or where I'm going'.[132]

Several factors seriously holding up operations for a considerable time was the late arrival from the United States of machines and furnaces. Of 440 major items on orders, only 110 had arrived from March to December 1941.[133] However, this full-frontal attack against CAC saw government appoint key figures to investigate the political leanings of the two Dutch-Americans employed by CAC. For example, Robert Menzies and Percy Spender referred to the possibility of fifth column activities at the Lidcombe Aircraft Engine plant. Apparently the previous government

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[130] NAA: A2684, Advisory War Council Agendum 10/1942, report to PM Curtin on the allegations concerning the CAC engine factory at Lidcombe, NSW by A.W. Fadden, 19 January 1942, p.5.

[131] *Ibid*.

[132] *Ibid*.

[133] *Ibid.*, p.3.

(in June 1940) doubted P.W. Schipper's reliability believing he supported Nazi Germany. This suspicion arose because as a Dutch national, Schipper spent 1933-34 training in Germany. Reports were also held by military intelligence on P. Schelling. This led Spender to claim that Schipper should not be permitted to return to America if the case against him justified internment.[134] At the direction of the Minister for the Army, the matter was referred to the Director of Security Services in Canberra. The result of the investigation revealed that both American citizens were clear of suspicion by Australia's security services, Canberra.[135] Then when a foreman, Gordon Sparkes, spoke in support of Schelling, Kirby conveniently brushed off the statement by saying that Schelling and Sparkes 'were attempting to work up some sort of antagonism to the management'.[136] Being accused of managerial incompetence, Kirby retaliated by looking for the slightest infraction in work practices, preferring to accept hearsay instead of separating fact from fiction. Kirby, when told that Schelling was having some personal difficulty with a foreman (Moore) and also with the factory superintendent (McFarlane) reported the matter to Arthur Fadden, who included this hearsay evidence in his report to the War Cabinet on 19 January 1942.[137]

This led the Minister for Aircraft Production, Senator D. Cameron to write a strongly worded letter to John Curtin on 20 January 1942 in support of E. H. Fenn and P.W. Schipper stating that Schipper was seen walking about in Sydney on 'leave' when we are supposed to be gathering about us into one organisation the best brains available'.

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[134] NAA: A5954, 221/7, Lidcombe aero-engine factory. Investigation by Hon. A.W. Fadden, January 1942. Advisory War Council Minute 678 of 12 January 1942, referring to the pro-German sympathies of P.W. Schipper, Engineering Superintendent at the factory. Letter, F.G. Shedden, Secretary of the Department of Defence, to F.M. Forde, Minister for the Army, 13 January 1942.

[135] NAA: A5954, 221/7, War Cabinet Agendum No. 53/1942 and Supplement 1, Lidcombe aircraft engines factory. Investigation by Hon. A.W. Fadden, 19 January 1942.

[136] *Ibid*.

[137] *Ibid.*

However, as many facts of the case appeared to be based on a clash of personality and hearsay rather than on actual events, it became a tricky matter of separating the truth from fiction. It was no secret to management that Wackett and Schipper did not get along. Schipper, a Pratt & Whitney engineer was brought to Australia on secondment by Wackett. The main cause of discord that grew since Schipper's arrival at CAC centered on Schipper's belief that his position as Engineering Superintendent should give him final say on engineering matters concerning the R-1830 engine production.[138]

Schipper's view did not rest easily with Wackett's somewhat overbearing temperament. According to Wilson's portrayal of Wackett, he was known 'as something of a dictatorial tyrant by many, firm and unshakable in his views and absolutely certain of the validity of those views'.[139] Yet, it was precisely Schipper's knowledge of Pratt & Whitney's engineering practices in general, and including the R-1830 engines in particular, that attracted Wackett to hire him. It seems that the only fault Schipper committed was to bring his engineering skills to Australia where there may have been differences in engineering practices, particularly in areas where American technology was more advanced than the British. There was nothing unorthodox or unacceptable about that. Schipper's report titled 'Synopsis of the Cylinder Barrel situation' of 31 October 1941 is exceptionally concise and explicit.[140] Schipper had warned CAC against using an *ad hoc* method to solve a problem that had developed with cylinder barrels for the R-1830 engine (made from the first batch of chrome-molybdenum (CM) steel alloy provided by BHP). Wackett proposed to nitride case- harden the cylinder barrels, a procedure

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[138] NAA: A5954, 221/7, War Cabinet Agendum No. 53/1942 and Supplement 1, Lidcombe aircraft engine factory - Enquiries into complaints regarding management, Senator D. Cameron's letter to Prime Minister Curtin, 20 January 1942, pp.1-7.

[139] Wilson, *Wirraway, Boomerang & CA-15 in Australian Service*, p.13.

[140] NAA: A5954, 221/7, War Cabinet Agendum No 53/1942, and Supplement 1, Lidcombe aircraft engine factory - Enquiries into complaints regarding management, A.W. Fadden's report, pp.1-7.

Schipper was not at all in favour of because it introduced a new variable into the cylinder problem without addressing the underlying cause. Schipper's report discussed the performance of the CAC cylinder barrels at a time when there was evidence to suggest that the cause of the problem was a faulty batch of CM steel. Also why would Pratt & Whitney want inferior CAC made cylinder barrels entering production?

Schipper's appreciation of Pratt & Whitney engineering change and quality control processes would automatically bring him into conflict with Wackett's brash approach. In granting CAC a license to manufacture the R-1830 engine, the American firm expected the licensee to meet Pratt & Whitney specifications, standards and procedures and to work with them to handle any technical anomalies that arose, which was exactly what Schipper proposed. Fadden reported that 'Wackett relied upon resource, ingenuity and improvisation. In his view the orthodox procedures of the US or GB (was) often unsuitable in Australia'.[141] Schipper viewed Wackett's determination to use nitride hardening with great caution. Schipper preferred to use sound engineering practices he learned in the US to ensure the locally-built engines were identical in manufacturing and performance rather than to experiment with the unknown. Schipper would have known that if he accepted Wackett's approach he would risk introducing new metallurgical problems that could lead to a disastrous waste of time and money. Ultimately the cylinder barrel difficulties disappeared without resorting to nitriding, but Wackett persisted in the view that it should be tried.[142] He refused to allow the matter to be referred to Pratt & Whitney for advice. Schipper's position on the purely technical aspects of this incident was totally correct. However, Schipper's numerous attempts to be heard by CAC management fell on deaf ears

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[141] NAA: A5954, 221/7, Lidcombe aircraft engine factory. Investigation by Hon. A.W. Fadden, January 1942. Advisory War Council Agendum 10/1942; War Cabinet Agendum No. 53/1942. Confidential report upon the further employment of Schipper, Fenn, and Schelling in aircraft production in Australia, 3 March 1942.

[142] NAA: A2700, 277, CAC, Synopsis of the cylinder barrel situation as at 31 October 1941 by P.W. Schipper, Engineering Superintendent at Lidcombe aircraft engine factory.

and only diminished his status as a professional. Schipper claimed his intentions were for the good and future of the aircraft industry and as a result of the dispute Australia's future in aeronautical engineering was at risk. However, Curtin did not propose to take any further action in the matter. As for P.W. Schelling, he had 'repeatedly asked during the last three years to either engage additional experienced American engineers or to train competent Australian engineers'.[143] Schelling's main concern was that his advice was not taken seriously and as a result the departure of the two American engineers would leave a void in the system, without qualified men to take over the engineering side of operations. Voicing his concern, he said: 'I want to state here that too much emphasis is being placed in certain quarters on Australians versus Americans in this respect; since the engine industry is new to Australia the real issue is inexperienced men versus experienced men'.[144]

Schipper had identified a number of problems that he believed showed the Board of Directors had failed in their responsibilities. In April 1940, he sent a report to the Board predicting that delay in the production flow would surely happen unless the quantity of materials purchased from America were increased to cover one year's output (400 engines) rather than just three months' output. The Board did not give due attention to the engineer's recommendation. His suggestion to at least 'extend material purchases beyond 250 engines' was finally approved, but the purchase was, according to Schelling, then made too late. At this juncture, it may be that the Board resented being told what to do by a foreign professional. However, on 22 August 1941, 17 months after Schelling's report, the Board finally approved increasing material on hand to cover 450 engines. Cameron having been acquainted with Schelling's report, pointed out individuals in high level positions prepared to speak their minds about problems affecting a government-backed

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[143] NAA: A2671, War Cabinet Agendum No. 53/1942 and Supplement 1, Lidcombe aircraft engine factory - Enquiries into complaints regarding management, Statement by P.W. Schipper to CAC, 16 January 1942.

[144] *Ibid*.

aircraft company such as CAC was unusual and risked retribution if they did. Being in a position of power, CAC was accused of dictating government policy, which was an idea given to Cameron in Sydney 'from unexpected, unsolicited sources'.[145]

On 10 January, an investigation conducted in the presence of top level executives such as A.S. Drakeford, the Minister for Air and the Deputy Chairman of the Aircraft Advisory Committee, D. McVey, came to nothing. No doubt public servants and ministers were anxious to moderate criticism of their policies or administration in the public arena. On 31 March, War Cabinet gave support to Sir O. Dixon's finding P.W. Schipper guilty of insubordination. Both Schipper and Schelling were found to be partly responsible for factory industrial disputes. E. H. Fenn, due to his favourable disposition and proven competence as an aircraft engineer, was asked to continue as Chief Engineer. On 21 April 1942, Curtin, in a letter to Fadden, wrote that Schipper's resignation be 'allowed to take effect and no attempt should be made to use his services in that factory or to require CAC to employ him.[146]

Schelling's services were to be excluded from aircraft production in Australia. The inquiry concluded that they were not indispensable and the value of their services was not high enough to justify continued employment. We cannot discount the prejudice of Australia's Anglo-centric culture. This situation may not have developed had the officer in charge, Wing Commander Wackett, shown a more moderate and accommodating approach and had government not been so one-sided and uncritical in their faith in Wackett. In Schelling's case it was observed that difficulties in the Assembly Section between Schelling and the men arose from time to time. Consequently, it was concluded that these were due to 'Schelling being a foreigner and failing in his handling of

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[145] NAA: A2671, War Cabinet Agendum No. 53/1942 and Supplement 1, Lidcombe aircraft engine factory - Enquiries into complaints regarding CAC management, January 1942.

[146] NAA: A5954, 221/7, Lidcombe aircraft engine factory, PM Curtin's letter addressed to A.W. Fadden, 21 April 1942.

Australians'.[147]

The much publicised mismanagement of CAC and the hostile treatment of their foreign employees were seen as a reflection of inflexibility and rigidity in CAC's management style, which conceivably tarnished the public reputation of CAC. Industrial and military historians seem to have downplayed the drama that occurred at the Lidcombe aircraft engine factory, but it certainly gained the attention of the media. It is clear that both Australians and British held prejudicial views against foreign (non-British) professionals. Evidence of this attitude is clearly documented in CAC's Articles of Association which under the heading: 'British control' specified that 'it is regarded as a cardinal principle of the company that it would remain under British control. Accordingly no aliens shall be qualified to hold office as a director'.[148]

Conclusion

In summary the acquisition of aircraft inevitably involves long lead-times, hence urgent last-minute attempts to ramp up aircraft acquisition or production were not a workable solution that could overcome the lack of timely preparation. This chapter showed that tangible advances were further complicated by political and managerial involvement, subjected to a complex maze of regulations and administrative details, risk of errors and omissions that often resulted in a great waste of time. Dealing effectively with aircraft acquisition and/or manufacture demanded a level of sophistication well beyond the simple logistics of moving people, equipment and supplies to designated points, at the right time and in the right quantities. Australia, always intent on pleasing Britain and the British aircraft industry, had little input into the selection of aircraft for the RAAF. Australia continued acceptance of the uniformity of equipment policy was detrimental to their changing strategic situation. The Air Board

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[147] *Ibid*.

[148] NAA: CP5/5, bundle 8/141, Aircraft manufacture companies Act 1928. Memorandum and Articles of Association of CAC Pty. Ltd, p.41.

waited an inordinate time to acquire a fighter and bomber aircraft for the RAAF. As shown, the British offered unsuitable aircraft, and the Air Ministry could change priorities and dispatch aircraft elsewhere, such as occurred with the Vultee Vengeance dive Bomber which was diverted to India. According to Ross 'the role of air defence was heavily restricted by the adoption of the defence contingency of defence against light raids'.[149] His assessment does contain some interesting points. But Ross is also convinced that 'Robert Menzies' determination to go ahead with the Beaufort project had compelled the RAAF to accept an aircraft it never wanted, and was never capable of fulfiling the major requirements outlined for it by the RAAF'.[150]

As indicated in the previous chapters, the Air Board had tried its utmost to expand the RAAF aircraft fleet. Considering the paucity of suitable aircraft available from Britain, any aircraft from anywhere able to perform the general reconnaissance and light twin bomber roles that Australia could acquire quickly could have been of great value to the RAAF.[151] When in 1936 Air Chief Marshal Edward Ellington inspected the Wirraway at the CAC factory at Fishermen's Bend, Melbourne, his lack of faith in the aircraft is evident in his written comment considering it 'as a temporary expedient' which could 'only be regarded as an advanced training aircraft'.[152] This being the case, CAC was stuck with manufacturing the wrong aircraft for the RAAF. Ellington's feeling was that the Wirraway was the best aircraft available for the work required of a single engined two-seater squadrons, but did consider that when 'an aircraft of better performance becomes available it will be time for review'.[153]

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[149] Ross*, Armed and Ready,* p.308.

[150] *Ibid.,* p.307.

[151] Weston*,* 'The Australian Aviation Industry: History and Achievements guiding defence and Aviation Industry Policy'*,* p.54.

[152] Gillison, *Royal Australian Air Force*, p.49.

[153] NAA: A816, 37/301/360; Ellington report and most confidential note in relation thereto; Sir Edward L. Ellington, Inspector-General and Marshal of the RAF to

As shown, the Australian government had many troubles bringing the Blenheim-Bolingbroke-Beaufort succession to its conclusion. The Beaufort project was more difficult and intricate than any previously attempted in Australia requiring intensive, multi-layer planning and project management effort to schedule and coordinate the multitude of supply, fabrication and assembly operations. A legally binding contract had been made between the Bristol Aircraft Company and the Australian government in 1939, but it took until mid-1941 to bear fruit. Having made the decision to build the Beaufort, Australia had to wear the time penalty involved in setting up the airframe and engine factory. The degree of difficulty experienced in transferring a Beaufort production to Australia was much greater than the Bristol Aircraft Company envisioned. First flown on 5 May 1941, one of the Beaufort's many problems was the elevator trim that caused a number of fatalities, until it was finally resolved months later.[154]

Clearly the decision to send the Beauforts to Singapore was incredibly premature and irresponsible given that the first production aircraft had been handed to the RAAF in October 1941 for only test flying.[155] In questioning the goals and the motives employed in the local manufacture of the Beaufort, the fact was as Storey explained that the making of torpedo bombers was new 'and no one knew how it was to be done'.[156] Furthermore, as Storey stressed:

> it was one thing to choose the ideal aircraft, but quite another to build it in a country lacking experience in aircraft construction and with a limited pool of technicians and skilled labour and no facilities for producing machine tools, small tools, jigs and gauges and the many thousands of aircraft parts essential to a project of such magnitude.

Prime Minister Lyons' government, 16 July 1938.

[154] Weston, 'The Australian Aviation Industry: History and Achievements guiding defence and Aviation Industry Policy', p.54.

[155] Royal Australian Air Force, 'The Beaufort', *RAAF Museum*, http://www.airforce.gov.au/raafmuseum/research/units/100sqn.htm, URL retrieved 28 May 2017.

[156] John Storey, *An address on the organisation behind torpedo bomber manufacture in Australia*, p.1.

> The Government approved the mission's recommendation but imposed a condition that the industry must be established with a minimum of capital expenditure. To achieve this end, and also to make the fullest use of the available technical and manpower resources the aid of the State Railways departments in Victoria, New South Wales and South Australia was invoked and it was agreed that the Railway Workshops in those States should establish Annexes for the assembly of major Beaufort components.[157]

What occurred at the Lidcombe engine factory should have brought CAC to review its management system, but in view of the way foreign professionals were treated by management, it is doubtful that despite their significant experience in production, matters remained unchanged. Certainly the frequency of union disputes and the controversial treatment of CAC top level professionals tarnished the image of Australia which was conditioned by attitudes mutually incompatible for the development of an efficient and viable aircraft industry. Despite numerous technical difficulties, significant delays in establishing the Beaufort production program, and the prejudicial treatment of foreign aircraft experts, the Beaufort project was ultimately a significant success. It was well suited to low-level attacks on Japanese shipping using bombs and torpedoes. Although overshadowed somewhat by the arrival of the Beaufighter, the exploits of the Beaufort bear witness to their useful role as after a period of intensive training in Queensland they were sent on their first operational deployment in Papua and New Guinea in June 1942.

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[157] *Ibid.*, p.2.

Chapter Seven: Aircraft repair facilities and stores depots

As argued in the preceding chapters, Andrew Ross believed that Australia was in a position to defend itself had Japan decided to invade Australia. The 1942 raids on Darwin showed that defenders were unable to counter the Japanese aerial forces due to a general lack of weapons. As discussed, at the time the RAAF operated an assortment of aircraft unsuitable for combat operations and hence less than ready to counter the Japanese air power. When the USAAF arrived in Australia during January and February 1942, it became quite obvious that they would require overhaul facilities for the maintenance of their aircraft and that the two existing southern depots in Victoria would not be able to cope with their demands as well as those of the RAAF. While the RAAF did not have enough weapons to defend the homeland, the Government provided support to USAAF by directing the establishment of aircraft repair depots in different parts of Australia to provide a maintenance service to both the RAAF and the USAAF. This chapter demonstrates that a severe lack of spare parts at aircraft repair depots profoundly affected the repair of aircraft, leaving many grounded for weeks. During the Pacific campaign of 1941-1945 repair aircraft depots were pushed to crisis point as aircraft servicing further intensified.[1]

This chapter specifically studies the operational support provided by aircraft repair depots, their strategic importance and their constant need to adapt to new technical challenges, and it shows how aircraft were rendered operational through the sheer tenacity and ability of aircraft

[1] NAA: A705, 9/1/548, Overhaul of aircraft and engines during development period and when fully developed. Policy, 1940-1941. Memorandum from the Chairman of APC to the Director General of DOM, 2 August 1940, p.1.

technicians. This is a subject that has largely been ignored by military historians, although Gillison did make note of the existence of the staging bases at Drysdale and Port Hedland in Western Australia and at Millingimbi, east of Darwin. He noted the creation of No. 1 Flying Training School at Point Cook, pointing out that aircraft needing servicing every 240 hours flying had to go to Richmond in New South Wales,[2] but did not detail the functions and performance of the various maintenance bases and possible dysfunctional aspects within their internal structures. Approaching the subject from this angle reveals the importance of the link between the increasing complexity of newer aircraft systems and the higher level of skill required to maintain them.

Prior to the first attack on Darwin in February 1942, aircraft servicing operations were small, commensurate with the number of aircraft and size of the depot. From 1925 there were two aircraft repair depots, No. 1 AD based at Laverton, Victoria, and No. 2 AD at Richmond, New South Wales.[3] This chapter argues that the performance of these two depots with respect to parts holding, inventory control, shortages and timely replenishment functions was performing below the level desired. The arrival of the American air forces necessitated the expansion of maintenance facilities across northern Australia and many more specialised facilities scattered the country which occurred after the first raids on Darwin in February 1942, beginning in March.[4] The fact that aircraft repair depots relied extensively on overseas suppliers for many items, ranging from major components to the smallest spare parts, created many supply problems which multiplied in response to EATS and increased hours flown by trainer aircraft. Larger centralised air force maintenance arrangements may have delivered some improvements in both manpower efficiencies and skills development but could only be

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[2] Gillison, *Royal Australian Air Force*, pp.27,125.

[3] NAA: A9186, 5, RAAF Unit History sheets (Form A50), Operations Record Book, No. 2 Squadron, May 1937 - May 1946. As reported in Commanding Officer's log books.

[4] See Appendix 8.

pursued with the greatest difficulty. This is because the availability of manpower was a major and near universal problem fundamentally linked to Australia's low population base. As a result, organisational efficiency drives and programs to upgrade manpower skill could only have marginal impacts in the short term.

It would be unrealistic to compile a list of all the references made by the commanding officers of aircraft repair depots which commented that during wartime their main complaint centered on the unavailability of spare parts.[5] This was a problem that drove many depots to a standstill and also had a prejudicial effect on technical staff's morale. Personnel were often inadequate to carry out major repair and maintenance work on aircraft, and half completed jobs took valuable space in hangar. Also depot personnel, who had gained experience on the uncomplicated technology of early aircraft, were limited in the range of work they were able to do. New aircraft which came up from the assembly lines such as the Bristol Beaufort torpedo bomber and the Lockheed Hudson medium bomber obtained from America were far more complicated to maintain.[6] Australia's ability to respond to future threats depended on the effective performance of skilled personnel able to understand the complexity of the electrical wiring, to maintain the complex structure engineering airframes and engines. This situation was remedied through the technical training scheme introduced by Australia during 1940 which enabled the employment of skilled tool-makers and metal tradesmen for the RAAF.[7]

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[5] NAA: A705, 9/1/1154, pt. 2, Status of aircraft in operational squadrons and aircraft repair position in ARDs, as reported in the Commanding Officer's log book of December 1947.

[6] NAA: A11233, 7/1/1b, No. 4 (Maintenance) Group; NAA: A1196, 1/501/451, unserviceability of training aircraft and effect on training, 30 April 1942; NAA: A705, 69/1/788, Aircraft Maintenance, Maintenance of Engines – Policy. No.13 ARD, Engines Repair Section, Breddan, Qld, CO's reports on shortage of spare parts, 3 November 1943 to 26 January 1944; NAA: A9186, 299, RAAF Unit History sheets (Form A50), Operations Record Book. Aircraft Repair Depots May 1944 - May 1946.

[7] NAA: A2671, 24/1939, War Cabinet Agendum No. 24/1939, shortage of skilled

Creation of new aircraft repair depots

In 1940, when Sir Charles Burnett was appointed Chief of Air Staff he decided to establish a policy which as specified in paragraph 3 of Supply Administration Instruction No. 3 all aircraft used in EATS would be sent out to civilian contractors for repair. This policy was not only devised to prevent excessive growth of air force depots, but also because the extensive work involved in repairing a crashed aircraft required spacious hangar and workshop facilities which the RAAF did not have. Burnett believed it unsound to develop RAAF repair depots to handle all such work.[8] At a meeting convened with the Department of Air, representatives of the RAAF and the Aircraft Production Commission (APC), members agreed to forecast the number of airframe and engine overhauls expected to be done, allowing APC to assess its requirements related to additional buildings, extensions and equipment. RAAF Area Headquarters were then instructed to provide Zone service Managers of each State a copy of anticipated overhauls to be allocated to APC contractors, and dispatch such information to the Servicing Department of APC HQ, Melbourne and to RAAFHQ.[9]

Following Japan's air raids in early 1942 and owing to an expanding inventory of aircraft types and to the existing limitations in repair capacity, the Air Board took the option to look into extending its servicing operations in other areas by implementing a greater spread of Aircraft Repair Depots (ARDS) in the north in support of RAAF and United States forces flying operations. This led the rapid build-up of RAAF technical services to cope with the engineering work required to maintain aircraft operational. Supporting engineering units, store depots were also

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artisans for defence needs (unsigned).

[8] NAA: A705, 9/1/548, Overhaul of aircraft and engines during development period and when fully developed; Policy, 1940 -1941.

[9] *Ibid.* Memorandum from the Chairman of APC to the Director General of DOM, 2 August 1940, p.1.

established for the holding and distribution of spares, tools and technical equipment. All maintenance units were required to submit reports on the type of service done on aircraft to enable for Air Force Headquarters and area Headquarters to have up-to-date statement regarding spare engines in forward areas to meet operational requirements.[10] From 1942 to 1944, RAAF Headquarters promulgated a RAAF Aircraft General Instructions (AGI-A7) which indicated the types of servicing Aircraft Depots were authorised to perform. Maintenance work carried out on aircraft was performed in a regulated environment that called on the expertise of specialists in the many aircraft sub-systems such as fitters armourers, engines, structures, weapons systems, instruments, riggers, flight mechanics, fitting, turning and machining, oxy-welding and the whole metal machining and assembly (turning, boring, drilling, milling, broaching, etc., using machine tools such as lathes, milling machines, and drill presses).[11] In general terms, major tasks like aircraft engine overhauls involved removal and disassembly, the detailed examination of all components, the replacement or refurbishment of worn or time expired parts, engine re-assembly and testing.[12]

In preparing these instructions RAAF Headquarters expected that repair depots would provide excellent service in the shortest possible timeframe. Maintaining airworthiness as promulgated in the AGI-A7 at an acceptable level across the aircraft fleet did require constant vigilance and unyielding standards.[13] Depot personnel played a crucial role in keeping aircraft operational, showing notable dedication to ensure aircraft performed at their best. Commanding officers ensured that if

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[10] NAA: A705, 9/1/1154, pt 2. Status of aircraft in operational and aircraft repair position in aircraft depots. RAAF Headquarters' statement to all personnel, 1942.

[11] NAA: A705, 9/1/1424, Directorate of Repair and Maintenance - Policy. RAAF Aircraft General Instructions (AGI-A7), 1944.

[12] NAA: A705, 9/1/843, RAAF Headquarters' instructions for the complete overhaul requirements of an aeroplane, 1941-53.

[13] NAA: A705, 150/4/1437, Publication of Technical Order, Aircraft, General Instructions, No. A7, Policy for overhaul, repair and maintenance of airframes, engines and technical equipments. Issue No. 2, 4 December 1942.

quality was allowed to slip the effort required to recover the situation would be virtually impossible. However, as Air Commodore C. R. Taylor pointed out, the requirement for training so many men for such a range of specialised work demonstrates how far Australia's military aircraft industry had developed.[14]

Maintenance organisation - Operational squadrons

Discussion on whether the advantages of placing bases conveniently proximal to services and other support facilities was made on 23 February 1942 by the Directorate of Technical Services (DTS), by re-organising aircraft maintenance within squadrons. For servicing purposes a squadron was divided into operational flights and a servicing flight. A repair and salvage unit was introduced to carry out maintenance and provide services beyond the scope of an operational squadron, but also because of geographical considerations, beyond the reach of an aircraft depot.[15] The vulnerability of seaboard air bases and consequent risk to Australian coastal regions led to consideration of moving maintenance facilities to locations safe from attack by carrier-launched aircraft or naval bombardment. On 1 April 1942, Burnett directed that sites should be not less than 200 miles (approx. 322 km) from the coast. Rail and road were to be adequately located for communication between ARD and engine Repair depots.[16]

Repair and Salvage Units (RSU) were positioned 50 miles (80 km) in rear of the servicing flights 'although the dominating factor was the

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[14] C.R. Taylor, 'RAAF Jubilee lecture: 50 Years of Aircraft Engineering in the RAAF', *delivered before the Aeronautical Branch of the Institution of Engineers*, Australia's Victorian Division, 4 March 1971 at Clunies Ross House, Melbourne, Victoria and published by RAAF Headquarters, Melbourne.

[15] NAA: A705, 4/4/301, maintenance organisation for operational units, Director of Technical Service, Group Captain's instructions to RAAF units, 23 February 1942, p.1.

[16] NAA: A705, 231/9/1185, Air Force Headquarters, Chief of Air Staff. C.S. Burnett, Organisation, Establishment, General, Aircraft Repair Depots, April 1942.

adequacy of transport communication'.[17] Squadrons not in a forward area and maintenance unit remained at the same station. RSU could be located at any station even if a squadron was already based, while Aircraft and Engine Repair Depots were located at some distance of 500-1000 miles (800 km-1600km).[18]

The new organisation was designed to increase the mobility of squadrons by removing from them stores and equipment used for aircraft servicing. To bring repair facilities nearer the scene of operations than could be done previously and to have a unit which could provide undivided attention to the needs of operational squadrons.[19] From April 1942, another organisational change was introduced designed to improve the standard of servicing to segregate depots into different categories based on aircraft type, with some specialising in the older wood and fabric types and others on more advanced metal aircraft. This reduced the range of skills and equipment needed at each depot. Streamlining maintenance tasks by having adequate stocks of swap-over spares for all complex sub-assemblies, such as engines, generators and other electrical units, flight instruments and radios, greatly reduced the real-time impact of major failures. Defective items were then repaired by specialised units or contractors and returned to stock.[20]

Function of aircraft repair and servicing depots

Specialised units were created to focus on well defined work areas and named to reflect their occupations. These facilities became known as Air Stores Parks (ASP), Aircraft Repair Depots (ARD), Repair and Servicing

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[17] NAA: A705, 4/4/301, Maintenance organisation for operational unit, Group Captain's instructions to RAAF units, 23 February 1942, p.2.

[18] *Ibid*. Group Captain, Directorate of Technical Services, to Headquarters of North-eastern Area, Townsville, 2 April 1942.

[19] NAA: A705, 4/4/301, Maintenance organisation for operational unit, Director of Technical Service, Group Captain's instructions to RAAF units, 23 February 1942, p.2.

[20] NAA: A1196/6, 1/501/451, EATS Unserviceability of Training aircraft and effect on training. Report of Air Officer Commanding RSU, 30 April 1942.

Units, Engines Repair Depots (ERD) and Airframes Repair Depots (ARD). Structured to improve the mobility of operational flying units, these allowed engineering personnel to focus on first-line maintenance and pilots to concentrate on operations.[21] The duties of flight personnel were re-arming aircraft, refueling, handling and inspect aircraft daily. Nos. 4, 5, 6 and 7 ARD could carry out a variety of technical inspections, repairs, modifications and maintenance and servicing to aircraft in their facility. Technical checking covered overhaul, repair and maintenance on airframes, engines and various other works. Also, No.1 Flying Boat Repair Depot (FBRD) performed maintenance work on flying boats.[22] On 27 June 1942, RAAFHQ renamed No. 2 AD (Richmond) to Aircraft Erection Park (AEP) by allocating airframes for repair and by replacing major components. AEP No. 1 (Laverton, Vic.), No. 2 (Bankstown, NSW), No. 3 (Amberley, Qld), and Pearce RAAF Station, WA, assembled and tested aircraft received from overseas and carried out repair by replacement only. Damaged components removed from aircraft were sent to Inland Repair Depots (IRD) for repair. Aircraft Parks (AP) erected and tested aircraft, but did not carry out repairs. For example, one Beaufighter was sent to No. 2 AEP at Bankstown, NSW for replacement of unserviceable components, which were then issued to 5 AD (Wagga, NSW) for repair.[23]

During 1942 the Air Board approved the dispersal of five maintenance groups to safer geographical locations. Some of the many functions of the Department of Aircraft Production (DAP) included overseeing DOM's activities, control over aircraft manufacture in Australia and the administration of overhaul and repair work on aircraft

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[21] NAA: A705, 9/1/1424, Directorate of Repair and Maintenance, Policy. Technical maintenance establishments by mustering, to RAAF units, 1944.

[22] NAA: A705, 4/4/301, maintenance organisation for operational unit, Directorate of Technical Services, Group Captain's instructions to RAAF units, 23 February 1942.

