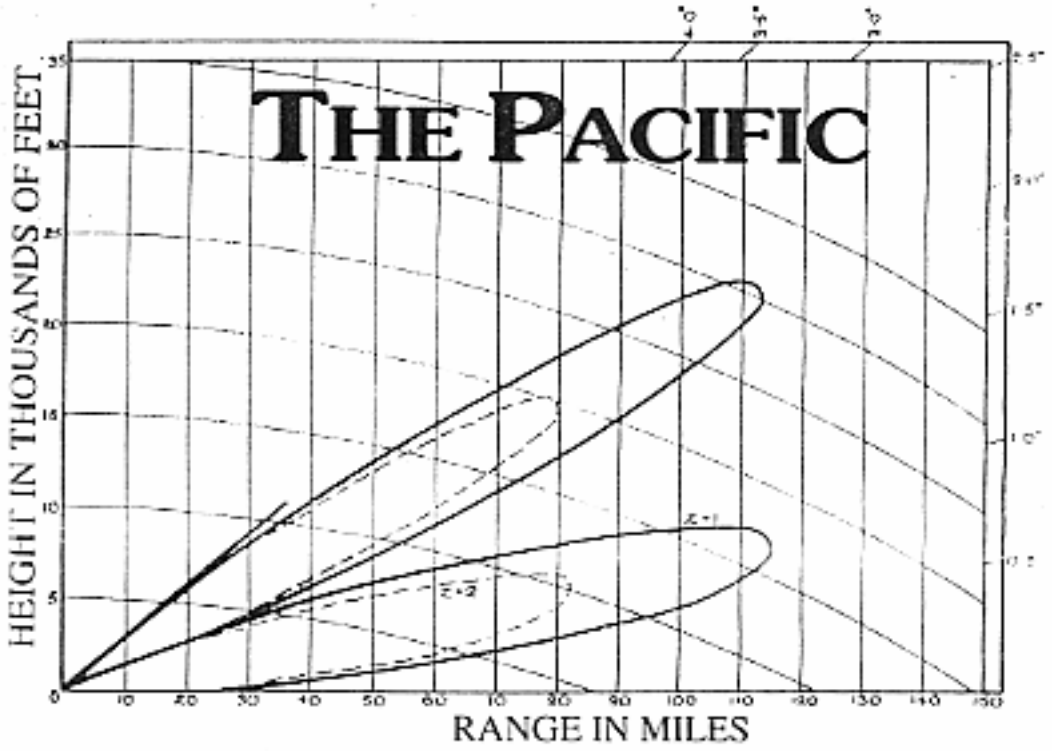
ECHOES OVER THE PACIFIC



by

Ed Simmonds and Norm Smith

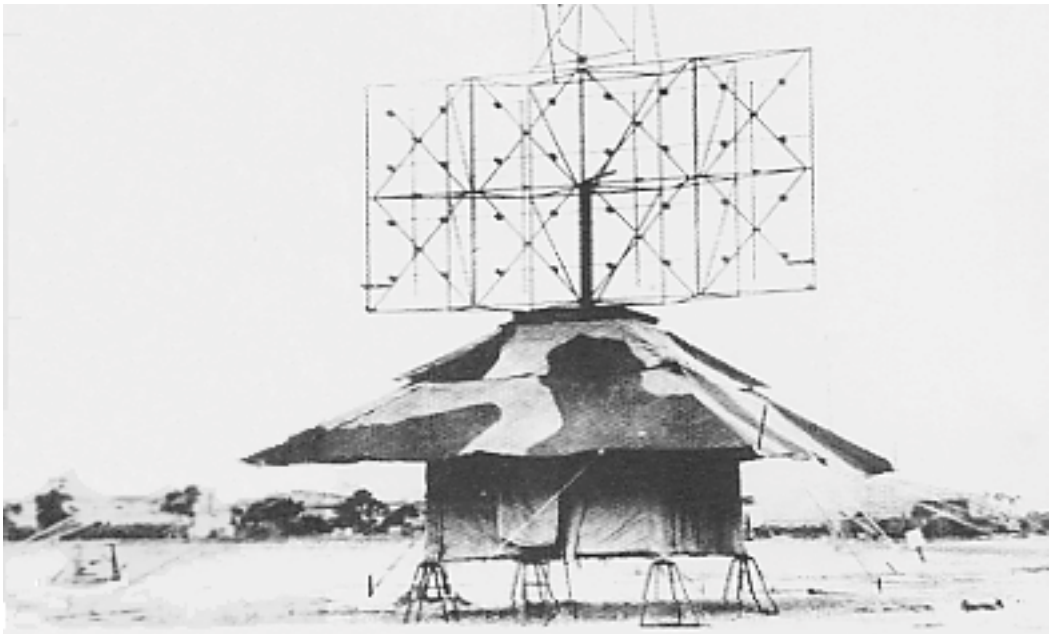


Photo: Worledge Collection
LW/AW Mk II Tower in Full Operational Garb
In 1943/44 it was the Backbone of RAAF Ground Based Radar

ECHOES OVER THE PACIFIC

An overview of Allied Air Warning Radar
in the Pacific
from Pearl Harbor to the Philippines Campaign

by

Ed Simmonds and Norm Smith

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DEDICATION

This book is dedicated to

those who died during WWII while serving in Allied Air Warning Radar

and

those who have subsequently died or suffered as the result of their service.

The names of the heroes of the early squadrons are immortalised in the landing strips in the Islands: but when the full story is told of how the tide of battle was turned in the Pacific, from the widest possible Allied view, one of the brightest and most inspiring chapters will be that on RAAF radar.

This is the final paragraph in an article by "a *Wings* Correspondent" entitled the *Story of RAAF Radar* published in *Wings* Magazine, Vol 6 No 3, January 15, 1946

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FOREWORD

My early operational flying was on ‘long-nosed Lincolns’ in the maritime reconnaissance role. The radar was ASV7 and it was virtually useless except for detecting the Australian mainland for navigational purposes. Hence, my early knowledge of, and familiarity with, air warning and GCI radar was essentially zero.

I first visited a radar unit (3CRU) in 1970 as part of staff course training, and was astounded to see people still writing backwards on perspex screens to display voice-told plots. The whole scene reminded me of those WWII films showing shapely WAAAFs pushing little blocks over a gridded horizontal plotting table; and I was flabbergasted at the little apparent progress from that 1940s era made by the RAAF’s air defence system.

Still, my career took me elsewhere; and it was not until 1990, when, as Air Commander Australia, I first took a direct interest in the business of air defence. The Commander of the Tactical Fighter Group was responsible to me for all fighter operations, including the activities of No. 41 Wing. He was also exercise director for the annual PITCH BLACK air defence exercise; and in this capacity he introduced me to the intricacies of air defence, including the technical capabilities and limitations of ground-based microwave radar, and its tactical application. Subsequently, I undertook a formal familiarisation course, visited radar units both at home and in the field many times, and followed the numerous related exercises with great interest.

With this background, therefore, I accepted with pleasure the opportunity to write the Foreword to *Echoes Over the Pacific*. Not only was I keen to learn of the work undertaken by the Allied radar units in the Pacific area in WWII (a subject virtually unknown to all but those involved, and generally overlooked by subsequent historians), but I was also interested as to the relevance of those experiences to the RAAF today.

Having now read the book, I can only praise the authors for their diligent and thorough - perhaps definitive - coverage of the subject. The text is eminently readable, presented in a logical manner, and provides a cohesive and comprehensive picture without causing obscuration through detail.

Several features which result from this coverage are worthy of comment. First and foremost, this book is about people: ordinary Australians doing extraordinary things in, usually, the most difficult of circumstances. The legendary characteristics of determination, perseverance in the face of adversity, improvisation, initiative - and scrounging, are all there.

Secondly, the generosity and willing cooperation of the American forces towards their Australian Allies comes through strongly; as does the apparent better understanding of the American commanders for the importance of air warning, the essentiality of coordinated operations, and the need to support critical units effectively. As a corollary, the deficiencies of Australian commanders and staffs in these aspects are referred to repeatedly in the text - and with some bitterness.

Thirdly, the doctrinal maxims of successful air warning radar deployments and operations seemed to be well understood by the Australian practitioners - but not by their wider superior staffs or administrative supporters. Surprisingly to me, these tactical maxims remain valid today: deployment flexibility, organic self-sufficiency, coordinated transportation, effective communication, good reconnaissance, camouflage, the value of integrated visual observation posts and coordinated sensor fusion, coordinated operations, user/provider understanding et

cetera. Indeed, five of the ten Principles of War apply directly to such activities: maintenance of morale, security, flexibility, coordination and administration.

Of course, another surprise to most readers will be the effectiveness of those early radars - despite their rudimentary design - and the coverage achieved. I understand that, at the peak of activity, there were some 124 separate RAAF radar units operational throughout mainland Australia and the Pacific islands. (Compare this with the RAAF's present three ground-based microwave air defence radars. Airborne early warning and control can't come quickly enough!) And ranges of around 100 miles were routinely achieved on medium-level targets. Fifty years on, our radars may be more sophisticated but the laws of physics haven't altered.

Finally, *Echoes Over the Pacific* corrects - at least in a general way - the apparent failure of Australian commanders and subsequent historians to recognise and acknowledge adequately the contribution made to Allied operations in the Pacific by these ordinary Australians and their 'doovers'. That the radars themselves were effective was a miracle of ingenuity and improvisation. But that these ordinary folk worked those miracles - without much help from 'the powers that be', and usually in the most primitive and debilitating circumstances - is an achievement in the best traditions of the Australian 'digger' (or airman !), and one which deserves to be recognised officially in our history - especially in this 'Australia Remembers' year of the 50th commemoration, and certainly by those whose business is the effective application of air power.

Well done Ed Simmonds and Norm Smith - and to all those who made this history, we salute you.

I B Gration AO AFC
Former Chief of Air Staff
RAAF
Canberra
10 June 1995

PREFACE

The introduction of radiolocation to defence forces was probably the biggest and most dramatic scientific change in warfare in the last two centuries. In many areas it was greeted with almost disbelief. To quote Walter Bagehot - “One of the Greatest Pains to Human Nature is the Pain of a New Idea.”

The acronym radar, which is now universally adopted, was introduced by the US Navy in mid-1943[1]. Prior to this time the RAF, the RAAF and the RNZAF used RDF (Radio Direction Finding) or radiolocation in addition to using expressions such as Telecommunications Research Establishment in the UK and Radiophysics in Australia in an effort to mask the real nature of activities. To avoid any confusion the word radar will be used throughout regardless of whether events occurred before or after mid-1943.

The fields in which radar was applied during the war were numerous and diverse with each one deserving individual treatment. Our particular interest is ground based air warning and refers to the detection of enemy aircraft. Of course detection was also made by either naval vessels or the Coastwatchers - some mention will be made of these aspects.

The original intention was to cover the operational side of RAAF ground radar during WWII but it was soon realised that the efforts and involvement of our Allies should be slotted in to provide an overview of the air warning radar in the Pacific from Pearl Harbor to the Philippines campaign - this cut-off point has been adopted because from that point in time the US Forces ‘went it alone’. In view of the early and close cooperation, between the Americans and the RAAF, the question was asked why this happened. Following some years of research a statement was made in 1992[2] that the Americans wanted RAAF radar units to go with them to the Philippines but not the RAAF bureaucracy.

To date, that statement has not been refuted or queried by anyone!

Any analysis will show that in fact there were virtually two theatres of operations in the region. The first was a static defence operation around mainland Australia and New Zealand, a situation that changed with the Battle of the Coral Sea. The second was the island hopping campaign where radar moved with the attacks on the Japanese forces, - from Port Moresby and Milne Bay, through Dutch New Guinea, New Britain, the Solomons Islands and Borneo.

These two areas have been separated to give the reader a more coherent picture, rather than a chronological statement of events that would jump from one area to the other.

W F Evans[3] has used the term Burden of Secrecy and stated that it applied to all levels from the development stage to manufacture, the services and operations.

In hindsight the depth of the secrecy imposed at the time was not needed after February 1942 because by then the Japanese had captured both English and American radar sets and some instruction manuals as well. Certainly new developments had to be safeguarded, together with details of such matters as the organisation of Fighter Sectors and radar countermeasures,

---

1 *Journal of Early Radio Enthusiasts* Vol 1 No 1 Skokie USA 1987.

2 Ed Simmonds *More Radar Yarns*, E W & E Simmonds 1992.p25

3 W F Evans *History of the Radiophysics Advisory Board 1939-45*. CSIRO 1970. p37.

but not the basic parameters. If other branches of the RAAF and the other services had been given rudimentary information about radar, more cooperation could have been experienced.

Radar stations were the 'eyes' of the Fighter Sectors and then in the forefront of technology - being totally dependent on the skills and achievements of individuals without modern niceties such as moving target indicators and computer enhancement.

The radar operator's level of competence was a controlling factor in the range achieved and applied to all types of manually operated radar stations during WWII. There were those who could detect and track signals at extreme ranges and below the 'noise' level. The ability to detect signals below the noise level is not fully understood but is believed to be an unconscious form of pattern recognition analogous to the 'cocktail party' effect where some can enjoy a conversation amid the background noise whilst others are 'socially' deaf in the same environment.

Of course there were natural elements that had a bearing on the overall efficiency - electrical storms, ionospheric and atmospheric conditions, sun-spot activity et cetera. On the human side morale of the personnel and the ability to work as a team, regardless of rank and mustering, was of paramount importance.

In essence there were three key technical components for a good air warning unit - a properly maintained and operated radar set on a good site, a reliable power supply and an efficient means of communication between the station and Fighter Sector or its equivalent. The weakest link was communications with, on occasions, long delays in getting through to Fighter Sectors resulting in a scenario of 'that is where the plane was when detected not where it now is'.

While the Allies certainly had problems with communications, the Japanese fared far worse. To quote F/Lt H R Carter[4]:

> One explanation for the apparent lack of use of information [by the enemy] gained from early warning nets is the inherent difficulties of the Japanese language which is unsuitable for the transmission of orders or instructions without writing down the characters. This is especially true if the subject matter is technical or complex. This may account for the lack of an adequate communication system which is vitally important when using a radar warning net.

While the prime purpose of radar was the detection and interception of the enemy, radar also fulfilled another very important role namely the support of Allied aircraft. For the first time in the history of aviation, aircraft could be forewarned of storms that were very important in the case of damaged planes trying to get back to base. In addition every station, whether it was on mainland Australia or overseas, tracked aircraft to and from their targets so assisting in navigation. The first reported example of the supportive role of radar was in the USA in late 1938[5] when winds blew a Martin B10 bomber off course. It was brought back to base by a prototype SCR268 that was being demonstrated to the 'top brass'.

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4 F/Lt H R Carter, 'Japanese Radar and Radio Activity in SWPA'. Australian Archives file AA 1969/100/1

5 *Journal of Early Radar Enthusiasts.* Vol 1 No 1 Skokie. USA. 1987

Repeatedly stations were asked by Fighter Sectors to search for lost aircraft, or to monitor responses from Identification Friend or Foe (IFF) sets for distress signals so that downed or lost aircraft could be quickly located by Air Sea Rescue groups. Official records are such that no estimates can be made of the total number of aircraft or aircrew who were saved in this manner. However we, the writers, believe that the figure could be many hundreds. For instance we do know that five stations in the Admiralties saved the crews of 25 bombers in a six month period.

A recent American article states that:

> It is conservatively estimated that the value of Allied aircraft saved by Radar countermeasures was twice as much as the cost of the entire program.

If this statement relating to countermeasures is correct then it is probably also true that ground radar in the Pacific was very cost effective if a figure could be put on the value of the number of aircraft and aircrew it saved.

Radar was not the only element in the air warning system. Ground observation was needed to cover areas where there were black spots in radar coverage and in more remote locations outside radar range. On mainland Australia there was the Volunteer Air Observer Corps, spotters and coastwatchers were used overseas. The Americans made good use of Australian Coastwatchers in the Solomons campaign and had their own ground observers in their Signals Air Warning Battalions (SAWs).

The Royal Australian Navy Coastwatchers and the spotters of the Army Air Warning Wireless Companies were organised long before RAAF ground radar became effective. No one should deny them recognition for their outstanding and valiant efforts in New Guinea and the Islands. Their stories have been recorded in Commander Eric Feldt's book *The Coastwatchers,* Alan Mansfield's *A Brief History of the New Guinea Air Warning Wireless Company* and *The Private War of the Spotters* by A E Perrin.