[23] NAA: A705, 9/1/617, pt 2. Repair, overhaul and maintenance of airframes, engines and technical equipment - Functions of units, general policy. Statement from the commanding officer, Group Captain D.E.L. Wilson, No. 5 (Maintenance) Group to RAAF Units, 3 September 1942.

performed outside RAAF establishments. Their sphere of responsibility extended to the Area and Assembly Workshops and necessitated establishing annexes to produce major parts for aircraft, such as engines, airscrews, forgings, hydraulic components for landing gear and a variety of associated tools. The Aircraft Servicing Department of DAP became responsible for equipment supply and overhaul and repair work on aircraft, engines, instruments performed within DAP or by contractors.[24]

Wartime servicing requirements –aircraft spare parts availability

Prior to the war, the small number of aircraft operated by the RAAF hardly warranted the need to stockpile supplies of aircraft spare parts.[25] On 7 November 1938, Frederick Shedden as the Secretary of DOD, sought the support of the Air Attaché in London to guarantee delivery of a range of maintenance spares, overhaul tools and handling equipment. With Britain fully focused on the war in Europe, and the risks associated with international shipping, considerable delays in delivery occurred. As a result up to fifty percent of trainer aircraft that Britain had sent to Australia for EATS were grounded with various unserviceabilities.[26] This raised the necessity of having appropriate management and technical skills at depots to report on failures or defects in airframes, engines and aircraft accessories and to develop projection of future requirements.[27]

However, forecasting the quantity of aircraft parts required was a difficult statistical challenge. The high rate of wear and unreliability of

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[24] NAA: A705, 9/1/1178, pt. 1, Instruction No. 1/1/1, Repair, overhaul and Maintenance of Airframes, Engines and Technical Equipment, 1937-1941. (See Appendix 5).

[25] NAA: A705, 9/18/1, Overseas Indents 55-1 & 65-8, maintenance spare parts, materials and overhaul equipment, etc., for Beaufort aircraft, Taurus engines called for on overseas indents 550, 591 and 657, 1937-1940.

[26] NAA: A1196, 1/501/451, Unserviceability of training aircraft and effect on training, CO report, 30 April, 1942.

[27] NAA: A7673, RAAF Air Board Orders, Section “N” Temporary Orders & Notices, (Issues Nos. 1-1029). Issue No. 384, 1942.

engines was a particular source of concern with pilots who reported engine problems such as loss of power and rough running. Many cases were due to failed ignition contact breaker springs or spark plug trouble. No. 1 Flying Training School at Point Cook operating Cadet, Moth and Wapiti aircraft to train pilots recorded that engine failure was often caused by the inexperience of trainees continuing flying in poor visibility, leading to aircraft striking trees, power lines and fences.[28]

As flying operations increased aircraft repair depots tried to maintain a high level of productivity, often forced to cope with reduced numbers of personnel. In this case, despite the fact that aircraft repair and engine depots were fixed establishments, under exceptional circumstances personnel were sent by road, rail or air to supplement other depots where work had increased to excessive levels.[29] The CO of No. 11 stores depot at Townsville complained of the difficulty of functioning successfully with reduced numbers. Apparently, this was caused by the frequent turn-over of officers and airmen. No. 8 depot had similar problems, which took many months to redress.[30]

From May 1941 to April 1942, the RAAF Engine Repair Squadrons reported having aircraft parked with engines in various stages of overhaul but unable to complete the work due to lack of parts. This situation caused further problems as the RAAF could not provide additional floor space for general aircraft maintenance as the workload and nature of damage to aircraft was now driven by uncontrolled events,[31] neither could they predict when work in progress would halt

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[28] NAA: A9186, 298, No. 1 Flying Training School (FTS), Point Cook. RAAF Unit History sheets, (Form A50), February 1934 to May 1940 and February 1946 to February 1952. Comment made by the Group Captain commanding No. 1 FTS, Point Cook, 24 October 1939.

[29] NAA: A705, 4/4/301, Maintenance organisation for operational unit. CO report, 23 February 1942.

[30] NAA: A9435, 119, Commanding Officers reports of RAAF Squadrons and Units: Nos. 2, 3, 4, 6, 8, 9, 10 & 11 Stores Depots, 1941-1944.

[31] NAA: A705, 9/1/1178, Overhaul and repair of aircraft, Policy, Instruction No 1/1/1, Repair and maintenance of airframes, engines and technical equipment, 1937-1941.

due to parts shortages.[32] On top of these problems, government's decision to dispatch some equipment intended for RAAF training upon these being received in aircraft depots to the Middle East to support flying operations effectively left the RAAF short.[33]

Spare parts availability to maintain airworthiness

Ensuring expeditious handling of aircraft repairs and the reduction of the time which RAAF aircraft spend in the hangars undergoing overhaul depended on spare parts availability. The Armstrong Siddeley Cheetah, a seven-cylinder British air-cooled aircraft radial engine of 13.65 litre capacity was introduced in 1935 to power British trainers, such as the Avro Anson.[34] During October 1941, the Machine Shop at General Engineering Squadron at Laverton, began to manufacture engine components, valves and rollers needed for four Cheetah engines that had been waiting many weeks for replacement parts.[35] Following discussions held at CAC on 24 February 1942, the RAAF requirement for 16,800 cylinder barrels for Cheetah engines at the rate of 700 per month was considered, as was the requirement for barrels for the Twin Row Wasp and Single-Row Wasp engines. Over a long period, the Air Board had requested the Air Ministry address the spares' requirements, which the Ministry was responsible for supplying. Between May and September 1941, the Engine Repair Squadron could not complete work on 8 Cheetah IX engines because they had no spring drive plungers in

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[32] NAA: A9186, 288, RAAF History Sheets (Form A50), Operations Record Book, No. 1 AD, Laverton, Victoria, May 1920 - December 1943. Minute Wing Commander, DAM to DAPLO, 1 September 1941.

[33] NAA: A1196, 1/501/451, EATS – Unserviceability of training aircraft and effect on training. Conference regarding reasons affecting operational and training program held on 22 April 1942, attended by the Directorate of Air Member of Organisation and Equipment (DAMOE), the Directorate of Technical Service (DTS), the Directorate of Equipment, and representatives of governmental departments.

[34] Alec Lumsden, *British Piston Engines and their Aircraft,* (Airlife Publishing, Marlborough, Wiltshire, 2003), p.74-76.

[35] *Ibid.* No. 1 AD Operations Record Book, 1920-1943. CO of No. 1 AD, Laverton, Victoria, 1 October 1941.

stock.[36] Also five engines required 1º taper piston rings but none were available. The Cheetah Section built a makeshift jig to grind the required taper on normal compression to relieve this emergency.[37]

On 23 April 1942, DAMOE made it clear to the Air Ministry that until the serviceability of aircraft improved, the training rate of pilots would be curtailed, with intakes expected to be reduced by 50 percent. He asked the Ministry to expedite supply from Britain or Canada. As a result, Ford Canada was able to assist. Even so, when spare parts finally arrived these were not anywhere near the quantity needed to meet the backlog. Reliability and predictability in the delivery of spare parts would have boosted morale. The spares situation had spiraled out of control, leaving maintenance personnel to take drastic actions. Ingenuity and improvisation came to the rescue. For example, the Kestrel Overhaul and Repair Section, which almost stopped functioning, was able to dismantle two Kestrel III instructional engines used at No. 1 Engineering School for parts to complete the overhaul of a Kestrel V which was stuck in the hangar for weeks. During February 1942, after waiting months for parts, the depot converted four unserviceable Kestrel engines to components for use as spare parts.[38]

The Advisory Committee Meeting No. 55, on 6 December 1943, had considered that the time normally required to overhaul aircraft depended on the size and degree of complexity of the aircraft and on the nature of the overhaul; that is, whether it was a 'time-expired overhaul', a 'minor repair' or a 'major crash.' Shown below is the estimated period

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[36] NAA: A1196, 1/501/51, EATS – Unserviceability of Training Aircraft and Effect on Training, Air Board Minute Agenda No. 3918/42. Notes on conference held in the presence of F.J. Mulrooney, Secretary of the Air Board, AMOE, AMP, DGSP, BM, FM and DCAS, 23 April 1942.

[37] NAA: A9186, 288, RAAF History Sheets (Form A50), Operations Record Book, No. 1 AD, Laverton, Victoria, May 1920 - December 1943. Minute Wing Commander, DAM to DAPLO, 1 September 1941.

[38] NAA: A9186, 288, RAAF History Sheets (Form A50), Operations Record Book, No. 1 AD, Laverton, Victoria, May 1920 - December 1943.

required to service various types of aircraft.[39]

Overhaul period - 1943

Aircraft Types	Time-expired Overhaul	Minor repairs up to 20%	Major crash over 20%
Anson	4 Months	3 months	5 months
Oxford	4 "	3 "	5 "
Wirraway	3”	4”	5”
Battle	3”	3”	5”
Tiger Moth	3”	2”	3”
Wackett trainer	3”	3”	4”
Avro Cadet	4”	3”	4”
D.H.84	4”	3”	5”
Douglas	3”	3”	6”
Beaufort	4”	4”	8”

With the policy of doing major aircraft maintenance in the state in which the aircraft were based, it became necessary in 1943 to provide space in hangars and workshops in additionl to the existing civilian aerodromes. This policy avoided ferrying aircraft over long distances. In some cases, manufacturing replacement parts in-house provided a viable solution that restored aircraft serviceability. Delays in obtaining crankshaft bearings from overseas led to four sets being manufactured locally at a plant called *Wassieffs* in South Melbourne. In June and August 1943, No. 1 AD reported that the Merlin Overhaul Section was practically at a standstill owing to the difficulty of obtaining bearing blocks, cylinder liners, magneto skew gears, main bearings and spiral drives for Merlin II and III. To reclaim floor space, six engines in various

[39] NAA: A705, 9/1/1178, pt. 1; RAAF Headquarters, Policy on overhaul and repair of aircraft. Extract from the Minutes of the Advisory Committee meeting, No. 55, held on 6 December 1943.

stages of repair were packed in boxes and stored. Also 20 Merlin III propeller reduction gears were fitted to Merlin II engines, a combination that was compatible with existing airscrews.[40] The consequences of a the scarcity of aircraft parts also effected morale and motivation, to the point where work performance dropped. The ability to maintain the necessary level of experience in specialised personnel declined under the relentless pressure.[41] Commanding officers at various AOBs complained that few repairs and hardly any maintenance tasks could be completed for intervals lasting many weeks. One such problem was reported at No. 4 ARD (Western Area). The depot could not function because the tools and equipment which No. 1 AD (Laverton, Vic.) promised to send had not arrived.[42]

Growing frustration and stress among personnel often led to unfortunate work-related conditions, including chronic boredom. In other situations, disharmony developed at many depots. Some personnel occupied their time making model aeroplanes or engaging in other diversions instead of devoting their efforts to productive work despite the regular issue of Air Board Orders (ABO). The following is particularly telling: 'Continued disuse is not likely to improve the condition of the aircraft, nor is enforced idleness likely to stimulate the zeal of either the pilots or the ground crew'. RAAFHQ also noted that 'the pernicious habit of souveniring' was growing at a time when Australians were being urged to save scrap metal and rubber. RAAFHQ thought that 'acts of waste, although they may be committed thoughtlessly, constitute positive acts of sabotage and reveal gross indifference to Orders and Instructions'.[43]

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[40] NAA: A11233, 7/1/1B, pt. 1, No. 4 (Maintenance) Group, Official History; Air Commodore, Air Officer Commanding report, pp.2-3, October 1944.

[41] NAA: A705, 113/2/712, Instruments, aircraft, RAAF Headquarters. DAM, Policy; instrument equipment; Commanding Officer's log book, June 1943.

[42] NAA: A705, 113/2/712, Overhaul, repair and maintenance. Policy - instrument equipment, Minute Air Officer commanding Western Area to the Secretary of the Air Board, 8 October 1943.

[43] NAA: A7673, RAAF Air Board Orders, Section "N" Temporary Orders & Notices, (Issues Nos. 1-1029): Salvaging, N.737, 1942.

Even after the Pacific War, problems obtaining replacement parts continued well into 1947. This resulted in RAAFHQ instructing Areas and Groups to make older aircraft obsolete. Subsequently, when aircraft became due for complete overhaul or major repair, they were converted to components, to scrap or stored for disposal by sale.[44]

Aircraft repair depots – testing and periodic servicing inspection

In May 1940 increased flying activity led to the RAAF undertaking further reorganisation, including the creation of the Aeronautical Inspection Directorate (AID). Inspectors carried out quality checks on all work that involved modifications or routine dismantling, reconditioning and testing of components, instruments, engines and airframes. Quality control included tests to determine if parts could be reconditioned or if new components were required. Routine maintenance called for in-service inspections or workshop checks at 30-hour service intervals, work that included tasks such as checking and rectifications of reported faults, lubricating parts, checking flight control cables and linkages and control surfaces (elevators, rudder, ailerons, flaps, rim tabs) for signs of wear.[45]

Repair and service units carried out daily and between flight inspections, while all other routine maintenance was handled by a servicing flight which did 30, 60, and 90-hour inspections, minor repairs and replacements. This structure was to limit work to relatively simple tasks that could be carried out within 48 hours. Stores were therefore limited to 7 to 14 days' typical consumption, thereby avoiding the accumulation of tools, parts and equipment likely to limit the mobility of the unit, depending of course on the location of the unit with respect to replenishment.[46] ASP, AD, ARD and ERD specialised in major repairs,

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[44] NAA: A705, 121/1/249. Manufacture of aircraft in Australia. Policy directive to ARDs with copies to DAM, AMEM & AMSE, 1947.

[45] NAA: A705, 9/1/617, pt. 2, Repair, overhaul and maintenance, airframes and engines and technical equipment, Functions of units general policy, 1941-1945.

[46] NAA: A705, 4/4/301, Aircraft maintenance organisation for operational units. CAS, AVM W. Bostock, regarding Policy Directive, Serial No. 3, 1 Mach 1942.

such as 180-hour and 240-hour deeper overhaul programs and engine overhauls, which included an integrated on site store facility. As workload increased, these establishments grew to occupy large expanses of land and played a crucial role in keeping aircraft operational.[47]

Technical issues were often encountered when ARD installed reconditioned engines. Such problem had to be identified and if possible fixed on the spot. One particular problem related to Glycol coolant leaks on low-hour reconditioned Merlin engines. A Merlin engine from No. 1 AD was sent to No. 1 Aircraft Performance Unit to investigate whether the leaks were caused by damage to sealing rings during assembly or transportation or as a result of incorrect engine operation.[48] While some airframe spares for Fairey Battles finally arrived, no further shipments from Britain were expected for the foreseeable future. As a result, DAP began the involved process of negotiating local manufacture with suitable contractors.[49] The RAAF was in an unenviable position when statistics for April 1942 showed that 48 percent of Battles and 56 percent of Wirraways were unserviceable for lack of spare parts. But USAFIA was also in an unenviable position. In July 1942, when needing replacement main bearings for 20 Allison engines, they resigned themselves to reconditioning bearings as the only solution.[50]

Considerable difficulties at operational base units were experienced owing to the unserviceability of transport. Unit 56 based at Gove (NT) reported that 'it had been an uphill job to maintain aircraft fuel to No. 13 squadron who were unable to assist in cartage from the dispersal point at the anchorage'.[51] On 15 January 1942, DCAS pointed out that urgent

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[47] NAA: A705, 9/1/1178, pt. 2, RAAFHQ, Overhaul and repair of aircraft: Policy. Minute, Wing Cdr, DAM for AMEM to RAAFHQ, 16 September 1942.

[48] NAA: A11233, 7/1/1B, pt. 1, No 4 (Maintenance) Group, Official History; Commanding Officer report, 1944.

[49] NAA: A705, 9/1/617, pt. 1, Repairs, overhaul and maintenance of airframes, engines and technical equipment; Functions of Units; General policy, 1937-1941.

[50] NAA: A2671, 1/46, Aircraft Development and Production. Report, 1942-43.

[51] AWM64, 16/3. RAAF Formation and Unit Records - Operational record book;

measures were needed to transport stores and equipment to any destination required. Sea transport was considered unreliable because of the likelihood of enemy action.[52] On 13 April 1942 the delivery need was examined by RAAF headquarters which suggested using the overland route which was controlled by the Army. If a more rapid response was needed service aircraft or chartered civil aircraft for air freight was opted for.[53] A Douglas DC-2, surplus to No. 1 WAGS was made available for the most urgent spare parts and equipment.[54]

Given that transport aircraft were becoming so crucial that any steps to increase their serviceability and longevity were justified. The Chief Engineer of DAP issued a dispensation to extend Inspection Schedules and thereby improve aircraft availability.[55] As a result of these decisions, from September 1942 to September 1944, spare parts were supplied to remote units using all available transport. In fact, since 1936, the RAAF used motor cycles to collect light stores, and dispatched heavy equipment by goods train. By October 1942, RAAF amendments were introduced to transport procedures concerning all high priority deliveries to Isolated Repair Parties (IRP).[56] The new procedure was to send a signal to the HQ Unit or to the nearest repair and service unit, and upon acknowledgment of receipt, requested spares would be sent to IRP.[57]

Commanding Officer's logbook, 18 March 1942.

[52] NAA: A1196, 12/501/72, Lines of Communication Darwin, 1943. Report titled 'Transit and Policing of air force stores en route to North West Area', p.2. Minute, Squadron Leader, D.J. Rooney to the Secretaries of the Department of Air and of DOA, 13 April 1942.

[53] *Ibid*.

[54] NAA: A705, 9/1/1175, pt. 1, Directorate of repair and maintenance, maintenance of aircraft – general; Wing Commander, Commanding Officer's report, 20 January 1942.

[55] NAA: A9186, 1, RAAF History sheets (Form A50) Operations Record Book, No. 1 Squadron, July 1925 - February 1946, Commanding Officers' comments.

[56] *Ibid*; NAA: A7673, Bound volume of RAAF Weekly Orders, Issue N.366, 17 February 1936.

[57] NAA: A705, 9/7/464, AMOE, Maintenance schedule on Anson aircraft, general policy; Commanding Officer's report, 17 April, 1941.

From August 1944 a supply vessel with a capacity for carrying 280 tons of goods was employed for coastal or island supplies. During the same year to reduce fuel consumption, the Air Board allotted 650 bicycles to No.7 Operational Training Unit, to permit the squadron to proceed from barracks to hangars, a distance of about 2 miles (approx. 2.6km).[58] During 1942-1943, with the war now extending in the Pacific, depots became extremely busy places that were always searching for suitable men with skills for inspection duties. As the largest maintenance facility of RAAF Units, No. 1 AD needed inspectors. This resulted in the release of 154 Non-Commissioned Officers (NCOs) under a policy laid down by Air Board on 9 July 1943.[59] As promotion depended on having served in depots for at least two years, very few accumulated this level of experience due to early postings to other duties. This created another problem as the loss of experienced men to new depots left a void that affected the quality of training for new arrivals. A compromise was found that required NCOs to remain at a particular depot for at least six months to maximise the transfer of knowledge to recruits. Due to the combined effects of less than ideal levels of supervised instruction, specialisation of work, the frequent changes in technology and infrequent scheduling of some more specialised tasks, it was difficult to keep all personnel fully occupied in either work or training.[60]

Repair and maintenance work involved communication and consultation with operational units to clarify the status of reported faults and the general condition of aircraft. The latter category usually concerned faults requiring adjustments or replacement of parts such as ‘a weeping petrol joint, maladjustment of brakes, and incorrectly wired

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[58] NAA: A11233, 7/1/1B, pt. 1, No. 4 (Maintenance) GP, Official History, 1944. Senior Equipment Staff Officer, No. 2 Transportation and Movements Office to Official Historian, Headquarters of No. 4 (Maintenance) GP, 11 September 1944.

[59] NAA: A705, 109/3/1206, Department of Air, final inspection sections, ARDs and aircraft parks, 1943-1946. Letter A.W. Murphy, Air Officer Commanding to the Secretary of the Air Board, 11 September 1943.

[60] *Ibid*.

cabin light switch'.[61] Long-standing complaints from aircrew were worked through between representatives of the complaining unit and the responsible maintenance unit. If an aircraft was still faulty when returned from DAP contractors, the Resident Inspector took charge of the complaint. Otherwise the complaint was referred to an AID Inspector.[62] However, owing to a number of flying accidents, a comprehensive 180-hour inspection was imposed on all aircraft types. To ensure that aircraft were maintained in optimal condition, Service Schedules were introduced to provide RD with detailed information on the condition of aircraft, type of service needed and service previously performed.[63]

Expediting the flow of aircraft through repair facilities was necessary to free up limited space in hangars and parking areas. Action to amend overhaul and repair procedures for aircraft engines and equipment (as laid down in AGI-A.7) was instigated when new technical faults were discovered. This then prompted RAAFHQ to cancel previous instructions and issue amendments for distribution to all relevant RAAF establishments. Maintenance personnel were to make log entries and sign off all work in the Aircraft Maintenance Schedule. In one instance, No. 1 Training Group reported that the undercarriage of an Anson failed to retract fully. The winding handle became free only after the strenuous efforts of pilot and crew. Later inspection showed that 'the split taper pin holding the bevel gears had worked loose and had eventually dropped out, apparently through faulty assembly during manufacture'.[64]

As one example, an inspection of the taper pin had not been

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[61] NAA: 705A, 9/1/1206, pt.2, Aircraft maintenance – condition of aircraft received from depots, parks and DAP; Contractors and complaints policy. Wing Commander reporting unsatisfactory conditions of technical equipment in minute addressed to RAAF Headquarters and AMEM, 22 July 1944.

[62] *Ibid*.

[63] NAA: A705, 150/4/4261, RAAF Headquarters Directorate of Repair and Maintenance. Publication of repair and maintenance Instruction No. 1 – RMGI 1-1-1; Policy for overhaul, repair and maintenance of engines and technical equipment; Instruction No. 1/1/1, pt.1, February 1943- 1948.

[64] NAA: A11334, 5/1/28 Air, No. 1 Training Group, Operation Convoy US3. Officer Commanding No.1 Training Group, log book, 18 October 1941.

included in the Anson (Cheetah IX) Maintenance Schedule, so service personnel saw no reason to check it. RAAFHQ amended the Anson Maintenance Schedule. The amendment instructed that in Section 1, Sub-Section A, Page 4 'Cockpit and Cabin' C.O. 304, after 'retracting gear' to insert, 'see that split taper pin is secure and tight'.[65] These mechanical details certainly demonstrate the thoroughness required in aircraft maintenance but also the level of expertise reached in identifying and rectifying problems. A number of Anson aircraft that had recently completed a 180-hourly service showed too many problems, indicating that the quality of servicing on the machines was sub-standard. The unit concerned was suspected of not carrying out the provisions of Form 1801 of the Maintenance Schedule with sufficient care. One particular concern was evidence of corrosion found later on the aircraft had not been detected.[66] Depots were reminded to fully comply with airworthiness requirements and to fully implement the comprehensive schedule of inspections to detect early signs of corrosion.[67] Technical staff was informed that failure to conduct a thorough check on aircraft would cause corrosion of the fuselage. They were told to clean the fuselage flooring to avoid the fabric covering the aircraft to grow mouldy from an accumulation of moisture and dirt. The fabric cover at this section of the fuselage was attached by means of tacks to a wooden former, the removal of which was essential to enable an inspection to be made. An amendment was produced to Form 1801, stating: 'Remove fabric and wooden former from fuselage longer on members j - h - and j1 - h1 - g1, clean and examine for evidence of corrosion'.[68]

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[65] NAA: A705, 9/7/464, AMOE Maintenance schedule for Anson aircraft – general; Officer Commanding No.1 Training Group's log book, 17 April 1941.

[66] *Ibid*.

[67] NAA: 1944. Air Commodore, Air Officer Commanding to RAAF Headquarters, December 1944.A11233, 7/1/1B, pt. 1, No. 4 (Maintenance) GP, Official History, 1944. Air Commodore, Air Officer Commanding to RAAF Headquarters, December 1944.

[68] NAA: A705, 9/7/464, AMOE Maintenance schedule Anson aircraft - general policy. Memorandum from the Senior Administrative Officer, 15 April 1941 to the

To control or limit the effect of poor workmanship, regular inspections of maintenance work, both in process and on completion, was introduced.[69] There were instances where operational units, keen to have their aircraft back as soon as possible, arranged for repair work to be carried out at ARD not equipped to handle the work. This is reflected in some of commanding officers' daily entries in log books commenting on the poor performance of some depots that required expertise beyond the capabilities of the depot.[70] Considerable time was lost, and often the poor workmanship later caused additional rectifications as well as being unsafe and was obviously in breech of regulations.[71]

As a rule, establishing main maintenance facilities in Forward Areas was not considered advisable. Front line units usually operated under harsh conditions and struggled to carry out minor maintenance let alone handle major failures or battle damage. They only carried basic spares sufficient for fourteen days of operations.[72] While single-engine squadrons were able to perform some servicing on their aircraft, there were limits to what they could do. They lacked heavy lifting devices and did not have all the tools and facilities for complex repairs. When heavy maintenance was due, aircraft were flown out to an ARD for 240-hourly servicing or engine replacement. The policy also reduced the risk of a concentration of equipment, stores and unserviceable aircraft being exposed to enemy action.[73]

Secretary of the Air Board.

[69] NAA: A705, 9/1/1206, pt. 2, RAAF Minute, Air Commodore, Air Officer of North Eastern Area, Townsville to the Air board, 25 May 1943 regarding the importance of implementing major inspections at Aircraft Repair Depots.

[70] NAA: A11233, 7/1/1B, pt.1, No. 4 (Maintenance) Group, Official History, 1944. Air Commodore, Air Officer Commanding to RAAF Headquarters, December 1944.

[71] *Ibid*.

[72] NAA: A705, 4/4/301, maintenance organisation for operational unit, DTS, Group Captain's instructions to RAAF units, 23 December 1942, p.2.

[73] NAA: A705, 9/1/1206, pt. 2, RAAF Minute from the CO of North-eastern Area, Townsville to Air Board, 25 May 1943 regarding the number of major inspections required to be carried out at ARDs.

A major overhaul on a Beaufort shows the complexity of the work, which usually took 14 to 60 days, depending on the condition of the aircraft.[74] If modifications were to be incorporated, or if unusual or unforeseen problems surfaced, the aircraft could be delayed. For example, when one Beaufort was tested, engineers noticed vertical cracks in the tail-plane front-rear spar web approximately 4'' on either side of the rib.[75] No less than 22 minor defects and 34 major ones were discovered. The latter included faulty brakes, tail wheel strut and an oil pressure gauge. These were rectified by mid-1942 by sub-contractors Dunlop (wheels & tyres) and Franklin & Anderson (wheels).[76]

Servicing conditions at isolated repair depots

Maintenance capabilities in isolated repair depots such as at the RAAF Daly Waters Station (NT) were extremely low. Dispersed over a large area of underdeveloped bush, units had difficulty maintaining immediate contact with each other. In his log book, the commanding officer reported that was a very high incidence of sickness caused by poor water supply and bad sanitation arrangements.[77]

Even walking to work was strenuous as personnel had to cover 3.2 km from their camp, return to camp for lunch, reputedly of inferior quality and repeat the same before dinner. As aircraft were widely dispersed personnel servicing aircraft were obliged to walk daily many kilometers in the hot sun. To use the few showers located at the base necessitated walking long distances in the dark as there was no area lighting. Severe

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[74] NAA: A705, 9/1/1178, Overhaul and repair of aircraft, Policy, Instruction No 1/1/1, Repair and maintenance of airframes, engines and technical equipment, to all units, 1937-1941.

[75] NAA: A705, 9/18/74, Directorate of Technical Services, Beaufort aircraft. General defects. Cablegram from A.L.O, Air Ministry, Kingsway, London to the Air Board, Melbourne, 20 June 1941.

[76] *Ibid*. Director of Technical Service's letter to the resident Technical Officer, Beaufort, CAC, Melbourne, 25 February 1942.

[77] NAA: A1196, 12/501/72, Lines of Communication, Darwin. As reported in his log book by the Commanding Officer of RAAF Daly Water Station, pp.5-6.

heat made metal too hot to handle increasing the difficulty of working on aircraft during the day. It was recognised that performing heavy tasks without special tools and expending effort walking several hours per day reduced the physical capacity of personnel to only five hours per day.[78] The CO painted a gloomy picture of the Daly Waters Station after Japanese raids between 20 and 28 February 1942. Much of the Station's equipment was destroyed, including food and housing.[79] Many of the men, after being evacuated from the islands, were in poor physical condition. There were many cases of dysentery and a high incidence of various environment-related sicknesses.[80]

In Darwin the majority of aircraft was destroyed. As most surviving aircraft needed servicing, providing maintenance under the prevailing conditions was difficult, and as usual aircraft could not be repaired for lack of spares and essential operational equipment. At times the Nos. 2 and 13 squadrons could muster only 2 or 3 serviceable aircraft. This position was gradually improved by the arrival of replacement aircraft, new aircrews and equipment. However, personnel posted at No. 9 stores depot, Winnellie, (NT) also had much to complain about. Telephone calls to and from there incurred a delay extending to 2 or 3 hours and even then voices were reported as inaudible. Because all technical groups were without telephones, this caused serious delays in satisfying supply requests made by operational units.[81]

Weather conditions: dust storms and corrosion

Aircraft standing idle for long periods were subject to corrosion damage, particularly in severe climatic conditions. Dust build up inevitably

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[78] *Ibid*.

[79] AWM64, 1/13, RAAF Formation & Unit Records - Operations Record Book, No. 2 (GR) Squadron. Commanding officers reports, May 1940 – May 1946.

[80] *Ibid*.

[81] NAA: A9435, A119, Commanding Officer Reports of RAAF Squadrons and Units. Nos. 2, 3, 4, 6, 8, 9, 10 & 11- Stores Depots, February 1942.

occurred when aircraft were left in the open, threatening rapid deterioration of aircraft and components. Service Bulletins calling for more frequent checks did not always result in the detection of engine deterioration or airframe corrosion. Undetected corrosion led to a number of training aircraft being grounded, seriously impacting on the training of aircrews. The principal maintenance issue effecting training aircraft was severe wear on cylinder barrels, pistons and rings. This 'excessive wear on other parts which, while not causing the aircraft to be grounded, [required] a larger percentage of replacement spares during overhauls than would normally be the case'.[82]

The Air Board called for immediate investigation. On 24 April 1942, a conference with representatives from DAMOE, AMP, DGSAP, and DCAS, considered that dust ingestion in the dry conditions prevailing at aerodromes caused excessive engine wear.[83] The suggested remedy was to fit air cleaners to engines and to seal runways, or alternatively switch to gravel or grass runways. Depots recorded that the Hawker Demon and Douglas DC2 did not need cleaners, while excessive cylinder wear was notable on Wackett trainers even though cleaners were fitted. At No. 4 FTS, Amberley, it was found that the standard 'Vokes' air cleaners used successfully on some aircraft became choked with dust after two or three take offs. Experiments carried out with a repositioned air intake appeared to have fixed the problem.[84]

Dust was unavoidable in the natural environment and corrosion was an even more serious problem judging by the number of reports on the subject. A Department of Air paper dated 9 July 1943 blamed the aircraft Reserve Pools where spare machines were parked in the open

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[82] NAA: A1196, 1/501/451, Unserviceability of EATS aircraft and effect on training. Minute, DAP Secretary to AMOE, DGSP, DCAS, 28 January 1942.

[83] *Ibid.* Minute/Agenda 3918/42, signed by F.J. Mulrooney, Secretary of the Air Board regarding the meeting held on 24 April 1942 and attended by AMOE, AMP, DSP, BM, FM, DCAS and departmental executives.

[84] NAA: A1196, 1/501/451; EATS. Group Captain, AMEM's report on the unserviceability of training aircraft, stressing no cleaners would prevent dust getting into aircraft engines to the Acting CAS, 5 June 1942.

for long intervals. It appeared that some aircraft had not been corrosion-inhibited before storage.[85]

The suggestion that stored aircraft be run on the ground regularly and flown occasionally was rejected by the Deputy Director of Equipment on 5 August 1943, on the grounds that it was both impracticable and uneconomical. Instead, he referred to the measures in Engine General Instruction (EGI No 36), prescribed for preventing the corrosion of engine internal components. The solution was to turn the engine daily by hand and run up the motor once per week. The Deputy Director of Air Maintenance was convinced that this procedure worked at No. 13 ARD.[86] It may be that this success was related to less severe environmental factors at that depot. Under more severe conditions, notably in salty marine or tropical environments, corrosion caused problems. Personnel at No. 2 Flying Boat Repair Depots (FBRD), Rose Bay, an eastern suburb of Sydney, discovered that salt water had corroded the shielding wire of a Sunderland aircraft. An application of clear lacquer on exposed positions was recommended at each major inspection.[87] During December 1944, No. 1 FBRD reported that the prevalence of severe dust storms damaged some Catalinas that were waiting to be serviced.[88] In spite of precautions, electrical and mechanical equipment, especially switch-gear, generators, booster pumps, was susceptible to dust penetration. Furthermore, dust accumulated in fuel tanks, pipelines and in inaccessible spaces in airframe structures.[89]

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[85] NAA: A705, 109/3/1206, Department of Air Aircraft depots and aircraft parks. Report, Deputy Director of Equipment to the Deputy Director of Air Maintenance, August 1943.

[86] *Ibid*.

[87] NAA: A705, 201/88/101, CAS, Directorate of Telecommunications and Radar, Telecommunications - Radio planning - Flying Boat Repair Depots – W/T (Wireless telegraphy) - Maintenance facilities – Policy to RAAF units, 1943-47.

[88] NAA: A11233, 7/1/1B, pt. 1, No. 4 (Maintenance) Group, Official History; Minute, Air Officer Commanding RAAFHQ, December 1944.

[89] NAA: A1196, 1/502/5. Manufacture of aircraft and engines in Australia, 1938-

Technical orders, instructions and various other notices

Between 1939 and 1945 while the war was going on in Europe, ARDs and contractors fought their own battles. The maintenance crew and APC contractors faced many obstacles in their efforts to maintain and repair aircraft, due to the increased workloads reflecting intensifying flying operations and the effects of an ongoing shortage of aircraft parts. At No.1 FTS, flying was restricted because all aircraft, particularly the Avro Ansons which by the end of July 1937 had become unserviceable.[90] However, in most cases, Air Force Order 19/A/11 authorised aircraft personnel to remove components from unserviceable aircraft and engines to render aircraft serviceable.[91] All repairs and overhauls of training and operational aircraft where the aircraft was either beyond repair or waiting for parts over two months for an AD and about four months for DAP Contractors. Both repairers were told to fill in AFO 19/C/3 and ABO 'E' 24/6 to state the amount of time required. If the time was greater than the periods specified, the aircraft was placed in the line for conversion to components for economic reasons.[92]

In addition to standing RAAF Instructions an ample circulation of other documents were distributed to all establishments. However, the rationale behind some of the instructions can be questioned. In the context of aircraft maintenance, the term cannibalisation meant to temporarily borrow parts from an aircraft, usually one grounded for repairs or to remove parts from a badly damaged aircraft. RAAFHQ permitted this procedure only if an aircraft was doomed to fall into enemy

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1944. No. 1 FBRD Commanding Officer report on dust penetration to equipment.

[90] NAA: A9186, 298, No. 1 Flying Training School, Point Cook. RAAF Unit History sheets, (Form A50), February 1934 to May 1940 and February 1946 to February 1952. Comment made by the Group Captain commanding No. 1 FTS in 1937.

[91] NAA: A705, 9/1/548, Overhaul of aircraft and engines during development period and when fully developed. RAAFHQ's policy issued to RAAF units, 1940-1941.

[92] NAA: A705, 9/1/1178, pt.1, RAAFHQ, Overhaul and repair of aircraft, Policy, Instruction No. 1/1/1/, Repair & maintenance of airframes, engines & technical equipment, CO's report for AMEM to RAAFHQ. Nos. 4 & 5 (Maintenance) GPs, Perth, Western Area, 11 September 1943.

hands. One Air Board Order stated that: 'cannibalisation is a most undesirable practice robbing serviceable or repairable equipment of one or more parts in the field and must cease forthwith'.[93]

As a matter of fact repair depots cannibalised parts when they judged it as the only sensible option. As a last resort they would 'borrow' parts from other aircraft that were either unserviceable or were undergoing extended maintenance. Although cannibalisation of parts might have been tempting, personnel were duty-bound to comply with RAAFHQ's instructions regarding the removal of components unless some form of dispensation was available. ARDs were instructed to make decisions based on the major relevant issues covered by an ABO. The ability to return an aircraft to operational status was a most relevant issue under these conditions and the cannibalisation of parts was admissible if the length of time involved in obtaining spares to conclude the transaction made such action reasonable.[94]

To justify the process the depot was required to complete an Inspection Report, Form 114, detailing the circumstances of the cannibalisation. All parts taken were to be exchanged for parts tagged unserviceable and removed from the receiving aircraft. If these unserviceable parts could not be temporarily remounted on the donor aircraft all details related to these items were to accompany the cannibalised items together with Form 114.[95] Some directives contained provisions that were expected to be used as guidelines for intelligent interpretation. One instruction required designated 'ferry pilots' to fly aircraft over the uninhabited interior of Australia or over lengthy water crossings. This perplexing instruction raises the question to what would

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[93] NAA: A7673, RAAF Air Board Orders, Section "N" Temporary Orders & Notices. (Issues Nos. 1-1029): Salvaging, N.319, 1942.

[94] NAA: A7673, Issues 448 to 527; Bound volumes of RAAF Weekly Orders; Claims for the salvage of aircraft. Nearest seaplane station, land and port. Air force order 10/D/5, N.469, 11 July 1938.

[95] NAA: A7673, RAAF Air Board Orders. Section "N" Temporary Orders & Notices. (Issues Nos 1-1029): Salvaging, N.737, 1942.

have happened if the pilot encountered engine trouble over such deserted areas.[96] Those who were assigned to think-through ways of salvaging an aircraft proposed an interesting solution for pilots who were lost in the outback or at sea. If the accident occurred in an area remote from RAAF establishments, the wreckage was to be returned to depot either by ship or rail without being packed in transit cases.[97]

Engineer officers were instructed, in the event of an aircraft becoming immersed in water, to follow 'In every case the instructions detailed in AGI, part 5, of instruction No.6 and EGP.15 paragraph No. 7 … at the earliest possible moment in order to arrest corrosion and thus prevent the loss to the service of valuable items of equipment'.[98] Clearly these instructions ignored the difficulties of transporting damaged or wrecked aircraft from remote sites without vehicular access. There were two main roads in NWA: Alice Springs to Darwin and Tennant Creek to Mount Isa. Sea transport was hardly a solution as only one ship in 6 weeks was the maximum obtainable from southern ports.[99] As the Air Officer Commanding NEA noted, the other means of delivering aircraft to Breddon and Charters Towers was by truck. However, both areas were isolated from Townsville when the Burdekin River was in flood (February-March) for several days. As for Mackay, Queensland, most of the road was rough and impassable during the wet season (December - March).[100]

At the Coen RAAF Station in north Queensland, as the road was

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[96] NAA: A705, 9/1/1206, pt. 2, Condition of aircraft received from depots Parks and DAP - Contractors - Complaints policy,1944-1952.

[97] NAA: A7673/1, Weekly Orders (363 - 447), RAAF Headquarters' reports on failure, defective parts and experimental equipment, Issue no. 384, 6 July 1936.

[98] NAA: AA11334, 5/1/28 Air Part 242, No. 1 Training Group, Routine Orders: Salvaging, 22 March 1945.

[99] NAA: A705, 73/6/1142, pt.1, DRM (Director of Repair and Maintenance), Transport of salvaged aircraft and engines. Minute titled 'transport of salvaged aircraft' addressed to the Secretary of the Air Board by Air Commodore, Air Officer Commanding, 5 April 1943.

[100] *Ibid.* Minute from the Air Officer Commanding NEA to the Secretary of the Air Board, 22 November 1944.

not trafficable all-year round, pack horses were used to get supplies through.[101] Challenges to the effectiveness of the working environment became frequent, in particular with record-keeping. But then, the war disrupted the methodical routines developed in peacetime as depots were becoming hives of industry operating under constant strain.[102] The focus on meeting deadlines sometimes caused grievance. As the Secretary of DAP commented to Headquarters of Nos. 4 & 5 (Maintenance) Groups, there were instances whereby some RAAF Maintenance Groups found it necessary to bypass administrative procedures by giving civilian contractors additional work without clearance by Service Managers.[103]

A lack of discipline became a problem when RAAF Units repaired faults but omitted making any record of them, despite instructions to capture all data on paper.[104] Quarterly returns on engineering, airframes and engines showed that many units were not compiling these returns accurately. Some units' continual use of obsolete forms resulted that information on airframes and engines overhaul frequently left out.[105] Records for reserve engines, irrespective of hours run, were not kept separately from installed engines and were rarely filled in completely. Uncertainty about previous fault history contributed to delays while efforts were made to find out what had been done previously and re-establish history. Furthermore, quick-fix methods often complicated work later when an aircraft came in for major service and discrepancies where discovered between the paper records and the actual state of the

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[101] NAA: A11297, 24/5/AIR pt.1, No. 24 Squadron – Advanced Operational Bases. Reports from an intelligence officer based at Archerfield sub-area to the Commanding Officer of No. 24 Squadron, Townsville, 2 April 1941.

[102] *Ibid*.

[103] NAA: A705, 9/1/1178, pt. 1, RAAFHQ; Overhaul and repair of aircraft, Policy, Instruction No.1/1/1, Repair and maintenance of airframes, engines and technical equipment, 1937-1941.

[104] NAA: AA11334, 5/1/28 Air, pt. 2, No. 1 Training Group. RAAF Headquarters, Routine Order No. 192, 22 March 1945.

[105] *Ibid*.

aircraft. As a result, Zones Service managers, AID inspectors and the Secretary of the Air Board complained that omissions caused unnecessary correspondence or time-consuming inspections to determine the actual position. Major discrepancies were particularly annoying since decisions on whether an aircraft should be repaired or converted parts depended on valid data.[106]

Unpleasant feeling also arose between civilians employed in RAAF establishments and RAAF personnel. On 9 September 1943 the CO of No. 5 (Maintenance) Group reported that civilians refused to conform to station routine and standing orders. Apparently civilians were seen smoking while working on aircraft. They requested special transport to and from their accommodation and also demanded to be housed at the sergeants' mess, much to the dislike of the sergeants. More bad feeling arose after normal stand-down when civilian employees were paid overtime rates of pay. This resulted in little or no co-operation being offered or accepted between parties.[107]

Due to competition for spare parts, some depots developed unorthodox methods in their acquisition and hoarding. A Minute dated 25 August 1943 by the CO of the Directorate of Equipment makes this clear. He complained that the long awaited spares for Beaufort aircraft A9-35 and A9-38 (earlier types), which he discovered, had been dispatched at least six times but on each occasion failed to arrive at No. 10 Repair and Service Unit. Apparently, they were being 'pinched' by some other unit on the way.[108] This type of behaviour had almost become standard practice for a few rogues and was very difficult to redress, particularly as increased flying activity meant the need for parts had grown significantly.

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[106] NAA: A705, 9/1/1179, overhaul and repair of aircraft, general, Air Officer commanding No.5 (Maintenance) GP, Air Commodore T.R. Marsden (n.d).

[107] NAA: A705, 9/1/617, pt. 2, repair, overhaul and maintenance of airframes, engines and technical equipment. Functions of Units - general policy. Letter from the Air Officer commanding No.5 (Maintenance) GP, Air Cdre T.R. Marsden to the Secretary of the Air Board, 9 September 1943.

[108] NAA: A705, 9/1/1178, pt. 1, Overhaul and repair of aircraft. Policy, 25 August 1943.

In December 1943, No. 4 AD (WA), which had limited facilities, was authorised to convert unserviceable aircraft to components.[109] But this new policy was not without problems. No.13 ARD (NEA) complained that a number of airframe components for aircraft of various types were held due to zealous salvaging operations for conversions. The personnel in the airframe repair section could not cope for months after these wayward activities.[110]

Contractors' maintenance support

Repair and maintenance work beyond the capacity of RAAF Unit and Depot Workshops was contracted to civil firms by DAP. While this alleviated the situation it was a costly remedy, but easily justified given the urgency and increasing volume of aircraft repair work. There was sufficient work on hand to ensure that contractors would be fully occupied for some considerable time.[111] When Burnett introduced outsourcing in 1940, the policy was that only work deemed beyond the capacity of the RAAF would be given to civil contractors. This policy as DTS reported was misused as an excessive volume of work was given to contractors. Notably, Aircraft Depot Instrument Repair Sections were operating well below their capacity, and because of this the approval of Repair Requisitions (AFO. 19/C/7) was ignored.[112]

Understandably, the endless cycle of repairs and aircraft re-assembly at depots was not always conducive to the maintenance of

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[109] NAA: A705, 151/9/1178. Overhaul and repair of aircraft. RAAF Headquarters, policy, Instruction No. 1/1/1, Repair and maintenance of airframes, engines and technical equipment, 1937-1941.

[110] NAA: A705, 9/1/1106, No.13 ARD, North Eastern Area. Comments made by the Air Commodore, Air Officer commanding NEA, 18 February 1944.

[111] NAA: MP407/13/0, General correspondence, 1941-43.

[112] NAA: A705, 113/2/712, Instruments, Aircraft. RAAF Headquarters, DAM (Directorate of Aircraft Maintenance), Overhaul, repair and maintenance. Policy - Instrument equipment. Memo to Headquarters, Central and Southern Areas, Pearce and Darwin RAAF Stations and No.11 Squadron, Port Moresby by Group Captain, DTS, 19 March 1941.

good housekeeping procedures.[113] Instead of reducing workloads as expected, assigning work to contractors potentially created new problems requiring management intervention and additional work to sort out poor work practices by contractors. Some contractors recognised the limits of their capacities but others, motivated by the possibility of losing work to a competing contractor, were prepared to take more work than they could handle. As one manager stated:

> very few civilian contractors [refused] new work even though the position in their hangars at the time is such that they cannot handle the work expeditiously. Most of these companies accept any work offered to them on principle.[114]

To enable contractors' employees to acquire knowledge of Air Force maintenance on aircraft, a conference was convened by the Director General of Supply and Production.[115] Arrangements were to have contractors visit RAAF units to inspect facilities and maintenance procedures. Under the supervision of DAP, civilian contractors worked on EATS aircraft, fleet cooperation aircraft, land transports and flying boat transports. Most other work was handled by RAAF units such as Aircraft Erection Depots (also known as assembly depots) which assembled new aircraft arriving from overseas.[116] While increasing reliance on external contractors helped deal with workload, one of the unresolved issues that developed was the protracted dispute that developed between contractors and DAP over the process for awarding government contracts which gave successful bidders little lead-time to prepare

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[113] NAA: A705, 9/1/617, repair, overhaul and maintenance of airframes, engines, functions of units; RAAFHQ's general policy, 1941-1945.

[114] NAA: A705, 9/1/1178, pt.1. RAAF Headquarters; Overhaul and repair of aircraft, Policy, Instruction No.1/1/1, Repair and maintenance of airframes, engines and technical equipment. Memorandum, DAP Secretary to the Secretary of the Department of Air, 12 May 1942.

[115] NAA: A705, 9/1/643, pt. 2, Servicing of RAAF aircraft by civilian contractors, routines, standard forms, etc., 1942-43. Ability of contractors to handle the volume of work: Conference convened by the Director General of Supply and Production to discuss APC servicing of RAAF equipment and implementation of amended Supply Administration Instruction No. 3, Operating from 1 October 1941.

[116] *Ibid*.

workshops, acquire tools, obtain technical information and hire personnel to gear up for the work. Another grievance concerned the short-term nature of their hard-won contracts given the high costs they incurred bidding for work and the high cost of mobilisation after a tender was won with no real assurance that further work would come their way.[117]

Contracts with providers covered a period of twelve months and were by necessity subject to numerous amendments. Many contractors complained, pointing out that the mobilisation phase of the contract only allowed three months prior to the commencement date. This short ramp-up period 'dictated a start-stop type of operation'.[118] Some contractors gained a reputation for high quality workmanship in the performance of this work as they learnt to live with DAP's contract condition. Individual contractors usually specialised on one or two types of aircraft, overhauling engines or airframes or both. RAAF Support Command Servicing Instructions (Contractors) Instruction No. 2/A/5 mapped out the procedures for allocating work to contractors.[119]

When spares could not be obtained from RAAF sources or commercial channels in time, contractors were allowed to have some generic spares manufactured to meet target requirements. Another instruction, No. 2/B/8, authorised contractors under a system of blanket orders to obtain emergency spares that the RAAF could not supply from commercial sources.[120] Based on contractors' normal reasonable overhaul timing for components and sub-systems, DAP was able to estimate the length of time involved in repairing, servicing and overhaul

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[117] NAA: A705, 151/9/1178, pt. 1 RAAFHQ, Overhaul & repair of aircraft. Policy, Instruction No. 1/1/1. Repair & maintenance of airframes, engines and technical equipment, 1937-1941. Memo from the servicing department to the CO, Pool, RAAFHQ regarding contractors, 1941.

[118] NAA: MP407, 13/0, General correspondence, Servicing of RAAF aircraft by civilian contractors, Commanding officer's report, p.3, 1942-43.

[119] *Ibid*.

[120] NAA: A705, 9/1/1178, pt.1. Overhaul and repair of aircraft. Policy. Instruction No. 1/1/1, Repair and maintenance of airframes, engines and technical equipment, 1937-1942, Memorandum from the manager of servicing department to Wing Commander Pool, RAAFHQ, 29 August 1942.

of complete aircraft.[121] Assuming there was no delay obtaining spares contractors were instrumental in expediting backlogs of aircraft waiting for repair and maintenance.[122] To some extent air force service personnel had cause to question the use of sub-contracting work, as they lost the opportunity of gaining and maintaining experience in the overhaul of any modern aircraft, except the Liberator.[123]

Providing aircraft repair facilities to USAAF

The rapid build-up of US forces in Australia during 1942 created a number of logistics problems. Chief among the difficulties was finding sufficient aircraft repair facilities to cope with both the RAAF and USAAF. The number of American aircraft operating in Australia continued to increase as US forces intensified operations in the Southwest Pacific Area. On 2 February 1942, War Cabinet agreed that the RAAF and USAAF should be provided with additional repair and overhaul depots. War Cabinet also decided to go ahead with the planning of six projects involving the construction of engine repair shops which were planned to be built at some distance from aerodromes at an estimated cost of £162,800.[124] Tentative inland locations were selected for 25 associated projects covering all States and providing for a total floor area of 795,000 square feet: Kalgoorlie, WA; Renmark, SA; Mildura, Swan Hill, Maryborough, Vic; Narrandera, Griffith, Junee, Dubbo, Forbes, NSW; Chinchilla and Roma, Qld. Selecting a suitable building site for an aircraft assembly depot was no small affair as it required the grouping of various

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[121] NAA: A705, 9/1/643, pt. 2, Servicing of RAAF aircraft by civilian contractors; Commanding officer's report, 1942-1943, p.3.

[122] NAA: A705, 9/1/1059, pt. 4, Overhaul and repair of aircraft by DAP. Memorandum to director of repair and maintenance, DOA by J.T. Brown, Acting Director, DAP Maintenance Division, Port Melbourne, 28 February 1945.

[123] NAA: A705, 231/9/37, pt.1, Air Force Headquarters, AMOE, Establishment, Aircraft Depots, general, 19 September 1941. Minute by Group Captain, Air Member for engineering and maintenance, to RAAF Headquarters of No. 4 and No.5 (Maintenance) Groups, 19 May 1943.

[124] NAA: A5954, 726/2, vol. 11, (War Cabinet Minutes 1930 to 2292), War Cabinet Agendum No. 176/1942, 18 February to 29 July 1942.

elements, such as the need to position buildings so they were aligned with the prevailing winds. Another consideration was to provide site-road access and easy accesses to nearby facilities, including wharfage. The possibility of an infrastructure expansion in the event of war and to the availability of building sites at Melbourne and Sydney for aircraft assembly depots had been discussed at a meeting held at Victoria Barracks on 12 July 1939. The Essendon aerodrome layout presented too many disabilities: inaccessibility for labour, lack of water and considerable road making required to the site. Competing favourably on all points was Fishermen's Bend, which was unanimously approved by the meeting and estimated to cost £669,170.[125]

When General Douglas MacArthur arrived in Brisbane on 22 December 1941 and setup headquarters at Lennons Hotel, he was soon followed by the American Fifth Air Force. Qantas Empire Airways (QEA) was contracted to overhaul the Wright Cyclone engines on their Boeing B-17 Flying Fortress aircraft. USAAF created new demands which were hard to foresee exactly. Foremost among them was aerodromes, storerooms, camps and other facilities such as repairing and maintenance of their aircraft. In this, Qantas' workshops and maintenance expanded hugely throughout the war where service facilities maintained both RAAF and USAAC/USAAF aircraft.[126] Although DAP provided workshops with essential tools, there were never enough of them. Fortunately, the Americans often provided the resources so badly needed. An American general visiting the Liberator workshop at Archerfield was told of the general lack of tools. The next morning, ten army trucks arrived at the hangar and unloaded air compressors, a 240-volt generator, rivet guns and electric drills.[127]

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[125] NAA: A705, 9/18/24, Availability of building sites at Melbourne and Sydney for Aircraft Assembly Depots, Cabinet Agendum No. 72/1939.

[126] Bruce Leonard, A Tradition of Integrity: The Story of Qantas Engineering & Maintenance, (University of NSW Press, Sydney, 1994), p.25.

[127] Jim Eames, *Courage in the Skies, the untold story of Qantas, its brave men and women and their extraordinary role in World War II*, (Allen & Unwin, Crows Nest,

Engineering staff worked six days a week, repairing and overhauling aircraft for USAAC. During April 1943, servicing work on B-17 Flying Fortresses was stopped as a number of B-24D Liberator bombers required immediate modification to their forward armament. The work was carried out in the open, pending the completion of an Igloo hangar which Qantas had ordered from DAP.[128]

Sir Hudson Fysh recounts that during the late 1930s, instrument repairs were carried out in a small shed at Rose Bay flying-boat base. Rather primitive at first, but very effective, the staff used a vacuum supplied by a milking machine pump. From this early development, the wartime instrument shop at Double Bay was as well as processing its own instruments for repair, also overhauled an extensive flow of vital instruments for the armed forces, 'over 20,000 instruments were put through during the course of the war'.[129] ANA and Ansett also undertook an increasing amount of engine and airframe overhaul and repair works for the armed forces and by the end of 1942 450 employees were engaged in these tasks.[130] In 1942, as US Air Force activity entered the islands to the north, Flying Fortresses and Liberators were sent to Archerfield repair depot in addition to Airacobras and Ansons, Cheetah IX and Wright Cyclones were been serviced at engine shops. In September 1942, 9 Wright Cyclones were turned out for the US Air Corps while a further 32 were under overhaul.[131]

With regard to US aircraft in Australia, plus those scheduled to arrive, the way forward was settled after due consultation at the Chiefs of Staff Committee at a conference held on 9 April 1942 involving senior officers of USAAF and the United States Army. Essentially, most senior US military officers took part in discussions involving US interests. On 17

NSW, 2017), p.286.

[128] Eames, *Courage in the Skies*, p.83.

[129] Sir Hudson Fysh, *Qantas at War*, (Angus and Robertson, Sydney, 1968), p.101.

[130] *Ibid.*, p.164.

[131] *Ibid.*, p.196.

March 1942 General George Brett of USAAC was appointed Deputy Supreme Commander, Southwest Pacific Area and Commander of Allied Air Forces which was formed on 20 April 1942, and had his headquarters in Melbourne.[132] Other conference attendees were the CAS, Sir Charles Burnett, and Essington Lewis, Director General of Aircraft Production. On 14 April, War Cabinet approved the expenditure of £1,301,790 for workshop equipment and the training of technical workforce. On that same day, faced with the continuing delays linked to the drawn out process of committees, USAAF Brigadier-General Edwin S. Perrin, wrote to War Cabinet requesting additional overhaul facilities, diplomatically pressing for a rapid response.[133] Approval being slow in coming, Perrin's letter to War Cabinet indicates the immense strains that developed. He wrote that he appreciated 'the excellent cooperation afforded by [the Department of Aircraft Production] and the organisations under the department in assisting the US in the past trying months'.[134]

What Brigadier-General Perrin saw was War Cabinet's prompt approval to create capacity to service and repair Twin Row Pratt & Whitney engines at Sydney's Lidcombe Aircraft Engine Factory and similar facilities at CAC, Fishermens' Bend to service Twin Row Wright engines. USAAF also requested facilities at Geelong's Ford Motor Company for the overhaul of Twin Row Wright R-1820-65 engines for B-17 aircraft, prompting War Cabinet on the urgency of their engine overhaul requirements for operational aircraft. In view of this, Perrin requested War Cabinet's immediate approval of their projects to ensure that combat aircraft were not grounded due to a lack of reconditioned engines. In response, War Cabinet pointed out that previous arrangements as regards to providing facilities with DAP had been purely

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[132] Jones, *From Private to Air Marshal*, p.80.

[133] NAA: A5954, 726/2, vol. 11, Minute No. 18 of Administrative Planning Committee of 26 April 1942 on establishing facilities for the repair and overhaul of aircraft at coastal and inland centers.

[134] NAA: A2684, 987, pt. 1, Repair and maintenance facilities for US aircraft in Australia, Brigadier General Edwin S. Perrin's letter to the DG of DAP, 7 July 1942.

for EATS aircraft.[135]

The demands of continuous flying required that every effort be made so that the intensity of flying operations could be maintained. As things stood all repair facilities could not meet the need of the USAFIA and doubtless they had anticipated such fundamental logistical problems when they first arrived in Australia. Washington had taken for granted that suitable facilities would be available for US use and had also not anticipated being frustrated by bureaucratic process.[136] The cumulative impact on RAAF Aircraft Depots struggling to function with limited resources led to some strained relations between the two Forces. The Government decided to set up another Committee and a sub-committee to deal with Australian and US demands, which were becoming increasingly complex and difficult to manage. It was decreed that storage space and other facilities would be made available and released in an orderly fashion to meet actual requirements.[137]

Pressure was reduced when it was found that the three existing engine facilities already contained most of the necessary tooling for the overhaul of US engines. The Lidcombe Plant could overhaul Pratt & Whitney R-2800 series engines but needed an additional 15,000 square foot building to store parts and equipment.[138] The Fishermen's Bend site could overhaul the Twin Row Wright R-2600 engines but required some additional tools. In both facilities a traveling overhead two-ton crane, sand-blasting equipment, spray booths and degreasing stations would have to be installed.[139] At the Ford Plant in Geelong (Victoria) some floor

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[135] *Ibid*.

[136] NAA: A9791, 42, DOD, Cooperation of State Governments; Historical Division General Headquarters. SWPA, File No. AG, GHQ 314.7; Reports on organisation and activities of USAFIA, by Major General Julian F. Barnes, 7 December 1941 to 30 January 1942 (henceforth referred to as the Barnes report), p.9.

[137] NAA: A2684, 987, pt. 2, Repair and maintenance facilities for US aircraft in Australia. Questions raised in report No. 22 by the DG of DOM, April 1942.

[138] *Ibid*.

[139] *Ibid*.

space enabled the overhaul of Twin Row Wright R-1820-65 engines. Minor changes in electrical wiring and construction of benches, cribs and so on were necessary. All facilities required engine-specific sets of tools for overhaul work. Other tools were to be issued on loan or duplicated by the USAAF.[140] In response to the increasing work at the ARD, arrangements were made for overflow to be hand over to DAP's civilian contractors. This included USAAF requirements until their own facilities came on line. Even after the way forward was agreed by War Cabinet on 15 July which involved US authorities and the DG of Aircraft Production for £250,000, War Cabinet gave its approval on condition that the facilities would be funded by Australia under Reverse Lend Lease.[141] The philosophy adopted was to reduce new construction and the burden it imposed on already insufficient resources as far as possible.[142]

Finally, War Cabinet ordered additional buildings and facilities at Rocklea (Qld) and at Lidcombe (NSW) been made available to USAAF. On 26 April, after studying the details of the proposed facilities, APC endorsed the project.[143] While the main problems were the lack of ready facilities and the considerable capital expenditure involved which, under Reverse Lend-Lease, committed the War Cabinet to provide assistance to USAFIA. It was the intensity of Australia's actions to quickly implement and assume some responsibility in relation to Brigadier General Perrin's demands that is questionable, particularly taking into account that the US presence provided Australians with reassurance and much needed deterrence against the Japanese threats.

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[140] NAA: A2684, 987, pt. 1, Repair and maintenance facilities for US aircraft in Australia, Brigadier General Edwin S. Perrin's letter to DG of DAP, 7 July 1942.

[141] *Ibid*. Response from War Cabinet, Agendum No. 301/1942, 14 July 1942, Federal government's approval to grant facilities, signed by the Minister for Aircraft Production, D. Cameron on 15 July 1942.

[142] NAA: A2684, 987, pt. 1, Repair and maintenance facilities for US aircraft in Australia, War Cabinet's agreement to provide facilities to USAFIA, 15 July 1942.

[143] NAA: A1308, 706/1/210, War Cabinet Agendum No.176/42, Minute No. 18 of the Administrative Planning Committee, 1942.

Conclusion

This chapter emphasised the important functions of RAAF depots during World War II. In discussing general aspects of the RAAF, Gillison could not detail the full range of support activities at the lower operational levels of defence activities, but he note the existence of aircraft depots and staging bases in northern Australia.[144] With the extension of the RAAF and the arrival of Allied Forces in Australia, a great number of military servicing facilities were established. Most Australians would have been unaware of their existence and significance. Yet, without these technical services and the skilled personnel attached to them, most aircraft would have been rapidly grounded, with a significant impact on frontline capability. This was vital work carried out in difficult conditions, but it has never been truly recognised in Australian military history. This chapter shows that although aircraft mechanics and technicians were confronted with crippling problems, they nevertheless succeeded in keeping aircraft operational through sheer resilience and exceptional ingenuity by reconditioning parts from unserviceable equipment and even making from scratch 'new' replacements.

The need for speed in the overhaul and maintenance of an increasing number of urgently needed aircraft exacted an exhausting toll on ARD personnel. The difficulty of estimating spares requirements well in advance of servicing, and of having parts available when required, added another dimension of the problem. The daily entries in the Operation Record Books and RAAF Unit Histories provide evidence that ground support personnel were clearly focused on solving challenging technical problems, often with limited resources and under the weight of a very high level of responsibility. Although Japanese attacks on Allied vessels rendered shipping routes very hazardous and resulted in the loss of much needed materiel, on 12 August 1944, No. 1 AD successfully completed the overhaul of two Kawasaki engines so that a captured

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[144] Gillison, *Royal Australian Air Force*, pp.70, 125.

Japanese fighter could later be used to carry out comparison tests against Spitfire and Kittyhawk aircraft.[145]

This chapter has demonstrated that ARD personnel did their utmost to return aircraft to service, frustrated as they were by the lack of parts, tools and other essential equipment. It also shows that they had attained a remarkable level of expertise in keeping aircraft operational.

[145] NAA: A705, 109/3/249, RAAF Aircraft maintenance, general engineering equipment & testing equipment and lifting appliances, Air Officer Commanding No. 1AD, report, 12 August 1944.

Chapter Eight: Managing the logistics of war

With major technical changes occurring within RAAF operations, the best-trained force in the world would be powerless without good administrators to oversee the RAAF's growing need for administration. In order to attain maximum efficiency from their military forces, the RAAF was divided into two categories: the fighting corps and administrative services, including ARDs. This issue is just as important as the manufacture of weapons and aircraft acquisition. Hence, we can hardly claim a comprehensive understanding of the RAAF without revealing the inner workings of its administration and organisation. Along with the expansion of the RAAF, the growth of guidelines that headquarters promulgated to all units had become an essential and important part of the system, and yet, has been ignored by military historians. This chapter therefore fills this gap in RAAF history. It investigates the organisational and administrative functions of the RAAF and it shows that individuals in their respective hierarchies managed the critical interface between responding to the administrative needs and task deliveries of the RAAF. In circulating their instructions and amendments to units, RAAFHQ expected that all their personnel would endorse their contents sufficiently. As this chapter argues despite the careful and detailed design of government and military administrative structure, mistakes and inaccuracies and oversights by those employed in clerical tasks in Australia were common. Office management systems in this era were unable to detect or correct errors of this nature, and the higher staff turn-over in wartime diluted the level of experience and possibly the level of dedication needed to minimise clerical errors.