The RAAF also had Wireless Units monitoring Japanese radio transmissions co

operating with the American Signal Intelligence Service (SIGINT). Their activities were classified as ultra secret that was a higher category than applied to radar. It was not until 1991 that their story was revealed by Jack Bleakley in *The Eavesdroppers*.

All four of the books mentioned above are well worth reading.

Unfortunately the full history of RAAF radar cannot now be written based only on official documents and A50 Unit History Sheets because many of the latter were never completed or are now missing - most of the existing A50s are little better than a visitors' book. This is compounded by the fact that RAAF Air Defence Headquarters (ADHQs) and Zone Filter Centres (ZFCs), designated as such towards the latter part of the war, were not listed as official units as they were sectors under the control of Operational Base Units (OBUs) or (Fighter Control Units FCUs or MFCUs) - once again there are no Unit History Sheets.

With the gaps in records one cannot help but wonder whether the authorities of the time ever wanted a history of RAAF radar to be written. Perhaps secrecy dominated their thinking, overlooking the fact that 'the events of today become the history of tomorrow' from which we should all learn.

Every endeavour has been made to cover all major aspects of the Allies' efforts in air warning radar but as we had limited access to overseas research material it may appear to

some that we have overly concentrated on RAAF activities - for which we make no apologies.

Because eye witness accounts have been used to a large extent to fill in gaps in official documents some people may consider this book to be an ‘informal’ account of events as opposed to being called an ‘official’ history. Be that as it may, it is hoped that the end result is that the air warning efforts of the RAF in Singapore, the RAAF, the RNZAF and the US Forces in the Pacific have been brought together to present a clearer picture of the situation as it was than has been published hitherto.

CHAPTER 1

Background Information and the Situation Before Pearl Harbor

Certainly several countries had radar in some form before WWII and the British had a defensive radar chain. However, the Allies did not have any air warning radar systems in the Pacific region at the beginning of 1941. Perhaps a brief coverage of contributions, by different countries, in the way of the development of equipment and techniques should be made before covering the role of air warning radar stations during the hostilities in the Pacific.

United Kingdom

The first English Chain Home (CH) station working in the High Frequency (HF) band was operational in May 1937[6] but only covering high-flying aircraft. The need for another type to cover low-flying aircraft was foreseen in 1936[7] with the first Coast Defence Chain Low Flying (CD/CHL) coming into service in December 1939 - later the dual function was dropped and the equipment became known as CHL or COL for the equipment modified for overseas service.

The proper use and interpretation of information at Fighter Sector, provided basically by these two types of stations, was instrumental in the success of radar during the Battle of Britain with the CH stations giving height assessments.

Introduction of the Plan Position Indicator (PPI) tube had a profound effect on the development of radar and is still the most accepted method of display. H E Guerlac[8] said:

> The importance of the PPI - later to be so useful for airborne search systems - for warning and control systems cannot be exaggerated.

The PPI tube, when fitted to CHL stations, reduced the time of reporting because grid references were read directly from the PPI screen. The Battle of Britain was over before the first interception was made by an experimental Ground Controlled Interception (GCI) station in November 1940. Six hand-made GCIs came into service early in 1941. Here, once again, the skill of individual operators was of paramount importance as the correct estimate of the ratio of split images determined the accuracy of the height assessment.

Better control of interception was possible with the GCIs as the controller (himself a fighter pilot) stood or sat behind the operators. All the necessary data, including a height assessment, was immediately available - no delay in getting details of plots via Fighter Sector. Furthermore he was in direct contact with the interceptors by R/T radio.
Both the CHL and GCI worked in the Very High Frequency (VHF) band at 200 Mc/s complementing the CH stations to give an excellent coverage.

---

6 Brian Johnson, *The Secret War*, Arrow 1979. p 87

7 Brian Johnson, ibid. p88

8 Henry E Guerlac, *Radar in WWII*. Tomash/American Institute of Physics. The History of Physics. 1800-1950. 1987 Vol 8 p155

In addition the British were responsible for developing Fighter Sectors, the second generation of radar systems ie, Aircraft to Surface Vessels (ASV) beacons and Identification Friend or Foe (IFF). All were valuable contributions to the overall radar scene in WWII.

Britain was very keen to disseminate secret information to member countries of the then British Empire even before WWII started. Civilians and service representatives from Australia, Canada, New Zealand and South Africa were invited to the UK in the northern hemisphere spring of 1939 to learn about the new developments. Information was also passed to the United States as part of Lend Lease arrangements culminating in the Tizard Mission visiting Canada and the USA in September 1940[9] when one of the experimental magnetrons was given to the USA.

Some English equipment was sent direct to Australia and New Zealand in addition to some transmitters and receivers originally intended for Singapore and South East Asia which were diverted after the areas were captured by the Japanese.

United States

In the Pacific region under consideration, the four pieces of American equipment which played a very significant part were the SCR268, SCR270, SCR271 and SCR602. The first two pieces of equipment were transportable while the SCR271 was a fixed installation. Development of the SCR268 began in 1937 with the first production model being tested in April 1940 at Fort Hancock. It remained as the standard searchlight radar equipment with the Americans until January 1944. It was also used in conjunction with the M4 director for anti-aircraft guns.

The Australian Radiophysics Laboratory (RPL) modified the pulse recurrence frequency (PRF) to increase the range from about 20 miles to 100. The RAAF called this unit MAWD (Modified Air Warning Device) and made good use of it as will be seen later. The Americans also made a similar modification to the SCR268 for air warning, added a PPI tube and improved performance by increasing the HT voltage to the oscillator - it became the SCR516.

The SCR270, designated for long range early warning, started out as a parallel line of development to the SCR268 and was used extensively by the Americans in many theatres.

Extensive use was made of the SCR602 (of which 10 variants were produced) for warning the infantry during assaults. W/Cdr Ron Christie, a post-war RAAF radar officer, expressed the opinion that the Americans regarded their SCR602 series as being expendable - provided they lasted long enough to satisfy the immediate needs then it was of no concern if they broke down within 48 or even 24 hours.

Another side of the US activities, which was envied by some of their Allies, was the effort made to keep their personnel well provisioned with a greater variety of food plus other amenities. Their units could hardly be described as being ‘neglected’.

A vital contribution by the Americans began in mid-1943 when RAAF radar stations were equipped with the BL4 interrogators, designed for the US Navy, to identify friendly aircraft when the Mk III IFF sets were introduced.

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9 E G Bowen, *Radar Days.* Adam Hilger 1987 p151

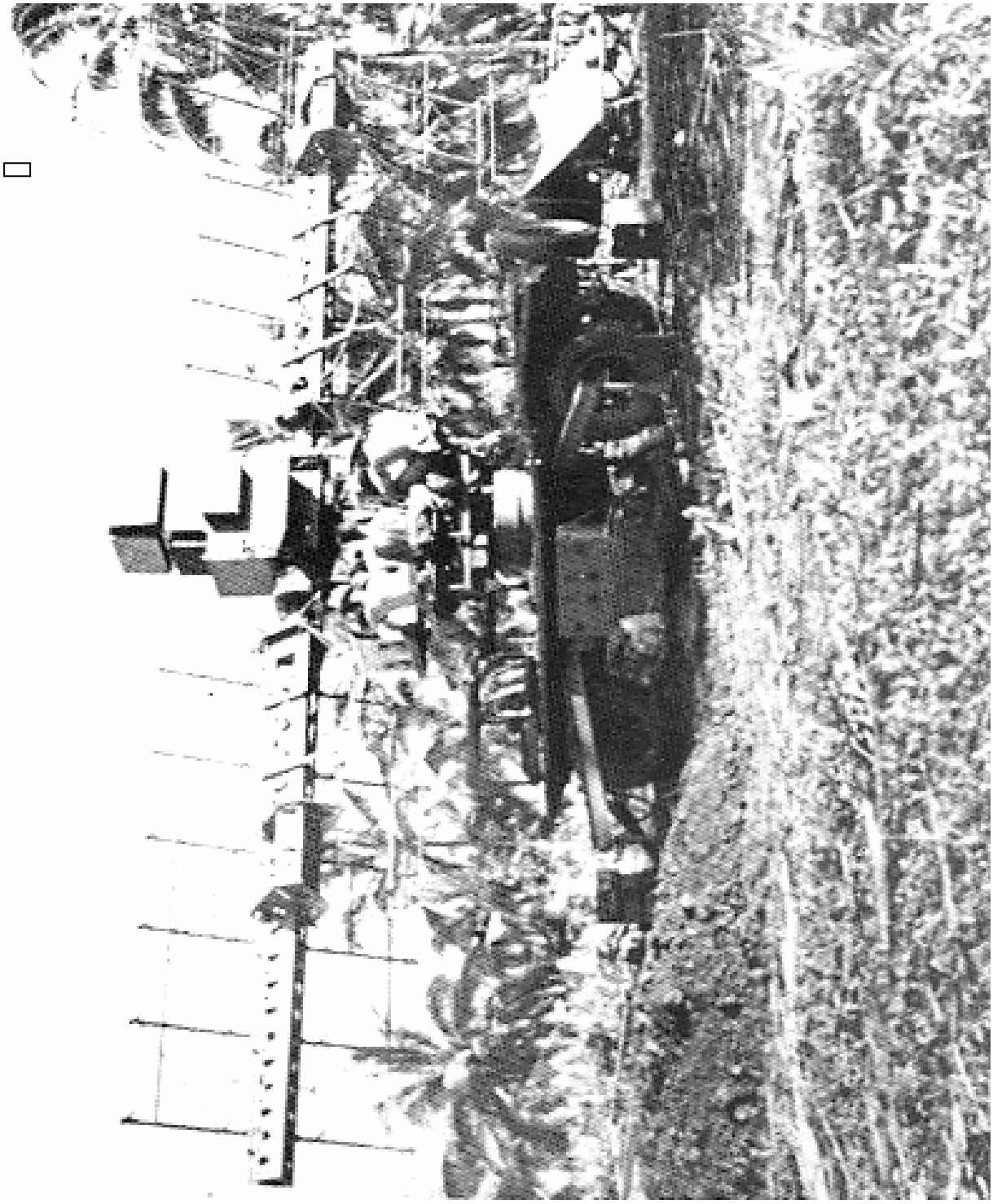

Photo: US National Archives No 111SC 233352-4
An SCR268 operated by A Battery Coast Artillery at Segi, New Georgia. Note how the operators were exposed to the elements.
When modified by the RAAF it became known as MAWD (Modified Air Warning Device).

The production capacity of American industries using mass production techniques was vital in the supply of all types of *materiel* during WWII. However, in general terms there was a penalty, the lead time of around two years between design and coming off the production line. A further complication was the agreement between President Roosevelt and Prime Minister Churchill that they should initially concentrate on the European theatre in preference to the Pacific. In consequence the SWPA was virtually starved of equipment for quite some time.

It was therefore of extreme importance that Australian industry was able to at least fill the gap in respect of air warning radar.

New Zealand

New Zealand was the smallest nation of the Allies. Yet on a population basis it can be said that it made the biggest contribution to the overall radar scene in WWII. Approximately half their radar mechanics served overseas with the RAF in many areas ranging from Greenland, the UK, Europe including the Italian Campaign - in fact everywhere the RAF went. This was in addition to their commitment to air warning in the Pacific. It is to be noted that most of their developmental effort was devoted to the needs of their Army and Navy.

Dr E Marsden was the NZ representative at the 1939 Conference in the UK. His newly acquired knowledge was used in South Africa as he visited that nation on his way back to New Zealand advising Dr Schonland on radar policy. The method of transfer of this very secret information probably would not have been approved by Britain. Peter Brain[10] has said that the two experts had travelled together on the ship from Cape Town to Durban and while the ship was in port two members of the university's physics department borrowed a camera and photographed the secret RDF manual.

Training schemes in radio physics were established at both Auckland and Canterbury Universities under Professors Burbridge and White, the courses being directed more towards the type of scientists required for development rather than the services. Two one-year courses were held in 1940 and 1941 after which the New Zealand University Physics III course was converted to radio physics.

Like many other research organisations, there was some conflict between scientists and administrators which is summed up by NZ DSIR[11]:

> Equipping New Zealand *de novo* called for unremitting high speed work, a minimum of administrative delays, an imaginative outlook towards expenses and purchases, and in fact single minded attention to radar. The Post and Telegraph Department had its own radio problems, its organisation was vast and planned along well defined lines, its officers, like Aristotle's perfect gentleman, were dignified and unhurried, and time was of secondary consideration compared with the necessity for close scrutiny and checking all expenditure, overtime work, purchasing and so on. In these circumstances a certain amount of friction developed.....in May 1941 the situation satisfied nobody and reorganisation was imperative.

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10 Peter Brain, *South African Radar in World War II*, The SSS Radar Book Group 1993 p 17.

11 DSIR (New Zealand) 'WWII Narrative No 3 Radar - Summary.'

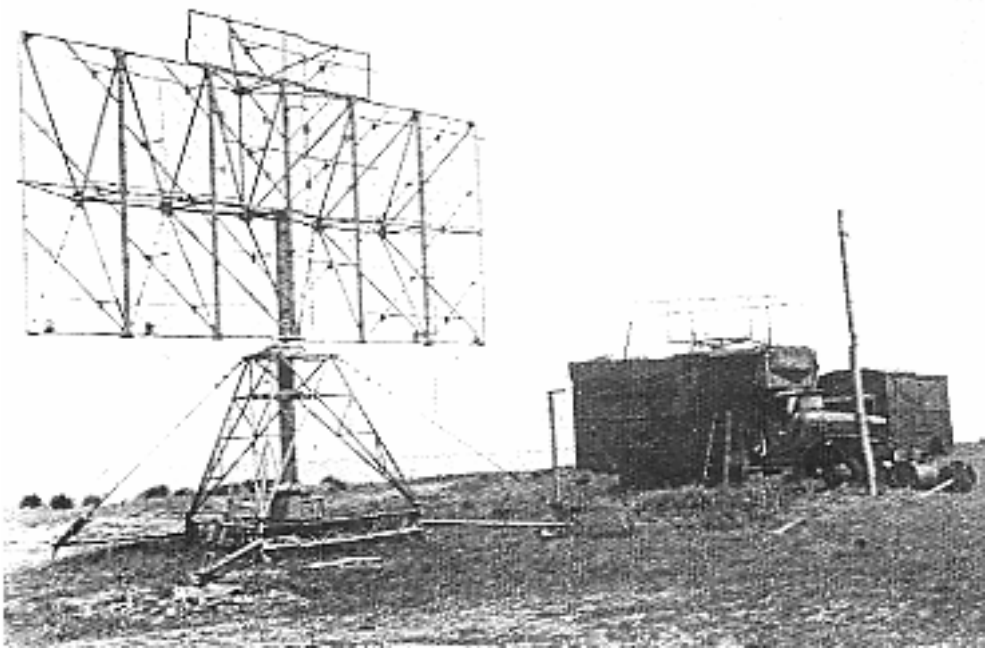

Photo: Dr R S Unwin
A New Zealand LRAW. Alternative broadside aerial on left. Truck with double Yagi 'assault' aerial and equipment to the right, in front of radio truck.

This did not stop New Zealand scientists making substantial steps in radar. For example in June 1940 a locally made copy of an Admiralty model 79Z radar was installed at Motutapu then in September 1941 a common aerial system was achieved by John Banwell and I E Coop of the Department of Scientific and Industrial Research (DSIR). Then as a further example of their capability, DSIR built a receiver to work with an HF transmitter - an English MB2 - which was installed by the Post and Telegraph Department at Whenuakite in June 1942.

New Zealand did produce an air warning set working at 200 Mc/s but the authorities felt that because of the difficulties in obtaining overseas components, particularly valves, the country would be better served by importing English COLs and GCIs.

Installation parties were accompanied by civilians who had played a part in research at Radio (Radar) Development Laboratory (RDL). Subsequent visits were made by RDL scientists[12] to some of their operational stations with the aim of 'ensuring that lessons learned in the field and improvements and adaptations foreseen as desirable were incorporated where possible in later models'.

Lt (RNVR) S D Harper[13] when working on the development of a Ship Warning Gunnery set discarded the then conventional rack and panel construction replacing them with sliding

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12 R S Unwin 'The Development of Radar in New Zealand in World War II,' *The Radioscientist* Vol 3 No. 1 March 1992 p 16.

13 R S Unwin, ibid p12.

drawers and long trailing leads. The somewhat revolutionary design was very successful and was adopted for all subsequent radar sets built in New Zealand.