This chapter demonstrates that many of those employed in the administration, repair and stores depot lacked a clear purpose in their tasks which, consequently led to performance failures. Judging by the comments made by RAAFHQ in reports and minutes, and by the flow of

amendments and new instructions distributed to personnel, the RAAF was trying to find solutions. Also, miscommunication or lack of communication between units and headquarters and suppliers was a key problem and widespread. Owing to the imposition of austerity measures, the Government had to ensure the maximum efficiency of its forces and industries within the funding, personnel and materials available. Poor communication and lack of coordination occasionally led to competition for resources and waste of effort. In some cases, the war with its changing priorities may partly explain that some problems were caused by an inability to respond to changing circumstances simply because the military machine is not well designed to cope with these situations.

Background principles of RAAF instructions

Leigh Edmonds in examining the communication system in the Pacific theatre explained that Command, Control and Communication were vital contributors of war. Through a laborious system of 'cybernetics', which he clarifies 'as a system for propagating, receiving and acting upon messages' the air force operated successfully because communication is closely linked to control'.[1] The Orderly Room was the area which administrative matters 'were handled in a routine and orderly manner',[2] and within this environment clerks were trained 'to a uniform standard'.[3]

However, as this chapter will show this is a slightly over-simplified version of what went on in different environments of the RAAF. What motivates a person and his or her attitude towards allotted tasks is complex as the priorities of personnel needs and aspirations differ for each. The fact is incomplete or misunderstanding instructions have no place in a military force. What this section illustrates is interpreting RAAF

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[1] Leigh Edmonds, 'Hardware, software and wetware: Seeing the Royal Australian Air Force during the war in the Pacific as a cybernetic system', (13-19), *Journal of the Australian War Memorial*, no. 24, (April 1994), p.13.

[2] *Ibid*., p.14.

[3] *Ibid*., p.16.

administrative and technical guidelines and having to abide by all their amendments must have been considered as a laborious and tedious task by some personnel. From time to time, several orders and directions were issued to various establishments in the belief that these would provide the necessary level of understanding to those consulting the particular regulations related to RAAF supply. The RAAF Field Service Regulations had been written for this purpose but it is possible that all new and amended instructions did not reach all intended recipients, or sometimes were not fully understood or possibly not even read.

Obviously, each new case potentially presented a set of unique problems requiring both consultation and mutual understanding of tasks and responsibilities. To obtain maximum cooperation, all relevant personnel were fully briefed. In a conscious effort to remedy the situation, the movement section of Advanced Land Headquarters (ALHQ) laid down clear responsibilities from the time provision action was initiated through the various stages of handling, storage, movement, delivery and so on until they reached RAAF units. It was concluded that the most efficient way to deal with any problem was to deal with each separately and in turn. The door was then opened for dialogue and improvement, consistent with the fundamental elements of communication, which required all Chiefs of Staff to consult and seek advice from other staff officers to choose an appropriate course of action and pass on their decisions to the lower ranks.[4]

In seemingly mundane work such as in the shipment of parts and spares, omission of items, errors in or missing paperwork caused delays and unnecessary additional work and frustration at many points in the system. Just like the RAAF, the Army and USAAF were not immune to the problem. Australia's Army Ordnance, although operating short-handed and often with inexperienced store clerks, was often accused of poor inventory control, and inefficient management of the all-important

[4] NAA: A2653, vol. 2, Military Board Proceedings, signed by the Secretary to the Military Board, AALHQ memorandum to all RAAF units, 1940.

distribution to units. Of course one of the primary considerations would be to air any such issues even if the effort invested took months. As an example, on 3 August 1942 the General Headquarters of USAAF (GHQUSAAF) issued an instruction defining the Australian Army Headquarters as the responsible authority to provide transport for the movement of all RAAF personnel and stores to operational areas in northern Australia. This instruction also included unit movements, reinforcements and shipment of equipment and stores, in accordance with priorities laid down by the Commanding General of Allied Air Forces for the RAAF, US Fifth Air Force and by GHQUSAAF. On 5 November 1942, ALHQ Movements section advised the Air Board that the RAAF had failed to inform them of their transport requirements for the Gulliver base. On 12 November, RAAFHQ was informed that the Deputy-Quartermaster General could not accept responsibility in connection with Gulliver or other movements, as they did not have the necessary transport facilities. It would seem the intent of the instruction advising new procedures had been lost in its interpretation. To clear up the confusion another conference was held at GHQUSAAF on 30 November and 8 December, attended by high level staff of the RAAF and the Army. On 3 December, after considerable discussion, it was decided that the movements of RAAF Operational Units and Ancillary Units would now be administered by the Commanding General of Allied Air Forces. GHQUSAAF were to respond to all ALHQ needs by establishing priorities for all personnel and material movements and ensure proper co-ordination and correct observance of priorities for all Air Force organisations including the RAAF and the US Fifth Air Force.[5]

Taking stock of RAAF administrative directives

The development of RAAF administrative structure began in 1920 and grew in complexity as the RAAF developed into an organisation with its

[5] *Ibid*.

operational units mainly based in Victoria and New South Wales.[6] Since its establishment, the RAAF had expanded into a large organisation with a well-established administrative system that routinely circulated masses of paper detailing rules were regulations and procedures reminded personnel to accurately record events, and requiring them to comply with all details pertaining to regulations. Operation and maintenance of aircraft had acquired its own specialised methods and language with numerous technical terms being introduced as new engineering technologies and improved methods of quality control developed. To achieve optimum performance from its aircraft, RAAFHQ produced Air Board Orders, Air Publication, Weekly Orders and RAAF Instructions. Distributed to all establishments, these instructions were meant to remind RAAF personnel to carry out tasks accurately and to take all reasonable care in keeping aircraft fully operational. To illustrate, a large number of discrepancies in ARD reports taken at random by AID showed that many aircraft were incorrectly reported. Physical checks of aircraft against schedule were often not made prior to the machine been issued to other units, while consignor units neglected to make proper schedules checks when the aircraft was handed over to them. Such practice led to consignee units having a list showing both surpluses and deficiencies of schedule items that contradicted statements by receiving units.[7]

Major changes were made to government administrative arrangements to reflect emerging priorities and to meet new planning and management challenges. The expanding military administration operated using a large but generally inexperienced workforce that was not always competent or fully reliable. Poorly completed forms exasperated depot personnel and inspectors well into the post-war period.[8] Correct handling of technical

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[6] NAA: A7673/1, 1/2/1937, RAAF Weekly Orders, (Issues 384 and 405 - 1936-1937), Issue N.405, 1 February 1937'; Brief history of RAAF administration.

[7] NAA: A7672, Section N/1943, RAAF Section "N" Temporary Orders & Notices: N.357, stocktaking, 1943.

[8] NAA: A705, 9/1/643, pt. 2, servicing of RAAF aircraft by civilian contractors, routines - standard forms, etc. 1942-1943. Wing Commander Senior Maintenance Staff Officer to the Secretary of the Air Board, 28 September 1943.

paperwork was essential to RAAF flying operations. Much time was wasted if forms were not completed accurately or if inappropriate forms were used. Headquarters decided that the best approach was to reach some sort of agreement with all involved parties of the RAAF. The cardinal rules imposed on all was that a paper trail would provide concrete information on the history of aircraft reliability and maintenance and that all Instructions be read and followed precisely.[9]

High-level communication and planning left much to be desired. A total of 32 Air Stores Parks provided various supply to Airfield Construction Wings (ACW). For example, 21 Air Stores Parks (ASP) provided support to 62 ACW. It concentrated on holding stocks of transport and works plant spares. However, the unit was hampered by a lack of direction as the CO of ACW noted in December 1944, 'it is felt that the unit suffers from a complete absence of anything on paper to definitely set out its function'.[10] The CO of 21 ASP verbally informed that it would become a unit under 62 Works Wing and would be responsible for five Airfield Construction Squadrons, but had not received clear advice from higher authority regarding the unit responsibilities. Similarly he had issues with stores holding policy and complained that he could not leave this important matter to chance. He was unaware as to the number of units to service, and for how long, or the establishment from which equipment could be requested.[11] The Army on the other hand dealt with failure to follow their instructions by introducing new and drastic penalties to officers and other staff. Delays were traced to the failure of senior officers to accept the responsibilities of decision-making, and they were instructed to delegate some of their tasks to subordinates. Failure to accept and discharge the responsibilities of rank or appointment was a sufficient cause to remove an officer from his

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[9] NAA: A705, 109/3/1206, Department of Air, Final Inspection section, Aircraft Depots and Aircraft Parks, 1943.

[10] NAA: A705, 9/1/1059, pt. 4, Overhaul & Repair of aircraft by DAP. Correspondence, August – December 1944.

[11] *Ibid*.

position.[12] General Blamey, the Commander in Chief of the Australian Army, even found it necessary to give strict instruction that all cases of undue delay and failure to delegate authority or to answer correspondence were to be reported to the appropriate authorities. While the style of intervention may seem harsh, the Army believed that this was an effective way to reduce administrative bottlenecks.[13]

The dynamic or even turbulent situation created some inconsistency of communication across a whole spectrum of governmental departments posing a further barrier for those depending on and expecting clear instruction. There were no allowable short cuts to RAAF procedures. Given the number of personnel involved in the system and the human factors at play, reaching a satisfactory method of transmitting details and completing requisitions in accordance with RAAF Instructions remained a hazardous process given the uncertainties affecting meeting stipulated completion-times. The involvement and coordination of a multitude of public organisations may have been destabilising and confusing for many clerks and administrators in the middle and lower levels. However, this scenario oversimplifies a much more complex reality. These problems were just as prevalent in later years, indicating the difficulties of managing change under pressure.[14]

Stores and stocktaking procedures

RAAF logistic support drew heavily on established British procedures to facilitate management, administration and financial control imposed by government. One key aspect of this development was the stores

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[12] NAA: A5954, 199/13, Administration Allied Depts. Army Administration - concerning criticism of allegations by Army of delays by the Business Board; Action to eliminate bottlenecks - Press release. The Deputy PM and Minister for the Army, Forde's statement, 2 November 1942.

[13] *Ibid*.

[14] NAA: A705, 9/1/1178, pt. 2, Overhaul and repair of aircraft. Policy: Inspection schedules, transport overhauls; Group Captain commanding No. 5 (Maintenance) GP to the Secretary of the Air Board, 19 December 1944.

accounting system introduced after World War One, modeled on the RAF storage system.[15] The RAF had acquired experience handling huge quantities of equipment held in stores depots destined for various units and had introduced a system adaptable to RAAF needs, but should have provided RAAF personnel with adequate training and advice.[16] Most of the RAAF equipment was stored at Point Cook and Spotswood, Victoria and needed to be put in some sort of order.[17]

As with the establishment of many new organisations, some trial and error was unavoidable. As no attempt had been made to develop internal expertise in auditing stores accounts, auditing was defaulted to the Auditor-General's Department. Stocktaking of the large inventory of the Imperial gift was first attempted in 1923. It failed because it proved difficult to find many items due to inappropriate storage, lack of adequate descriptions for items and a lack of complete and accurate listing of assets. Patchy personal knowledge of much of the equipment made recovery of the situation impossible. Overcoming the problems caused by the inaccurate way in which the accounts were established proved virtually impossible. Thus stocktaking expectations realistically grounded in the knowledge that it 'could be regarded at best as only a step in the process of putting the stores administration on to a proper basis'.[18]

By 1926, thousands of RAAF stores items were transferred to a new facility at No. 1 AD at Laverton where they were identified, organised, recorded, binned and assembled for the first time into proper order. At about the same time the accounting was greatly improved with new mechanical ledger-keeping methods, and by a gradual centralisation of the accounts under a specialist staff.[19] Experienced staff at RAAFHQ

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[15] NAA: A9186, 288, RAAF History Sheets (Form A50) Operations Record Book, No. 1 Aircraft Depot, Laverton, Victoria, Brief history of RAAF administration. May 1920 - December 1929.

[16] *Ibid*.

[17] *Ibid.*

[18] *Ibid*.

[19] *Ibid*.

administrative sections in Melbourne and at other clerical sections of the RAAF was overloaded with submissions and schedules. The slow response of the logistic machinery was often caused by the simple fact that issue requests and other official documents were incorrectly addressed, lacking essential details required to be processed or being sent to wrong locations.[20]

Most important was the need to keep stock in good order and record the quantities sent to workshops, external sub-contractors and RAAF Depots. The RAAF was not the only organisation that suffered from the on-going shortage of manpower. DOM's Stores Branch activities had increased in step with the expansion of the functions of the other departments and the increased volume of production in munitions factories and annexes producing material for the war effort. While centralising all accounts brought great improvement with ledger-keeping methods, these did not capture all the internal movements at Stores or between Units and irregular checking and limited auditing allowed the errors and omissions to accumulate. New staff were assigned to the task of making a full inventory of items, improving the accounting system and simplifying when possible. It was realised that the previous distressing state of the records and the difficulty of finding and redressing errors was the direct result of the delay in training internal audit staff and to the Auditor General's reluctance to carry out further audit activities in some of the stores. The problem was that by 1926 much of the huge accumulation, which made up the 'Imperial gift' material was by then obsolete or unserviceable and was disposed of by sale or written off.[21]

The introduction of mechanical recording devices made it possible for all Procurement Sections to be supplied with audit sheets setting out for each supplier the total contract value, weekly contractual rate,

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[20] NAA: A9435, 119, Commanding Officer reports of RAAF Squadrons and Units – Nos. 2, 3,4, 6, 8, 9, 10 & 11 Stores Depots, 1941-1944.

[21] NAA: A9186, 288, RAAF History Sheets (Form A50) Operations Record Book, No. 1 Aircraft Depot, Laverton, Victoria, May 1920 - December 1929 - Brief history of the stores administration of the RAAF, 20 December 1929, p.2.

deliveries by the States, total deliveries to date, balance outstanding and arrears on contract. These sections were able to monitor suppliers who were behind on contracts and if necessary arrange the transfer of unfilled contracts to other suppliers to ensure that overall targets were on track. This however was difficult to maintain in wartime when an expanded but generally untrained workforce took over these tasks.[22]

Carelessness and inadequate supervision were responsible for inaccurately maintained clerical records. This can be inferred from instructions requiring unit accounting officers to make frequent but unannounced checks of units' stores inventory and accounts to ensure that records were correctly maintained and stores adequately safeguarded. As noted in an ABO: 'considerable neglect in their maintenance being apparent'.[23] In taking remedial action, the accounting officer was asked to use his judgment to achieve the desired purpose. Checking vouchers against entries in the accounts was also recommended, and by calculating a running balance between tallies and ledger sheets it was possible to pick up discrepancies. Further examination of books was recommended to ascertain if sheets had been torn out, and vouchers not yet processed were checked to determine if there were excessive delays.[24]

All units were asked to provide new returns after checking current holdings against previous returns and report discrepancies. A complete list of items was compiled from the new returns and kept up-to-date by applying all subsequent variations. To headquarters this was a far simpler process than reproducing once more a whole list. To save time and to avoid the trouble at headquarters of inserting amendments, the argument advanced was to reduce the number of man-hours and the

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[22] NAA: A12269, RAAF, ABO, Section "N", Temporary Orders and Notices, Issues (Nos. 1-896), N.752: Stocktakings, 1940.

[23] *Ibid*.

[24] NAA: A7673, Issues 448 to 527, bound volumes of RAAF Weekly Orders; Stocktaking, N.487, 1938.

consumption of paper.[25] Clerks were advised to use a card system or a loose-leaf index, as the master control in line with current practice in commercial enterprises and some government departments had already adopted. However, mistakes continued to occur. Whenever a change of key personnel was to be effected Station Commanders were to ensure that AFO. Appendix 19/B/16 (stocktaking) was followed. The outgoing Equipment Officer was to remain responsible for the stocktaking of equipment and hand-over.[26]

To reduce incorrect interpretation, stock-takers were instructed to provide estimated quantities of their holdings including items on loan for which receipts must be produced. These were entered on Form E/A/19, Certificate of Stocktaking bearing the name of the unit and group of stores concerned, dated and showing the total number of Details of their description from the bin or other labels (or if necessary from RAAF Publication No. 2) were obtained. In doubtful cases the services were requested to provide a qualified person to advice on the correct description sheets and its own consecutive number, prepared in duplicate. Generally personnel employed in repetitive and tedious work lose interest to the point where mistakes become commonplace. There is remarkably little written about why human errors occurred. Middle-ranking officers, while providing some explanations in their correspondence, usually failed to dwell on the personal factors behind the occurrences. One small but important improvement in stocktaking was introduced by Eastern Area on 13 June 1945 because the frequent relocations of the unit made it impossible to carry out a full stock-take in the interval between moves. Prior to relocating a Squadron, it was decided that it would be more efficient if the bulk of their accounting records were sent with the advance party allowing records to be

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[25] NAA: A705, 109/3/249, RAAF Aircraft maintenance, general engineering equipment & testing equipment. Lifting appliances, 1939-1943, Half Yearly Return of General Engineering Equipment AFO, 19/F/4, Letter to the Air Board from Group Captain, Commanding No. 5 (Maintenance) Group, 11 March 1943.

[26] *Ibid.*

accessed while the follow-up convoy was still in transit. This avoided the confusion of trying to unravel and catch up with changes that had accumulated over three weeks or so.[27]

Area Finance officers frequently referred to errors and omissions in minutes and letters, requesting RAAFHQ to amend their Weekly Orders and Instructions to clarify or tighten procedures. Recognising that some unit leaders were placed in positions with little supervisory experience while others were reluctant to make decisions on their own authority, they were asked to pay more attention to the work of subordinates. Most of the problems associated with this laxity were 'abnormal discrepancies of equipment due to bad storekeeping and accounting; failure to allocate the responsibility for losses and damage due to inexcusable delays in dealing with investigation'.[28]

Evidently, good control procedures are necessary but too much of the same thing can also promote undesirable effects as it seems bureaucratic systems and in particular, the Army, tend to resist innovation or even minor change. For example in 1939, an Australian inventor advocated replacing the scarce and expensive aluminium core-tip of the .303 bullet with a functionally equivalent plastic filled-tip.

After an extensive exchange of communications and several visits to Army Headquarters for discussions, the Army finally accepted the inventor's idea. The invention and development of the Owen sub-machine gun underwent the same type of scenario before acceptance. Evelyn Owen, of Wollongong, developed a light sub-machine gun with a high rate of fire and exceptional simplicity and reliability. He submitted drawings to the Inventions Board in Sydney in July 1939 but they rejected it on the grounds that the British Army 'did not use weapons of

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[27] NAA: A11066, 8/2/19, RAAF Headquarters, Eastern Area; Organisation of operations - Brisbane area, 1942- 1944; RAAF Air Board Order, 19 July 1944.

[28] *Ibid*. Minute: supervision of unit administration by commanding officers from Air-Vice Marshal, Air Officer Commanding NWA, to all RAAF Units, Darwin, 28 August 1944.

this type'.[29] The Board also informed him that if his drawings were dispatched to Britain he should not expect a response for two years. In September 1940 the Owen gun was reconsidered by the Army as a result of lobbying by the Manager of Lysaght Works at Port Kembla. It was tested against two other sub-machine guns (Sten and Thompson). After immersion in mud and covering with sand to simulate the harshest environments, the Owen gun was still firing after the other types had jammed.[30]

Problems maintaining engineering equipment

There were also a number of issues related to the return of general engineering equipment to store by units. Under a long-standing arrangement, equipment no longer being used was returned with accompanying paperwork to the central facility. Established in the pre-war era this *ad hoc* arrangement was not closely monitored and had grown without restriction. By the 1940s with the increased scale of operations and the greater range of equipment in use, the number of 'returns' had increased to the point where a re-think of the process had become urgent.[31] As noted by one CO, units had developed a careless attitude toward returns which 'had survived tenaciously'.[32]

Once instituted as a 'return' each item had to be inspected, tested and, if necessary repaired to ensure the item was in serviceable condition before it could be returned to stock or written off. Due to cost in man-hours and materials and scarcity of labour many of the older items had no net value. Clearly non-economic expenditure could not be tolerated neither could the indefinite accumulation of unexamined returns

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[29] *You, Me--and This War*: *A critical account of some problems in Australia's organisation for defence,* pp.44, 105-108.

[30] *Ibid*.

[31] NAA: A705, 109/3/249, RAAF Aircraft Maintenance, General Engineering Equipment - Testing, Inspection, etc., Lifting Appliances. Letter to the Air Board, Melbourne from Group Captain of No.5 (Maintenance) Group, 11 March 1943.

[32] *Ibid*.

be regarded as a solution. It was generally understood that wartime created an over-riding reason to pay limited attention to administrative details. However, in this matter headquarters still required keeping to this elaborate process for of all general engineering equipment covered by AFO. 19/F/4. Recording airframe and engine hours in operation was introduced on 31 October 1938 by the Air Member for Supply instructing squadrons and flying units, depots, workshops and stores to maintain log books correctly.[33]

Although RAAF headquarters circulated Aircraft Instructions (AI-13) describing the correct procedure for units when delivering aircraft to ARD, failure to complete forms accurately regularly created additional work for depots that depended on the accuracy and completeness of the paperwork. Valuable time was wasted matching up, checking log books and adjusting aircraft schedules.[34] Aircraft instruments sent for repair to contractors by EATS units and others often arrived without 'Instruction to Proceed' vouchers (ARD Order - Instruction to Proceed - Form E/E.104). The form was the basis of contractors' claim for payment and the Air Board's authority to make funds available for payment. Without this authority contractors were unable to repair and return instruments to the RAAF, a situation that could cause delays if unchecked. Contractors were instructed to return instruments to the depots for return to stock on completion of repairs unless otherwise instructed, for issue against demands for instruments in the normal way. All units concerned were instructed to ensure that all instruments for repair by contractors were processed in accordance with set instructions.[35]

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[33] NAA: A7673, Issues 448 - 527, bound volumes of RAAF Weekly Orders. Log books: Issue No. 484, 1938.

[34] NAA: A705, 150/4/2495. DTS, publication of Technical Order, AGI- A13. Refers to the collection and delivery of aircraft at ARD and AP, 1942-1943. Minute to all COs of Depots from No. 5 (M) GP, 9 March 1943.

[35] NAA: A7673, 113/1/651, RAAF Air Board Orders, Section "N". Temporary Orders & Notices, (Issues Nos. 1-1029), Repair and distribution of aircraft instruments: N.520 regarding the failure of some contractors to fill in forms correctly or omitting doing so, 3 July 1942.

Analysing office communication

Increasingly the amount of tedious paperwork had a serious effect on clerks. Incorrect addressing of signals and correspondence led to delays in registering documents and mistakes in classifying and filing. For example, correspondence destined for the operational base at Hamilton, Queensland. was often sent to Armament School, Hamilton, Victoria.[36]

Various depots addressed grievances to the Department of Aircraft Supply or to RAAFHQ regarding non-acknowledgment or excessively slow response to their returns. This led Headquarters to release instructions on the proper handling of messages and signals, particularly to those classified important or higher priority.[37] Even though, the frequency of complaints continued. On 5 November 1942 staff was reminded to handle correspondence promptly. In some cases, weeks passed without acknowledgment being received. In one instance a staff member was told to be more attentive to daily tasks and instructed to list daily communications, whether inter-departmental memoranda or letters received from outside sources and to which replies had not been achieved within 48 hours of these being received.[38]

Indexing was of a skeletal nature mostly depending on the knowledge and memory of Records' Officers. Failure to quote file reference numbers on outward correspondence led to time-consuming searches and frequent misfiling. A serious paper shortage caused the abandonment of the filing system for all outward correspondence, adding to the difficulties of records, while saving thirty percent in paper stocks.[39]

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[36] NAA: A7672, Section N/1943, RAAF Air Board Orders, Section “N”, Temporary Orders & Notices: N.247. Regarding incorrect addressing of correspondence, Air Officer Headquarters reporting the various administrative mistakes to the Secretary of the Air Board, 2 April 1943.

[37] *Ibid*.

[38] NAA: A2671, 10/1941 and Supplement 1, War Cabinet Minute Agendum 10/1941, Remote Receiving Stations: RAAF communication poor.

[39] NAA: A9186, 288, RAAF - brief history of stores administration, Operations Record Book. No.1 AD, Laverton, Victoria, May 1920 - 20 December 1929, report

Such minor administrative problems produced stalemates or held up responses from other areas. One particular example of this concerned a Bill of Lading essential for the clearance of aircraft timber that had taken ten days to reach the Traffic Control section in the Beaufort Division. It required a Clearing Order for the shipping company concerned to release the consignment, which they claimed they never received. Eventually, the problem was traced to the Mail Room where those responsible claimed they were unable to decipher details on the Bill of Lading. The document, which had not been placed in a properly addressed envelope, was set aside and no further attempt was made to forward it.[40]

Providing for the USAFIA – administrative procedures

To make provision for the US Forces, instructions issued by various RAAF headquarters to all units were revised. Equipment Administrative Instruction Serial No. 75 gave units authorisation to provide 'normal services and reasonable issues from RAAF stocks for US units at the request of responsible US authorities'.[41] Another important document was the direction and related instructions, Issues from Stores and Aircraft Depots which specified 'where US Units were operating at RAAF Stations, all bulk supplies were to be obtained from the appropriate stores or Aircraft Depot through the Station Equipment Officer'.[42]

If US Units were stationed at independent US Stations in their geographical zone, arrangements provided that a RAAF Equipment Officer was permanently available to assist US Units to provide advice

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from the Air Officer Commanding regarding the necessity for economy.

[40] NAA: MP407/13/0. Correspondence, Department of Aircraft Supply, 1942-43; Report from the senior officer in charge of the records section, 1941.

[41] NAA: A7675, vol. 1, RAAF Equipment Administrative Instructions,. Serial No. 75 authorise giving normal services from RAAF stocks to US units, upon request of US authorities. Minute, Wing Commander, Director of Equipment and Administration, 4 September 1942.

[42] *Ibid*.

for requests, issue, receipt, etc. Bulk stores issues to independent US Stations were done by Repayment Voucher.[43] In 1942, administrative instructions detailing procedure for requisition by and delivery of stores and equipment to the RAAF and the US Forces by Australian Ordnance Depots generated a considerable stream of paperwork as documents detailing demands passed up the chain of command for approval. A system of priority was introduced. Schedules were marked 'A' or 'A.1'.[44]

Documents were passed on to five or six organisations responsible for financial, legal and implementation of procurement. In many cases when a requisition was submitted for approval, several copies were distributed to the three nominated chiefs of the USAFIA and one each to the DG of DOM, the DG of Allied Works, the Administrative Planning Committee and DOSAD. The project then waited for a decision, which could not be agreed until all the addressees met to formally consider the merit and priority of the proposal. Only packages correctly prepared passed scrutiny by administrative officers and were then passed on to relevant committees. Deficient documents were returned to originators for correction and provision of further information. With such a system in place the ability to respond to urgent request may not have been readily accepted by all involved. One possibility open to those wishing to shorten the waiting time was to telephone the OIC of the issuing Depot, who would then advise the Deputy Director of Supply for action.[45]

Overseas suppliers – long problems with lead-time

The procedures governing aircraft procurement were unfamiliar and seemingly complex to many personnel. This can be illustrated by the submission (Overseas Indent No. 657, 1938) authorising the purchase of

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[43] *Ibid*.

[44] NAA: A9791, 42, Department of Defence; Cooperation of State governments in connection with matters of defence value. Report on State government works and other services, 30 January 1942.

[45] *Ibid*.

40 Beaufort aircraft and supporting spares including 12 Taurus engines. Without any service history to draw on it was difficult to estimate the types and quantities of parts required to support operations for the aircraft. Despite a comprehensive list of items prepared by the Air Member for Supply, on quantities to be purchased at the time of initial delivery. A solution was found by using the history of parts consumption by the related Bristol Bolingbroke aircraft in service with Canada as a guide to future Beaufort consumption of 'wearing parts such as undercarriage components, tanks, brake equipment, etc.' This approach was also used as a guide for overhaul requirements for Taurus engines.[46] In another instance the supplier had advised that during December 1941, January and February 1942 defective radius rods for Anson aircraft had been dispatched to the RAAF quoting relevant serial numbers.[47] Receipt of this information required mobilising personnel to check maintenance records and all Anson aircraft with radius rods that had been renewed since December 1942 and checking all stock held at RAAF stores to determine if all the radius rods with matching serial numbers could be accounted for. Once this task completed, the number and location of all defective items were signaled to RAAFHQ to the attention of DTS to develop a plan for remedial action. A lack of clear focus on policy purpose persisted. The most common complaint from the Records Section was that returns were not being prepared in accordance with RMGI. 1/3/8. RAAFHQ was ever hopeful that once correctly filled in, a copy of each return would reach their office on time, not later than the 10th day of January, April, July and October. These dates were hardly ever met.[48]

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[46] NAA: A705, 9/18/1, Overseas Indents 55-1 & 65-8. Maintenance spare parts, materials & overhaul equipment, etc. for Beaufort aircraft – Taurus engines called for an overseas Indents Nos. 550, 591 & 657.

[47] NAA: A7673, 1943, RAAF Air Board Orders - Section 'N' Temporary Orders & Notices, (Issues Nos. 1-896), Missing Anson Radius Rods: N. 205.

[48] NAA: A5954, 199/13, Administration, Allied Departments, Army administration concerning criticism of allegations by Army of delays by the Business Board Administration, 1943.

When an Audit Inspector investigated the Lidcombe engine factory stores department, 'goods received notes' were no where to be found. The correct procedure would have been to register all incoming goods at the factory, noting supplier date, order number and information related to suppliers' delivery dockets, etc., This step would normally have occurred prior to receiving copies of the suppliers' invoices from the CAC in Melbourne for certification of goods received. On investigation, the Auditor could not reconcile vouchers with the quantities of items paid for on overseas vouchers and the quantities of items received at the factory. Examination of journal entries showed payments to local and overseas suppliers had been certified to comply with the London Account Reg. 57, but it was apparent that those responsible for the certification had not complied with the statutory provisions. By verifying overseas vouchers, the Chief Auditor's staff compiled a list of 125 items listed on various vouchers from factory records but evidence from other records showed that goods listed in the vouchers had been lost at sea. The Auditor uncovered further problems related to control of the fixed assets at Lidcombe when he discovered that a physical stock-take of plant had never been done since inception.[49]

Lack of space in RAAF store depots, 1943-1945

Lack of time, space, manpower, inadequate facilities and funds contributed to poor practice. This situation was described in 1945 by AMEM and the Senior Equipment Staff Officer of RAAFHQ of No. 4 (Maintenance) Group. They reported that considerable waste of equipment was caused by a lack of proper treatment before equipment was placed in long-term storage and to a lack of follow-up maintenance while in the depot. It was not until after the cessation of hostilities that sufficient storage space was available to allow a satisfactory layout of the complete inventory. Since the RAAF adoption of the RAF's method of

[49] NAA: A1831, 1942/139. Letter to RAAF Headquarters from the Secretary and Chief Inspector of the Commonwealth Audit Office, Melbourne, 12 August 1947.

handling stores at workshops, copying the RAF's system may not have produced the best result because the RAF had about one million square feet of workshop space compared to the RAAF requirement of approximately 1/8th of this total.[50]

Specialised storage facilities including environmental control were required for sensitive equipment. Technical Officers posted at Stores Depots were equipped with essential tools to carry out periodical checks laid down for such equipment as air-sea rescue equipment, parachutes, instruments, etc. Increasingly, the RAAF needed additional workshop space to perform minor repairs, breakdown of assemblies, inspection and identification of items.[51] Advanced LHQ (ALHQ) proposals regarding movements of units to New Guinea were unacceptable to Q Plans or Movements, who stated that the fault lay with the General Staff at ALHQ in not establishing a general headquarters' priorities for all movements. As not all of these were established priorities, it resulted that when proposals were submitted, the matter was argued for some time. The solution was to create a central co-ordinating authority. Meanwhile, such lengthy debates with freight shipments reduced the prospect of units receiving supplies in a timely fashion. A conference held on 10 March 1943 decided to introduce a decentralised system, dividing Australia into a series of zones, with field formations in each zone made responsible for the allocation of controlled stores within that zone.[52] Land Headquarters (LHQ) allotted an Ordnance Depot to the First Australian Army for NSW and Victoria and provided the depots with sufficient stocks to cover contingencies, including a percentage surplus to form the General Staff Reserve (GSR). In terms of effectiveness, LHQ maintained GSR and when items were in short supply LHQ provided these to zones.