Mention should be made of their LRAW (Long Range Air Warning) equipment - a well thought out piece of equipment. Working at 97 Mc/s with a power output of 150-200 kW using GEC NT99 valves, this unit was truck-mounted and had two aerial systems. It also had a low power requirement using a diesel driven 3kW alternator. For combat conditions there was a double Yagi aerial system mounted on the roof of one of the trucks so enabling the unit to be operational within 30 minutes. The second aerial was a broadside array which stood apart from the operating truck and could be erected in about three to four hours. The range of the Yagi aerial was said to be 90 miles on a single aircraft and 125 miles on a group. In comparison the broadside array gave ranges of 100 and 180 miles respectively.

The RNZAF did not operate the LRAW itself but about six LRAWs were utilised by the Americans. The first one left New Zealand in December 1943 and was used in the landings on Nissan Island in February 1944. Others were used at Emirau Island, Peleliu and Ulithi. A possible key to their success was the fact that an RDL expert-in-charge accompanied the equipment and he was determined to get the best out of each unit.

Canada

The main contribution by Canada in the Pacific region was in supplying equipment to both the Americans and the RAAF plus instructional staff (some 64 officers and NCOs) and GL equipment to the Australian Army as well as assisting in New Zealand. Like the Radio Research Board in Australia, Canada had a Radio Section in the Division of Physics and Electrical Engineering of the National Research Council of Canada. The question of manufacturing equipment in Canada was raised at the 1939 conference in the UK. Then in July 1940 the decision was made to produce radar equipment locally in a special Government controlled company known as Research Enterprises Limited (REL).

The Canadians had realised that even special components would not be available in any quantity from the UK so they decided to modify some of the British designs to utilise North American valves and components wherever such action could be taken.

The two types of equipment made by REL, and used for air warning in the Pacific, were the RWG/GCI and the SCR602. The first was the Canadian version of the English Mk V CHL - with acronym RWG designating that it was made by REL. The Americans classified it as SCR588. The SCR602 was a version of the English Air Ministry Experimental Set (AMES) Type 6.

Australia

After Dr D F Martyn of the Council for Scientific and Industrial Research (CSIR) made a four month visit to the UK returning in August 1939, the Radiophysics Advisory Board was formed holding its first meeting on 29 November 1939.

The Australian Joint Planning Committee decided that Radiophysics would be responsible for research and training, concentrating on Shore Defence (ShD), Gun Laying (GL) and Aircraft to Surface Vessels (ASV); with the Postmaster General’s Department (PMG) being

the manufacturer. In retrospect that decision was not surprising since the Government's[14] appreciation of the situation at the time was "that Australia was not open to the threat of invasion and that we need only prepare for sporadic raids".

Recruitment[15] of 2000 officers and radar mechanics to serve with the RAF began in mid 1941 and Radio (Radar) School started teaching in July. In August 1941 the first six months crash course in radiophysics for officers began at Sydney University - to be followed by two months at Radio School early in 1942. Direct entry officers and mechanics, having passed trade tests went straight to Radio School where the first instruction related to ASV equipment. There was an expansion to the program in October at Radio School when a piece of English air warning equipment, a CD/CHL, and teaching staff arrived to cover air warning radar in addition to airborne equipment.

The Radiophysics Laboratory (RPL)[16] commenced an investigation on 8 October 1941 into the feasibility of constructing AW radar sets in Australia but the project was shelved because of the shortage of suitable valves in the country. Shortages of many types of valves continued for quite some time and hampered local manufacture.

There was much prolonged discussion in the Joint Planning Committee and the War Cabinet in 1941 which ultimately resulted in the RAAF being given the responsibility for air warning on 7 November 1941 - just one month before Pearl Harbour !!

The UK was the only supplier of radar equipment open to Australia and planning was in accordance with British practice. Initially 32 sites were nominated for the defence of Australia with a Transportable Radio (Radar) Unit (TRU) working in the HF Band for high flying aircraft and a Chain Overseas Low Flying (COL) set being ordered for each location. Naturally delivery from the UK was not a quick process due to distance plus the fact English equipment was in great demand for other areas.

On hearing of Pearl Harbour, the reaction by Dr J Piddington, of RPL, was immediate. His design team was called together as soon as he arrived at work and the end result was outstanding. The construction of the set, which was to become the famous AW transmitter and receiver was made in five and a half days using modified components of the CA (Coastal Artillery) No. 1 Mk II (Aust) and was based on the experience gathered so far from ShD, ASV and GL production. It was indeed fortunate that Col (later Maj. Gen.) J S Whitelaw, of the Australian Army, had shown an early interest in radar so giving Dr Piddington an excellent base from which to start.

The Australian Army made a building and ShD aerial available at Dover Heights, Sydney, NSW for testing the prototype which began at 2100 hours on 12 December 1941. When it went 'on air' it picked up an aircraft at 62 miles. This set was operated by the Army for several months in the defence of Sydney providing air warning.

Archival files indicate that W/Cdr A G Pither, considered by many to be the Father of RAAF Radar, examined the Dover Heights set on 15 December 1941 and immediately sought

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14 W/Cdr A G Pither, *An Account of the Development and Use of Radar in the Royal Australian Air Force* 1946 p4 - unpublished, held by 41 Wing Williamtown NSW

15 W/Cdr A G Pither, ibid. p 8

16 T B Alexander. *The History of the Development of the Australian LW/AW Equipment.* RP Report 207/3 p3. 11 January 1945.

approval to order three complete sets including aerial, masts et cetera. It is ironic that at this stage W/Cdr Pither only had one unit under his control, the Radio (Radar) School, and for the next three months or so all purchasing had to be done through the School. Pither, during this period, acted as a committee of one with a sense of urgency, slashed red tape and proceeded as if RAAF radar was his private empire. In his postwar report he admitted that his actions had caused administrative and accounting difficulties that lasted for some years afterwards.

RAAF radar mechanics were sent to RPL to assist in the manufacture of those prototypes. Shortly afterwards the order was increased to six 'to be manufactured as experimental pre-production models'. Pither added "that these sets will not be as efficient as sets on order from the UK but will fill a want". It would be only a matter of months before Pither realised that the AW electronics could and did fulfil more than 'a want' in WWII.

The question of why order the six sets was answered by another statement by Pither that it was fixed by the number of spare valves available at the time. It is to be remembered that Australia was a remote country with special components such as valves having to be imported from the UK - which was hard pressed to fulfil its own needs at the time.

Probably the most outstanding feature of the AW electronics was the time base developed by Dr J Piddington and L Hibbard. Utilising a bridge type circuit, the time base maintained calibration during voltage and frequency surges in a power supply so enabling small petrol driven alternators to be used. Any surges made the trace expand and contract but the range reading remained the same.

The prototype AW electronics, with some tidying up and minor modifications, became the backbone of the RAAF air warning network particularly when coupled with the LW (Light Weight) aerial developed by the RAAF in conjunction with the New South Wales Government Railways.

The LW/AW Mk IA, further modified to incorporate lessons learned in the field, was remarkable in its achievements with such a low power output of 10-15 kW - an LW/AW could operate on full power from a 240 Volt 10 Amp power point !

To meet the Army requirements for the ShD aerial and turning gear the Wilson Street Defence Annex had been established under the control of Mr J G Q Worledge, a pre-war senior design engineer in the Chief Electrical Engineer's section of the Railways. Ultimately this Annex was responsible for the construction of the radar aerials, towers et cetera for the services as shown on the list on page 16.

S/Ldr (then F/Lt) B F N Israel played a major part in the electronic design of the LW aerial while Mr E Bullock of NSWGR, under Mr J G Q Worledge's direction, was responsible for the LW Mk I tower and subsequent structures. Construction of the towers was largely by subcontract but each tower and aerial was test assembled in the Annex to ensure that each item was in fact an entity so that personnel in the field were not delayed by problems making it fit together.

Production of the LW Mk I tower was indeed a manufact-uring achievement by the Wilson Street Annex as the first production model was handed to the RAAF only 30 days after final acceptance of the design in June 1942. W/Cdr Pither stated that Mr Worledge's expertise and

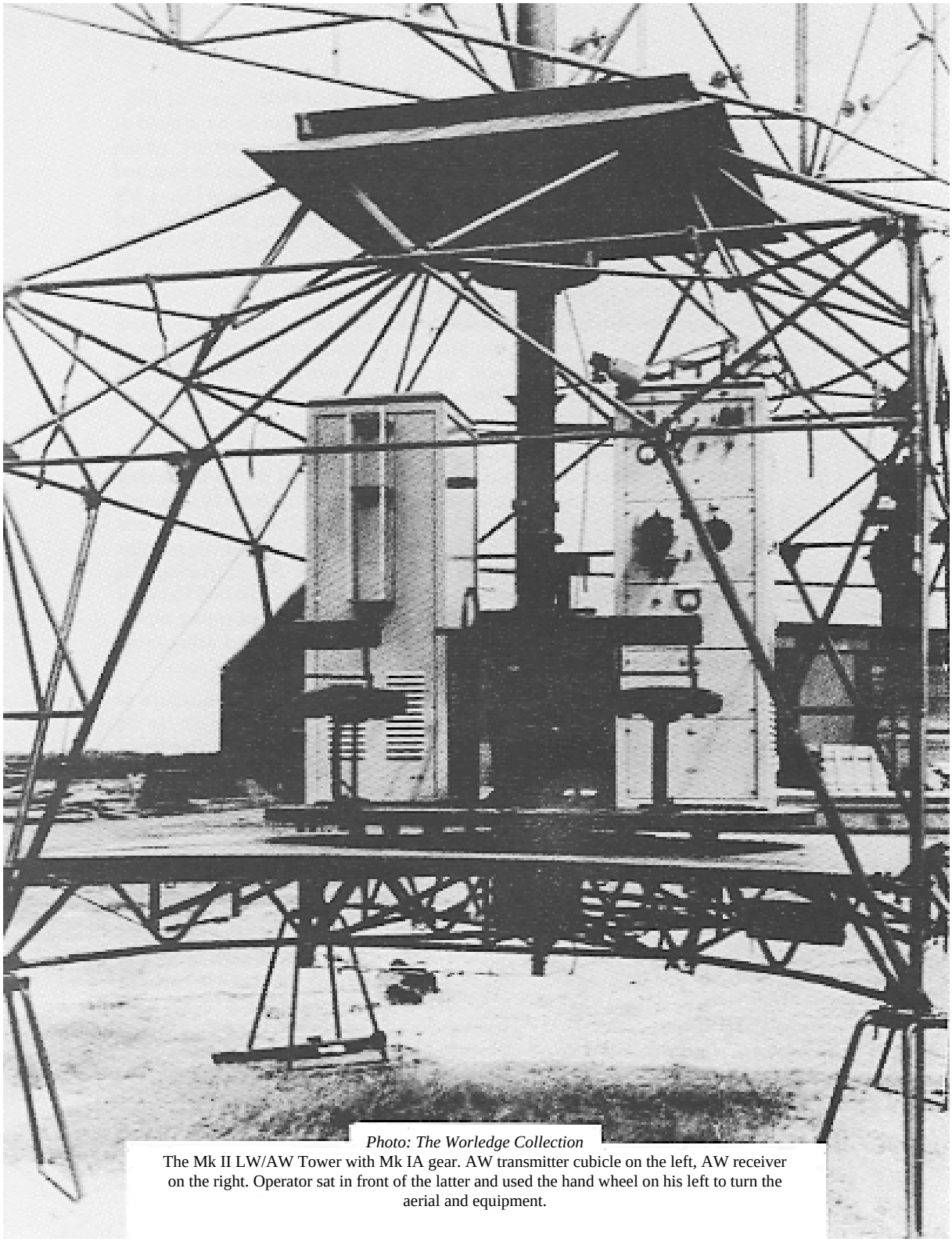

Photo: The Worledge Collection

The Mk II LW/AW Tower with Mk IA gear. AW transmitter cubicle on the left, AW receiver on the right. Operator sat in front of the latter and used the hand wheel on his left to turn the aerial and equipment.

efforts advanced the RAAF's air warning program by at least six months and in recognition of his work the Mk I tower was officially designated as the 'Worledge' aerial.

Then in 1943 the RAAF sent Mr Worledge to New Guinea to report on the performance of the Mk I tower. This resulted in the Mk II model tower which was more spacious and more user friendly by improving the working conditions in the tropics.

The LW/AW was described as many things such as a 'tinny crystal set' or a primitive piece of equipment. However, it was probably the first truly air-transportable, even hand-portable, air warning set - to quote Guerlac[17] once again:

> The Australian built LW/AW was the first light weight radar available to the US forces in the South West Pacific area. This set, which was rushed into production after Pearl Harbour, was particularly distinguished by its excellent tropicalization.

The overall weight of equipment, including a Jeep, and personnel for an LW/AW Mk IA station was approximately 47,000 lbs plus fuel and food. Details of individual items are given on the last page of Appendix I.

Lt Col G Quanrud, Chief Radar Officer of the US FEAF, was interviewed by S/Ldr W R Nash[18] and F/Lt A D Thomas at Biak on 14 March 1945 and said of the efficiency of Australian radar:

> If it had not been for the radar training given to us in Australia by RAAF Radar School, and the Australian designed and built LW/AW, of which the USAAF bought some 60 odd sets, the American radar effort in the SWPA would never have reached the standard it has.

Forty three Mk II sets were manufactured using American 100TH type valves in a ring circuit in the oscillator when the Australian production of VT90 valves fell behind requirements. With a power output of 40-50 kW this version had a greater range but manufacture reverted to the Mk IA when the VT90 became more available.

Even though the scientists at CSIR and RPL were strongly recommending that air warning should progress to centimetric wavelengths the RAAF stuck to the LW/AW Mk IA on the apparent basis that it was doing an excellent job and there was some reluctance to modernise on the basis that it may have introduced the need for retraining the technicians. Much later W/Cdr Pither did take steps to introduce the Mk V LW/AW, using the MK III transmitter (around 200 kW) and anti-jamming measures incorporated in the receiver with only one becoming operational on Papen Island, Borneo. The final result was that the RAAF was left with outdated equipment at the end of the war and a partial vacuum in the immediate post-war years.

Following some incidents of sets being drenched during landing operations watertight transit cases were made to protect equipment, electronics in particular. Tests were made to ensure that, in an emergency, the cases could be thrown overboard from a barge and floated ashore. This innovation not only protected the equipment but it also made the Mk IA even more

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17 Henry E Guerlac, op. cit., p1017.

18 Source - Papers held at RAAF Historical Section, Canberra.

hand-portable. In some stations the transit cases were stacked one upon the other replacing the cabinets.

In 1944 Australia also produced a Light Weight GCI (LW/GCI) by designing an aerial system, similar to the English GCI, but with SCR602 electronics. Experience gained by the RAAF with the LW aerial was beneficial and most of the design work including, aerial switching, was done by RPL and F/Lt George Day, RAF, who spent most of his war service with the RAAF in Australia. The LW/GCI Mk II type of equipment, which soon replaced the Mk I, saw limited service in the Borneo campaign. Only 13 Mk I LW/GCIs and 11 Mk IIs were produced, with the Americans taking 10 of the MK Is. The SCR602 electronics had minimal tropicalisation which resulted in breakdowns so it was recommended that each LW/GCI unit have a spare transmitter and receiver when deployed in the field !

Just as the text of this book was being finally edited, some of Mr Worledge's papers were revealed to the authors. These confirm that the extent of the Annex's work was much more than satisfying the needs of the Australian services as can be seen from the following list which only relates to air warning activities - many more pieces of equipment were supplied to both the Australian and New Zealand Armies and Navies.

For the ROYAL AUSTRALIAN AIR FORCE

13	AW Towers and Aerials
52	AW/CHL Towers
75	LW Mk I Towers and Aerials
24	LW Mk II Towers and Aerials
3	LW/GCI Mk I Huts, Towers and Aerials
11	LW/GCI Mk II Huts, Towers and Aerials
64	LW/PR Plotting Rooms
4	LW/LFC Paraboloid Aerials and Trailers
3	LW/LFC Static Stations
1	Mobile AW

For the UNITED STATES

21	LW Mk I Towers and Aerials
83	LW Mk II Towers and Aerials
10	LW/GCI Mk I Huts, Towers and Aerials

For the ROYAL NEW ZEALAND AIR FORCE

4	LW MkI Towers and Aerials
?	CHL Transportable Towers (various numbers quoted, probably around 25 used, but many more allegedly supplied)

For the FAR EAST ASIA COMMAND

12	LW Mk II Towers and Aerials
12	LW/PR Plotting Rooms

It may also be of some interest to note that Australia[19] did make a contribution to the British overseas radar system by providing, under contract, a total of 12 towers for the Middle East and Far East - the original order, placed in 1940, was for 54 towers ranging in height from 125 to 240 ft. Due to changing conditions only the smallest towers were needed. Made from

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19 UK Air Ministry, *The Second World War 1939-45* - Works 1956 p328.

either jarrah or blackbutt hardwood these towers for ACO stations were designated as being 'Timber Self Supporting Tower 125 Feet High For Overseas Stations - Typhoon Conditions'. The plans show that the towers were actually 132 ft high !

US Radar Stations in Hawaii

The following is summarised from *Radar in WWII* by Henry E Guerlac and an article 'The Air Warning Service and The Signal Company, Aircraft Warning, Hawaii' by Stephen L Johnston[20].

The strategic importance of Oahu was recognised in late 1939 and the Air Warning Service (AWS) was to provide warning of approaching enemy aircraft using the newly developed radar.

Extensive negotiations were needed as the sites, for the three SCR271s received in Hawaii on 3 June 1941, were located on land owned by either the Department of Interior National Parks Service or the Territory of Hawaii. In addition access roads, power supply, water supply, buildings et cetera had to be constructed - which occasioned even further delay. The net result was that none of the SCR271s had been installed by 7 December 1941 !

Six mobile SCR270Bs arrived in Hawaii on 1 August 1941 and were shortly thereafter put into operation because very little site preparation was required. Extensive testing of the sets was carried out in the next few months on installations at Kaaawa, Kawailoa, Waianae and Koko Head, Schofield Barracks and Fort Shafter.

On 27 September 1941 the SCR270Bs were tested in an exercise which, in retrospect, resembled to a remarkable degree the actual attack of 7 December. The exercise began at 0430 hours. Attacking planes were detected by the equipment at Waianae and Koko Head as they assembled near the carrier from which they had taken off 85 miles away. When they had assembled, the planes headed for Hawaii. The 'enemy' were clearly seen on the cathode ray tube and fighter aircraft were notified within about six minutes. They took off and intercepted the incoming bombers at about 25 miles from Pearl Harbour.

Under the control of the Signal Corps, Air Warning, Hawaii, the Schofield training SCR270B was moved to the site at Opana about two weeks before the attack on Pearl Harbour. The construction of a temporary Combat Information Centre (CIC) was in progress and training of the personnel at the centre was under way with reporting coming from six mobiles SCR270Bs. Ironically the program was to hand the CIC over to the Air Corps when the installation had been completed and the personnel had been properly trained - scheduled for about two weeks after Pearl Harbour.

US Radar Stations in The Philippines

The source of the following information was the volume on *The Signal Corps: The Test*, which is part of the series the *US Army in World War II.*

In August 1941 a Signals Air Corps Air Warning Company landed in the Philippines and immediately started to organise themselves. They were followed by an SCR270 which arrived on 1 October. Fortunately it worked from the time it was set up as no test equipment was sent with the gear.

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20 *Systems Magazine*. IEEE Aerospace and Electronic Systems Society. Vol 6 No. 12. December 1991. p3.

At the end of October Lt C J Wimer and 30 men moved the this SCR270 to Iba, about 95 miles north west of Clark Field, becoming operational at the end of the month.

More radars had arrived and the position on the fateful morning of Pearl Harbour was:

Paracale had an SCR270, just finished tuning and testing plus an SCR271 still in crates; Tagaytay Ridge had a faulty SCR270 which was still giving trouble but able to be used for training; Burgos Point had an unassembled SCR270; Nagasugbu had an SCR268 with an untrained crew and Manila had an SCR271 still in crates in a storeroom. However the SCR270 at Iba was the only radar which was 'fully competent and able to perform its role' at that the time.

On both 3 and 4 December Iba had detected and tracked aircraft north of Lingayen Gulf with the plots being reported by radio to Neilson Field. Single 'hostile' planes had also been sighted visually that week over Clark Field but attempts to intercept them had failed.

RAF Radar Stations in Malaya and Singapore

The following has been summarised from The Ministry of Defence History - Signals Vol 4 - Radar in Raid Reporting to give the reader an insight into this region.

The English War Cabinet fully appreciated the strategic importance of Malaya and Singapore and a brief survey was made in 1939 but no equipment was then available. The question was considered again in March 1941 when recommendations were made for the establishment of a Radio Installation and Maintenance Unit (RIMU) and the deployment of one Mobile Radio (Radar) Unit (MRU), one TRU and two COLs to Malaya and Singapore. Immediate action was taken with the MRU and TRU arriving in the same month and the two COLs in April. MRU No. 250 was soon erected on the south-east side of Singapore Island at Tanah Merah Besar, near Changi. It was a single line-of-shoot system at a bearing of 67 degrees covering the sea approach. Good height measurements were obtained over an arc from a bearing of 20 to 160 degrees.

TRU No. 243, which arrived with MRU No. 250, was ultimately erected at Mersing on the east coast of Malaya about 100 miles from Singapore. Once again, a single line-of-shoot on a bearing of 45 degrees. Performance was affected by large permanent echoes (PEs) from the 2000 ft hill on the island of Pulau Tioman but reasonable height finding was achieved.

The two COLs immediately ran into delays even though sites were selected when they arrived in April 1941. The installations were not completed until December! To quote from page 197 of Chapter 13 of the history:

> It was a marked characteristic of the Far East Theatre, that the whole of the RDF [radar] programme was consistently held up by the extreme slowness of the Directorate of Works. Provision of hutted buildings for the COL stations took at least six times the time required for similar work in the United Kingdom, apart from which the huts were badly built and seldom completed. Part of the reason for this slowness was undoubtedly the extreme peace-time control which the Ministry Auditors appeared to exert over the Chief Engineer.

COL No. 511 was sited at Bulit Chunang, on the extreme southeast tip of Johore overlooking the sea with a clear sweep from 10 degrees over the sea round to 290 degrees covering

Singapore and south-west Johore. COL No. 512 was located on the corresponding south-west tip of Johore at Tanjong Kupang.

Three more COL type stations were sent to Malaya and Singapore but once again difficulty was encountered in getting them established. The official MoD History states ‘More often it was just the administrative machinery was not used to or designed for working at any great speed’.

Nevertheless stations Nos 511 and 512 at Bukit Chunang and Tanjong Kupang respectively became operational at the beginning of December 1941 with No 518 at Kota Tinggi nearing completion.

CHAPTER 2

Associated Radar Units, Station Identification and Appendices

Some difficulty was encountered as to where these topics, of a general nature, should be treated. Since they had a bearing on all of the areas under consideration, a decision was made to separate them from the main theme of the book - the operational side of air warning.

Australian Fighter Sectors

When the Australian War Cabinet decided that the RAAF should man the air warning system the decision also implied that a chain of filter rooms, operations rooms and fighter squadrons was needed to act as a single coordinated body.

However, initially the responsibility was divided. Planning and establishment of radar stations was under the mantle of W/Cdr A G Pither but the filter and operations room organisation was given to A/Cdre Vincent who had been associated with the operations room at Singapore before the surrender. Vincent relinquished control before he was able to get the system running efficiently.

The following quotation from Pither[21] leaves no doubt as to his opinion of the situation at the time:

> From then on the filter and operations room became one of the greatest white elephants in Australian defence.
> Very elaborate organisations were set up in Southern areas where no enemy was ever seen while in the Northern areas which were frequently raided by the Japanese, only scratch organisations were available. In spite of this the only operations rooms which really worked which were operating in the face of the enemy. The greatest trouble however was associated with the filter rooms. At that time the Radar and Filter organisations were quite separate. The responsibility ceased when the teller in the radar station passed his information by telephone or radio to the filter room. It was extremely unfortunate that the people in the filter room usually had no conception of the problems or capabilities of the radar organisation, with the result that on many occasions radar warnings were wasted and many bitter misunderstandings occurred.
> This unfortunate situation persisted until 1943 when, by determined effort, the Directorate of Radar gained control of the entire training and instituted a training programme which resulted in radar and filter personnel becoming more or less interchangeable, producing an understanding which was successful in removing most of the difficulties. This organisation was afterwards handed over to the Directorate of Operations.

Five Fighter Sectors, Nos. 1-5, were formed on 25 February 1942 and these were located at Sydney, NSW, New Lambton, NSW, Townsville, QLD, Port Moresby, PNG, and Darwin,

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[21] Pither AG, op. cit., p 19.

NT. An American operated Fighter Sector was located in Brisbane, QLD in March 1942 but was not numbered as No. 8FS until it was taken over by the RAAF on 3 August 1942 when the Americans moved northwards. No. 6 FS was formed on 11 April 1942 at Mt Lawley, WA, and No. 7 FS at Preston in Melbourne on 5 May 1942. Later numbering of these units was changed, by adding 100 to the original number, to avoid confusion with American units.

A disturbing part of Fighter Sector operations, particularly on the mainland units in 1942 was the lack of coordination between the three services. There were several instances reported where Naval representatives at the sectors were either not available at the time or refused to accept radar station reports of submarine activity. On more than one occasion the Naval officer in the sector allegedly said that the Allies did not have any submarines in the area so the reports were wrong ! To make matters worse both S/Ldrs Don Kennedy and David Swan, in 1942 when they were only P/Os, were each threatened with a court martial[22] if they continued to report the plots as submarines.

Pither went on to claim that the Darwin Fighter Sector, originally operating in a tin shed, with only one radar station reporting to it, grew with the expanding network and became an example which was later copied successfully in mobile operations.

There were successive changes in operations and title when Fighter Sectors became Fighter Control Units (FCUs) in early 1944 followed by yet another step to Mobile Fighter Control Units (MFCUs). Late in 1942 and early in 1943 six Fighter Sectors were formed bringing the total to 14. Their history is being treated by others.

The introduction of MFCUs was a beneficial move dictated by the fluid nature of the war which was rapidly moving away from mainland Australia. The lines of communication also became stretched between Wings and stations, particularly within No. 41 Wing, so the responsibility for the administration et cetera of individual radar stations was transferred to the appropriate MFCU in overseas areas.

At the same time on mainland Australia, because of the static nature of operations around the continent, Air Defence Headquarters, sometimes with Filter Zone Control centres, took the place of the MFCUs utilised in the island hopping campaign.

No 1 Radar Installation and Maintenance Unit (RIMU)

No. I RIMU was established in June 1942 when the Presbyterian Ladies College was taken over by the RAAF with S/Ldr Mitchell, RAF, as Commanding Officer. The RAF install-ation party plus RAAF personnel operated from this base with the old film studios at Figtree, near the Gladesville bridge, being used as the main stores depot.

The role of No.1 RIMU was to provide an adequate stores depot, form stations, Mobile Installation Sections (MISs), Mobile Maintenance Sections (MMSs), carry out matching and phasing of antennae and to calibrate stations. Another function was to clean up any salt water damage to English equipment which came out as deck cargo and align them before the RAF Installation Party were involved in their deployment.

Radar Wings

Early in 1942 Area Radar Officers were appointed to Darwin, Townsville and Port Moresby to liaise with the local AOC in each location. Growth was somewhat rapid and late in 1942 it

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22 E W Simmonds. Personal interviews with both officers.

became apparent that there were serious defects in the organisation. Pither's report of 12 September 1942 (file RAAFC 413.44C) concentrated on Port Moresby where conditions of support et cetera were very rudimentary indeed. NWA Head-quarters in Darwin had not supported its stations and it can be said that 38RS on Bathurst Island, only 60 odd miles away, was almost totally neglected during 1942.

Realising the shortcomings, W/Cdr Pither made several attempts, without success, to introduce a system of Radar Wings to look after radar stations which were 'more or less motherless' in the field.

To quote yet again from W/Cdr Pither's 1946 Report:

> In the field [RAAF] radar grew up as a private empire. This was unfortunate but in the circumstances there was probably no alternative. Although AOCs were kept informed of developments they and their staff were often too busily occupied in other matters to give too much attention to this new and unknown organisation. Radar personnel appearing in the area got amounts of assistance from the different staff officers varying from obstruction to cooperation.

Fortunately S/Ldr Gibbs, of the RNZAF, arrived to examine the Australian radar organisation. There seems to have been a certain amount of collusion. Was Gibbs' report the catalyst which caused RAAF Command to ask RAAF Headquarters to set up a system which was almost identical to the Pither proposal?

In support of his concerns about conditions in Papua New Guinea W/Cdr Pither sent S/Ldr (then F/Lt) Israel on an inspection of the six radar stations then operating in the region namely 29RS and 138RS at Port Moresby; 50RS at Dobodura; 303RS at Tufi; 301RS at Kanokopi and 302RS at East Cape. The starting point was a conference with the Area Radar Officer, P/O W J Scarff, at Port Moresby. P/Os R G Sheaffe and B N Moss were also present.

S/Ldr B F N Israel, MID, US Medal of Freedom (with Bronze Palm), played a very important role in the RAAF radar organisation so it is perhaps appropriate to interrupt the flow of the story to give an outline of his contribution.

P/O B F N Israel, who attended the first officers course at Radar School, was initially involved with fitting ASVs to Hudson aircraft. He was then sent to Singapore as part of a small team to assist the RAF with the installation of ASV equipment in aircraft and fortuitously served under W/Cdr Cave at an RAF RIMU.

More information was needed about matching the cable lengths of the ASVs with the result that W/Cdr Cave sent P/O Israel back to Australia for these vital details - Singapore fell before he even reached Melbourne.

Having seen the problems encountered by the RAF in moving their heavy equipment during the Malayan campaign he, and P/O Andy Lewis, put forward the idea of using ASV sets on trucks to act as early warning stations in Java. This opinion strengthened Pither's December 1941 contention that the key to the success of radar in the Pacific would be mobility.

In 1942 Israel quickly rose in rank and served as Radar Liaison Officer in Sydney where his knowledge of the local radio industry was invaluable. He was responsible for the electrical design of the LW/AW antenna in addition to working with the NSWGR on the structural design. He was also involved with the modifications to the Mk I LW/AW to produce the Mk IA model.

He was used by W/Cdr Pither to investigate conditions on the New Guinea stations. His report played a vital part in gaining approval for the creation of Radar Wings. He formed No 41 Wing in Port Moresby, PNG, becoming its first Commanding Officer before returning to Australia in 1944 as Commanding Officer of No. 1 RIMU at Croydon, NSW, where his knowledge and administrative ability was put to good use.

Interviewed at Ballina on 9 November 1988 Bert Israel had this to say about the stations at the entrance to Milne Bay as he felt that these units were the most disadvantaged:

> [Each unit] had an establishment of only about five people on each unit - a corporal mechanic and operators - not even a cook. They had to look after themselves apparently. They were in a parlous condition, malaria stricken and in the first stages of blackwater fever.
> The visit to 301 and 302 was a shock to me for they were all very ill. They had no mail and no care taken of them by anybody. There were no back-up facilities for those stations.

S/Ldr Israel's report confirmed the urgent need for Radar Wings. Accordingly the Directorate established No 42 Radar Wing at Townsville on 1 February 1943 to be responsible for North Eastern Australia and of Dutch New Guinea (Irian Jaya); No 44 Radar Wing located at Adelaide River, NT, on 8 February covering radar stations in the north and north west of Australia and No. 41 Radar Wing at Port Moresby on 26 February to support the stations in Papua New Guinea and beyond.

The three units were responsible for the administration and technical control of their radar stations and the role of Radar Wings was seen to be to:

1. Establish a central filing system of personnel records relating to all radar stations within Wing's control.
2. Re-allocate personnel where needed in the best interests of the system.
3. Build up a store of items likely to be requisitioned by radars in the field.
4. Arrange various avenues of distribution to meet all contingencies.
5. Provide staging facilities for stations in transit.
6. Organise combat training for airmen in transit to forward locations.
7. Provide a working base for mainland personnel on special assignments within the radar organisation.
8. Carry out radar siting expeditions in areas chosen after consultation with the local Operations Group or the US Fifth Fighter Command in the case of No. 41 Wing.
9. Have teams of suitably skilled persons ready to assist with installation of new stations.
10. Equip and staff a workshop capable of repairing unserviceable radar and all associated equipment.
11. Maintain a pool of skilled technicians able to visit stations with specialised test gear and carry out modifications and adjustments.
12. Make provision for the camouflaging and defence of remote radars.