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[50] NAA: A705, 231/9/818, pt. 1,RAAF Headquarters, Chief of Air Staff; Organisation, Establishment of RAAF Stores Depots and Maintenance Facilities; Technical Maintenance staff; No. 6 Stores Depots, 1945.

[51] NAA: A11233, 7/1/1B, pt. 1, No.4 (Maintenance) Group, Official History. Group Captain, Senior Equipment Staff Officer commenting on the acute shortage of storage space at stores depots, December 1944.

[52] A7675, vol. 1, RAAF Equipment Administrative Instructions, 1936 - 1942.

The LHQ formation commander could in an operational emergency use the stores as he saw fit.[53]

Six months later the Director of Equipment noted that policies concerning deliveries from overseas suppliers were contained in the Master Depot's Policy. A new policy to prevent unnecessary double-handling involving several stores depots was introduced. Only depots nominated as Master Depots (Nos. 1, 6, 7) were to receive equipment direct from ship. This method was considered more effective than double handling at seaboard depots. As existing Depot Holding Policy required the storage of technical equipment at Inland Stores depots, it was recognised that seaboard depots would with time lack personnel experienced to handle technical equipment.[54] Scarcity of aircraft spares encouraged depots to develop a culture of self-help by holding equipment and aircraft spares. RAAFHQ knew that some depots were holding stocks of spares urgently required by others. One Routine Order stated that headquarters were aware that some units requested equipment and items in excess of their maintenance requirements and 'unless this practice ceases, much equipment [will] become dispersed into units which have no constant and regular use for it'.[55] RAAFHQ ordered that any items held in excess of unit actual requirements returned immediately to the appropriate Stores-holding unit.[56]

Personnel were ordered to closely collaborate to make certain that such occurrences did not recur. This loss of spares' visibility once leaving stores depots created serious operational problems for squadrons. Until the introduction of modern computerised systems, little could be done but to rely on the dedication and efficiency of store

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[53] NAA: A1196, 12/501/72, Lines of Communication, Darwin; Formation, Commanding Officer's report of LHQ, 1942.

[54] NAA: A705, 9/1/1393, Directorate of Equipment Administration (DEA) Aircraft & associated spares, Delivery to Master Depots - Policy, 1943.

[55] *Ibid.*

[56] *Ibid*. (As specified under the terms of ABO A199/42 and RMG I, 1/1/1 Repair and Maintenance General Instruction).

personnel to follow procedure to the letter. Laxity within the supply systems also allowed units to build up local caches of consumables. Anything ranging from a handful of nails, oil, screwdrivers, rifle pull-throughs, brooms, etc, over-ordered and accumulated led to a depletion of stock at stores depots and non-fulfilments of orders from units with genuine needs.[57] Some missing items could be sourced locally if petty cash was available. On occasions where a requisition for stores was submitted without result, several repeats followed. This failure to communicate would then result in duplicated requests eventually being delivered unexpectedly many months later when no longer needed. At this stage no one really knew or cared whose fault it was.[58]

Inadequate packing, negligence, pilferage and the unions

The logistic problems involved in the prosecution of the Pacific war were legion and intricate in their interlocking and competing priorities. Australian and American aircrews were confronted by the operating conditions – serviceability of aircraft, condition of airstrips and their distances apart, transport problems, accommodating and messing.[59] Air-Vice Marshal J.E. Hewitt was impressed by the high-level logistical training available to USAAF and to US Navy officers which managed to move and to operate huge forces over thousands of miles by sea. Hewitt felt that, in comparison to their Australian counterparts, American senior officers and leaders in industrial, scientific and technological fields were better trained to analyse lapses in logistic implementations and therefore resolved a variety of logistical problems.[60] However, working out solutions in an office environment is clearly different in the field. Over-

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[57] NAA: AA1966/5, No. 4 (Maintenance) Group; Operations Record Book. Routine Orders compiled by Commanding Officer of No. 4 GP, 1942.

[58] AWM52, 10/38/5, Routine Orders from Headquarters OC 2/5, Aust Sup Depot Coy, Allied Supply Council, 31 July 1945, No. 627, AASC, June 1943 to February 1946.

[59] Hewitt, *Adversity in Success*, p.162.

[60] *Ibid*., p.323.

focusing on multiple logistic problems posed by various military environment constraints were not that simple to solve. In Australia, as far as the RAAF and the manpower employed in support of their operations, all too often things could go wrong arising from a dearth of challenges, especially when it involved manpower of different aspirations, skills and capability or those unwilling to cope with their environment. Rules of behavior regarding what were morally acceptable or not were not fully absorbed by unresponsive individuals. Ethical problems were widespread, systematic and morally unacceptable leading to negligence and poor discipline with pilferage becoming significant challenge difficult to control.

Major General Julian F. Barnes, commander of US troops in Australia, was left with a negative impression of Australia's very limited manpower available for stevedoring and other labour in Australian ports including Darwin. He was particularly unimpressed by the uncaring attitude of dockyard workers and the frequency of union disputes at a time when a collective effort was required.[61] Referring to one of the more incongruent casualties of war, Drea wrote that when the *Pensacola* convoy berthed at Brisbane in early 1942 strike action by stevedoring labour made it necessary to task some US personnel to unload the ships. Amid the confusion, American soldiers and Australian wharf workers pilfered items which had been left stacked *ad hoc* on the wharves. The Sydney-based American consul requested Australia pay for the supplies.[62]

The absence of accurate and detailed records made compliance impossible. The problem was that 'during unloading no one had checked the ships' manifests carefully'. Establishing cost and value would have been a waste of effort and as Edward Drea stated: 'in January 1942 no

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[61] AWM54, 16/2/5, General headquarters SWPA. Report on organisation and activities. United States army forces in Australia; Report by Major General Julian F. Barnes, 7 December 1941 to 30 June 1942, p.1.

[62] Edward J. Drea, 'Great patience is needed': America encounters Australia 1942', (21-51), *War and Society,* vol. 11, no. 1, (May 1993), p.23.

one in Australia much cared'.[63] The American government took a different view. General Douglas MacArthur had planned for the 55 A-24 Banshee dive-bombers in the cargo-holds to be assembled at Brisbane, ferried via Townsville and Darwin to the Philippines. The inaccuracy of shipping documents made the tasks of locating many aircraft parts impossible. Many days in the cargo-holds searching for trigger motors and solenoids indispensable to fire the A-24's machine guns led to the realisation that the essential parts were missing. Major General Barnes requested that Washington urgently dispatch replacement parts to Brisbane, but by the time the parts arrived, General MacArthur had already been forced to withdraw from the Philippines.[64]

In another instance, one of the general principles of loading ships calls for heavy and bulky items being stored first and lighter items loaded on top.[65] However, consideration must also be given to the order of unloading if there are multiple points of disembarkation. Examples of misplaced equipment continued. In 1942, the Minister for Supply was informed that crates containing RDF equipment shipped from the US and valued at one million pounds were discovered stacked on the wharves in Melbourne. A hastily devised action plan was tabled at a CAS conference, where General George Brett in charge of USAAF recommended taking a full inventory of equipment by type and serial number and dispersing the equipment to operational Units as quickly as possible afterwards. This relied on finding suitable installation sites and the possible allocation of some of the sets to Australian forces. Availability of trained personnel to operate the sets was discussed, as was the option of recruitment and training personnel as operator-observers, with timing dependent on the availability of additional RDF equipment.[66]

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[63] *Ibid.,* p.23.

[64] *Ibid.,* p.23*;* The Barnes report, p.6.

[65] Drea*,* p.22.

[66] The Barnes report, p.6.

Another example of negligence was found following inspection of Supply Depots at Winton, Jericho and Emerald in October 1942. A considerable accumulation of various commodities was found, packed into cases and stacked on a non-uniform case content basis at Jericho.[67] Supplies had arrived in damaged cases due to rough handling. Other cases arrived weeks later having fallen off the rail trucks in transit from Townsville and were picked up along the rail line and brought in by drivers and linesmen.[68]

Stationmasters later confirmed that railway trucks were loaded haphazardly at Winton and Jericho without proper attention to the security of goods. When the train arrived at Winton a number of cases, which had slipped from the trucks were found jammed between the trucks. When two tea cartons arrived empty, it was surmised that they had been pillaged en route. Once again consignment notes did not accompany all items.[69]

The unauthorised movement of items, where supplies were transferred between units informally, without documentation and approval of appropriate headquarters, was known to occur. At Winton, the NCO complained that he could not make a tally of the stores because the crew that established the depot had stacked large quantities of stores seemingly at random. At Jericho, Inspectors noted that because of a general lack of supervision, it was impossible to conduct stocktaking until all the stores were located, identified and repacked. In many cases long-standing problems with stores remained hidden until units were disbanded. For example, when No. 21 Base Wing disbanded to form

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[67] NAA: A5954, 742/1, Labour for Allied Works. War Cabinet Agendum No. 134/1942. American Radio Direction Finding equipment. Calling up Under Section 60 of the Defence Act of Classes 4 and 5 for the Formation of Labour Units and War Cabinet Agendum No. 135/1942.

[68] NAA: MP407/13/0 - Correspondence - Department of Aircraft Supply, War Diary - Supply & Transport Unit. Stuart Street. Report on inspection of supply depots at Winton, Jericho and Emerald by Capt R.J. Ward, OC. A.S.D. Rockhampton, Emerald 18 to 29 Sept 42;16 Oct. 1942.

[69] NAA: A1196, 12/501/72, Lines of Communication Darwin. Minute Wing Commander, DDE regarding pilferage to RAAF Headquarters, October 1942.

Group 959, No. 45 Operational Unit reported that considerable quantities of equipment remained at the base. No one was certain whom the equipment belonged to.[70] Establishing the truth after the event became somewhat irrelevant. Some items were confirmed from vouchers found on site to be on 21 Base Wing's charge. No. 10 Signals Unit had also transferred similar items to the new unit, GP-959. Ledgers were double-checked to find all items issued to GP-959, but trying to obtain a clear picture of which unit was responsible, item by item, was difficult. Identification of items and tracing responsibility showed that many had been acquired from various sources over an extended period. Sources included the Australian Army, the US Forces and from individual private sources.[71]

In fact ,some items had been manufactured internally by No. 21 Base Wing. Several significant items were found to be surplus to requirements. The Area Salvage officer was instructed to send most items to No. 3 AD and compile a list of all other serviceable items for transfer to No. 9 Operational Group for redistribution.[72]

RAAFHQ's determined attempts to address mismanagement did not prevent substantial losses of goods on the North Australian Railway between Larrimah and Darwin (NT), most of which were attributed to inadequate packaging or loading. The loading party stationed at Larrimah was required to document all items loaded and a NWA officer transmitted consignment details and date of dispatch from Larrimah. There were reported instances of Army personnel removing cases thought to contain foodstuffs and helping themselves. Cases were found smashed open and foodstuffs or other items missing. In some instances equipment was found destroyed or was discovered hidden near the

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[70] NAA: A705, 109/3/1181, RAAF - Air Member for Supply and Equipment, Department of Air. Visit by Formation Equipment staff to No. 9 Operational Group Units, 1943.

[71] *Ibid*.

[72] NAA: A705, 9/1/1059, pt. 4, Overhaul & Repair of aircraft by DAP. Correspondence, 15 September 1944.

railway line. In April 1942, the pilferage problem was much reduced when permanent armed guards were stationed at Larrimah to 'travel on all trains going north to ensure that pilfering does not occur'.[73] Isolated cases of pilfering continued. A CO's entry in his unit diary for October 1942 refers to serious pilfering of goods in transit at Manbuloo Station near Katherine making it essential to introduce a weekly stores convoy as from 10 November 1942.[74]

The Army reduced confusion by appointing officers to supervise the movement of supplies at Terowie, Alice Springs and Larrimah, NT. They were instructed to check all loading and trans-shipping of RAAF stores onto trucks and to record details of stores and equipment dispatched from these stations including case markings, date of dispatch and vehicle numbers.[75] They were to ensure that all equipment and stores were securely packed and legibly addressed. Although instructions were provided to commanding officers at ARDs during early 1937 to secure all instruments from pillage and to prevent damage in transit by crating them immediately upon delivery. Depots were to record all details on Form 19/B/18.[76] Even so, by 1943, rates of pillage and theft escalated. An Air Board Order noted a shortage of wheels and tyres for RAAF vehicles, theft having reached 'alarming proportions'.[77]

The fact that these items had civilian uses probably contributed to their disappearance. The RAAF attributed the problem to carelessness and a failure to comply with the orders and regulations laid down in AFOs 16/A/12, although it was made clear that ignorance would not be

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[73] NAA: A1196, 12/501/72, Lines of Communication. Darwin, Chief of Staff Minute, 13 April 1942 and October 1942.

[74] *Ibid*.

[75] NAA: A11233, 7/1/1B, pt.1, No. 4 (Maintenance) Group, Official History; Memorandum regarding packing and marking of packages for conveyance from the CO to all RAAF Units, 15 June 1936.

[76] *Ibid*.

[77] NAA: A7673, RAAF Air Board Orders, Section "N" Temporary Orders & Notices, (Issues Nos. 1-1029). Care of spare wheels and tyres on service vehicles: Issue N.227, 1943.

accepted as an excuse for failure to follow instructions. RAAF personnel were instructed to take reasonable precaution against theft.[78]

Civilian contractors' reaction to filling out RAAF forms

Contractors' best recourse was to conform to RAAF Headquarters regulations, if they wished to continue receiving work from the Government. However, abiding to the administrative regulations was a continuing challenge to contractors, particularly the time they spent filling out correct forms. Contractors, pressed for time regarded filling out forms as a nuisance. Unable to ignore the administrative system, they were obliged to complete RAAF Aeronautical Inspection Directorate forms Nos. 27, 32 and 42 and enter all relevant information in Log Books, History Sheets, Aircraft Schedule and Maintenance Schedule including an Aircraft Maintenance form E.E.77. With this accomplished, contractors were then required to ensure the red copy of the Issue Voucher was with the aircraft. Some contractors were reluctant to perform all the required administrative tasks or took an inordinate amount of time to comply.[79] This caused considerable delay in the contract management system. Another common delay occurred when a firm requested parts or other items such as tools, which had not been previously assessed as a requirement. The RAAF encouraged contractors 'to seek urgent cost and availability information for any items for which inability were received'.[80]

This point was covered with a new form 2/B/8, introduced to 'reflect provisioning and a three year servicing program to be provided and regularly updated, with six months notice'.[81] It also made it difficult for

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[78] *Ibid*.

[79] NAA: A705, 4/4/585, Technical administration of AD, ARD, FBR Depots, 18 March 1943-1944.

[80] NAA: A705, 4/4/879B, Aircraft maintenance - Procedure to follow by a contractor and reasons for delay, 1942.

[81] *Ibid*.

contractors to provide an assessment of the required equipment and accurate cost estimates.[82] Contractors employed during 1942 and 1943 were regularly complaining that the RAAF provided unrealistic servicing programs and did not allow for difficulties in procurement when spares costing over £200 were required. Determining the actual spare requirements without firsthand knowledge of precisely what needed to be replaced led to 'a heavy volume of re-demanding and additional administrative overhead both for the RAAF and the contractors'.[83]

Worst of all, administrative procedures set out by the RAAF, generated a series of protests from contractors who argued against processing Form S.G.7A. Contractors considered the breakdown of requirements to support repair a real chore. Once this painstaking task was done and an appropriate form was dispatched to RAAFHQ Support Command, contractors then had to wait for a response which they declared was 'unacceptably slow and cases of several months delay were quoted'.[84]

Freight handling, stocktaking and transport

The consequences of rough handling and neglect during loading and transport and the fact that items were often exposed to the weather for extended periods during transit needed to be minimised. This led headquarters to send the Inspector of Administration to see what could be done. It was concluded that some losses and deterioration of valuable equipment were inevitable even with the most careful measures, given that stores depots were understaffed and not provisioned to handle the full range of stores. The inspector suggested that the Training Syllabus

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[82] NAA: A705, 9/1/643, pt. 2, Servicing of RAAF aircraft by civilian contractors, routines - standard forms, etc. 1942-1943.

[83] NAA: A705, 9/1/1178, pt.1, Overhaul and repair of aircraft, Policy. Instruction No 1/1/1, Repair and maintenance of airframes, engines and technical equipment, 1937-1941.

[84] *Ibid*.

for Equipment Officers be amended to include more instruction on handling, packing and storage of equipment. Storemen were given specific advice such as the use of drying cupboards or use of rooms with electric light globes and radiators in tropical conditions.[85]

Store depot bottlenecks were frequent. The CO of No. 6 Stores Depot in May 1944 reported that large overseas consignments had been stacked unopened due to the lack of manpower and adequate lifting and handling equipment. By 31 May, there were 4,088 unopened cases. During June, 7,239 were opened and processed but the number unopened had risen to 6,948. Despite the posting of additional equipment assistants to Dubbo the situation remained far from satisfactory. The CO was able to reduce the problem by having the whole unit working overtime solely on opening cases for three hours at night and concentrating efforts on the various sections where the backlog of inward consignments were the greatest. By August the number of unopened cases had declined slightly to 5,804. Sustaining this level of effort was not possible. Several personnel were redeployed for urgent stocktaking tasks and discharges of personnel caused by rapid demobilisation were increasing. Maintaining the necessary spread of skills necessitated constant shuffling of personnel. As a result, those remaining were over-taxed and increasingly lacking in experience.[86]

Reports and memos from both local units and overseas-based units showed that equipment in transit was often left on wharves unattended. When No. 10 Works Supply Unit departed Australia for Milne Bay in February 1943, it soon became apparent that some of their equipment was left on the wharf. Several units had been loaded with their respective equipment, but amid the confusion accompanying embarkation, the Army had put some items already loaded back on the wharf in no semblance

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[85] NAA: A11233, 7/1/1B, pt. 1, No.4 (Maintenance) Group, Official History. Memorandum titled 'packing and marking of packages for conveyance' from the Commanding officer to all RAAF Units, 24 October 1944.

[86] NAA: A649, 224/603/677, No. 6 RAAF Stores Depot, Dubbo, 1944; Commanding Officer's report in daily log book, May 1944.

of order. Presumably this was a temporary step to make room for the re-arrangement of deck cargo but by some oversight the items removed were not reloaded. This created considerable confusion as in the rush of establishing campsites units were unable to locate their equipment.[87]

Australian units also encountered problems with consignments of their equipment and supplies. Much needed wireless equipment arrived at field units badly damaged.[88] When Formation Equipment staff (Group 961) visited No. 9 Operational Group Units they reported equipment storage and accounting procedures were in chaos, primarily due to a lack of storage space.[89] Adding to the disorder was the arrival of equipment intended for 10 Radio Direction Finding Stations. Some of it was allocated to No. 41 RDF Wing, but the majority was forwarded to other units at remote locations. The absence of an efficient recording system made the situation harder to manage as the two personnel assigned to sorting out the problem were both radio operators with no experience in equipment control procedure. Stores movement details were noted on packing slips and sheets of plain paper. As no action had been taken on accompanying vouchers, this caused delays in their acquittal.[90]

An Air Board Order of 17 April 1944 referred to the serious disorganisation at unloading points which was attributed to the absence of proper distinctive markings on supplies consigned to northern units including New Guinea. The greater problem was tracing the location of equipment afterwards. The remote Radio Stations operated as separate accounting Units and continued to function as such. To achieve consistency, Group 961 also became the parent body to which the

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[87] AWM64, 48/5, Operations Records Books of Nos.10 and 11 Works Supply Unit; 12 & 13 Survey & Design Units 1/1/1943 to 2/9/1944.

[88] NAA: A705, 109/3/1181, Air Member of Supply and Equipment, Department of Air. Visit by Formation Equipment staff to No. 9 Operational Group Units (Group 959 - No. 45 Operational Unit and Group 961 - No. 41 RDF Wing), 1943.

[89] *Ibid.*

[90] *Ibid*.

remote sections referred to for their technical equipment. For non-technical items, Sections were to rely on the Wing who would raise consolidated Extraction Lists for submission to No. 16 Stores Unit. Under a new administrative arrangement supplies were then dispatched directly to Sections. General instructions relating to the packing and marking of packages for conveyance contained in AFO, Appendix 19/E/1 contained instructions covering consignment of stores to units in NWA. The Packing Note was to be endorsed 'received correct' signed by the recipient section, then forwarded to No. 41 Wing. The packing notes were then checked against vouchers, which No. 16 Stores Units forwarded to the Wing for their action. Under the new administrative system the two equipment staff at the Wing spent considerable time inspecting vouchers and raising tally sheets.[91]

Cost-saving exigencies

Given the general shortage of manpower and government economic restrictions, managers were finding it difficult to institute and maintain good administrative systems. At Central Accounts, clerks processing stores vouchers complained that delays often occurred as units were retaining voucher copies intended for return to the Account Section.[92] Practical directives were given to all concerned. Unit copies and the Central Accounts copies were to be quickly forwarded upon acquittal and registration. In 1941 one instruction reminded store men that their depots could not function efficiently unless 'recklessness' was eliminated. A CO Unit entry for March 1942 stated that each month the volume of administrative work increasing resulted in some orders and instructions, in particular those on stores-accounting procedures, not being complied with promptly. The CO expressed belief that morale and *esprit de corps*

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[91] *Ibid*.

[92] NAA: A705, 9/1/1178, pt.1, Overhaul and repair of aircraft, Policy. Instruction No 1/1/1. Repair and maintenance of airframes, engines and technical equipment, 1937-1941.

affected the efficiency of his unit. For example, the rate of personnel turnover left little time to instruct newly enlisted airmen assigned to technical tasks.[93] The CO wrote: 'the professionals' standard of officers in the administration and disciplining of their men (was) low,' adding nor could these officers achieve some form of competence as they moved on quickly.[94] In numerous cases officers and airmen were not located at the units to which they had been posted. As no satisfactory personal records were maintained, commanding officers could not ascertain what men belonged to them or the units to which they really belonged.[95]

In 1942 RAAFHQ introduced an easier retrieval system at DAP designed to provide better control of stock and boost personnel efficiency. However, the counter argument was it now involved far too much filling of forms. Towards the end of 1942, DAP suggested training civilian storekeepers to interpret Vocabularies of Stores and understand RAAF procedures. At least they would have the advantage of not being posted away as soon as they became proficient, as was the case with RAAF manpower. By March 1942, the high rate of turnover of RAAF support personnel had become a drag to efficiency as some 200 inexperienced personnel arrived to replace 200 experienced personnel.[96]

A CO Unit entry dated 26 November 1943 raised two shortcomings typical at depots. Firstly, personnel posted to a stores depot for the purpose of assisting store men with technical aspects of stores were not being used to their full potential and consequently lost interest in their tasks. Secondly, investigation of requests made by services to the depots showed that errors were being made in the identification of

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[93] *Ibid*.

[94] NAA: A9186, 288, RAAF Unit Sheets (forms A50 & A51, Operation Record Book - Aircraft Depots 4-7 March 1942 - July 1947.

[95] NAA: A1196, 12/501/72, Lines of Communication. The Director of Personnel's report following his inspection of units in NWA, 1942.

[96] NAA: A705, 9/36/138, Air Member for Engineering and Maintenance (AMEM), 1943.

technical equipment making it very difficult to locate items.[97]

Motivating staff performance

Although the RAAF tried to motivate personnel by aligning individual performance within organisational goals, the continued emphasis on the need for improved efficiency provides evidence that the positive response expected was actively resisted as instructions were ignored. Getting some personnel to follow headquarters instructions was a losing battle, as headquarters stated in Air Board Order. N.742/42: 'little or no effort has been made by many units to comply with the instructions so promulgated'.[98] RAAFHQ concluded that not all Air Board Order instructions reached all personnel, and responsible officers were failing to exercise proper supervision. Application of adequate markings was to be closely supervised prior to all dispatches until personnel became 'thoroughly acquainted with their responsibilities'.[99]

Air Board Order N.60 stipulated that once a voucher was acquitted by receiving officers. Equipment and Accounting staff were to ensure the rapid transit of vouchers to their destination, including the use of airmail from outlying places, such as Darwin and Port Moresby.[100] Commanding officers were told to take serious notice of delays in processing vouchers when brought to their notice by correspondence or other and take disciplinary action were necessary. Vouchers not recorded in registers but believed to have been returned to their final destinations were to be tracked down. In this instance, acquitting of blue and yellow copies was to be done promptly in accordance with Order N.1251/41. Consigning

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[97] NAA: A9186, 288, RAAF Unit Sheets (forms A50 & A51), Operation Record Book, Aircraft Depots, 4-7 March 1942 - July 1947.

[98] NAA: AA1966/5, No. 4 (Maintenance) Group Routine, Orders 1942. ABO N.742/42: Marking of RAAF supplies consigned to Northern Units, 1942.

[99] *Ibid*.

[100] NAA: A7673, 113/1/651, RAAF Air Board Orders, Section "N". Temporary Orders & Notices, 1942, (Issues Nos 1-1029). N.60: delay in handling and routing of stores vouchers, 1942.

Units were required to query consignee units if acquitted blue copies were not returned within a reasonable interval following acceptance of deliveries. Voucher registers were to be checked regularly by officers responsible for their maintenance. These administrative incidents were highlighted by the three services and governmental departments posing an increasing challenge that continued into the post-war era.[101]

Conclusion

This chapter covered the development of the RAAF's administrative control process after its subsequent expansion after having become a separate force in 1921. As procedures became formalised, performance relied on the competence of administrative structures in both the military chain of command and the supporting civil service. A strong management theme was to improve personnel performance to make best use of key military resources. Receiving consignments involved checking order details against manifests and other documents, recording details of serial numbers and other relevant data, repacking and organising items for shipment to the correct stores and recording acceptance into stock. Problems in this chain were due to poor communication between the major parties, inadequate documentation received with shipments or lack of diligence by operatives, caused serious delays. Project managers and the Air Board were often unaware of critical details such as what items were shipped, expected date of arrival and cost of consignment. Administrative matters relating to the invoicing of items were often overlooked and the paperwork required to identify material received was often either inaccurate or missing. Without comprehensive statistics showing the total sum of failures and the totality of successes, final judgment must be largely qualitative.

As late as 29 May 1944, HQ Eastern Area complained that units neglected to provide details of operations completely and accurately in

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[101] *Ibid*.

Unit History sheets, A.50 and A51.[102] RAAFQ had optimistically assumed that units were documenting full and accurate versions of operations covering reasons for forces deployment, contacts with enemy, weather conditions, and all other factors 'affecting the degree of success attained in the operation'.[103] The completeness of historical records has an immediate value to military leaders in both tactical and strategic decision-making. RAAFHQ was keen to provide future generations of military historians anything related to their operational activities, and other information of historical importance. If there was a single underlying purpose for RAAF insistence on requesting their personnel be more attentive when filling forms and notes entered in the unit diary, the following neatly expresses the point being made:

> An examination of the historical records previously submitted reveal that Units have not appreciated the necessity for the proper observance of A.F.O.18/F/5 with the result that a large quantity of information of historical value has already been lost to the RAAF.[104]

To conclude, taking delivery of consignments of aircraft parts and spares from overseas suppliers into RAAF stores was a task that had to be performed correctly. Maintaining efficiency at all levels was essential but so too was the ability to respond to new and changing circumstances. This chapter argues that with the commencement of hostilities in Europe, organisational change swept through most sections of the economy, public service and military. Finding and training people to fill jobs in essential areas was a critical challenge. As the RAAF developed gradually, it was legitimate to question reasons why so many mistakes occurred in the administration and in the field.

As the war escalated the RAAF required training, equipping and provide housing for their personnel. It also required administrators to

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[102] *Ibid*.

[103] NAA: A705, 150/4/4261, Headquarters Directorate of Repair and Maintenance, February 1943- 1948; CO's memorandum to all units, 1944.

[104] NAA: AA1966/5, No. 4 (Maintenance) Group Routine, Orders 1942. Marking of RAAF supplies consigned to Northern Units: ABO N.742/42.

assess and upgrade existing resources, conduct an efficient managerial review as well as having a competent workforce and good book keeping practices. Chapter nine assesses RAAF's dependence on the Army for its logistics. It argues that it was not always plain sailing and at time it reached a point where problems compelled the RAAF to recognise the necessity to repair an apparent breakdown in communication between the two forces.

Chapter Nine: Army logistic support to the RAAF

According to the 1939 Commonwealth Year Book, the area of the Northern Territory was 1,420,970 km² supporting an estimated rural population of only 3,209, giving a population density of only 0.002 per km².[1] Also lacking were road and rail networks capable of moving large military forces across the continent in an efficient and timely manner. Australia could not respond successfully to an enemy attack unless its military forces were better resourced, a problem that was further aggravated by the risk of having unprotected lines of communications cut off by the enemy. As mentioned in the chapter three, the local industries were unable to produce sufficient quantities of equipment and parts, let alone aircraft to replace combat losses. Just as important was rapid transport for the timely delivery of material to the forces, often delayed by the poor state of the roads over the huge distances involved and the effects of fire and flood. Many northern areas were susceptible to blockages and bad weather. Darwin was no exception, being remote from the main industrial centres, the town lacked substantial infrastructure of even the most basic kinds.

The wartime years from 1940 to 1943, were the most critical years which the War Cabinet had ever had to face as it had to invest considerable efforts on a multitude of defence-related construction works, by co-opting the various main road construction departments of all States in a major campaign to both upgrade existing roads and build new roads where nothing previously existed.

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[1] NAA: A431, 1951/1070, Northern Territory information, letter from C.L.A. Abbott, Administrator to the Secretary of the Interior, 7 July 1941. Abbott was quoting the 1939 Commonwealth Year Book, chapter 14, p.358, which gives the population of Darwin in 1933 as 1,566.

Extension to supply lines – building up the infrastructure

Driving through difficult terrain over long distances on poorly formed tracks caused exceptional delays depending on route conditions, disrupting the flow of military equipment and stores reaching the forces freely across the country at short notice. Carving out new roads across Australia was demanding in terms of finance, labour, engineering, equipment costs and consumables, including fuel and construction material. Figure 7 shows the extent of the labour involved in building a road from a zero base. However, First-class roads with a proper foundation and bitumen top-seal were a rarity. Prior to the war roads were so bad that heavy vehicles were unable to move on unsealed roads and tracks when the ground was soft. The army used bullock teams to haul logs along forest roads or to extricate bogged trucks in rough country as shown in Figure 8.

Figure 7. Road construction by members of RAAF No 12 Squadron near Darwin, 1941. Source: AWM ref. 238224.

Figure 8: Kairi, Queensland, 26 February 1944. A bullock team extricating a badly bogged truck of the 27th Field Regiment. Source: AWM, Ref. 56601.