Item 1 in the above has caused problems for veterans after the war because the Radar Wings, MFCUs and ADHQs often did not record airmens' postings to outlying and remote stations. Many veterans have had claims for pensions refused on the basis that official records have

not included postings to a ‘forward’ unit. For instance an airman may have been posted to No. 42 Wing at Townsville which subsequently did not record that that airman served on one of the Dutch New Guinea stations under its control.

As the war moved northward a review was considered to be necessary so on 25 February 1944 F/Lt John Allan (DRS) arrived at Port Moresby to report on the possible decentralisation of radar installation and maintenance services. The following is an extract from his report in the Australian Archives, Canberra.

> It is apparent that 41 Wing has to deal with too wide an area of responsibility. Broadly speaking its respons-ibility falls into two separate classes i.e.
>
> 1. Those radar stations in Papua which provide information for Fighter Sectors under the operational control of RAAF.
> 2. Those radar stations in New Guinea and the islands that feed information into Sectors for which Vth Fighter Command is responsible.
>
> F/Lt Allan’s inquiries from the Americans indicated the likelihood of selecting a more forward base than Port Moresby with harbour facilities. Finschhafen was likely to be chosen. He suggested that 41 Wing send a squadron to Finschhafen to administer the forward area until the Wing moved there to take over.

This move never eventuated as far-reaching changes were beginning to occur within the whole RAAF organisation. Radar Wings were not sufficiently mobile to keep pace with the new island hopping nature of the war. The Wings were soon disbanded; No. 41 on 31 July 1944, No. 42 on 16 November 1944 and No. 44 on 22 August 1944. Radar stations came under Mobile Fighter Control Units for administration purposes.

In 1944 five more RIMUs were formed when the three Radar Wings were disbanded. They were No.2 at Townsville, QLD; No. 3 at Milne Bay, PNG; No. 4 at Nadzab, PNG, later Noemfoor, DNG, Morotai, DEI and Labuan, BOR; No. 5 at Darwin, NT; and No. 6 at Morotai, DEI. Their roles were not as wide as No.1 RIMU at Croydon, Sydney, NSW, being mainly maintenance.

The liaison between these RIMUs and the MFCUs and indi-vidual stations does not seem to have been clearly defined so may have been a haphazard arrangement.

Victualling was the responsibility of the Australian Army even though the Wing was supposedly responsible for organising supplies. Deliveries were irregular so remote units in all areas suffered as a consequence. At least the Army adopted an egalitarian approach as some of their isolated units had the same problems with regard to food supplies.

US Fighter Sectors.

On the American scene in the late 1930s and early 1940s there was no coordination within the three American services as each one proceeded with the development of radar and its associated reporting independently, ie each to suit its own perceived needs. Procedural matters in communication and the use of grid maps varied from service to service. This proved to be a hindrance to cooperation between the Fifth and Thirteenth Air Forces and others in the Pacific War.

It was soon realised however, that it was undesirable to have Navy and Army duplicating air warning installations in the same area. The logical approach was for a consolidated warning

system, a centralised system for gathering, assessing and informing the various Fighter and other Commands. This was seen to work very effectively in setting up the defences of Efate during May 1943.

Structure of SAW Battalion.

The US Army Signal Corps developed the Signals Air Warning (SAW) Battalions and Platoons which, at first sight, appeared to be complex. Therefore the structure of the 565th SAW Battalion is dealt with here on the basis that it was a typical example of their organisation.

The 565th SAW Battalion consisted of Companies A,B,C,D,E and F. Each Company contained a number of Reporting Platoons, a Plotting Platoon and an Observer Group. A Reporting Platoon was a composite group of about 30 personnel commanded by one officer, trained to take radars into the field or to take over established radars and operate them.

A Plotting Platoon applied itself according to the requirements of any particular situation. For example where it was required to work with and give warning of aircraft attack on assault troops on a beach landing it would form up an assault echelon which carried a small plotting board to interpret plots from the radar or radars and Observers. Where a permanent base with airstrip was established the unit would set up a building accommodating a Fighter Sector.

Ground Observers were specially trained in aircraft identification and worked as an independent group in any particular operation. From vantage points the outposts fed visual information by land line or radio to their own Communication Centre which fed filtered information to the main plotting board at the Fighter Sector.

Controllers, specially trained to direct fighters in air operations, were on standby at Fighter Sectors and also at individual Ground Control Interception (GCI) radars. They worked directly with the fighter pilots by a special ground to air radio link.

Flexibility was inherent in this organisation. Any Company or Platoon could deploy itself and operate independently wherever required. While the American SCR268 and SCR270 were considered to be mobile sets their overall weight was measured in tons - around 40 in fact. The weight of the trucks and trailers on rain soaked surfaces of the Pacific Islands proved insurmountable at times. On occasions steel matting was used beneath wheels when traversing boggy terrain. In consequence, the Americans used the SCR602s to a large extent supplemented with Australian LW/AWs and some New Zealand LRAWs.

Station Identification

In the research involved in this book it has not been possible in many cases to identify station numbers of American radar stations so, in the text, they have been referred to by the SAW Battalion or Platoon.

On the other hand both the RAAF and RNZAF allocated numbers to each unit. To assist the reader the following system has been adopted:

335RS means RAAF radar station number 335.

RNZAF 59RS equates to RNZAF radar station number 59.

RS406 means United States radar station number 406.

SCR268, SCR270 et cetera means un-numbered United States radar station using SCR268 or SCR270 type equipment.

Appendices

Three appendices, as listed below, are included to provide the reader with some additional details which may be of interest.

APPENDIX I	-	Summary of Equipment Types
	-	LW/AW, weights of individual items.
APPENDIX II	-	RAAF Station Numbering
	-	Formation of RAAF Stations
APPENDIX III	-	Location of Operational RAAF Stations
	-	Associated RAAF Radar Units

CHAPTER 3

Pacific Radar

December 1941 to March 1942

The attacks on Hawaii, the Philippines and Singapore were well orchestrated being timed almost to perfection and so achieved the maximum impact on defending forces and great psychological damage to the civilian populations of America, Australia and New Zealand. The loss of HMS *Prince of Wales*, HMS *Repulse* and Hong Kong plus the fall of the 'impregnable' fortress at Singapore and the capture of the Dutch East Indies dealt further severe blows to the morale of the Allies. Those events and associated strategic questions have been dealt with by many authors and the aim here is to give a summary of events as they related to radar alone.

Hawaii

A training period for operators of the SCR270Bs and the Combat Information Centre was scheduled for Sunday morning, between 0400 and 0700 hours, on 7 December 1941. There were two operators at the Opana site, George Elliot a recent transferee from the Air Corps, and Joseph Lockard.[23] Because the supply truck did not arrive on time Lockard decided to give Elliott some more training on the SCR270B.

At 0702 hours a huge echo, almost due north of Opana at a range of 137 miles, appeared on the screen. Lockard immediately checked the equipment to ensure that it was functioning properly since it was a maximum size or saturation echo. Having established that it was indeed moving and needed to be reported, efforts were made to report it to the plotters at the Information Centre but these proved to be fruitless as the Centre had closed down.

Eventually, on another phone, a Lt Kermit A Tyler was spoken to and he told Lockard not to worry even though it was a huge echo and travelling towards Oahu - mention was later made about a flight of B17s being expected.

Plotting continued until 0740 hours when the supply truck finally arrived at which time the aircraft had disappeared in the Permanent Echoes (PEs) at a range of 20 miles. These PEs were the result of back radiation from the antenna as the mountains were behind the radar set. The unit was closed down, the men boarded the truck and proceeded towards Kawailoa for breakfast meeting another truck travelling at high speed towards the SCR270B. On reaching the camp they learned that Pearl Harbour had been attacked by the Japanese thereupon they realised that they had plotted the enemy approaching Hawaii for more than half an hour.

In his reminiscences Lockard summed up the situation:

> The incident at Opana is one of those 'what if' footnotes in history... What if the attacking planes had left their carriers 15 minutes earlier?

The Philippines

Before midnight on the morning of 8 December (7 December in Hawaii) the Iba station picked up a flight of enemy air-craft at a range of 110 miles. The *History of The Signal Corps: The Test* states :

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[23] Joseph Lockard. `The SCR270B on Oahu, Hawaii; Reminiscences. *Systems Magazine*. op. cit. p8.

> The first news of the Pearl Harbour attack had not yet reached Iba. The 3rd Pursuit Squadron sent out planes for an interception. But the long-range radars of that period could not show elevation of targets, and in the darkness the pilots did not know at what altitude to seek the enemy. Poor air-ground radio conditions prevented contact with the American planes, although the Iba station was keeping in touch with air warning headquarters at Neilson, point by point. As the American pursuit planes neared the calculated point of interception, about 20 miles west of Subic Bay, the radar tracks of both groups of planes merged, showing a successful interception. Actually the pursuits did not see the Japanese aircraft and apparently passed beneath them altogether as the Japanese turned and headed back out to sea.

Iba at 1120 hours picked up several enemy flights, once again over Lingayen Gulf, and frantically radioed the plots to Neilson Field. At 1145 hours, when Col George decided that Clark Field was the target, a teletype warning was sent to Clark, receipt of which was acknowledged.

Iba was still picking up and reporting new flights when it was struck at 1320 hours completely destroying and silencing the station.

Iba radar had a short but honourable life.

Singapore and the Malayan Peninsula

Unless otherwise annotated the source of information for this summary is *The Ministry of Defence (MoD) History - Signals Vol 4 - Radar in Raid Reporting.*

At the outbreak of war the RAF had the following radar stations operational; TRU No. 243 at Mersing; MRU No. 250 at Tanah Merah Besar; COL No. 511 at Bukit Chunang and COL No. 512 at Tanjong Kupang.

At 0320 hours on 8 December 1941 RAF station No 243 at Mersing detected a flight of aircraft at approximately 75 miles flying southwards. Ten minutes later station No. 250 at Tanah Merah Basir started to plot the same flight and gave a filtered height of 18000 ft. When about 30 miles off the south east tip of Johore this flight turned towards Singapore.

Plotting continued throughout the raid even to the extent of plotting them for 110 miles towards Saigon (Ho Chi Minh City) when the aircraft were returning to their base.

About two hours, in actual time, after the disastrous raid on Pearl Harbour Singapore was bombed. The first stick of bombs fell on Sembawang airstrip near Seletar at 0415 hours - 55 minutes warning had been given by the radar stations, but no air raid alarm was sounded. The aircraft were still on the ground and the personnel were ‘still mainly in bed’. The Japanese pilots were surprised to find that all the lights were blazing in the city when they reached the target area.

This raises the question as to why there were no alarms.

One answer[24] put forward was that ‘Sir Shenton Thomas, Governor of the Straits Settlements (including Singapore), thought sounding of sirens might cause the civil population to panic.’

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[24] *The World at Arms*. Readers's Digest Illustrated History of WWII. p141.

Another[25] explanation was that fighter control 'had been unable to raise anyone at Civil Defence Headquarters.'

Neither opinion explains why Fighter Control had not alerted the Seletar air base. The MoD History seems to have avoided this aspect and one wonders whether it was a fault of the organisation, another case of human frailty or some technical problem - it is known that reports by the radar stations were made but that is all.

By the third week in December 1941, COL No. 518 went on the air at Kota Tinggi and other stations were either well advanced or nearing completion, namely CD/CHL No. 575 at Bukit Dinding in the middle of Malaya; TRU No. 307 at Kahang, two miles from No. 575 and No. 306 TRU about a mile from No. 511. Installation of services and buildings had commenced on another six stations.

Bukit Dinging and Kahang, about 70 miles north of Singapore, were both poor radar sites but were the best available in difficult country. As the Japanese had captured both airfields at Alor Star and Khota Bharu, No. 307 was rushed down to Serangoon on the northern side of Singapore Island to take the place of an ACO station whose towers were incomplete. Late in January 1942 No. 307 went on the air using a very simple type of improvised aerial on top of the 50 ft stubs of the half-erected 125 ft towers intended for an ACO station.

On 15 January 1942 No. 243 at Mersing reported that their position was untenable and the unit withdrew under consistent heavy bombing and strafing - more than half of the personnel were suffering from malaria and transport was inadequate. The unit was converted into an MRU by putting the transmitter and receiver into vans and No. 243 MRU went on air at Tuas on the western coast of Singapore Island. This unit gave high flying coverage over the Malacca Straits and the western coast of Malaya reporting plots at 120 miles or more but without height assessment as no calibration had been possible.

An Army CD/CHL was mounted on the top of the water tower at Changi Gaol with the appropriate code name of CALABOOSE. However its performance was sub-standard but it did report by telephone to No. 250 MRU. The Radio R/T Unit, which was located in the top floor flat of the Cathay Skyscraper apparently did an excellent job feeding the plots to the Filter Room by telephone or radio.

Between 20 and 29 January 1942 the three COL stations at Bukit Chunang, Tanjong Kupang and Kota Tinggi were withdrawn together with CD/CHL No. 575 and one of the Army's CD/CHL to the RIMU at Ponggol where they were overhauled, carefully packed and put aboard the SS *Loch Ranza* - destination Sumatra and Java. It is said that there was 1000 tons of radar equipment on that ship when it was sunk by the Japanese. Using other means of transport most of the crews of those stations plus other radar and radio personnel managed to get to Batavia.

By 12 February even the Changi area was highly dangerous due the advance of the enemy and units were instructed to withdraw and proceed to Batavia and Java. Many were lost on the ships which were bombed on the voyage.

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25 Bryan Boswell. `The Japanese Master Plan. '*The Battles that Shaped Australia*. ed. by Dr D Horner. Allen and Unwin 1994 p25.

Batavia and Java

It was a surprise when three Army GL sets and six complete MRUs were found by the RAF in a Batavian transit camp. An immediate decision to use two of the MRUs on the Batavian defence line was made. The Dutch erected 95 ft towers with platforms made of bamboo and supplied temporary buildings and telephone lines. All of this was achieved with the Filter Room being operative on 26 February 1942 ie, in just 10 days.

On 24 January 1942 an RAAF contingent comprising P/Os Colin Abercrombe and Don Thomas arrived in Singapore on the *Aquitania* with AC1s Paul Britnell, Brian Bruillat, Max Bucchorn, J B Evans, A S Faulk, Jack Goodwin, Harold Hine and Adrian Knowles. They were seconded to the RAF RIMU at Ponggol and after being involved in the installation of the CD/CHL on the water tower at Changi Gaol were evacuated to Java on 6 February with a party from the RIMU.

In *The Signal Corps: The Test* it is stated that SCR268s were sent to Java on 1 February 1942 and that Ensign John D Salisbury, USNR, had supervised the installation of five of these units for the RAF while the other three were in a Dutch depot.

After about two weeks in Java, the RIMU party moved to Sourabaya to set up eight American Gun Laying sets (SCR268s). P/O Abercrombe took one unit and a few mechanics and operators to Sitoebondo, just east of Sourabaya on the mainland and P/O Thomas took three SCR268s and a party to the adjacent island of Madura where they installed the sets at Modoeng, Tambaroe and Parmakasan.

The range of the sets was supposed to be 25 miles but reliable echoes at 35 miles were obtained at Modoeng. The Modoeng station operated from 18 February to 9 March 1942, the unit was at Parmakasan from 24 February, where the station was erected. The party on Madura Island moved to Djamble where they surrendered to the Japanese on 12 March 1942 to become prisoners of war.

Meanwhile P/O Colin Abercrombe had moved, on 7 March, from Sitoebondo approximately 50 miles south to Sempol. The next day he went to Banyuwangi on the east coast of Java in an attempt to leave the island. In the harbour he found some yachts, although he had had some sailing experience before, he had nobody who could lend him support. Sadly he had to forgo his attempt to escape. Colin and his group became prisoners of war.

At the western end of Java P/O Andy Lewis was killed in a Japanese ambush. In the same ambush Brian Bruillat feigned death and escaped alive with a bayonet wound in the wrist. Brian later became a prisoner of war.

RNZAF in Fiji

The New Zealand Government had acquired, from the UK, a CHL set prior to the outbreak of war with Japan. It had been installed at the Electrical and Wireless School at Wigram in the South Island where it was used for training purposes - it was therefore immediately available to be used in the conflict.

This piece of equipment became NZAF 59RS and was established on Malolo Island off the coast from Nadi Airport. Nadi was then an important strategic air base in Fiji especially for the ferrying of aircraft and supplies from the USA to Australia, New Zealand and other South Pacific positions.

The following has been summarised from the submission by former radar mechanic Roy D Stewart, appearing in *Radar Stories of the RNZAF 1939-45, Volumes 1 and 2*, edited by Ian M Sexton.

On 12 January 1942 the personnel for Malolo Radar Unit embarked on the TSS *Taroona* in Auckland, NZ, arriving at Lautoka, Fiji, four days later where NZ army troops disembarked for Suva. The 28 radar personnel remained on board. At 1700 hours a Japanese submarine attacked the *Taroona* - formerly on the Melbourne Tasmania ferry run - firing three torpedoes which fortunately hit patches of coral reef. HMNZS *Monowai* came round the point and opened fire on the submarine which submerged and disappeared.

TSS *Taroona* returned the radar personnel to Auckland where they transferred to the TSMV *Matva*. They returned and disembarked at Lautoka on 28 January 1942. The installation party travelled by open sampans to Malolo Island where the buildings were in the process of construction by the Fijian Public Works Department.

The New Zealand party consisted of: Prof. T R Pollard, Canterbury University School of Engineering; Mr H Walker, an electrical engineer from Christchurch; 2nd Lt Mason, NZ Army Engineers; W/O Rowe, radar mechanic in command of RNZAF; I.S. Sgt D Wilcox, wireless mechanic; and AC1 radar mechanics, K A Jorgensen, B E Gillespie, L P Mitchell, R D Stewart, E Singh and C Hoadlet.

Radar and wireless operators were billeted and rationed at Nadi Air Base until they were posted to Malolo Island on 20 February.

Malolo Radar Unit was commissioned and fully operational on 22 February 1942 thus being the first of many radar stations to be deployed in the Pacific region by the Allies. While the station did not report any enemy aircraft a number of enemy submarines were detected on the surface at night. Many Allied aircraft were directed to a safe landing after being disorientated due to instrument failure or severe weather conditions, especially at night.

Being sited at 750 ft above sea level ranges of 110 miles on aircraft and 40 miles on shipping were obtained so providing good air warning for the many navy ships and transports assembling in Nadi and Lautoka Bays.

On 20 April 1943 the New Zealanders were relieved by the Americans using an SCR270.

Summation

It cannot be said that radar *per se* failed at Pearl Harbour, in the Philippines or at Singapore. If anyone wants to apportion any blame associated with those events, then one should look at a higher level of command.

The only equipment available to the RAF in Malaya was totally unsuited to the campaign and highlighted the need for a truly transportable radar set. Had such a set been available the quick re-deployment of stations, resulting from the rapid advance of the Japanese, would have been facilitated.

Since a lightweight radar also needed fewer people to operate it, it may have also reduced the number of the RAF who were either captured or killed in the Malaya/Singapore Campaign. Sadly the AMES Type 6 did not become available until mid-1942.

History tells us that of the 40 officers and 500 airmen, of all musterings, who manned the RAF radar organisation in Malaya/Singapore only two officers and 29 men reached Ceylon - few, if any escaped to Australia.

The value to Australasia of the New Zealand radar station in Fiji in assisting with the navigation of Allied aircraft cannot be gauged in monetary terms. It was a prime example of the supportive role of all radar units in the Pacific and more importantly it came on air early enough in 1942 to be of great value.

CHAPTER 4

The New Zealand Scene

New Zealand

New Zealand and Australia were half a world away from the major conflicts in Europe and the Middle East. The major early commitment by both countries being to send many thousands of men to assist Great Britain on the ground in the Middle East and in the air over England.

Until 1941 there appeared to be an almost common outlook within the Defence hierarchy in both countries believing that they would not be subject to air attack by a foreign enemy. Certainly consideration had been given in Australia to the possibility of some sporadic incursions from surface raiders and in consequence early radar efforts were concentrated on coastal defence and airborne radar for reconnaissance. S/Ldr J M S Ross in his book *Royal New Zealand Air Force* (part of the series *New Zealand in the Second World War*) provided a view of the New Zealand attitude in the following quotation:

> As New Zealand, in the early years of the war, did not possess the fighter aircraft to intercept attacking air forces, the development of ground radar was considered unnecessary. Consequently the RNZAF confined its activities in connection with radar to the development of airborne rather than ground equipment. The original airborne set which Marsden had brought back with him from England was used as a pattern on which another set was designed by the staff of DSIR, and fitted to Waco aircraft in April 1940.... Twenty airborne sets were manufactured by the Post and Telegraph Department and were fitted to Vildebeeste and Oxford aircraft which carried out general reconnaissance duties round the coast.
>
> In the middle of 1941, when the threat of war with Japan was becoming more evident, priority was switched to ground radar, and from then until the end of the war maximum effort was directed to the erection, maintenance, and operation of air warning systems, both in New Zealand and the Pacific.
>
> In March 1942 a sub-committee of the Chiefs of Staff Committee in London recommended that New Zealand should establish fifteen COL (Chain Overseas Low-flying stations, seven TRU (Transportable Radar Unit) stations and five GCI (Ground Control Interception) stations.

The first ground radar operated in New Zealand was built in the country by Collier and Beale of Wellington using drawings and specifications of an Admiralty 79Z set. The DSIR installed the equipment at Fort Mototapu in Waimata Harbour with the set being in operation as early as June 1940 but apparently it had some problems. Whilst this firm may not have constructed any more radar sets, it did fulfil a need by providing the Americans with communication transmitters with a larger power output than was otherwise available to them in the field.

As mentioned previously the original intention was for local industry to manufacture as much as possible of New Zealand's radar needs but great difficulty was encountered in getting those essential components, such as valves, which were only available from abroad. Having concluded that local production was not a practical proposition it was decided that complete units would be ordered from the UK. On receipt of the recommendations of the London

Chiefs of Staff Committee most of the required equipment was ordered in May 1942 and began arriving a couple of months later.

Because of the distance from the UK, delivery was a protracted affair and it has been said that any possible threat of an attack on the country had passed before the radar network was truly up and running.

However, by August 1942 three stations were in operation in Auckland and seven others were in progress. They immediately began fulfilling a supportive role and also assisted the Navy in controlling shipping. When ships were reported in unexpected positions then aircraft were sent to identify the ship or ships involved.

After Pearl Harbour thousands of Americans and their *materiel* were sent to New Zealand for training and assembly for the attack on the Japanese in the Islands. This involved heavy air traffic to and from the country and it should be remembered that the science of aerial navigation of that era was somewhat primitive.

The supportive role of RNZAF radar came to the fore with the installation of stations on Malolo and Norfolk Islands primarily for navigational assistance to aircraft travelling to and from Hawaii. The stations on the North and South Islands extended the role, locating many lost aircraft including some travelling between Australia and New Zealand.

It should be pointed out that some of the RNZAF stations were in very isolated regions with difficult access and very high winds - at least one station had some of their personnel quarters and support buildings blown away. Removing salt deposited by those winds on the aerial to maintain efficiency was a hazardous task and not one which many mechanics enjoyed.

According to S/Ldr Ross only a single enemy aircraft ventured into NZ skies:

> On one occasion a hostile aircraft, launched from a Japanese submarine, did make a reconnaissance flight over Auckland. It was plotted by radar units in the Auckland area, but for some time the plots were disbelieved. By the time it was recognised as an enemy plane, it had returned to its mother-ship and was safely out of harm's way. Enemy submarines were reported on one or two occasions by radar stations around the coast and aircraft were sent to search for them, but none were ever found.

Training

Some officers and NCOs from the RAF, experienced in both training and installation of the English equipment, were sent to New Zealand to assist the RNZAF. Training of mechanics was undertaken in New Zealand at the Electrical & Wireless School at Wigram near Christchurch, South Island. As in the UK and Australia, hundreds of women both, WAAFs and WRNs, were trained as operators serving on less remote stations.

Even though the prospect for an invasion was diminishing in late 1942, training continued. RNZAF mechanics and operators were therefore available when the Americans asked for assistance in the Solomon Islands as will be seen later in Chapter 12.

If and when there was a surplus to requirements it was a comparatively easy task to re-train ground mechanics for airborne radar when the focus and direction changed later in the war. Unfortunately many WAAFs were re-mustered to other trades and positions when this occurred.

Radar Administrative Units

Whereas the RAAF designated their support units as Radar Wings the RNZAF originally called their local administration units Flights.

No 1 Flight, headquarters at Whenuapai, embraced all the units in the Auckland area.

No 2 Flight, at Rongotai, was responsible for radar stations from New Plymouth to the Clarence River.

No 4 Flight, at Wigram, was to have covered those units in the Canterbury and Otago regions.

Later, in the same year, 1942, the Flights became Squadrons. No. 60 Squadron replaced No. 1 Flight; No. 61 Squadron took over from No.2 Flight and No. 62 Squadron replaced No. 4 Flight. Since the radar air warning network did not develop in the south, the No. 62 was allocated to the Squadron which was formed at Guadalcanal in August 1943.

There is an odd coincidence between the RAAF and the RNZAF. For no obvious reason No. 3 was not used as a Flight number in New Zealand and in the RAAF there were Nos 41, 42 and 44 Radar Wings but no No. 43.

Observer Corps and Filter Rooms.

In 1942 an Observer Corps was formed to report on aircraft movements within and around New Zealand. Prior to this the Navy, Army, Marine Department and Harbour Boards had established watching posts to observe shipping. These were incorporated with new Observer Posts to form a comprehensive reporting system administered by the RNZAF. Six or more people manned the Observer Posts, which reported by telephone to Observer Centres where WAAFs did the plotting.

The next development was the establishment of two filter rooms on the North Island, one in Auckland at Headquarters in the Teachers Training College and the other in Wellington. A smaller Fighter Sector was also located at Blenheim to cover the operations of fighters over the Wairau Valley and the Marlborough Sounds area. Radar stations in this area were connected with and reported to both Blenheim and Wellington.

LOCATION OF RNZAF MAINLAND RADAR STATIONS

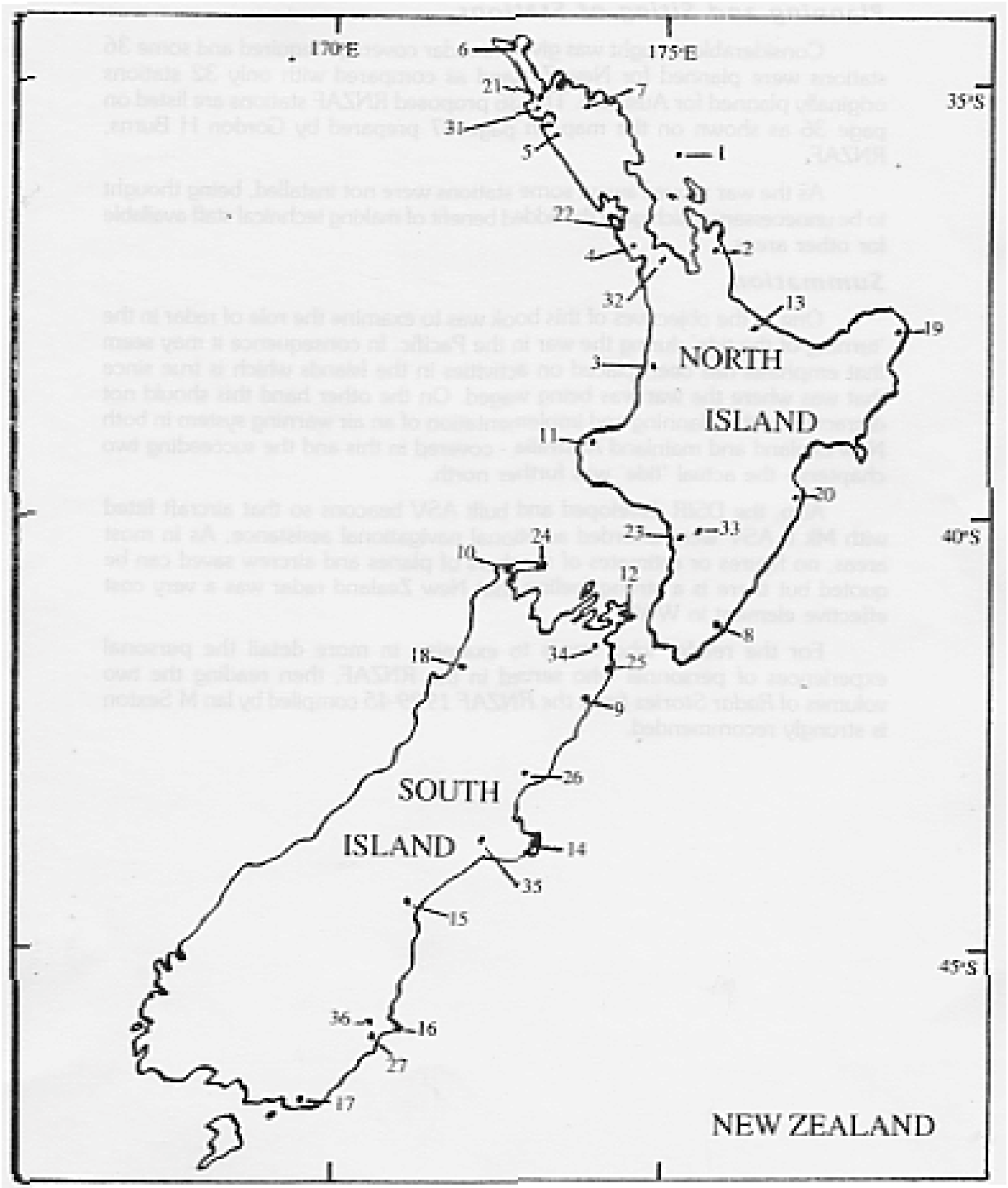
The map and list were researched by Gordon H Burns, RNZAF.

The following numbers refer to the map on the facing page. A name or names (in brackets) after the location are alternative names which appear in official records.

Unit Number	Type	Location
1	COL	Moko Hinau Island 1942-44. Equipment first installed at Fort Motu Tapu in Hauraki Gulf for test in 1941 then to Moko Hinau after modifications in 1942
2	COL	Hot Water Beach (Whenuakite, Whitianga) 1942-44
3	COL	*Woody Head (Raglan)
4	COL	Piha 1942-58
5	COL	Maunganui Bluff 1942-45
6	COL	Pandora (Spirits Bay, North Cape, Cape Reinga) 1942-45

7	COL	Wainui (Kaeo, Whangaroa) 1942-45
8	COL	Te Awaiti 1942-45
9	COL	Clarence River 1942-43
10	COL	Pillar Point (Cape Farewell) 1942-43
11	COL	Egmont (New Plymouth, Kaitake) 1942-44
12	COL	*Cape Jackson
13	COL	*Maketu
14	COL	*Goughs Bay
15	COL	*Otaio (Timaru, Jack's Point)
16	COL	*Cape Saunders
17	COL	*Slope Point (Bluff)
18	COL	*Denniston (Westport)
19	COL	*East Cape
20	TRU	*Cape Kidnappers
21	TRU	Waihahara (Waipapakauri) - test only.
22	TRU	Kaipara (Helensville, Parakai)
23	TRU	Foxton
24	TRU	*Farewell Spit
25	TRU	*Cape Campbell
26	TRU	*Rangiora
27	TRU	*Akatore (Dunedin)
31	GCI	*Kaitaia
32	GCI	Takanini (Alfriston, Papakura, Ardmore)
33	GCI	Kairanga (Palmerston North)
34	GCI	Blenheim - test only
35	GCI	*Dunsandle (Halswell, Tai Tapu)
36	GCI	*Taieri

* unit sited and later cancelled or non-operational.


170°E
175°E
35°S
40°S
45°S
NORTH
ISLAND
SOUTH
ISLAND
NEW ZEALAND
1
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Planning and Siting of Stations

Considerable thought was given to radar coverage required and some 36 stations were planned for New Zealand as compared with only 32 stations originally planned for Australia. The 36 proposed RNZAF stations are listed on page 36 together with the map on page 38 were prepared by Gordon H Burns, RNZAF.

As the war moved away, some stations were not installed, being thought to be unnecessary which gave the added benefit of making technical staff available for other areas.

Summation

One of the objectives of this book was to examine the role of radar in the ‘turning of the tide’ during the war in the Pacific. In consequence it may seem that emphasis has been placed on activities in the Islands which is true since that was where the war was being waged. On the other hand this should not detract from the planning and implementation of an air warning system in both New Zealand and mainland Australia - covered in this and the succeeding two chapters - the actual ‘tide’ was further north.

Also, the DSIR developed and built ASV beacons so that aircraft fitted with Mk II ASV were afforded additional navigational assistance. As in most areas, no figures or estimates of numbers of planes and aircrew can be quoted but there is a strong feeling that New Zealand radar was a very cost effective element in WWII.