Recognition of the need for better roads servicing remote areas was of strategic importance. In 1935 the Resident Engineer with the Department of Works in Alice Springs, D.D. Smith, suggested the necessity for and benefit of road links, recommending a road between Alice Springs and Darwin. Smith suggested a five-year plan to the Department of Interior to replace the narrow bush track that followed the Overland Telegraph.[2]

At this early stage, the Government was reluctant to spend substantial sums of taxpayer money unless military and civilian transport would make extensive use of an improved road. Three years later, when the need to facilitate access to strategic areas became a part of defence planning, Smith's initiative was revived and brought to Parliament where

[2] Frank Alcorta, *Australia's Frontline. The Northern Territory's War*, (George Allen and Unwin, Sydney, NSW, 1991), p.39.

the priority of roads relative to the acquisition of defence equipment was debated. On 19 July 1939, both the Ministers for Defence and for the Interior created the Advisory Panel on Defence Works to advise government on various aspects of defence building programs and to act in a supervisory role and go-between. This led government to decide that the highest priority was to upgrade the north to south link between Alice Springs and Darwin, which began on 1 September 1941.[3]

Also during 1940-41, civil engineers began to carve roads and build bridges linking South Australian centres to the remote north. These were remarkable tasks given that most of Australia's infrastructure was concentrated in the southern coastal areas where most Australians resided. Even so, it was difficult to maintain reliable delivery of goods during the wet season which caused prolonged closure of roads and to a lesser extent the railways. The Australian Army being by far the largest force in terms of manpower, experience and equipment capable of long-range overland transport was called upon to provide logistic support to meet RAAF needs.[4] However, managing the interface would prove problematic as operational details went beyond the general task concept given in Army's agreement to cooperate.[5] The *Field Service Regulations*, Section 87 of Paragraph 4, set out the terms of agreement between the Army and the RAAF for the provision of services in the field, provided that the service with the best capability in each case was to perform the function for both services.[6]

Army vehicles transported supplies, ammunition and stores from

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[3] AWM54, 422/7/8. Organisation of supply and transport services. War Cabinet Minute No. 656 of 10 October 1940 and No. 841 of 27 February 1941.

[4] NAA: A2653, vol. 2, Military Board Proceedings. Agenda 90-1900. Problems of supplying aviation fuel and lubricants, bombs and rations to certain RAAF AOBs. Quartermaster-General's recommendation, 15 April 1941. Military Board Meeting 21 April 1941, Agendum No. 114/1941.

[5] *Ibid*.

[6] NAA: MP/B5505, 79. Field Service Regulations, vol. 1, Organisation and administration. Bound manual of regulations authorised by the War Office, Britain in 1930 and reprinted with amendments in Australia, 1939.

railheads to air force units, provided units were within the distance normally covered by one echelon of Army transport (that is, 40-65 km, depending on circumstances.) Beyond this distance, the Army was responsible for the delivery of supplies to air force authorities at a refilling point within reach of the local transport capability of the RAAF units concerned. The Army agreed to transport bombs and other supplies to the Advance Operational Bases (AOBs) at the place and time required either by road, rail or a combination of both, provided adequate notice was given.[7]

For the RAAF, this arrangement avoided the need to set up a parallel supply organisation for their AOBs' accessibility by road and rail transport, including coordinating delivery of bulk stores to aerodromes. By providing much needed assistance to the RAAF, the Army bore the brunt involved in these tasks which required efficient management, clear demarcation of lines of responsibility and effective communication between involved parties. While the establishment of various government factories across the country represented the visible, positive steps towards the goal of self-sufficiency, the negative effects of long-distance transport and shortages of various kinds far outweighed such positive actions.

Much of the consignments destined for forward formations were delayed for considerable periods because of incorrect addressing and packing, and due to the confusion existing as to the exact location of Northwest Area Headquarters, located at some 36 km south of Darwin and other units in NWA. The effort to bring munitions and equipment to the forces in a timely fashion met with significant costs on mileage or tonnage charges as the production plants were confined to the eastern and southern coastlines with a concentration of light industries in Brisbane, Sydney, Melbourne, Adelaide and Perth. The major heavy industries were situated at Newcastle and Port Kembla, NSW, Whyalla

[7] NAA: A2653, vol. 2, Military Board Proceedings; Agenda 90-190, signed by the Master-General of Ordnance, 1941.

and Port Pirie in SA. In addition there were other specialised industries established in places such as Castlemaine, Vic, Lithgow, Broken Hill, NSW, Port Augusta, SA, Zeehan and Mt Lyell, Tasmania and Kalgoorlie, in WA. That meant a total of 16 isolated supply sources spread out over a distance of roughly 6,400 km.[8]

Records show that the Army's commitment to supply RAAF units was at times hindered by a lack of satisfactory delivery instructions. The Army was in many instances required to deliver shipments to isolated areas where even basic transport infrastructure was often lacking. This led the Lieutenant General in charge of administration to question the arrangement, stating: 'there appears to be so some doubt existing in regard to the responsibility of the Army for the provision and transport of supplies for the RAAF'.[9]

Supplying RAAF Advance Operational Bases (AOBs)

During 1941, to ease the supply situation, a joint committee meeting of representatives of the three services investigated ways of supplying isolated RAAF AOBs on islands and inland areas inaccessible to the normal methods of replenishment used by the Army. Their report, submitted for the consideration of the Military Board, recommended that supplying RAAF AOBs by air when possible, depending on the availability of aircraft. When major RAAF projects required Army participation, both forces were to determine the extent of Army commitments. Even by 1944, because of the siting of RAAF establishments in forward areas, supplying the RAAF could not be easily done as there were few suitable locations for landing strips and operational bases. There also were technical limitations on radar stations. Many of them required delivery of large quantities of

[8] NAA: A3095, 32/1/3, pt 1, Munitions, Australian Departments, 1940-1947. Report on transport facilities during wartime Australia, p.135.

[9] AWM61, 414/2/877, Responsibility of the Army for supply of RAAF and Allied Air Forces, in Military Board Proceedings, Minute from Lieutenant-General in charge of Administrations to AMF Headquarters, Melbourne, 22 January 1944.

constructional equipment and materials, in addition to the difficulty of delivering petrol, rations and general stores to units.[10]

Added to these problems, cloud, humidity and precipitation affected high frequency transmissions to military operations, while low frequency transmissions were most susceptible to ducting caused by atmospheric temperature layers. Consequently, high drift and variation disturbances occurred in the radio, radar and navigational systems transmissions of Australian sensors.[11]

The Army was to supply RAAF outlying stations and deliver supply via wharf or beach. RAAF was to assist and transport bulk stores within 8km limit from their respective station and beyond this distance, the Army was to undertake transport. In each case, the RAAF had to provide maximum assistance in manpower, vehicles and aircraft. If other circumstances did not necessitate assistance from the Army or Navy, the RAAF was responsible for the distribution of supplies to its stations and AOBs and instructed Operational Group Commanders of both the USAAF and the RAAF to discuss issues requiring clarification at a conference. In the presence of a representative of Advanced Land Headquarters (ALH) a conference was called for to take note of new projects requiring action by ALH and no departure from this principle was to occur without reference to ALH.[12]

Supplying the forces operating in the north effectively and efficiently had become a matter of learning from mistakes. Keeping a detailed record of materials supplied, with details of how and where items were

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[10] *Ibid*. DCAS, Air Commodore J. McCauley's letter to the CGS, Lieutenant General J.A. Northcott regarding frequent delays caused by shortage of vehicles and means of transport, 21 January 1944. Appendix 8 refers to the number of bases created after the raids on Darwin.

[11] J.O. Langtry, 'The Ambient Environment of the Northern Territory, Implications for the conduct of military operations', (1-29), Strategy and Defence Studies Centre, *Working Paper no. 11*, (October 1987), Canberra, ACT, p.7.

[12] NAA: A1196, 12/501/72, Lines of Communications, Darwin. CO's report to RAAFHQ regarding supplying the forces and the responsibility of Group Commanders, RAN, USAAF, RAAF and the Army, 1942.

obtained, including names and address of suppliers, quantities available, delivery times and so on was important, as the supply organisations, in building up this data, facilitated prompt responses to future demands. However, this ability to learn did not appear to be the case for Darwin, since it was so remote from the main concentration of commercial and industrial centres.[13]

Long distances, rough terrain and drivers' fatigue often took their toll on drivers. North Western Area headquarters was located on the North-South Road, 35 km south of Darwin. Uncertainty as to the exact location of NWAHQ was often due to inaccurate addressing, which in turn led to confusion and delays.[14] In addition, most sites lacked suitable facilities for receipt and storage of goods so equipment for the northern area was forwarded to the RAAF Stations at Daly Waters, Batchelor or at Darwin. On arrival north, Army drivers continued to be unclear on the correct geographical delivery point for consignments.[15]

Army drivers worked under arduous and trying conditions. Not only were they working long hours on convoy duties which took them out for a period of 8 days from Alice Springs to Mataranka (NT) and return, but the conditions of traveling over the northern roads were such that the red dust arising caused fatigue and discomfort to a marked degree.[16]

The arrival of American forces created a new level of complexity in the operation to supply land transport. This resulted in both Australian and American Forces agreeing to establish forms of equitable control over supply and transport. It was agreed, for example, that No.5

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[13] NAA: A1196, 12/501/72, Lines of Communication, Darwin, 1942 as noted by the unit CO in his log book.

[14] *Ibid*. Report on supply of equipment to NWA by Squadron Leader D.J. Rooney, 13 April 1942. Routine Orders No. 67, O.C.2/5 Sup. Dep. Coy. ASC regarding incorrect addresses leading to delays and confusion in delivery of bulk stores and mail, August 1943.

[15] AWM64, 48/5, RAAF Formation and Unit Records - Operation Record Book - No. 11 Works Supply Unit from 1 January 1943 to 4 September 1944.

[16] NAA: A10605, 1132/4, vol. 1; No. 10 Works Supply Unit, Personnel Occurrence reports, 1 January to 31 January 1943 – 1 January to 13 January 1944.

Replenishing Centre (5RC) would not have to supply petrol to US forces, as they would move their own. However, the RAAF could call on them for assistance. Explosives for supply to United States Army were handled by the American Ordnance Platoons. The Australian Army took care of the movement of supplies, including the provision of all trucks to carry materials coming in by ship or overland. They supplied unloading and loading parties and transported stocks to the location designated by the Army executive officer. No. 5RC's responsibility began when it received supplies from the Army trucks, which included stacking supplies, camouflaging storage dumps and the maintenance of fire breaks. Empty crates were back loaded onto Army trucks, delivery vehicles and ration tenders.[17]

Transport of supplies, stores and personnel to and from their respective points along with maintaining communication was difficult as various sections of RAAF headquarters were located in areas up to 18 miles (about 29 km) from Darwin RAAF station. The vehicular strength of the Darwin Station as Squadron Leader R. S. Choate explained to the Inquiry after the air raids on Darwin was insufficient to cope with normal demands and hopelessly inadequate to meet the requirements occasioned by changing operating conditions. Cars and trucks were acquired by various means, and from the Army Vehicle Collecting Centre at Adelaide River.[18]

During 1942-1943 an acute lack of coastal shipping capacity, of vehicles and drivers created more problems of delivery. More than 4,000 vehicles were waiting for servicing at 3rd Echelon Workshops at various northern units and in Central Australia. Most vehicles were beyond repair and had to be written off as being involved in accidents or by enemy

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[17] NAA: A9186, 374, RAAF Unit History Sheets (form A50), Operations Record Book; Replenishing Centre, No. 5 RC, Commanding Officer Unit Diary 1940-1944.

[18] NAA: A9695, 238. Justice Lowe Inquiry in relation to attacks made by enemy aircraft on Darwin on 19 February 1942 - Interview with Squadron Leader R. S. Choate, 1942.

action.[19] Obviously, easy access could not be expected into remote areas. Some Darwin Overland Maintenance Force drivers reported that they saw 'smashed trucks hundreds of miles from nowhere [and] impossible mountains of stores and equipment to be shifted'.[20] Further, the poor state of the roads significantly slowed down the delivery of stores to units, as Figure 9 shows.

Figure 9. A truck of the Supply Transport, Driving and Maintenance School bogged on a mount slide at Fishermen's Bend, Victoria, 30 November 1943. The driver is laying tree branches under the wheels. Source: AWM ref: 060681-1.

Before the raids on Darwin, government expedited a number of measures, some of which had been contemplated for some time but were delayed by other priorities. The acute shortage of vehicles at

[19] NAA: A2671/1, War Cabinet Agendum No. 462/1942. Department of Defence Coordination. War Cabinet Agendum No. 42/1942. Provision of mechanical transport vehicles and motor cycles for the Australian military forces, 7/11/1942 – 17 March 1943.

[20] NAA: A1196, 12/501/72, Lines of Communications. Report from the Administrative Planning Committee, Darwin referring to the shortage of vehicles, posing a serious problem in supplying RAAF stations based in the north, June 1941.

Darwin to transport personnel, supplies, stores made it difficult for inter-unit communication as many units were dispersed up to some 29km from their respective headquarters or from other units. Darwin had been waiting for large number of motor vehicles, tenders, ambulances, tractors, tankers and trailers despite high priority for their provision.

By 1941, the shortage had become even more acute as additional units arrived. To solve current problems and to ensure that additional vehicles would be available in case hostilities were to occur in or near Australia, on 30 June the Army Quartermaster-General had lodged a request through the Contract Board to requisition a large number of vehicles. This prompted the RAAF Darwin Station to request the Director of Equipment to coordinate with the Army to ensure that there would be sufficient transport to distribute aviation fuel and bombs and other stores to RAAF locations. Much correspondence had been exchanged with the Military Operations and Plans and other units on the increasingly urgent need for vehicles. Finally, during March 1942 the first consignment of fifty new vehicles for Darwin was loaded into rail trucks with another fifty expected to be dispatched at a later date.[21]

Japanese submarines operating off the Australian coast between 1942 and 1943 sunk many Australian ships, incurring the loss of many lives and losses of military equipment.[22] In June 1942, worse news came in from the Australian Military Mission at Washington announcing that three American vessels - *Surrey, Ardenvoh* and *Port Montreal* - had been sunk by enemy action with all their cargo, which included an assortment of 220 armored fighting vehicles, trucks and spare parts.[23] War Cabinet immediately negotiated with Washington to replace the vehicles. To expedite the administrative details, the Government decided that should some form of demand be necessary for accounting purposes, it would have to be in the form of a replacement requisition under Lend Lease

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[21] *Ibid*.

[22] *Ibid.,* pp.260-262.

[23] *Ibid*.

rather than a new order to be taken up by the Allied Supply Standing Committee.[24]

Due to the lack of transport aircraft and the necessity of avoiding sea-routes, the overland route was the safe option. At Darwin there were no facilities to receive goods ex-rail or to store them. As there was no way to increase capacity to the air or sea routes in the foreseeable future, the overland route became increasingly used to transport urgent stores for Darwin and beyond. The meeting of the Joint Planning Staff in March contracted the International Harvester Company to supply bodies and chassis for a total of 405 vehicles. USAFIA was asked to supply some 2,000 drivers and maintenance crew.[25]

Wharf facilities: Darwin and Brisbane in 1939-1942

The RAN took a very active part in preparing the ground for the present Allied offensive in the southwest and south Pacific. In the west, shipping was restricted as the Navy closed ports north of Derby. Ports on the north-west coast are subject to large tidal variation and it was common peacetime practice for vessels to dock at high tide, unload and reload and then wait for the next sufficiently high tide (up to a maximum of four weeks). This practice could not be tolerated during wartime when greater efficiency was required and when idle ships risked becoming sitting targets. Accordingly, some ports were simply by-passed and goods were landed at the next available port. For this solution to work it was necessary to provide better inter-port overland transport.[26] Prior to the raids, the Navy consistently reported that conditions at the Darwin wharf

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[24] NAA: A1196, 12/501/72, Lines of Communication, Darwin. Report from Squadron Leader, D.J. Rooney on the problems associated with supplying equipment and other supplies to NWA, 13 April 1942, to DE, DS, DSUPP.

[25] NAA: A1196, 12/501/72, Lines of Communications. Report from the Administrative Planning Committee, Darwin referring to the shortage of vehicles, posing a serious problem in supplying RAAF stations based in the north, June 1941.

[26] AWM64, 59/1, Operations Record Book, W2 Section (North Queensland). General History, 1943-1944.

facilities impacted northern defence preparations, being ill-equipped to handle the increased numbers of ships and the volume of cargo. In 1939 a defence committee had recognised the necessity of improving and expanding Darwin's wharf to handle the ship movements expected in future years. Unloading delays in Darwin could partly be attributed to the high tidal range (max. 27ft or 8m) forcing ships to wait at moorings, further crowding the harbour. In worst case conditions unloading a ship could take up to 25 days if tides were particularly unfavourable.[27]

Navy's effort to lobby for improved docking for auxiliary vessels and merchant ships continued. Between 1939 and 1941, numerous committees debated ways to redress the problems. In 1940, at one of the Chief of the Naval Staff's weekly meeting explained that implementation was a long drawn out process. The Darwin wharf issue which had been referred to the Board of Business Administration (BBA), depended on a report from the special committee set up by the Department of the Interior (DOI). Its minister (H.S. Foll) was asked to expedite delivery of the committee report to BBA. The minister was asked to send a report to the Department of Coordination and a copy to BBA.[28]

In early 1941 the committee recommended that the Darwin wharf upgrade proceed at an estimated cost of £250,000. However, construction work was deferred pending completion of detail designs and the usual administrative procedures required to let contracts. At a meeting in Sydney on 15 May 1941, the Chief of Naval Staff (Admiral Sir Ragnar Colvin) took the matter in hand, arguing that delays to shipping at Darwin were a direct result of the inability of DOI to deliver a solution. At this point, DOI had promised that every effort would be made to complete a new Darwin wharf but warned it would require considerable time. The Assistant Director-General of Works was left with a detailed

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[27] NAA: A5954, 455/11, Labour and Industrial Relations. Employment conditions at Darwin.

[28] NAA: A2673, vol. 1, War Cabinet Minute nos. 1 to 158, 1940. Minute no. 139, Agendum no. 3/1940 and Minute no. 152.

explanation of the construction schedule and estimated time-frame. Apparently, the Department of Works had already been given approval to extend goods sheds and make alterations to the layout of the yards at Darwin.

One prime reason for the slow progress was shortage of labour and the difficult working conditions restricting the hours of work. A meeting convened resulted in the decision to take immediate steps to increase individual working hours and the number of available workers. Back in 1939, the Minister for DOI had been asked to investigate the possibility of appointing a project supervisor 'not connected with any of the departmental services at Darwin'.[29] The meeting was hopeful that the supervisor would have complete control and ensure that unreasonable delays did not occur, in processing ships and moving cargo on the Darwin wharves.[30]

It is worth nothing that after several months of further investigation, the existing wharf design was identified as being too short, causing delays that extended up to several weeks in the transfer of items between ship and Darwin RAAF Station. Naturally, the lack of an adequate lifting capability made the task of unloading large and heavy cargo very slow and difficult. In January 1941, BBA attempted to explain what anybody connected with shipping and defence work in Darwin already knew. Recycling all the previous known reasons, the Board found that the difficulty in obtaining reliable contractors to tender for works and the lack of waterside workers remained the prime concerns. Some of the work proposed was on a cost-plus basis, which added to the uncertainty in the final cost. Shortage of local building materials necessitating import by sea at excessive cost was another factor that further restricted development work.[31] Naval Board persistence finally

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[29] *Ibid*.

[30] NAA: A1196, 15/501/157, Minister of the Interior, John McEwen, Report, 27 April 1939.

[31] *Ibid*; NAA: A1196, 15/501/107, pt 1, Fortress Combined Operational

succeeded in having a contract to extend the jetty finally awarded. The necessary plant and other building materials and parts were assembled at the site ready to be erected.[32]

Considering the prevailing maritime conditions, this demonstrates a lack of forethought by the federal government who should have envisaged well in advance of the Japanese raids the necessity of giving priority to existing wharf facilities, to the transport of bulk fuel for aviation and motor transport over most other supplies as this was an operational requirement necessitating constant monitoring. Evidently, these problems called for a strong management response at least until a safe sea route to Darwin could be opened. Although the RAAF issued precise instructions to all the Stores Depots involved in the consignment, loading and transshipping of stores deliveries were hampered by unnecessary delays.[33]

During 1942-1944 the RAAF issued numerous notifications on the fact that large numbers of consignments were delayed or mislaid in transit due to incorrect destination address, labels being detached or rendered unreadable or poor packaging allowing contents to spill.[34] These issues were raised by the senior equipment officer who was alarmed by the considerable number of valuable equipment, much of which was not immediately replaceable, that was lost, destroyed or damaged due to incorrect packing.[35]

Later that year during a visit to operational areas, the Inspector of Administration made a point of stressing the importance of care in

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Headquarters, Darwin - Darwin Defence Coordination Committee, reports, 3/1939, 1940-1941.

[32] *Ibid*.

[33] NAA: A1196, 12/501/72, Lines of Communications, Darwin; Commanding Officer report to RAAF Headquarters regarding delivery of supplies, 1942.

[34] NAA: A11233, 7/1/1B, pt. 1. No.4 (Maintenance) Group, Official History; Memorandum regarding packing and marking of packages for conveyance from the CO to all RAAF Units, 24 October 1944.

[35] NAA: AA1966/5, 137, No. 4 (Maintenance) GP, Routine Orders, Senior Equipment Officer's order to No. 4 Units by the, 24 October 1944.

transporting equipment, provided constructive advice on many aspects of packing, forwarding and storage of equipment and stores. He was particularly concerned that persons posted to stores units had no experience in the care of handling equipment. Some also lacked appreciation of the problems associated with the storage of equipment under tropical conditions where heat, moisture, fungal growth, corrosion and infestation can quickly cause deterioration. The humidity meant that stored equipment required constant maintenance, such as cleaning, oiling, airing and dehumidifying. Stores were often held in storage for extended periods with little or no attention to maintenance issues affecting shelf life or to maintaining the correct storage environment. No. 1 Stores Depot was simply not equipped to perform inspections or to take the necessary action to preserve stores. For example, some equipment sent to Papua and New Guinea arrived partially or completely ruined through negligent packing at stores depots or by contract suppliers. Experienced storemen learnt to take precautions when packing or storing equipment for the tropics to prevent losses.[36] With the volume of stores movements, the large distances generally involved a variety of transport arrangements, including training staff selected to perform some of these moves. It was inevitable that some mistakes and outright failures would occur. Poor packing at stores depots made identifying and meeting all transportation needs difficult.[37] To illustrate, in early 1942 the RAAF had been waiting for a consignment of Browning machine guns. These arrived with gun bodies and breech blocks packed separately into different cases, with both included in the same shipment. The blocks were off-loaded at some point in transit, arriving some three weeks later. The ensuing investigation rapidly reached the point where

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[36] NAA: A11233, 7/1/1B, pt. 1, No.4 (Maintenance) Group, Official History. Packing and marking of packages for conveyance. Memorandum from the Senior Equipment Staff Officer to all Units, No. 4 (Maintenance) Group, 24 October 1944.

[37] NAA: A1196, 12/501/72, Lines of Communication Darwin. Memorandum from Wing Commander, DDE, Northern Area requesting RAAF personnel to be placed at Alice Springs and Birdum to act in liaison with the Army and check all Air Force stores on arrival or departure, 4 August 1941.

the RAAF blamed the Army for the mistake, but at that stage trying to find who was responsible for the mistake in this case was simply futile. As the machine guns were useless without their blocks, the delay could have been very serious if circumstances required their immediate use.[38]

Here the old adage 'if anything can go wrong, it probably will' applies. The Army's responsibility for all consignments including losses or damage was complicated by the fact that stores depots were not always informed of a consignment address. Similarly the Army was often unaware of particular consignments requirements and its level of urgency. Even when detailed communication sent well in advance of convoys there was no guarantee of correct transmission. All packages were to be addressed in accordance with Air Board Order E.10/1, paragraph 10. Failure to remove old address markings on packing cases before re-use was an important detail that was a common cause of consignments going astray, prompting RAAFHQ to instruct Units to remove all traces of previous details from cases prior to re-use. There were also instances at rail freight terminals where incoming freight was not processed quickly enough. As unopened boxes accumulated they were often stacked and those at the bottom could be delayed for long periods of time until they were discovered and distributed to units. Routine Orders and RAAF revised schedules were sent to all depots requesting that spare availability listings be correctly updated, but responding to these requests was often disregarded by some personnel. [39] When an aircraft needed replacement parts, the normal procedure was to determine if the part was available in store, issue parts on a store requisition and record the issue on a RAAF form. Any unused items had to be returned to store, appropriately noted and returned to stock. As the latter step was not always carried out, parts accumulated at depots

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[38] *Ibid*.

[39] NAA: AA1966/5, No. 4 (Maintenance) Group Routine, Orders 1942. Marking of RAAF supplies consigned to Northern Units - No. 4, 1942, ABO N.742/42. Memorandum from Group Captain C.C. Proberts, Senior Equipment Staff Officer to all Units, 5 July 1944.

becoming inaccessible to other depots needing parts.[40]

The Army was willing to assist further by breaking down supplies for distribution to RAAF unit and cooperated in the handling of aviation fuel and lubricants. In meeting their part of this agreement, the Army faced an unusually complex challenge. The Army argued that in the past responsibility in regard to supplying the RAAF had been dealt with in general terms and often the exact nature of responsibilities had not been considered or determined until a specific case arose. At this juncture, the RAAF was at fault as they did not always clearly establish which projects were in scope nor did they seem to appreciate the level of Army involvement prior to any commitments being made.[41]

Although the *Field Service Regulations* agreement evolved to coordinate activities and avoid duplication in the delivery of services, problems continued that suggested a need for ongoing coordination to manage the dynamics of actual implementation. Between 1942 and 1945, the two forces exchanged numerous items of politely-worded correspondence, requesting clearer instructions as to where the responsibility fell in supplying the RAAF. Certainly, instructions dispatched well in advance of an assignment may have cleared up some of the supply problems. Without reference to accurate and detailed written information, joint projects like this were doomed to fail. The Army had good reasons for wishing the problem resolved. They reported that it was proving particularly difficult to supply RAAF 2nd and 3rd Transport Echelons in outlying areas at a scheduled time and place. They requested clearer indications as to where material was to be off-loaded to RAAF Stations at Darwin, Daly Waters and Batchelor.[42]

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[40] *Ibid*.

[41] AWM54, 422/7/8, Organisation of supply by the Australian Army Service Corps (AASC) in supplying the RAAF and Allied Air Forces. Minute, Brigadier, Director of Supplies and Transport to Land Headquarters regarding transport and handling of bulk stores by either rail, road or by sea, operated by AASC and to the initial difficulties of delivering stores to the RAAF, 17 June 1944.

[42] AWM61, 414/2/4877. Responsibility of the Army of supplying RAAF and Allied Air

The Army Quartermaster-General pointed out that some RAAF aerodromes and other installations were inaccessible for deliveries, particularly over rough tracks and placed a heavy burden on Australian Army Service Corps personnel, vehicles and workshop facilities. In certain cases RAAF projects were located beyond the reach of ground transport facilities that required the Army to build a temporary track or at times, even arrange water transport and jetty facilities. The Army also complained that government supply policy had not ensured adequate provision for all RAAF deliveries, especially those distant from Army supply facilities. Seemingly the policy failed to address a most important aspect of planning in that it had not clearly defined the level of cooperation and forewarning that the Army required in responding effectively to each new project.[43]

Conclusion

Ross Mallet wrote that in 1943 when the Army was securing its position in New Guinea it encountered numerous hardships building up the necessary infrastructure to support of their jungle warfare operations. Apparently, it did not plan to dominate the battlefield from the outset, preferring to adapt and improvise as circumstances developed, ready to take the initiative when opportunity allowed.[44] Mallett contends that this attitude developed towards 'a tendency to complacency, relying too much on its ability to adapt and assuming that: 'she'll be right'. However, Mallett was more concerned with the logistics on operations as he suggests that a major lesson for the Australian Army from its involvement with support of other forces (including the US Army) was the need to be willing and able to deliver such support.

His appraisal does not fully represent the performance of the whole

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Forces; Minute CGS to CAS about delivery problems by Army drivers in supplying the RAAF in remote areas, 8 January 1944.

[43] *Ibid*.

[44] Mallett, 'Australian Army Logistics in the South West Pacific 1943-1945', p.169.

Australian Army and its motivation when serving in difficult circumstances. Within the narrow context of Army logistic support of the RAAF in Australia, the standard of performance and dedication the Army brought to their tasks was very good. As noted, Australia's defence preparation was intricately dependent on the environment, and as shown in this chapter, the Army in providing assistance to the RAAF in remote areas was not without challenges that on occasions led to frustration between the two forces, particularly when situations where task performance had fallen down. Defining tasks fully and in sufficient detail and obtaining a reliable measure of the risk and feasibility, while not simple, are always essential for successful implementation. Small details not explicitly mentioned in orders or not properly considered in planning led to operational difficulties that could not be resolved effectively and correctly in the field. Incorrect interpretation of route notes to remote bases or failure to meet a delivery time had serious consequences. Considering the negatives, what real chances were there for quick delivery of stores to the AOBs? The system of communication existing at the time was basic and precluded efficient communication between road parties, transport Army headquarters and RAAF units in the field. All of these problems adversely affected Darwin defence and it is no wonder that even such a strategic town as Darwin was so lacking in armaments.

Conclusion: converting poor preparation into success.

The main aim of this study has been to assess the state of Australia's defence preparedness in the Second World War, with emphasis placed on the role of the RAAF. It argues that the measures taken by the Australian government in preparing the ground to support Britain's Empire defence plans was not simply due to a crisis of self-confidence but more as the result of clinging to outdated policies. As a Dominion of the British Empire it was unsurprising that Australia's strategic reasoning would have been 'heavily shaped by issues of culture and imperialism'.[1] This created a confused situation where existing arrangements continued as before by default rather than taking account of the changing and increasing threat that Japan presented. In the case of defence matters, Britain instituted Imperial Defence Conferences to discuss and coordinate policy on a whole of Empire basis but this forum never addressed the fundamental issue of the delegation or retention of responsibility for various defence issues such as who will defend Australia. In considering this aspect, it follows that in return for their security umbrella, Dominion countries aligned their defence strategies with Britain, and in the event of war would collectively contribute by dispatching troops and resources to defend Britain and the Dominions.[2]

On this foundation, the development of Australia's as a fully independent nation remained fragile for several more decades until it was finally able to reassert a sense of self-worth with the development of its local industries and the gradual strengthening of the nation's

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[1] Grant, *Australian soldiers in Asia-Pacific in World War* II, p.5.

[2] Edwards, *Curtin's Gift*, pp.32-33.

infrastructure. As argued in chapter one, since the Commonwealth of Australia was created there was little incentive to reduce dependence on Britain in all aspects of governance. Australia naturally relied on Britain for economic, trade and political decisions cemented a solid bond of reliance and dependence between the two nations to the point that many decisions were effectively made by the British's political system for the benefit of the crown and empire, without prejudice.[3] One example of this was in March 1939, when the Government took the advice proffered by commercial representatives from the Bristol Aircraft Company regarding the dangers of manufacturing the Beaufort without technical analysis or due diligence.[4] Such faith in British's leadership and decision-making, justified by the perception of Britain's world leadership, critically impeded independent thinking.[5] Australia's participation in the Imperial defence arrangements became the bedrock of its defence policy and planning, and within this system Australia received its mantle of protection.

As discussed in chapter two, Australia's planning for the development of the RAAF lacked the direction and the commitment needed to achieve a useful level of capability, which left the RAAF constantly looking for ways to justify its existence. Where the impact of the nation's defence tardiness was particularly severe was providing the RAAF with the required level of capability with aircraft suiting Australia's environment.[6] This was a task which became significantly difficult and lengthy to implement given Australia's close interaction with the British Air Ministry at a time when the Ministry itself was over-committed in modernising the RAF.[7] The length of time it took to bring new types of aircraft into the RAAF was incompatible with the increasing pace of development in military aviation. This reality could have been

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[3] Attard, 'Australia as a Dependent Dominion, 1901-1939', p.9.

[4] Weston, 'The Australian aviation industry', p.49.

[5] Attard, p.12.

[6] Coulthard-Clark*, The Third Brother,* pp.73, 74.

[7] Barker, *The RAAF at War*, p.21.

ameliorated if particular aircraft in their original form had been carefully chosen to allow upgrades or development over an extended period, but to some extent air forces have to accept the fact that many machines become obsolescent before they enter service.[8]

Prior to the outbreak of war, the RAF presence in the Pacific was small. Plans were drawn up in the 1930s for the expansion of the RAF to protect British colonies - Singapore, Hong Kong, Burma and Borneo - but in 1940 Britain focused on beating Hitler, with scant resources shifted to the Far East.[9] In considering whether Australia had planned to send the RAAF to serve alongside the RAF, it seems reasonable to assume that since Australian squadrons had fought in Europe and the Middle East in 1914-1918, this possibility could not be excluded. Certainly, for obvious reasons of practicality, the common equipment policy and organisation structures with the RAF were justified on the grounds that equipment standardisation and the ability to build on Britain's existing manufacturing capability would deliver both efficiency and economic benefits.[10] In addition, it would facilitate RAAF squadrons to easily deploy alongside RAF units in Malaya, Singapore and other areas. As explained in chapter five, the agreement in principle between Britain and Australia for the RAAF to achieve a high level of uniformity of equipment with the RAF promised much but was not well managed and delivered little in a timely fashion. The point being made was acquisition of aircraft was only possible after making it profitable to Britain and British aircraft companies as their envoys visited Australia and successfully influenced government to purchase their aircraft. Examples of this high level trade mission approach occurred with Bristol and the Beaufort, A.V. Roe and the Anson. During these years, apart from Laurence Wackett's engineering

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[8] Stephens, '*The RAAF: A History'*, pp.116-119.

[9] 'The RAF and Far East War 1941-1945'. *World War II Series of Bracknell Symposia* held at the RAF Staff College, 25 March 1995 and chaired by Air Chief Marshal Sir Lewis Hodges, (published by the RAF Historical Society, United Kingdom), p.10.

[10] Ewer, *Wounded Eagle*, p.99.

expertise, the easiest course for local aircraft companies, lacking in engineering and technical know-how was to rely on assurances from Britain's Air Ministry and the industrial leaders that the Ministry promoted.[11]

Both the Air Ministry and British Aircraft companies for obvious commercial reasons expected to retain their effective monopoly in supplying aircraft to the RAAF. However, maintaining a mutually beneficial link between the Air Ministry and the Air Board was central to ensuring Australia's needs would not be overlooked. The problems the Air Board also encountered was related to the apparent lack of input into the numerous Air Ministry's specifications that guided the development of Britain's future aircraft with little or no allowance for the large disparity in the operating environment between the two countries and the somewhat vague specification of Australia's user requirements failed to clarify the environmental and task differences that the RAAF faced. As a result, the Australian government responded showing a blend of caution and diplomatic handling of its main suppliers.[12]

Important elements of the acquisition process was minimised in the extended period of discussion on the various aircraft offerings proposed. Australia's specifications and conditions, such as the aircraft had to be modern in design, cost estimates would not be subject to excessive escalation, and that delivery promises would be met were not enforced, and this lack of commercial prudence often led to poor results, including massive delays. With this unsatisfactory arrangement in place Australia missed out on the opportunity to seek wider advice on procurement options and to develop streamlined skills based on government-departmental purchasing group. This established orthodoxy slowed the acquisition and delivery process by interfering with the Air Board's efforts in finding suitable aircraft for the RAAF. The combined influences of inadequate role definition for the RAAF, the limited resources available,

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[11] Weston, 'The Australian Aviation Industry', p.70.

[12] McCarthy, *Australian and Imperial Defence 1918-1939*, p.109.

both in aircraft, weapons and munitions, the lead-time involved in obtaining aircraft and the low level of threat perceived by Australia, were reinforced by internal political influences that were not always to the long-term benefit of the nation. All of these factors make Andrew Ross's claim that Australia was armed and ready to repel a Japanese invasion in late February 1942, questionable.

This is not to say that Ross has not demonstrated considerable originality in assembling his facts and figures, but the evidence presented looks less convincing in the particular case when the Japanese launched their air raids on various areas of northern Australia. As highlighted in chapter one, the ferocity of these air attacks on Darwin and on Broome was unexpected and made worse, as defenders were ill-prepared to respond.[13] Ross' positive assurance that the munitions factories were producing an abundance of weapons for Australia's forces to fight the Japanese had they decided to invade Australia is hard to follow. As argued in chapter nine, the tyranny of distance in addition to the rough conditions of the roads made delivery of bulk stores to front-line forces very difficult.[14] But worse than that, there was no apparent thought about the tactical deployment within Australia in an all-compassing sense. Severely affecting Australia's defence was its lack of skilled forces, weapons and equipment. Also as consideration was given to abandon seven-eights of Australia to the Japanese and to prioritise industrial centres and ports,[15] little effort was made to provide for the strategic towns of the north partly because the military was convinced that Darwin's defences were sufficient to protect the town.[16]

Meaher's belief that one of the reasons Australia was ill-prepared for home defence was that Australia's industrial elites were only

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[13] Ford, 'The First Japanese Air Raid on Broome', pp.14-18

[14] NAA: A3095, 32/1/3, pt.1, Munitions, Australian Departments, 1940-1947. Report on transport facilities during wartime Australia, p.135.

[15] Hasluck, *The Government and the people*, pp.13, 87.

[16] Gillison, *Royal Australian Air Force*, pp.239, 424.

interested in making huge profits and should have taken heed of what was occurring in Europe, Asia and the Pacific and what these developments meant for Australia's security.[17] He points out that during the inter-war years political point-scoring and misguided or ineffectual policy deflected attention from serious long-term strategic defence issues. Despite his strong view, even if local industries had been able to manufacture large quantities of weapons in the mid-1930s, there is no certainty that these weapons would have remained in Australia to equip the services. Since Federation the Australian government hoped to gain large British munitions orders. Any surpluses of munitions were marked for export overseas for profit, managed through Australia's Contract Board.[18]

The years 1939-1942 showed the difficulty of creating a national development framework and the enormous work involved in overcoming the infrastructure deficiencies created by short-sighted policies of successive Commonwealth and State governments. The under-developed state of the country's Northern Territory at this time was a poor reflection on the governance of this vast area, perpetuated by ignorance of the areas potential resources and on-going neglect of national development generally. Australia's defence capabilities were inadequate to meet Australia's future needs and the development of supporting civilian infrastructure was at best poor and not strategically aligned.[19]

While government was aware of the developing risks in relation to Japan's increasing military power, its policy of waiting on events to happen meant not enough was done to prepare for worst-case scenarios. Such perceived lack of urgency resulted in a minimal level of practical achievement was simply a case of too little and too late.[20]

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[17] Meaher, *The Australian Road to Singapore*, pp.24, 169, 170,171.

[18] Ross, *Armed and Ready*, p.113.

[19] Butlin & Schedvin, *War Economy 1942-1945*, p.2.

[20] Palazzo, 'The Overlooked Mission: Australia and Home Defence', p.58.

However, efforts to maintain Australia's overall defence capabilities were affected by a number of adverse factors. At the conclusion of World War I, Australia was faced with huge war debt.[21] The nation was exhausted and looked optimistically towards a new socio-economic and political world order. From this standpoint, clear political visions came forward. Australia had stood down most of its military forces, retaining only a minimal officer corps, a small arms factory, some munitions works and a small state based militia. Continued investment in equipping the armed forces so soon after 1918, particularly when Australia seemed not in immediate danger of attack, was not a priority.

Among the variety of influential factors that affected defence preparation, Australian leaders were confronted by financial factors that determined the extent to which provision could be made for defence. Governments' concern in paying war debts led them to observe economic restrain until 1933-1934, when the worst of the financial crisis passed, allowing more funds for the development of defence infrastructure in Darwin and beyond.[22] The slight increase in the 1934 defence budget re-energised the RAAF and provided an opportunity for Australia to build a local aircraft industry.[23] Reducing the national deficit and debt were hence important objectives in these years, but the early decision to create an air force marked the start of over a decade of stagnation with its main role centered on the use of reconnaissance aircraft acting as long-range eyes for the Navy's defence of major ports and providing protection to merchant ships carrying greatly needed supplies. A general lack of resources brought about by the nation's financial difficulties meant that the challenge of creating an air force in the early interwar years made slow progress.

As argued in chapter three, industrialisation was an ambitious step

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[21] Ross, 'The Economics of Rearmament 1933-39', p.37.

[22] NAA: A705, 171/6/53. Roads, paths and general civil engineering services. RAAF Station, Darwin; AWM80, 11/432-438. Infrastructure development, 1940.

[23] Odgers, Air Force Australia, p.51.

geared to increase the output of private firms and at the same time reduces overseas import. Unfortunately, industrial developments do take years to bear fruit and made more difficult by the wartime absorption of skilled and semi-skilled men into the armed forces. Having the task of overseeing the equipping of the RAAF, the Air Board had some pressing challenges ahead. Australia's promotion of local aircraft manufacture by creating CAC was an entirely new and unique experience and a significant step forward. Unfortunately, the Wirraway advanced trainer built by CAC delayed the acquisition of a high-performance aircraft. Just as constraining was the time it took to conclude contractual details, combined with the dubious decision to use the trainer for combat roles.[24]

As discussed in chapter six, the decision to manufacture the Pratt & Whitney Twin Row Wasp R-1830 engine for the Beaufort locally was critical to Australia's war effort. Not doing it would have extended the air of uncertainty that was stalling the Beaufort project. Risk of failure was not a factor once the intellectual property and the necessary machine tools were obtained. War Cabinet's decisions to create DAP to build the Beaufort airframe was a matter of managing a rather complex organisational and mechanical engineering project. The 700 Beaufort bombers the company produced amassed an admirable operational record filling a role originally perceived as 'general reconnaissance' over the coastal waters in support of the RAN.[25]

The Lockheed Hudson was employed as a timely stop-gap acquisition after the Avro Anson aircraft ordered failed to arrive in Australia.[26] The arrival of the Beaufort saw the Lockheed Hudsons gradually relegated to communication and training roles. While the fighter-interceptor combat role was beyond the capability of the Beaufort, it nevertheless proved well suited to finding Japanese convoys and

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[24] Weston, 'The Australian Military Experience', p.54; See also chapter five.

[25] Robertson, *Australia at War,* p.187.

[26] Wilson, *Beaufort, Beaufighter and Mosquito in Australian Service*, p.27.

executing low-level attacks on enemy shipping.[27] Australia's position as a British Dominion and its isolation at the opposite side of the globe contributed to the assumption that the British Navy would take care of any threat against Australia by other nations.[28] Australia's decision to build a RAAF station base in Darwin was made more as a response to developments involving the dubious British strategy in Singapore rather than a positive move to protect Australia. Australia did show signs of developing a strategic direction, but sufficient urgency and the persistent problem of funding, scarcity of manpower and materials impeded programming. For this reason, the RAAF base at Darwin took three years to complete.[29] By early 1942 the base was nowhere near ready for meaningful operations against the Japanese air power.[30]

The effort of funding World War II, of furnishing ships and troops in support of Britain's struggle against Germany had repercussions at home. Although Australia did not hesitate to provide assistance to Britain to the point of neglecting its own home defence, as shown in chapter one, Britain and its allies often left Australia in the dark. Without a clear strategy, the Chiefs of Staff were not able to make a concerted and determined attempt to prepare for attacks on Darwin nor could they rapidly address external threats because of the Government's slowness in providing an appropriate response. However, while military chiefs provided their expert opinions to the Government, they remained dependent on the Government for financial backing which had the authority to make final decisions, whether right or wrong.

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[27] *Ibid*., p.20.

[28] Alan Powell, *Far Country. A short story of the Northern Territory*, (5th edn, Charles Darwin University Press, NT, 2009), pp.139, 141, 177.

[29] NAA: A705, 171/6/84 pt.1, Aerodrome works, letter from P.A. Gourgaud, Secretary of the Department of the Interior to the Secretary of DOD, 25 March 1938.

[30] NAA: A705, 171/6/84. RAAF Station Darwin – Aerodrome Works, 1938-1942. Minute, Secretary of the Air Board to the Secretary of DOD regarding effecting maximum economies in all projects, 19 July 1939. By 1941, the Air Board and the Minister for Defence recommended that funds be provide to have work done on the RAAF Darwin Station. War Cabinet Minute No. 803 of 1941.

As discussed in chapter two, in the course of deciding how to respond to particular circumstances government's leaders were often inconclusive. For example, in 1923 Australia's Lieutenant General Chauvel was doubtful about the Light Raids policy and the Singapore strategy. He suggested that the Government prepare the forces to counter an outside threat. His warning was brushed off by the Government.[31] As McCarthy wrote, well before World War II it was evident that Japan was up to something, being dissatisfied with the *status quo* in the Pacific. Australia's reaction 'was both unimaginative and unoriginal'.[32] Inherent in this, Australia had based its defence of Imperial defence in the 'blue water' doctrine believing in the ability of the RN to secure Australia with first line of defence.[33] However, by 1938 Lyons, disillusioned by the political unrest in Europe, assumed, 'that Australia might be left on its own to repel an aggressor and that in such a situation the RAAF would have to be its first line of defence'.[34]

In 1935, Billy Hughes had warned government against placing too much reliance on the RN, recommending that Australia 'secure her own future through the development of self-defence capabilities'. But, his prediction was not taken seriously by the Lyons government.[35] Then again, even if the light raids policy and the Singapore strategy were unconvincing, it was easier for government to hold on to both policies as they were the only ones available at the time. Also whatever the political symmetry between governmental parties, while military chiefs provided their expert opinions to the Government, they remained dependent on government for financial backing which had the authority to make final decisions, whether right or wrong.

Generalised capabilities, flexibility and adaptability are key

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[31] Coulthard-Clark, *Breaking Free*, pp.9, 11, 13.

[32] McCarthy, 'Air Power and Australian Defence 1923-1939', p.620.

[33] *Ibid*., p.622.

[34] *Ibid*.

[35] Fitzhardinge, *The Little Digger 1914-1952*, p.625.

ingredients for effective logistics in both the preparation and execution of military defences. Addressing such responsibilities was effectively eliminated by faith in and subservience to Britain's over-arching directions. Governments between 1939 and 1941 acted on three priorities – providing assistance to Britain, recovering their financial position and cutting back on imports. To achieve these goals, government placed significant emphasis on meeting Australia's likely future needs by expanding secondary industries and the role of the Munitions Supply Board of DOD which by early 1943 greatly contributed in moving Australia towards becoming an important industrialised nation.

The establishment and air operations of EATS as mentioned throughout this thesis made a significant contribution to the development of the RAAF. The scheme provided trained aircrew for the RAAF whose flying experiences with the RAF were put to good use against Japanese aerial strength. Through EATS the RAAF was transformed into a large scale operator of aircraft, capable of providing comprehensive aircrew training, operations management and engineering support. The scheme was undeniably instrumental in the RAAF's development through the critical years following 1940, and it also contributed in accelerating the nation's industrial development by involving local aircraft manufacturing, and the armament industries. It also provided employment opportunities and specialised skills to Australians particularly valuable in the post-war economy.

Significant benefits were gained from the arrival of USAAF in Australia towards the end of 1941, as they arrived equipped with an impressive array of modern aircraft, which played a key role in the Pacific War.[36] It also compelled government to have airfields built to accommodate US heavy aircraft or facilities to repair and overhaul aircraft. Between 1942 and 1944, some 300 airfields were built by DOI

[36] Stanley, *Invading Australia*, p.133.

Works and Services.[37]

In connection of American forces and assistance, it is quite reasonable to suggest that Australia was drawn into this politico-economic agreement for which she was financially and logistically ill-prepared, in return for US cooperation that did not automatically extend to the defence of Australia against Japanese aggression. No doubt US presence gave a boost to Australian morale, but their arrival did create an extremely dynamic environment as logisticians were still very much urgently building an operational capability across northern Australia from a near zero-base line. The decision-making processes and administration involved in providing suitable accommodation and in particular servicing the US aircraft were a case in point. As described in chapter seven, the ARDs performed a vital function in maintaining aircraft operational. It also shows that among aircraft servicing personnel there were many examples of amazing endurance and team-spirit in action in the discharge of their functions.[38] As the RAAF grew, no account exists that would even partially provide a modicum of information that contributed to the running of the RAAF. Its operations had become a giant enterprise with all the demands and appurtenances involved such as the ever-increasing bureaucracy who applied religious zeal its drive for accuracy and regularity. Chapter eight touches upon a crucial conditioning factor which has been neglected by military historians, in that, the extent to which RAAF headquarters administered their growing organisation, hopeful that their personnel would perform their duties conscientiously. As well as filling a void in RAAF's history, this chapter shows that from 1944-1945 RAAF commanding officers made a strong appeal to their personnel to record daily events which

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[37] NAA: A2684, 987, pt. 1, Repair and maintenance facilities for US aircraft in Australia, Brigadier General Edwin S. Perrin's letter to DG of DAP, 7 July 1942.

[38] NAA: A5954, 320/9, BBA. War Cabinet Minute no 1359.Criticism of BBA by the Advisory Works Panel, 4 September 1941. Regarding the considerable delay in authorising the treatment of the aerodrome at the RAAF Station, Darwin with bitumen, F. Shedden, October 1941.

would later be used by official historians to explain to the general public how the RAAF operated within its organisation and in the field. As the RAAF geared to develop their squadrons, as indicated in chapter nine the Army by virtue of their numerical superiority, provided greatly needed assistance to the RAAF such as transport, drivers and personnel in various areas of Australia was not without challenges.

After years of work on Darwin's defence infrastructure, it is incredible that the capability of Darwin RAAF Station as an operational base able to withstand hostile enemy action remained in February 1942 pathetically weak. Although according to Ross by 1942, Australia's industries produced large quantities of military equipment the nation was incapable of adequately defend Darwin against aerial attacks. Considering that the vast majority of air bases and aircraft repair depots which were created after the raids on Darwin do serve to show how under prepared Australia was before then. A lack of adequate roads and rail links, especially from Alice Springs to Darwin, severely affected the movement of men and supplies. The question of rail in Australia continued as a favorite topic for political promises prior to elections and was still being debated decades after the war ended.

This stands as an example of a range of deficiencies, errors and ill-conceived plans. This thesis sought to understand the underlying reasons for this failure. It argues that the overall situation as regards to the strategic distribution and deployment of military equipment should have been regularly monitored by defence managers to identify requirements. No systems are infallible but the strategic decision to establish factories and annexes in widely dispersed areas around the country exposed the production of war materials to the risks linked to a lack of infrastructure development in roads and inadequate transport that severely restricted quick delivery of stores to defence forces posted in northern areas. Of course, better railways could have moved large tonnages and at low cost, but as indicated political short-sightedness, interstate rivalry and lack of funds prevented sensible rail development on a national scale. This situation is made apparent by the fact that the

railways were burdened by interest charges on the capital cost of their infrastructure and its general servicing. As a result, State governments protected their railway investment by 'regulating road freight, until this became technically and politically untenable around 1970'.[39]

The problem was complicated by the fact that Australia was emerging from the Depression years and could hardly afford to sustain a defence force. There was also a vital need to work cooperatively and responsibly across the whole spectrum of boundaries between the services, governmental departments, and civilian organisations and later with the American forces. Earlier work on wartime Australia has never addressed what this thesis is offering. It is important to recognise that the need to move logistic support to front-line bases during World War II was a major operation, not previously contemplated by governments. Australia was sparsely populated, the civil infrastructure was minimal and, in the more remote areas, such as Broome, Darwin and other outback towns, were essentially non-existent and presented tremendous supply difficulties to the development of defence on a national scale. It is also important to commend those who performed the hard work involved in overcoming these problems on a wartime emergency basis were the unsung heroes whom almost without exception responded to their tasks with credit.

A major failure of wartime Australia was its reliance on the erroneous 'light raids' concept and on the considerable time and effort to counter an anticipated amphibious assault. The Government had anticipated that after the Japanese Army occupation of the Chinese province of Manchuria in late 1931 and by 1937 Japan's ruthless operation into eastern China and invasion of Indo-China by 1940.[40] The only potential aggressor against Australia could only come from Japan. The problem was a short notice of readiness was not practicable from 1939 and even in early 1942. In strengthening Australia's national

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[39] Lee, *Transport. An Australian History*, p.9.

[40] *Ibid*., pp.9,12.

security preparedness, the whole logistic operation was beset with problems generated by the need for the rapid build up of the forces combined with numerous infrastructure projects, which formed part of the Government's defence support program for the Northern Territory. Australia offset the loss of protection promised by Britain through the agency of its apparent but fast fading world dominance, which was amply shown with the loss of Singapore, by simply transferring defence dependence on the United States. The Government had to accommodate America's military and political might which increasingly played a great part to the nation, reversing Australia's great dependence on Britain for all manner of things. This transfer of focus to America was not done to a level that fully replaced Britain's influence in Australia as the mother country remained profoundly part of the conscious mind.

The later part of the 1930s wasted opportunities with the British delaying the efforts of the Australian government and the Air Board in acquiring aircraft required by the RAAF. Australia's intense lobbying of the British government to equip the RAAF with suitable aircraft paid off, especially with the decision to acquire the Bristol Beaufort and to make that aircraft and its Pratt & Whitney Twin Row Wasp R-1830 engine in Australia. By mid-1942, the Beaufort was replaced by a faster and more powerful aircraft: the British-built Beaufighter. Both aircraft were particularly effective against Japanese shipping and ground installations. The RAAF had grown to become a significant force, benefiting from early aircrew training programs and from the availability of many aircraft types, mainly from American production. The RAAF now possessed capabilities that would transform the role of air power for Australia.[41]

There is no denying that Australia from the 1920s to the Pacific War underwent profound political and military change. The stark reality behind Australia's defence preparation arrived like an unwelcome stranger when Japan entered the war, all manner of things previously set

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[41] Gillison, *Royal Australian Air Force*, p.139.

aside now sprang to prominence. Following the first raids on Darwin, the Government expanded the security of Australia with impressive numbers of new runways, air bases and aircraft repair depots which this thesis has addressed.

If there are lessons to be learned from wartime, despite its difficulties, the legacy of World War II made Australia a stronger nation in economic, socio-political terms. Contrary to Meaher's critical perception of Australian leaders, Australia was privileged to have had Robert Menzies and John Curtin as Prime Ministers. Menzies' acceptance of EATS was significant as it assured that Australian pilots acquired much useful experience, even though as shown in chapter four, opinions differed in this regard. Menzies' attempts to obtain first-class aircraft for Malaya were equally significant, as he bravely stood facing an opposed and patronising British cabinet. A fact obviously morally impermissible was that Menzies' appeal for aircraft led Beaverbrook to provide more Fairey Battles, an aircraft which proved unsuitable for the Australian environment, and 170 outdated Brewster Bermudas for which the RAF had no use in northwest Europe.[42] Curtin as Prime Minister from October 1941 to July 1945 bore the brunt of the total war effort, such as, the surrender of Singapore on 15 February 1942 with the capture of 120,000 men, becoming 'the high point of Japanese expansion in South East Asia.[43] Following the first Japanese air raids on Darwin on 19 February, Curtin ignored Churchill's bullying by switching the emphasis to strengthening home defence by bringing the 6th and 7th Divisions home. With General Douglas MacArthur's strong friendship and support, Curtin rose to the challenge of maintaining the morale within the nation.

The war created a new link between Australia and America and laid a basis for a new order of unity. Industrialisation provided employment to thousands of Australians, which in turn generated growth in the wartime economy. With a renewed confidence, Australia benefited from its

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[42] Ewer, *Wounded Eagle*, p.181.

[43] Warren, *Singapore the greatest d*efeat, p.292.

experiences, successfully adapting its capabilities to meet the exigencies of extreme and changing needs encountered in overcoming a powerful and determined enemy.

APPENDICES

Appendix 1: Prime Ministers and the Air Board 1923-1940

Billy Hughes, Labor, 1915-16; Nationalist Labor Party, 1917-1923

Stanley Melbourne Bruce, United Australia - Nationalist, 1923-1929

James Scullin, Labor, 1929 - 1932

Joseph Lyons, United Australia, 1932-1939

R.G. Menzies, United Australia - Nationalist, 1939-1941

A.W. Fadden, Country Coalition, 29 August -7 October 1941

John Curtin, Labor, 1941-1945.

The Air Board in 1928:

Group Captain S.J. Goble, Director of Personnel and Training

Air Commodore R. Williams, Director of Intelligence and Organisation

Commodore R.A. Mc Bain, Director of Equipment

P.E. Coleman, Secretary; A.C. Joyce, Finance member

The Air Board in 1940

Air-Vice Marshal H.N. Wrigley, Air Member for Personnel

R. Lawson, Director-General of Supply and Production

Air Chief-Marshal Sir Charles Burnett, CAS

Air Marshal R. Williams, Air Member for Organisation and Equipment

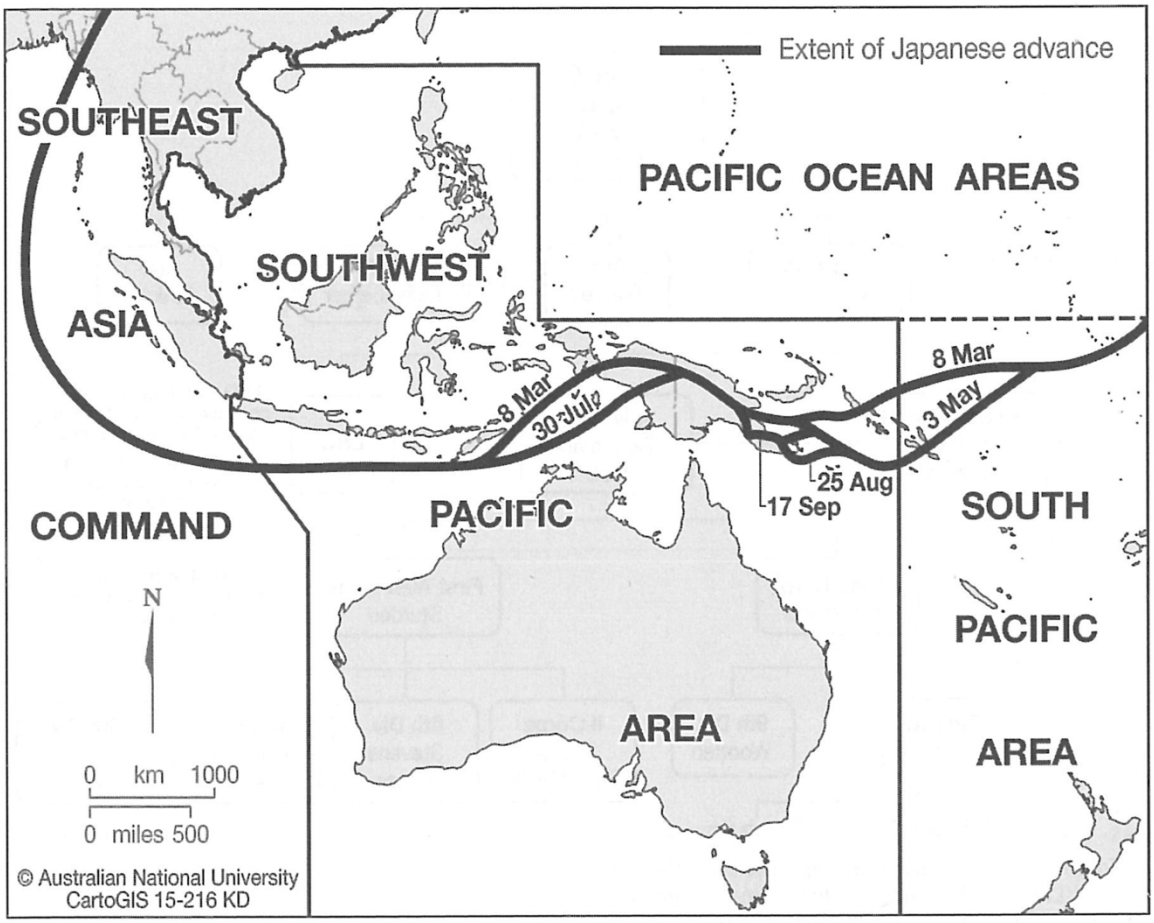
M.C. Langslow, Secretary of the Department of Air; C.V. Kellway, finance member

Ministers for Defence , 1932-1941

Senator Sir George Pearce	January 1932 - October 1934
Sir Archdale Parkhill	October 1934 - November 1937
J. A. Lyons	November 1937 - November 1937
H.V.C. Thorby	November 1937 - November 1938
Brigadier G.A. Street	November 1938 - November 1939
R.G. Menzies	November 1939 - October 1941

Sources: Parliamentary handbook of the Commonwealth of Australia, Government Printer, Canberra; C. D. Coulthard-Clark, *The Third Brother*, p.465.

Appendix 2: Map of the Southwest Pacific Area.



Map 1: Southwest Pacific Area

Source: CartoGIS Services, College of Asia and the Pacific. The Australian National University, Canberra.

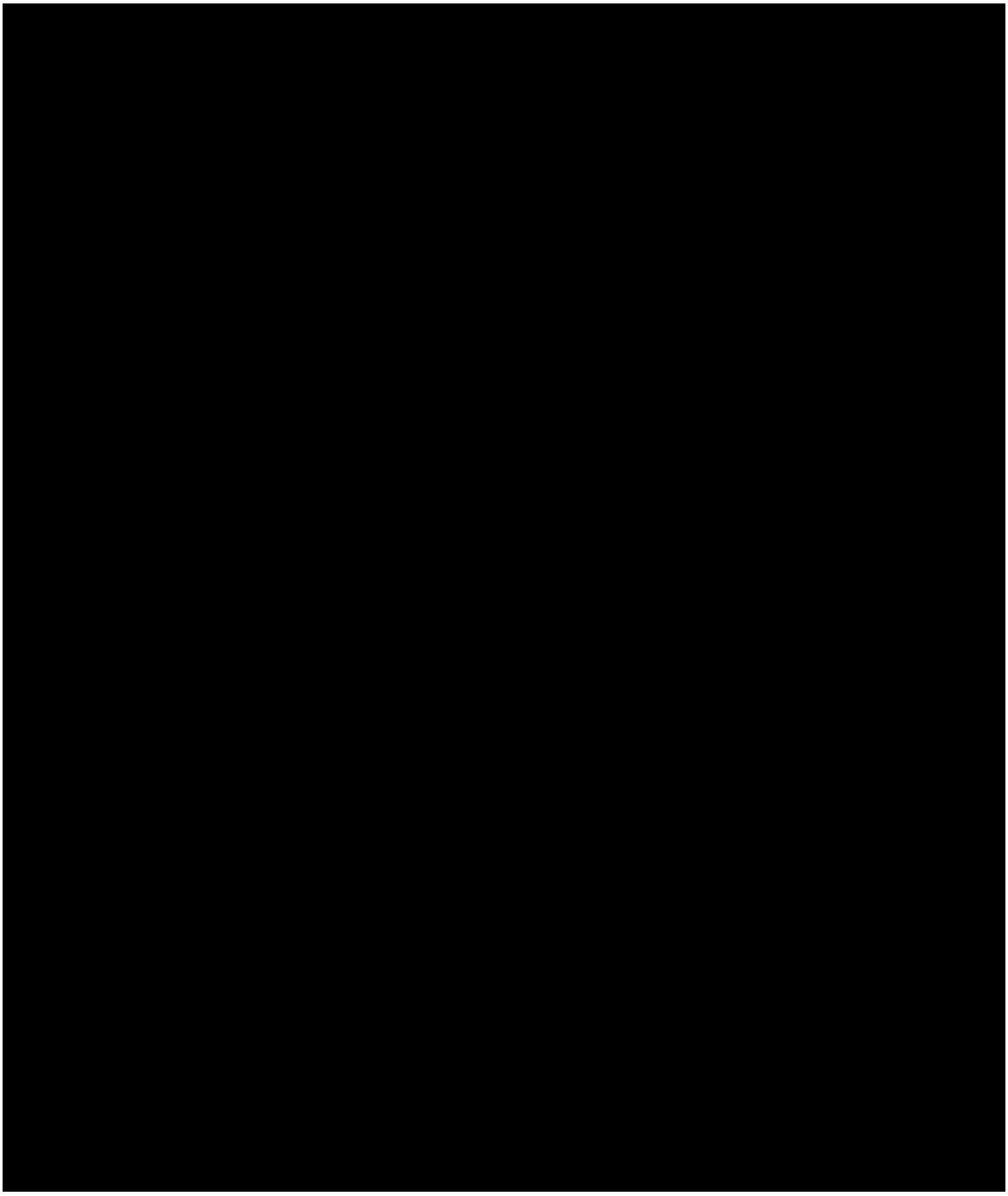
Appendix 3: Defence expenditure for the three services, 1924-1938.