For the reader who wants to examine in more detail the personal experiences of personnel who served in the RNZAF, then reading the two volumes of *Radar Stories from the RNZAF 1939-45* compiled by Ian M Sexton is strongly recommended.

CHAPTER 5

The Australian Scene
December 1941 to May 1942

Pearl Harbour to the Battle of the Coral Sea

The Japanese attacks on Pearl Harbour and Singapore were, to say the least, enormous shocks to the Australian public particularly as local news reports and propaganda had either played down or ignored the success of the Japanese Army and Air Forces in their war in China. The fall of Singapore, the occupation of the Dutch East Indies and the attack on Darwin raised the spectre of possible invasion of Australia. Another matter of real concern was that the Japanese carrier fleet was still intact and the eastern coastal cities and towns very vulnerable.

Coastal surveillance was of prime importance because the major supply system around Australia at that time was coastal shipping. Each State had a different rail gauge causing long delays and involved a lot of manpower trans-shipping goods at the change of gauges. The road system was largely unsealed and travel times were excessive. The Americans were appalled at the lack of telephone lines outside the cities and relied on Australian radio links for communications since they had very few W/T operators and virtually no cipher clerks the country. For the safe transfer of secret documents and bulk routine orders the US Command depended on 12-15 junior officers and about eight aircraft to carry out courier duties.

Townsville, in northern Queensland, became increasingly important as it developed into the major assembly point for Allied forces - it is reported that more than 500,000 troops passed through the city during the war. Here radar coverage was mainly needed from two directions, one from Papua New Guinea in the north and the other from the Aru Islands in the north west across the Gulf of Carpentaria. This latter objective was not completely achieved until 1943.

The situation, especially during the early part of this period, bordered on being in ‘panic mode’ with few trained officers and mechanics being available. Of necessity everyone involved was on a sharp learning curve. Radar equipment was almost non-existent in Australia, getting items such as power supplies et cetera was not an easy task as there was almost fierce competition between the services, and even branches within the services, since the nation’s resources were stretched to the limit at the beginning of 1942. To quote yet again from W/Cdr Pither’s post-war report:

> Arrangements were made with the Gramophone Company in Sydney to produce six [more of the] prototype sets and this was soon increased to a total of 21. It is impossible to record on paper the frantic activity with which all this work was attended. Priorities had to be arranged, material had to be secured from contracts already existing, and last but by no means the least, there was the problem of the construction of operating buildings for the stations.

The RAAF had no civil construction arm other than Aerodrome Construction Squadrons, which were fully engaged at the time, so an approach was made to the Department of Interior. A special section within the Department was formed to design special buildings for fixed radar stations. When plans and specifications had been prepared construction was undertaken by contract through divisional offices even to the extent of using Local Government Councils in some areas.

Some senior radar people felt that the introduction of radar had a mixed reception ranging from scepticism to obstruction. In retrospect, it is more likely that what was interpreted as obstruction could have been ignorance or a lack of understanding of the importance of radar or that people were fully stretched coping with problems within their own areas.

From an historical point of view this period is probably the 'greyest' area. No records exist for stations established during the first half of 1942. Official lists of RAAF units show that these radar stations were formed on 1 June 1942 when in fact they had been operational for some time, thus giving a false picture of the Australian radar network as it was in the period under consideration.

In 1995 it is hard to credit that the mustering of radio operator (passing through RDF operator to radar operator) did not come into existence until 1 January 1942. But when one recalls that prior to Pearl Harbour all RAAF training had been directed towards the technical support of the RAF in other theatres of war, it is understandable. The first group of operators, who were quickly re-mustered from airborne W/T operators, were given minimal training - only a matter of days - yet they performed admirably at all of the early units.

RAF Installation Party.

The RAF recognised Australia's predicament and sent an installation party to assist the RAAF in the erection of the English type equipment which was being diverted from the Far East following the collapse of Singapore or being delivered direct from the UK. The party consisted of F/Lt G A Day, F/Sgt Pete Williamson, Cpls Charlie Waldron and Roy Martin from the RAF plus two Cpls Charlie Cheshire and Doug Wiltshire from the RCAF. The latter were working on radar stations in the UK and it seems that the RAF posting clerk thought that their surnames were their counties of birth, so they were posted to Australia by mistake.

F/Lt Day's date of posting was 19 February 1942, the date of the first raid on Darwin, and he flew to Australia as 'cargo' in bombers flying over the Atlantic, USA and the Pacific. On arrival he was used on reconnaissance parties checking the previously selected sites around the country while waiting for the rest of his party to arrive. Access to most of them was somewhat difficult prompting George Day to comment that siting had been done by lighthouse keepers.

The remainder of the party had been posted on 5/6 February and travelled by ship to America, train across North America and another ship across the Pacific arriving in Australia in April - it took two and a half years for their personal effects to catch up with them due to inefficient cargo handling somewhere along the line !

This group were involved in many installations after the Battle of the Coral Sea and in many cases even the corporals were in charge of installation parties such was the pressure.

Shepherd's Hill - the First RAAF Radar Station

At the time of Pearl Harbour, RPL had an English CD/CHL set in its possession and this was made available to the RAAF at the end of 1941. Students from No 1G course were taken out of School before the course finished and sent to install the set at Shepherd's Hill near Newcastle where they arrived on 31 December under the command of then P/O R S Choate.

The installation was only made possible by the Australian Army lending their building and ShD aerial to the RAAF while they were waiting for their ShD equipment. The RAAF station went 'on the air' on 10 January 1942. It was later moved to Bombi NSW, to become operational as 19RS on 27 April of the same year when presumably the Army occupied the

building at Shepherd's Hill. It may be of interest to some to learn that in 1995 the building still exists and the major part of the receiver has been found and is now held by No. 3 Control and Reporting Unit at RAAF Base, Williamtown NSW.

Shepherd's Hill was the first station on which F/O Leslie William Gordon Bell OBE worked as an AC1 mechanic. The reader will find F/O Bell's name cropping up quite frequently in this text. Since he became one of the most important installation and field officers in the RAAF, this may be the place to briefly outline his service. Incidentally his OBE was awarded for his activities in the Pacific in general and Pilelo Island in particular.

Les Bell enlisted as a direct entry radar mechanic at the mature age of 37 having been a ham radio operator, an engineer, plantation owner, navigator and trader in Kavieng. His knowledge of the islands, local conditions, Pidgin English and the natives was invaluable to the RAAF and the Americans who both utilised his navigational skills at many places.

The Six Experimental Prototype AW Sets

The first three sets were allocated to Port Kembla, NSW, Darwin, NT and Rabaul, NB. However, by the time the equipment was available Rabaul had fallen to the enemy so the set designated for Rabaul was sent to Port Moresby, PNG. When W/Cdr Pither increased the order to six, the other three stations added to the list were Kiama, NSW, Hammond Island, QLD and Merauke, DNG. The establishment of the two sets at Port Moresby and Merauke are dealt with in Chapters 7 and 9 respectively.

Port Kembla, like Shepherd's Hill, was an unnumbered station and was once again established with the cooperation of the Australian Army which had prepared a building and antenna for their ShD set. By a process of deduction it became operative between 10 and 14 February 1942. Occupation of the site by the RAAF was only for a very short period gaining operational experience. Protection of Port Kembla then became an Army responsibility with its ShD set installed in the same building at Hill 60 or Illowra Trig.

One of the early incidents which may have caused problems with the RAN was at Port Kembla when operators were convinced that they had detected an echo from a submarine and the RAN insisted that there were none there! A second incident at the same station was when temperature inversion occurred and the two high side lobes of the transmission were 'ducted' down near the sea. Operators then plotted three lots of ships instead of the one group which was expected. There was some confusion which was only solved when one batch 'sailed' as far as the town of Liverpool, 20 miles or so inland!

31RS at Dripstone Caves at Darwin.

Delivery of this prototype AW was made to the RAAF by RPL on 4 February 1942 and AC1 (later F/O) Keith Blair recalls that there was some discussion as to whether the antenna could be carried externally on the DC3! Several flights, commencing on 5 February, were needed to transport the gear which was accompanied by the radar mechanics.

31RS at Dripstone Caves
The first RAAF radar in a combat zone and the first to detact enemy aircraft. Note the camouflaging - even to the aerial

The journey of the radar operators from Radar School at Richmond, NSW was by train via Melbourne and Adelaide to Terowie, SA, and then by trucks through Central Australia - under a complete 'security blanket', bordering on being an episode from a Gilbert and Sullivan comic opera. The men travelled in their winter uniforms to mask their northern destination. Then, while being fed at the Railway Refreshment Rooms in Melbourne they were closely guarded by a cordon of RAAF Service Police! The general public must have wondered what crimes had been committed by the group. The last straw was when they arrived at Parap in Darwin where their mustering of radio operator (the original classification) was queried by the officer at the personnel depot and they remained there until claimed by P/O Hannam.

No lifting gear, no power supply and only a few tools were sent with the gear. No firm arrangements were made for accommodating the men except for housing them in an Army hut. The Army fed them and conditions were almost bearable until the first raid when it was a case of every man for himself.

While the radar station at Dripstone Caves was not operational on 19 February, the date of the first catastrophic air raid on Darwin, there were visual sightings reported from Bathurst Island well in advance of the air attack - sufficient to give an adequate warning. So there was no real excuse for the failure to sound an alarm. Professor Powell in his book, *The Shadow's Edge*, has indicated that a public service syndrome of 'not wanting to make a decision for fear of making a mistake' could have been the reason for no action being taken to sound the air raid alarms.

There have been conflicting opinions as to whether the installation of the station had been completed or not at the time of the first raid. One historian at The Australian War Memorial has stated that the book by D P Mellor *The Role of Science and Industry*, being Vol V in the series *Australia in the War of 1939-45*, is the Memorial 'bible on radar'. Unfortunately many people have accepted the view expressed on page 435 which says:

> The set sent to Darwin was accompanied by technicians of the RAAF, though they were without manuals to guide them, felt confident of their ability to operate it. When an attempt was made they failed even to get the set on the air.

An extensive study of the status of this station as at 19 February 1942 has been made over the last few years, mainly interviewing surviving members of personnel who originally served on this unit, statements by Dr J Piddington and A/Cdre Pither in later years and newspaper cuttings. It can now be said, without fear of contradiction, that the above statement by Mellor is completely untrue - the aerial had NOT been erected at the time of the raid, and F/O F Hull did not deliver the last pieces of electronics until after the raid.

Following that devastating raid 'scrounging' became the order of the day. A refrigerator was 'liberated' from QANTAS's flight crews staging quarters; steel posts and sheets of iron were acquired to make a barbecue for cooking. Also there was no water supply until such time as a truck was allocated to the unit.

P/O Hannam approached the Americans who gave them a very small alternator, the capacity of it being compared, by John Scott one of the mechanics, with trying to start a car with a torch battery. P/O Hannam found a home lighting plant driven by a two cylinder Kelly and Lewis engine at a nearby property and this, despite the fact that valve trouble occurred and the engine was running on one cylinder with a plug removed, did the job until a Southern Cross 20KVA alternator arrived from 'down south' complete with its own fitter.

When the station first began to operate its performance was very poor indeed with problems with the coaxial cable and more significantly the aerial had not been ‘matched and phased’ - fine tuning was also needed. It then became necessary for the RAAF to ask for assistance from the team which designed and developed the AW transmitter and receiver.

Dr John Piddington and Brian Cooper, from RPL, visited the site and in a matter of only a few days had it working efficiently. This resulted in 31RS detecting an enemy raid at a range of 84 miles at 1100 hours on 22 March 1942 - the first radar plot of enemy aircraft by the RAAF in a combat zone.

G/Cpt (then F/O) Leigh Northey arrived in Darwin on 21 March and took up his duties as Signals Officer at No. 5 FS on the 22nd. He recalls how they had an air raid warning on that day and everyone immediately went to the slit trenches as had been the norm because practically no warning time had been given. But on this occasion the warning time was about 20 minutes because 31RS was now on the air!

Had the design team accompanied the installation party then Dripstone Caves may have been in operation several days earlier. It is possible that the lesson was learned as the same two experts were called in to assist at Hammond Island at a much earlier stage.

P/O Hannam seems to have assumed the complete responsibility, assisted by P/O Glassop for the installation of 31RS relegating the unit personnel to menial tasks such as filling sandbags. The ‘burden of secrecy’ reared its ugly head again when F/O Northey was refused admission to the Doover by P/O Hannam on his first visit to Dripstone Caves. He had to ‘pull rank’ to gain entry when he went back there to install an emergency AT5/AR8 radio as a back-up to the land-line to Fighter Sector.

Normally a fixed air warning station stayed in one location if it was giving satisfactory results which makes one wonder why 31RS was moved. The answer was found in the A50 report for February 1943 wherein it was reported that part of the cliff had collapsed leaving some of the wall overhanging the cliff.

In July 1942 good ranges were achieved with this prototype model made by RPL. Normally the range potentiometer was calibrated to 130 miles and could be extrapolated to 137 miles. With the potentiometer set to the latter figure, echoes appeared at the extreme right hand end of the trace with a signal-to-noise ratio of between 2:1 and 3:1 at 1241 hours on 30 July. The estimated range was 170-175 miles and the raid was 27 bombers escorted by 22 Zeros.

Notwithstanding the set-backs and problems encountered in the beginning, 31RS fulfilled an important place in the defence of Darwin and its valued service continued until 30 September 1943 when it was moved to Fenton, NT. During this period the antenna was raised in height to increase the range by the installation of a 105 ft tower. Sgt Dacy, a radar mechanic with a Mobile Installation Section, reported that when the tower arrived on site it had been badly damaged during transit and that quite some time was spent in straightening out the steel members.

Coastwatching on Bathurst Island.

No 5 FS was formed on 25 February 1942, nearly a week after the first raid and was initially located at the end of the main airstrip. F/O Northey painted a graphic picture on conditions existing at the time. With Fighter Sector being located so close to the airfield there were many breakages in the land-line to Dripstone Caves and there was a shortage of suitable wire

and insulation material, so short that at one stage surgical tape was used to insulate the line, which consisted of all sorts of wire to maintain the circuit.

G/Cpt E G Fyffe, who was at 5 FS at this time, was interviewed in Noemfoor in 1944, where he made the comment that 'on at least two occasions they were satisfied that the land-line had been deliberately cut by fifth columnists'.

F/O Northey recalls that Lt Col Paul B Wurtsmith, commanding the US 49th Pursuit Group which arrived in Darwin on 17 March 1942, held a briefing session after each raid. At one such meeting someone observed that all the previous raids had passed over Cape Fourcroy on Bathurst Island seemingly using it as a navigation point or where bombers and fighters rendezvoused for a raid. Lt Col Wurtsmith asked the RAAF to send some observers to this spot.

Cpl Bill Woodnutt, a very competent W/T operator, was sent out to the island with two clerks. The success of the exercise was immediate with the first radio report, using an antiquated R1082/T1083 set, being of a 50+ raid which gave Darwin an additional 20 minutes warning. Many enemy aircraft were intercepted and destroyed. Bill Woodnutt did two tours on Bathurst Island, received a commendation from Lt Col Wurtsmith and a BEM for rescuing the navigator of a 'downed' Beaufighter by swimming through shark and crocodile-infested waters.

Coastwatching on Bathurst Island ended on 6 January 1943, a short time after 38RS became fully operational at Cape Fourcroy - 38RS then took over the Air Observers duties.

A similar crew was sent to Point Blaze but no information has been found about this group.

36RS at Hammond Island

A radar station in this area was essential to monitor shipping, particularly enemy warships and submarines using Torres Strait, in addition to providing early warning for any attacks on northern Queensland and Horn Island which became a staging base and re-fuelling spot for aircraft going to Port Moresby.

The official listing of this unit states that it moved to Hammond Island on 25 September 1942. Since it was one of the experimental prototype AWs the above date is obviously incorrect - a memorandum recently sighted, dated 15 May 1942 and signed by W/Cdr Pither gives the date as being 9 April.

F/O Keith Blair, one of the original members of the unit, has supplied the following information. The equipment and personnel were transported by a Sunderland flying boat from Sydney, arriving at the jetty on Horn Island just hours after the first raid on that island on 14 March 1942. A coastwatcher at Kermera on the southern coast of Papua New Guinea had radioed a message that aircraft had passed overhead and were headed in the general direction of Horn Island. Kermera was some 250 miles away and almost on a direct flight path between Lae, which was held by the Japanese, and Horn Island.