	RAN	ARMY	RAAF	Civil Aviation
1924-25	2393	1558	398	105
1925-26	2621	1548	429	114
1926-27	2765	1526	572	112
1927-28	2598	1494	517	113
1928-29	2396	1466	549	98
1929-30	2167	1239	498	103
1930-31	1748	1195	392	1 50
1931-32	1444	995	326	132
1932-33	1496	978	320	137
1933-34	1646	1237	409	134
1934-35	1998	1328	536	164
1935-36	2371	1811	783	186
1936-37	2577	2232	1163	426
1937-38	2960	2182	1930	247

These figures expressed in £000s show the expenditure charged to each service and to the Civil Aviation Branch and are retrieved from the Commonwealth Year Books nos. 22-32, 1929-1939.

Source: C. D. Coulthard-Clark, *The Third Brother*, p.469.

Appendix 4: Strategic Roads, Queensland.



Source: AWM54, 422/7/8. Organisation of supply by the Australian Army Service Corps (AASC) in supplying the RAAF and Allied Air Forces, 1943.

Appendix 5:

Main contractors employed for general aircraft servicing:

Victoria:

Wirraway airframes	Australian National Airways Pty. Ltd.,
	P & W. Wasp single-row engines instruments, Essendon.
Avro Anson airframes	Ansett airways Ltd., Essendon.
Cheetah engines	
Tiger Moth airframes	
Gipsy Major engines	
Electrical equipment & accessories	Joseph Lucas (Aust) Pty. Ltd., Melbourne

New South Wales:

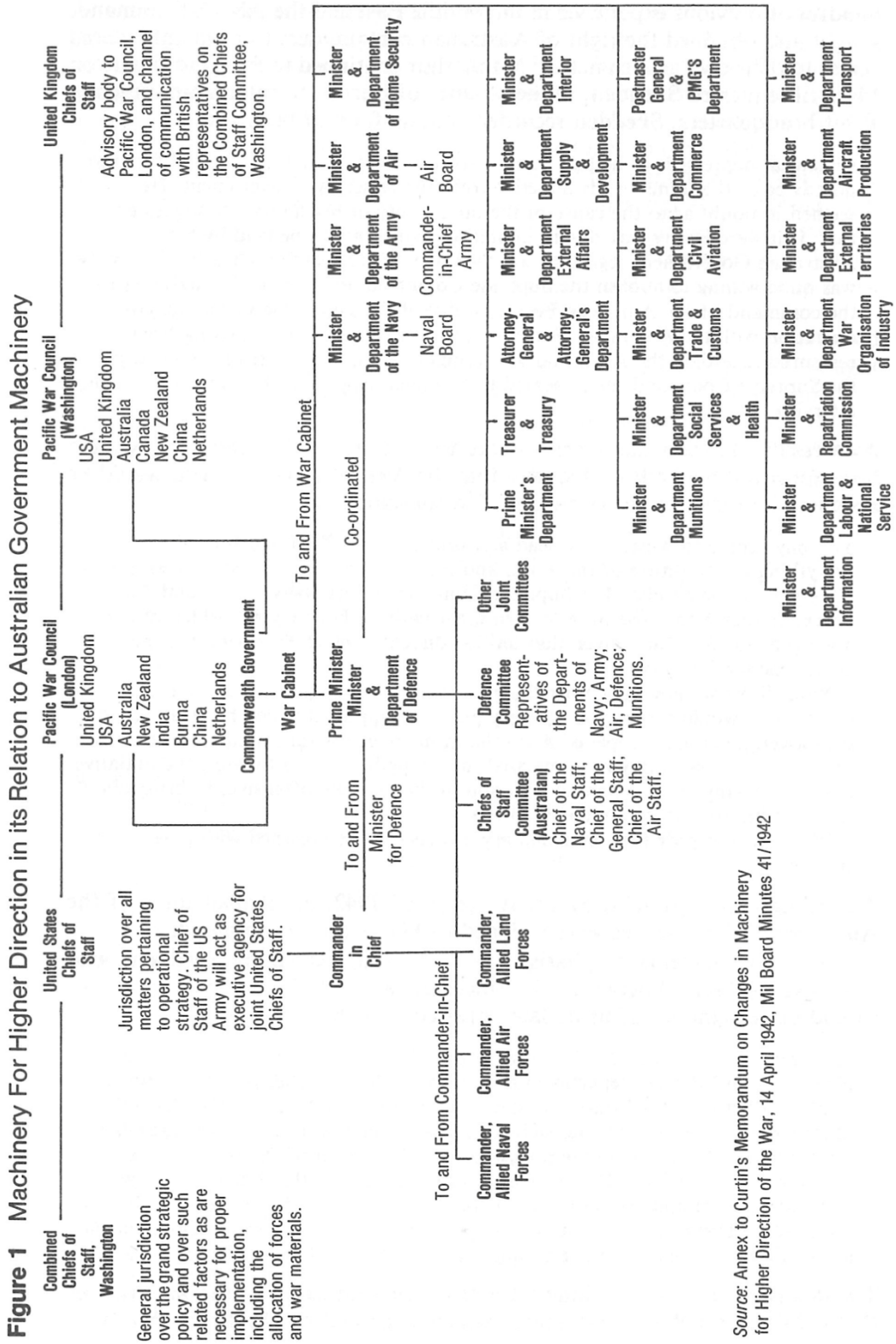
Avro Anson airframes	Butler Air Transport Co., Mascot
Cheetah engines	
Tiger Moth airframes	De Havilland Aircraft Pty. Ltd., Mascot
Gipsy Major engines (excluding Narromine and Tamworth)	
Tiger Moth airframes	Newcastle Aero Club, Newcastle
Gipsy Major engines (ex. Narromine)	
Rolls Royce engines	Qantas Empire Airways Ltd., Mascot &
Fairey Battle airframes	Rose Bay (eastern suburb of Sydney)
Pegasus engines	
Seagull airframes	
Electrical equipment & accessories	C. A. Fordham, Sydney

Queensland

Wirraway airframes	Australian National Airways Pty. Ltd.,
P & W. Wasp single-row engines	Archerfield.

Source: A705/1, 121/1/249. Manufacture of aircraft in Australia.

Appendix 6. Chart from D.M. Horner, *High Command. Australia and Allied Strategy, 1939-1945*, p.190.



Source: Annex to Curtin's Memorandum on Changes in Machinery for Higher Direction of the War, 14 April 1942, Mil Board Minutes 41/1942

Appendix 7: List of RAAF repair depots, 1921- 1945.

No 1 AD	Allison and Merlin engines – overhaul and repair, Laverton, Vic.
No 2 AD	A16-Hudson; A52 Mosquito; A59 Ventura, Richmond, NSW.
No 3 AD	A28 Boston; A47 Mitchell, Amberley, Qld.
No 4 AD	Depot dealt with types operating in WA depending on facilities; Wasp Twin Row (WTR), Kalgoorlee, SA.
No 5 AD	A9 Beaufort; A13 Link trainer; A8 Beaufighter MK XXI (Australia); A19 Beaufighter, Wright Double Row and Hercule engines, Forrest Hill via Wagga Wagga, NSW.
No 6 AD	A28 Boston; A29-K Kittyhawk; A46 Boomerang; A58 Spitfire; Allison & Merlin engines
No 7 AD	A72 Liberator; WTR and Wasp Double Row (WDR), R-2800, Corowal, NSW.
No 13 ARD	WTR & WDR R-2800, Tocumwal, NSW until 12/12/42. (13 ARD went to Breddan, Qld on 22 March 1943).
No 14 ARD	WDR & WTR, Ascot Vale, Vic.
No 1 FBRD	A24 Catalina A70 Mariner
No 2 FBRD	A24 Catalina A48 Kingfisher, Rose Bay, NSW.
No 3 FBRD	A24 Catalina A70 Mariner
No 1 RSU	c/- Army P.O., Katherine, NT
No 4 RSU	Darwin, NT
No 7 RSU	St Mary's, NSW
No 10 RSU	Charters Towers, Qld
No 11 RSU	Mount Druid, NSW
No 12 RSU	Charters Towers, Qld
No 15 RSU	Port Moresby, PNG
No 17 RSU	Cunderdin, WA
No 26 RSU	Werribee, Vic

EATS and various transport aircraft, including the Bristol Sunderland were serviced and repaired by DAP contractors. Units operating Link Trainers did not undertake complete overhauls or repairs beyond their capacity. Minor repairs such as replacement of parts were done on Vengeance aircraft and carried out by all depots. Transport aircraft were serviced by National Australian Airways, Parafield, Adelaide, S.A.

Appendix 8: Forces disposition in Australia, 1942-1946

Adelaide River, N.T

No 2 Base Personnel Staff Office	29. 3. 43	10. 5. 44
No 24 (Base) Wing	7. 12. 42	15. 3. 43
No 150 Radar Station	27. 4. 44	13 7. 45
No l61 Radar Station	10. 2. 44	30. 4. 44
No 321 Radar Station	28. 6. 43	27. 7. 43
No 44 RDF Wing	14. 12. 42	22. 8. 44
No 11 Signals Unit	6. 12. 42	22. 8. 44
No 8 RAAF Postal Unit	15. 3. 43	22. 2. 46

Alice Springs, N.T

No 57 Operational Base Unit	20. 5.42	30.1. 46
No 24 Inland Aircraft Fuel Depot	Nov 44	

Anjo, N.T (ex. West Bay, renamed Truscott)

No 154 Radar Station	23. 6. 44	2. 11. 44
No 161 Radar Station	30. 4. 44	13. 6. 44
No 319 Radar Station	1. 8. 44	19.10. 44

Batchelor, N.T

No 2 Air Ambulance Unit	8. 5. 42	16. 1. 43
(Detachment)	12. 2. 43	22. 3. 43
	16. 9. 43	11. 1. 44
No 1 Airfield Construction Squadron	15.12. 42	26. 1. 43
(No 1 Flight)		
No 9 Airfield Construction Squadron	21.12. 43	9. 3. 44
(Detachment)		
Batchelor Road	9. 3. 44	Jul 44
No 6 Communication Flight	27. 2. 43	7. 10. 45
(No 6 Communication Unit - 29.10.43		
No 53 Operational Base Unit	18. 3. 42	20. 2. 46
No 54 Operational Base Unit	23.10. 42	24.11. 42

No 83 Operational Base Unit	1. 1. 45	6. 3. 45
RAAF Station Batchelor	18. 3. 42	15. 7. 42
No 5 Replenishing Centre	22. 6. 42	14. 7. 42
	29. 2. 44	19. 4. 45
No 9 Replenishing Centre	22. 6. 42	26. 7. 42
No 2 Torpedo Maintenance Unit	6. 4. 43	17. 2. 44
No 79 Wing Headquarters	20.11. 43	29. 6. 45
No 2 Wireless Unit	8.11. 43	28. 3. 45
No 3 Wireless Unit	19. 1. 44	27.11.45
No 308 Radar Station	2. 3. 43	1. 4. 43
No 318 Radar Station	4. 6. 43	21. 8. 44
No 2 Squadron	16. 8. 42	12. 5. 43
No 12 Squadron	1. 9. 42	1. 7. 43
No 18 (NEI) Squadron	18. 5. 43	11. 6. 45
No 77 Squadron	18. 8. 42	15.10.42

Bathurst Island, N.T

No 38 Radar Station	14. 8. 42	18. 4. 46
No 12 Squadron - Flight 1942		

Berrimah, N.T

Air Defence Headquarters, Darwin	21. 1. 45	18. 4. 46
No 7 Convalescent Depot	16. 8. 43 2	1. 8. 44
(No 7 MedicaL Rehabilitation Unit)		
No 150 Radar Station	13. 7. 45	18. 4. 46

Berry Springs, N.T

No 7 Convalescent Depot	21. 8. 44	25. 8. 45
(No 7 Medical Rehabilitation Unit)		

Birdum, N.T

No 2 Base Personnel Staff Office	8. 6. 42	29. 3. 43
No 8 W/T Station (W/T Station N.W. Area)	15. 7. 44	16. 3. 46
(NWA Headquarters Telecommunications Unit)		
No 9 W/T Station	15. 7. 44	26. 7. 45

(W/T Station, Birdum)		
(Birdum Telecommunications Unit)		
No 55 Operational Base Unit	20. 5. 42	18. 1. 44

Brooks Creek, N.T

No 1 Airfield Construction Squadron		
(No 1 Mobile Works Squadron)		
-Detachment	10. 8. 42	7.10. 42

Cape Don, N.T

No 46 Radar Station	28. 3. 42	18. 4. 46
No 318 Radar Station	21. 8. 44	7. 4. 45

Cape Van Diemen, N.T

No 60 Radar Station	7. 2. 44	21. 1. 46
No 318 Radar Station	7. 4. 45	13. 8. 45

Coomallie Creek, N.T

No 1 Airfield Construction Squadron		
(No 1 Mobile Works Squadron)	1. 9. 42	8. 12. 42
-Detachment	16. 7. 42	1. 9. 42
No 9 Airfield Construction Squadron		
(No 9 Works Maintenance Unit)		
-Detachment	6. 9. 43	28. 6. 44
No 14 Airfield Construction Squadron		
(No 14 Mobile Works Squadron)		
-Detachment	17. 3. 44	16. 4. 44
No 1 Medical Receiving Station	13. 9. 42	30. 7. 44
No 3 Wireless Unit	12. 1. 44	18. 1. 44
No 61 Works Wing Headquarters		
(No 61 Airfield Construction		
Headquarters)	3. 2. 43	17. 9. 44
No 31 Squadron	11.11. 42	13. 10.43
No 87 Squadron	9.12. 44	13. 11.45

Daly Waters, N.T

No 2 Air Ambulance Unit	16. 3. 42	9. 4. 42
-Detachment	25. 4. 42	8. 5. 42
No 1 Medical Receiving Station	18. 3. 42	12. 9. 42
No 56 Operational Base Unit	18. 3. 42	30. 7. 43
RAAF Station Daly Waters	18. 3. 42	5. 5. 42
No 1 Repair and Salvage Unit	18. 3. 42	31. 8. 42
(No 1 Repair and Servicing Unit - 1.1.45)		
No 9 Stores Depot	10. 8. 42	6.10. 44
No 13 Squadron	21. 2. 42	1. 5. 42

Darwin, N.T

Refer also to Berrimah, Nightcliffe		
Air Defence Headquarters	21. 1. 45	18. 4. 46
No 1 Airfield Construction Squadron		
(No 1 Mobile Works Squadron)	7. 2. 44	11. 9. 44
No 3 Flight	16. 1. 43	9. 8. 43
No 3 Airfield Construction Squadron		
(No 3 Works and Maintenance Unit)		
(No 3 Works and Maintenance Unit)	7. 5. 42	8. 3. 44
Air Defence Headquarters	21. 1. 45	18. 4. 46
No 9 Airfield Construction Squadron		
(No 9 Works Maintenance Unit)	18. 4. 44	29. 9. 44
No 14 Airfield Construction Squadron		
(No 14 Mobile Works Squadron)	15. 3. 44	20. 4. 44
No 12 Aircraft Repair Depot	4. 8. 44	15. 8. 46
No 14 Aircraft Repair Depot		
(Salvage Section)		
(No 7 Airframe Repair Depot)		
- Detachment	12.10. 43	1. 6. 44
No 112 Air-Sea Rescue Flight	23.12. 44	6.11. 47
No 8 Central Recovery Depot	1. 6. 44	3. 9. 44
No 6 Communication Flight	7.10. 45	19. 3. 46
No 5 Fighter Sector Headquarters		
(No 105 Fighter Sector Headquarters)	25. 2. 42	21. 1.45
(No 105 Fighter Control Unit)		
No 1 Fighter Wing Headquarters	25. 1. 43	24. 4. 44

	28. 8. 44	12.10.45
No 3 Malaria Control Unit	17.10. 44	24.11.45
No 25 Medical Clearing Station	18. 4. 44	21. 4. 44
No 1 Medical Receiving Station	1. 8. 44	6. 4. 46
No 10 Mobile Fighter Sector Headquarters	10. 5. 43	1. 4. 44
(No 10 Mobile Fighter Sector Headquarters)		
(No 110 Mobile Fighter Control Unit)		
No 3 Mobile Torpedo Unit	9. 4. 44	4.10. 45
North Western Area, Headquarters	15. 1. 42	17. 8. 42
	13.11.43	29.6. 55
No 58 Operational Base Unit	5. 3. 43	15. 4. 46
No 85 Operational Base Unit	7. 6. 45	17. 6. 45
RAAF Station Darwin	1.6. 40	22. 8. 42
	1. 8. 44	30. 6. 52
No 31 Radar Station	1. 6. 42	30. 9. 43
No 38 Radar Station	25.6. 42	14. 8. 42
No 39 Radar Station	25.6. 42	17. 8. 42
No 109 Radar Station	1. 6. 42	20.10.43
No 132 Radar Station	23.11.42	18. 4.46
No 150 Radar Station	27. 6. 43	27. 4.44
No 224 Radar Station	24. 5. 43	18. 4.46
No 257 Radar Station	16.10.45	18. 4.46
No 302 Radar Station	28. 8. 44	1. 2.45
No 307 Radar Station	25. 1. 43	19. 3.43
(No 61 Radar Station)		
No 308 Radar Station	13. 1. 43	2. 3.43
No 309 Radar Station	13. 1. 43	10. 3.43
No 321 Radar Station	20. 6. 43	22. 7.43
No 351 Radar Station	28. 8. 44	16. 1.45
No 1 Repair and Salvage Unit	1. 6. 43	11. 6.43
(No 1 Repair and Servicing Unit)		
No 7 Repair and Salvage Unit	16. 2. 44	12.11.45
(No 7 Repair and Servicing Unit)		
No 9 Repair and Salvage Unit	17. 1. 45	25. 1.45
(No 9 Repair and Servicing Unit)		

No 18 Repair and Salvage Unit	2. 9. 44	1. 3. 45
(No l8 Repair and Servicing unit)		
No 9 Replenishing Centre	1.10.44	7. 10.45
No 28 Air Stores Park	2. 7.44	10. 8. 44
No 31 Air Stores Park	13. 9.45	22.11.45
No 76 Wing Headquarters	27. 8.44	21.11.45
No 85 Wing Headquarters	5. 6.45 2	7.11.45
No 61 Works Wing Headquarters	May 1944	31. 8. 44
(No 61 Airfield Construction Headquarters)		
-Detachment	12. 9. 44	10.10.44
No 2 Squadron	7.12.41	10.12.41
No 12 Squadron	24. 7.39	14. 7.42
	1. 5.45	31. 1. 46
No 13 Squadron	1. 6.40	20. 2. 42
No 20 Squadron	13. 9.44	20.11. 45
No 31 Squadron	14.10.43	1.12. 44
No 34 Squadron	6. 2.42	14. 7. 42
No 42 Squadron	1. 6.44	30.11. 45
No 43 Squadron	9. 4.44	23.11. 45
No 54 (RAF) Squadron	24.10.44	1. 9. 45
No 79 Squadron	12. 1. 45	12. 3. 45
No 99 Squadron	13. 9. 45	10. 12.45
No 452 Squadron	4. 9. 42	12. 1. 43
No 457 (RAF) Squadron	25. 1. 43	31. 1. 43
No 201 Flight	17. 4. 45	16.10.45

Fenton, N.T

No 1 Airfield Construction Squadron		
(No 1 Mobile Works Squadron)		
No 1 Flight	3. 5. 43	9. 8. 43
No 2 Flight	6. 5. 43	9. 8. 43
No 14 Airfield Construction Squadron		
(No 14 Mobile Works Squadron)		
-Detachment	5. 3. 43	Dec 43
No 24 Air Stores Park	12.11.44	16. 6. 45

No 27 Medical Clearing Station	16.10.44	21. 4. 45
No 30 Medical Clearing Station	1. 5. 45	17. 6. 45
No 31 Radar Station	10. 2. 44	1. 7. 44
(No 310 Radar Station)	1. 7. 44	13.11.44
No 309 Radar Station	10. 3. 43	3. 5. 43
No 319 Radar Station	6. 6. 43	30. 3. 44
No 6 Repair and Salvage Unit		
(No 6 Repair and Servicing Unit)	23. 2.45	10. 6. 45
No 18 Replenishing Centre	6.11.44	17. 6. 45
No 82 Wing Headquarters	20.10.44	18. 6. 45
No 21 Squadron	27.12.44	17. 6. 45
No 24 Squadron	1. 9. 44	17. 6. 45

Gorrie, N. T.

No 1 Airfield Construction Squadron		
(No 1 Mobile Works Squadron)		
- No 1 Flight	15.11.42	3. 5. 43
No 14 Aircraft Repair Depot	5. 5. 43	5.10. 45
(Not Airframe Repair Depot)		
No 55 Operational Base Unit	18. 1. 44	25. 4.46
No 9 W/T Station	15. 7. 44	26. 7.45
(W/T Station Birdum)	27. 7. 45	23.12.45
(Birdum Telecommunication Unit)		
(Gorrie Telecommunication Unit)		

Goulburn Island, N.T

No 309 Radar Station	3. 5. 43	21. 2. 45

Gould, N.T

No 9 Replenishing Centre	May 1943

Gove, N.T

No 56 Operational Base Unit	2.12. 43	30. 4. 46
No 13 Squadron	24. 5. 43	12. 6. 45
No 83 Squadron	19. 1. 44	19. 9. 44
No 8 Airfield Construction Squadron	25.10.43	29. 7. 44

No 5 Replenishning Centre, Green Ant, Creek	20. 8. 43	29. 2.44

Groote Eylandt, N.T

No 51 Operational Base Unit	15. 5. 42	2. 9. 44

Howard River, N.T

No 9 Airfield Construction Squadron (No 9 Works Maintenance Unit) - Detachment	5. 9. 43	14.11.43
148th Field Artillery Regiment (USAAF)		

Hughes, N.T

No 9 Airfield Construction Squadron (No 9 Works Maintenance Unit) - Detachment	31. 3. 44	May 44
No 54 Operational Base Unit	30. 5. 42	23.10. 42
No 1 Fighter Wing Headquarters	23. 6. 44	28. 8. 44
No 13 Squadron	2. 5. 42	20. 5. 43
No 34 Squadron	15. 7. 42	25. 8. 42
No 2 Squadron	12. 5. 43	31. 8. 45

Katherine, N.T

No 5 Replenishing Centre	15. 7.42	15.11. 42
No 12 Survey and Design Unit	1. 2.43	22. 7. 43

Knuckeys Lagoon, N.T

No 5 Central Reserve	28. 9. 44	20.10. 44
No 162 Radar Station	29. 8. 44	1. 2. 45

Larrimah, N.T

No 8 Replenishing Centre	10. 8. 43	6.11. 44

Lee Point, N.T.

No 59 Radar Station	20.10.43	18. 4. 46

Livingstone, N.T

No 1 Fighter Wing Headquarters	24. 4. 44	8. 6. 44
No 14 Repair and Salvage Unit	4. 4. 44	4. 5. 44
Security Guards Unit	1.10. 42	12. 6. 43
No 54 (RAF) Squadron	13. 6. 44	23.10.44
No 77 Squadron	16.10. 42	25. 1. 43
No 457 (RAF) Squadron	25. 1. 43	31. 1. 43
No 584 (RAF) Squadron	12. 7. 44	31.10.45

Long, N.T

No 23 Squadron	6. 3. 45	17. 6. 45

MacDonald, N.T

No 54 Operational Base Unit	24.11.42	14. 2. 43
No 18 (NEI) Squadron	18. 1.43	17. 5. 43

Manbullo, N.T

No 8 Airfield Construction Squadron		
(No 8 Mobile Works Squadron)		
- Detachment	1. 6. 43	19. 8. 43
No 6 Communication Flight		
(No 6 Communication Unit)	11.12.42	27. 2. 43
No 1 Repair and Salvage Unit	1. 9. 42	31. 5. 43
No 24 Squadron	1. 5. 44	31. 8. 44
No 34 Squadron	26. 8. 42	2. 1. 43

Melville Bay, N.T (Gove)

No 8 Airfield Construction Squadron		
(No 8 Mobile Works Squadron)	25.10.43	29. 7. 44
- Detachment	16. 8. 43	25.10.43
No 42 Squadron (GR/FB)	11. 7. 44	30.11.45

Melville Island, N.T

No 9 Airfield Construction Squadron

(No 9 Works Maintenance Unit)		
- Detachment	6. 7.44 Sept 44	

Millingimbi, N.T

No 1 Airfield Construction Squadron		
(No 1 Mobile Works Squadron)		
- No 3 Flight	2. 5.43	7. 8. 43
No 59 Operational Base Unit	12. 4.43	6. 9. 44
No 308 Radar Station	1. 4.43	5. 2. 45
No 9 Zone Filter Centre	23. 8.43	7. 2. 45

Nightcliffe, N.T

No 7 Convalescent Depot	25. 8.45	19.10.45
(No 7 Medical Rehabilitation Unit)		
Security Guards Unit	12. 6.43	19.11.45
(No 1 Airfield Defence Squadron)		
No 54 (RAF) Squadron	21. 1.43	12. 6. 44

Noonamah, N.T

No 1 Airfield Construction Squadron		
(No 1 Mobile Works Squadron)		
- No 1 Flight	6. 9. 42	15.11.42

Pell, N.T

No 14 Aircraft Repair Depot		
-Detachment	18.10.43	8. 6. 44
(No 4 Repair and Salvag Unit)	1.11.42	11.5. 45
(No 4 Repair and Servicing Unit)		
No 7 Repair and Salvage Unit	13. 1. 43	15. 2.44
No 9 Replenishing Centre	26. 7. 42	3.11.43
No 28 Air Stores Park	16. 8. 44	28. 2.45
No 12 Squadron	15. 7. 42	31. 8.42

Perron Island, N.T.

No 61 Radar Station	1. 5. 44	18. 4. 46
No 307 Radar Station	19. 3. 43	1. 5. 44

Pine Creek, N.T.

No 1 Airfield Construction Squadron		
(No 1 Mobile Works Squadron)	1. 7. 42	1. 9. 42
No 11 Works Supply Unit	26. 3.43	15.11.43

Point Charles, N.T.

No 31 Radar Station	1.10.43	10. 2.44
No 105 Radar Station	1. 6. 42	20. 1.43
(Mobile R.D.F)		

Port Keats, N.T

No 39 Radar Station	17. 8.42	18. 4. 46

Sattler, N.T

No 1 Airfield Construction Squadron		
(No 1 Mobile Works Squadron)		
- No 2 Flight	26. 1.43	6. 5. 43
No 9 Airfield Construction Squadron		
(No 9 Works Maintenance Unit)		
- Detachment	20. 1.44	15. 4. 44
No 22 Air Stores Park	10. 8.44	25. 2. 45
No 1 Fighter Wing Headquarters	8. 6.44	23. 6. 44
No 3 Malaria Control Unit	15. 5.44	17.10. 44
No 25 Medical Clearing Station	21. 4.44	18. 1.45
No 10 Mobile Fighter Sector		
Headquarters	1. 4.44	16. 1. 45
No 110 Mobile Fighter Control Unit		
No 60 Operational Base Unit	4. 5. 44	17. 1. 45
No 161 Radar Station	1. 8. 44	1. 2. 45
No 310 Radar Station	14.11.44	31. 3. 45
(No 31 Radar Station)		
No 343 Radar Station	11. 8.44	29. 1.45
No 352 Radar Station	2. 9.44	9. 1.45

No 9 Repair and Salvage Unit (No 9 Repair and Servicing Unit)	8. 4.44	16. 1.45
No 453 Squadron	16. 5. 44	1. 2. 45
No 457 (RAF) Squadron	16. 5. 44	1. 2. 45

Strauss, N.T

No 452 Squadron	13. 1. 43	15. 4. 44
No 549 (RAF) Squadron	11.7. 44	31.10.45

Tindall, N.T.

No 8 Airfield Construction Squadron (No 8 Mobile Works Squadron) -Detachment	1. 5. 43	1. 7. 43
No 5 Replenishing Centre	15.11.42	20. 8.43

Truscott, N.T

(No 14 Mobile Works Squadron) (No 14 Airfield Construction Squadron	25. 4.44	21. 8.44
No 58 Operational Base Unit	11. 7. 44	15. 4.46
No 154 Radar Station	21.11.44	18. 4.46
No 319 Radar Station	3.11.44	9.10.45

Venn, N.T

No 54 Operational Base Unit	15. 2. 43	29. 3.43

Wessel Island, N.T

No 312 Radar Station	23. 4. 43	6. 2. 45

Wynnellie, N.T

No 9 Airfield Construction Squadron (No 9 Works Maintenance Unit) -Detachment	9. 3. 44	31. 3. 44
No 4 Repair and Servicing Unit	11. 5. 45	9. 1. 46
No 2 Reserve Personnel Pool	12. 9. 45	13. 2. 46

No 28 Air Stores Park	9. 2. 44	2. 7. 44
No 9 Stores Depot	6.10. 44	21. 1. 49
No 8 Transport & Movements Office	1. 4. 44	1.10. 46
No 1 Airfield Defence Squadron	23. 9. 45	3.11. 45

Yirrkala, N.T

No 321 Radar Station	27. 7. 43	21.1. 46

9 Mile, N.T

No 14 Mobile Works Squadron		
(No 14 Airfield Construction Squadron)		
-Detachment	17. 3. 44	16. 4. 44
No 8 Central Recovery Depot	3. 9. 44	9. 1. 46
No 11 Works Supply Unit	15.11.43	4. 9. 44
No 61 Works Wing Headquarters		
-Detachment	6. 4. 43	1. 6. 43

10 Mile, N.T

No 5 Central Reserve	20.10. 44	12.12. 45
No 9 Replenishing Centre	4.11. 43	30. 9. 44

34 Mile, N.T

No 9 Airfield Construction Squadron		
(No 9 Works Maintenance Unit)		
-Detachment	18. 6. 44	3.10.44

38 Mile, N.T

No 14 Mobile Works Squadron		
(No 14 Airfield Construction Squadron)		
-Detachment	5. 8. 43 Dec 43	

40 Mile, N.T

No 9 Airfield Construction Squadron		
(No 9 Works Maintenance Unit)	2. 8. 43	18. 4.44

41 Mile, N.T (Fraser Strip)

No 12 Aircraft Repair Depot		
-Detachment	3. 8. 44	22.10.45

54 Mile, N.T

No 2 Reserve Personnel Pool	12. 7. 44	12. 9. 45
No 2 Base Personnel Staff Office	10. 5. 44	9. 10. 44

57 Mile, N.T

North Western Area Headquarters	17. 8.42	13. 11.45

58 Mile, N.T

No 14 Airfield Construction Squadron		
(No 14 Mobile Works Squadron)	20. 7.43	25. 9. 43
No 5 Radio Installation	22. 8.44 2	Jan. 46
and Maintenance Unit		

58 1½ Mile, N.T

No 161 Radar Station	13. 6. 44	1. 8. 44
No 344 Radar Station	6. 2. 44	22. 3. 44

Source: M.S.G. Amar, *The logistic support of the RAAF and associated activities in the northern area of operations during World War II – 1939 to 1945*, August 1993.

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