The Sunderland was equipped with a monorail and pulley which were used to unload the gear onto a barge to get it to the jetty. It then took about six days to move the electronics and the heavy AW aerial to Hammond Island and carry all of the gear to the chosen site, an Army building 514 feet above sea level. A borrowed Army Ford V8 utility was used for this purpose which was much appreciated by the unit personnel.

The holes for fixing the pedestal on which the aerial rotated, were drilled with hand tools, ie star drills and hammers, through nearly a foot of concrete which formed the roof of the structure. F/O Blair recalls that it took about 2/3 weeks to become operational.

Brian Cooper, who accompanied Dr Piddington to 31RS at Dripstone Caves, recalls that they had only been back in Sydney for a couple of days when they were requested to go to both Hammond Island and Port Moresby. As these two scientists from RPL had successfully sorted out the problems of 31RS on 22 March 1942 it is most likely that they were at 36RS around the end of March or beginning of April to put the final touches to the equipment. The matching and phasing of the antenna must have been almost perfect as the aerial was reported to 'sing' quite loudly as coronas formed at the end of the dipoles resulting in a 50 cycle hum or squeak.

The site was ideal and excellent coverage was achieved with the calibrated range being increased to 200 miles by putting another condenser in the time base circuit. Blair has also said that an enemy raid was detected at 175 miles. Even though at first the echo was virtually only a break in the trace it was reported to Horn Island and plotting continued as the raid approached. An independent report by RPL confirms the incident but no date was quoted. However, the warning was sufficient to get about 20 Bostons off the airstrip between two dust storms before 'The Tokyo Instant Excavation Company' bombed Horn Island from about 500 feet. No interception was made because there were no fighters in the area at the time.

Power supplies were still a problem at this stage and the alternator at 36RS was driven by a Rugby Red Seal car engine - the same as in the Blair's family car. Old automobile engines were still being used on other stations later in 1942, that is until the Department of Munitions took over the supply reins in July 1942.

Whilst 36RS was established only a matter of weeks after 31RS at Dripstone Caves the personnel had had the advantage of spending a few days at an operational station, namely Kiama.

This introduction to the equipment was very beneficial and enabled them to complete the task of getting on the air relatively quickly.

36RS was moved to Horn Island on 27 August 1943 and disbanded in October 1945 fulfilling a very important supportive role for Allied aircraft throughout the whole period of its existence. There was one incident at Horn Island which was somewhat amusing. 36RS was plotting a Walrus amphibian when it disappeared off the screen. Fearing the worst, Air Sea Rescue was immediately alerted and a search aircraft sent out to locate the 'crashed' plane. The end result was probably most embarrassing for the pilot and crew of the Walrus when they were found, floating on the sea peacefully fishing!

18RS at Kiama

S/Ldr (then P/O) Don Kennedy and S/Ldr (then P/O) Bill Weston spent a few days at Port Kembla, gaining experience, before collecting the AW from RPL and proceeding to Saddleback Mountain near Kiama, NSW. This was the highest air warning site in Australia being 1321 feet above sea level and therefore gave an excellent coverage on shipping.

Installation went smoothly and a Ford 10 power supply was 'given' to the unit by the Army because they could not get it working. Apparently the exciter had no residual magnetism and therefore the exciter did not get excited, a condition needed to generate AC power. Don

Kennedy diagnosed the problem and used a 45 Volt battery across the windings to create some magnetism and 240 volt AC power became available.

Soon after becoming operational on 22 April, gears in the in the aerial turning system stripped during heavy winds - that often happened in early AW models - and both the Army guards and RAAF operators were called out to turn the array by means of ropes to keep the station on air in heavy rain and wind as the spectre of Pearl Harbour was still in many minds.

The main lobe of the transmitter was very low so reducing the efficiency in detecting high flying aircraft. One mechanic, Noel McCormack described the main lobe as "sliding down the hill and staying close to the water". This deficiency did not prevent ACW Jo Lehmann picking up an aircraft on 19 February 1943 - Fighter Sector and others did not believe her since the echo was weak and had an erratic flight path. There were disparaging remarks from Fighter Sector like "one should not drink alcohol from the compasses". It is now thought that it was a low-flying small Japanese observation plane from a submarine.

In 1943, when English COL equipment was available, the AW electronics were replaced. 18RS was used as a training station for personnel and also a rest station for those men who had served a term on isolated units in the tropics. The unit was disbanded on 4 March 1946.

20RS at Tomaree

Tomaree was one of the early sites selected by W/Cdr Pither. The station was located on a headland on the southern side of Port Stephens ideally sited for the defence of the industrial area of Newcastle and the Port Stephens area which later became a major training area for amphibious warfare.

This station had several claims to fame. It was the first AW equipment commercially produced by the HMV Gramophone Company at Homebush, NSW, the first to be manned by mechanics wholly trained in the RAAF, the first to have a building specifically designed and built for radar and finally the longest serving RAAF radar in WWII.

Considering the fact that the first prototype AW was not produced until 12 December 1941, the local electronics industry should be commended in having the first factory made set delivered and installed in just four months.

For the first time a RAAF installation party, W/O "Scotty" Henderson-Wilson and F/Sgt Ray Howe, accompanied the station and being experienced radio men they were able to pass on techniques which had not been taught at Radio School.

The mechanics had completed 4G course and were on 6A course when they were taken out of the classroom and sent to the factory to collect the electronics. Thence they took both transmitter and receiver to RPL where the equipment was checked over and aligned for frequency before transport to the site.

Access to the building was not easy as both of the transmitter and receiver cabinets, weighing about 1200 and 1000 lbs respectively, had to be manhandled up the steep path to a point 580 feet above sea level. There was a narrow gauge rail line up the 45^{o} slope which had been used to construct the building but someone had forgotten to leave the trolley, cable and winch to enable it to be used. This track was considered to be hazardous at night so bunks were provided in the building. That opinion did not deter W/Cdr Pither who made a surprise visit to the unit at 1 am one morning.

The unit went on the air on 12 April 1942 and was disbanded on 20 January 1947 during which time it performed very well fulfilling a mainly supportive role.

The MAWDs

In February 1942 American forces arrived in Australia bringing with them both SCR270s and SCR268s. The latter, being gunnery sets, were first given to the Australian Army but they did not have the associated American predictors to couple them to Australian anti-aircraft guns. The RAAF obtained the SCR268s and, as mentioned previously, RPL modified them for air warning radar increasing the range to 100 miles whereupon they were called MAWDs - Modified Air Warning Device.

MAWDs were originally designated as Mobile RDF sets and as the SCR268s were part of the Lend Lease program was returned to the Americans at varying times up until late 1943. There is no doubt that the MAWDs filled an urgent need in Australia. One has to admire the operators of the SCR268s, SCR516s and the MAWDs because they sat out in the open exposed to all the elements, and hand turned the aerial with little complaint, even during tropical downpours, heavy winds et cetera.

S/Ldr (then P/O) David Swan OBE was the first CO of **101RS** station which was installed at North Head, Sydney, NSW close to the Army coastal batteries. Little is known of its performance there except that it interfered with Army communications between batteries when it was set up around the end of March. Later Brig. J S Whitelaw, Commander of Fixed Defences, spoke to P/O Swan requesting that the unit be moved adding the comment that 101RS would provide better air warning if it was relocated north of Sydney as Japanese ships were in the Coral Sea.

P/O Swan selected the Collaroy Plateau as the new site after travelling to Palm Beach by bus with one of his mechanics. One could not credit today that a junior officer would have the authority to move a radar station but that is exactly what occurred. So keen was Brig Whitelaw to be rid of the offending radar that the Army assisted the RAAF in the moving, about 18 April, and victualled them for some time afterwards.

101RS reported the sighting of a submarine travelling north but its presence was denied by Fighter Sector even when a periscope was sighted. Tempers became somewhat frayed.

However, Collaroy was to become one of the more important radar sites particularly as a testing ground for RPL, due to its relatively close proximity to the laboratory. When re-numbered to 54RS it also served as a training station for operators.

The set for 102RS was collected by Lance Bombardier Rod Griffin from the Army depot at Redbank where the Army had been trialing it in unsuccessfully with their anti-aircraft guns. The SCR268s were given to the Army without any technical personnel or literature. Whilst Australians had assembled the ‘jigsaw’ set and got it working it was some time before an error in the phasing of the elevation aerial was found - two wires had to be crossed. Correction of the fault enabled the set to track aircraft which had not been possible before.

After conversion from an SCR268 to a MAWD around the end of March 1942, Rod Griffin took the set to Point Danger at Coolangatta, Qld, to be used as a joint coastal defence air warning establishment.

The first American troops arrived at Point Danger in April in time to take part in the Anzac Day march. Since they had not been trained on SCR268s the Army initiated them to the

equipment. RAAF personnel joined the MAWD in May whereupon the unit became a cosmopolitan group for a while before the Americans moved north and then the Army left.

No incidents of any significance have been identified and 102RS was disbanded in July 1942.

In view of the possibility of a sneak Japanese attack on Brisbane, Point Lookout on North Stradbroke Island was selected for **103RS**, primarily for coastal defence with air warning as a second string - very similar to 102RS. The modification was done by RPL just prior to the unit being formed on 6 April 1942, moving to the island two days later. Considerable difficulty was met when the heavy trailers had to be manhandled to the site adjacent to the lighthouse even though the height above sea level was only 131 feet.

Due to its location the MAWD suffered from the problem of PEs as did many other SCR268s on exposed sites. Early siting instructions stated that units were to be located in a dish-like environment to minimise the effects of back radiation producing PEs - this condition applied to SCR270s and SCR271s as was encountered in Hawaii.

Two mechanics, Bill Humphries and John Fraser, not only reduced the PEs but also enhanced the performance of the radar set by adding chicken wire to the mesh behind the dipoles. Of course by so doing it increased the wind resistance of the asymmetrical aerial and so made it harder for the operators to rotate during high winds.

Unfortunately this minor modification does not appear to have been passed on to other users of this type of radar which reveals one of the shortcomings of the overall scene - no exchange of valuable information - or was it once again a by-product of the secrecy syndrome ?

The only incident of any note was the grounding of the Liberty ship *Rufus King* on the island in May 1942. A radar operator tried to warn the ship using an Aldis lamp but could not read the reply. However, the wreck was useful in tuning 23RS, Lytton as it gave a nice big PE.

Personnel were housed in fibrolite cottages which were part of a guest house - they lived in comparative comfort especially when compared with the remote stations in NWA, DNG and the islands. The unit was disbanded on 29 July 1942 and 49RS was established on Point Lookout in August 1943 to continue the supportive role for Allied aircraft.

Townsville was a very important assembly point for both personnel and *materiel* so **104RS** was established to provide air warning for the area with 10 April 1942 being quoted as the date on which the unit was operational.

The SCR268 was collected from Cape Palleranda before being modified to a MAWD. The first site was at Castle Hill which proved to be useless so it was re-sited at Fort Kissing Point where it worked quite well. Aircraft movements were very high in number, increasing almost weekly, and operators were fully occupied on all shifts.

This station picked up an echo about 80 miles from Townsville on 25 July 1942 and reported it to No. 3 Fighter Sector but little notice was taken and the wharf area was ‘lit up like a Christmas tree’. Many have credited radar for detecting this, the first, Japanese raid on Townsville but in fact No. 1 Wireless Unit at Townsville had intercepted radio transmissions from the Kawanishi flying boat hours beforehand and forecast the correct ETA to No 8 Operational Group. No damage resulted from the bombs dropped but the incident once again emphasises adequate warnings were still not being heeded in mid-1942.

The unit was replaced by an Mk V COL on 24 August 1943 and at the same time re-numbered to 57RS.

Of all the MAWDs 105RS was probably the most outstanding due to its deployment to the Northern Territory.

The situation in Darwin at the end of March 1942 can only be described as being extremely desperate. Certainly 31RS at Dripstone Caves was operating and Cpl Bill Woodnutt was coastwatching at Cape Fourcroy but additional air warning was an urgent necessity with more range towards the west being requested. The only piece of radar equipment available was a trailer-mounted MAWD, weighing around 20 tons and movement of this type, and the SCR270, was limited to trafficable roads.

Despite this, W/Cdr Pither decided that it had to be moved to Darwin. On 24 March 1942 a start was made to dismantle the set, which extended to reducing heavy items such as the alternator into more manageable components so that it could be transported in DC3 aircraft. By 6 April all of the essential elements had arrived at Batchelor airstrip. By 20 April the re-assembly had been completed and the unit was moved over 100 miles of bush track to Point Charles. W/Cdr Pither has stated that the unit was operational on 22 April and went further with the claim that, 'this move must have established a record for air transport at the time'.

The unit's record at Point Charles was outstanding in the field of air warning and it enhanced the creditability of radar within Fighter Sector. 105RS had alerted No. 5 FS when Japanese raid had split into two with one section proceeding towards Darwin and the other going south towards Katherine. The plots were not believed until a telephone call was received from Katherine irately telling Fighter Sector that they were being bombed without warning.

According to official records 105RS was disbanded on 20 October 1943.

F/O Harry Freeman has commented that humidity caused some problems when some of the insulation became acidic and affected electronic components. This does not mean that the design was defective - it only highlights the fact that equipment was used outside the design parameters and in areas which were not foreseen. The SCR268 was designed for intermittent use in association with searchlights and anti-aircraft guns which meant that only one 60 cycle power supply accompanied the set. In comparison Australian stations had two alternators and the Canadians equipped the RWG/GCI sets with three Caterpillar diesel driven alternators. However the single Le Roi driven alternator was a very reliable unit and gave virtually no trouble.

107 and 108RSs were sent to the Cloncurry region, 107RS to Quamby and 108RS to Dalgonally Homestead at Julia Creek. Only 107RS became operational and even this proved to be a waste of effort as W/Cdr Pither reported 'the absence of an adequate reporting centre rendered these stations useless'.

One fascinating aspect is that while these units were reasonably close to one another 107RS was under the control of North Eastern Area while 108RS was under North Western Area. Both units were officially disbanded on 11 September 1942.

American Participation.

There was a great sense of relief in Australia when the American 8th, 55th and 49th Fighter Groups arrived at Brisbane during the end of February and early March 1942. The 49th Fighter Group did not stay long in Brisbane as it arrived in Darwin on 17 March as previously mentioned.

Each of these groups incorporated a Fighter Control Squadron identified by the same number with each of the units having sufficient personnel and controllers to set up a Fighter Sector including plotting rooms.

Initially the 8th Fighter Group was assigned to the defence of Sydney and based at the Metropole Hotel in that city. The first location for the Fighter Sector was in a tunnel built some 30 years earlier as part of the Eastern Suburbs Railway which did not eventuate until well after the war. Entrance to it was through a plain doorway and extremely 'hush hush'.

The 55th Fighter Group was based at Brisbane in the WD & HO Wills Building and included the Fighter Sector for Brisbane, the administration of which was taken over by the RAAF in August 1942.

In Brisbane and Sydney the Americans and Australians worked in close conjunction under congenial conditions. These plotting rooms, plus the sub Fighter Sector at Townsville, were receiving information from both American and Australian radar stations already installed.

It has to be realised that the sense of urgency and emergency existed in the USA to the same degree as was occurring in Australia. To reinforce this statement the following is an extract of the submission received from G/Cpt Northey:

> A fully equipped US Army Air Corps Fighter Group arrived [in Darwin]; made up of a HQ Unit, a Signals Squadron (about 250 personnel and stacks of equipment) and three P40 Squadrons. The Group was commanded by Col Wurtsmith, his second in charge was Lt Col Hutchinson. I believe the pilots were given refresher or conversion training at Bankstown by the RAAF under Dick Cresswell. The majority of the Signals Squadron boarded the ship in San Francisco in civvies doing their initial training en route to Sydney. The Fighter Squadrons were disposed on strips paralleling the main highway and the ground staff travelled in a truck convoy to Darwin.
> With the arrival of this Group in Darwin, control of the Fighter Sector Ops Room passed to the Group. Because the CO of the Signals Squadron, although technically capable was still virtually a civvy, I was appointed the Group Signals Officer, with an overview responsibility for all Group Signal matters as well as those of FSHQ, which still remained RAAF controlled.

American Operated Radar in Australia.

This aspect is a very grey area indeed as no records have been found in Australia. In the volume entitled *The Signal Corps: The Test,* being part of the series *US Army in World War II*, on page 111, it is stated that there were two SCR271s in Australia 'but they lacked receivers and other parts'. They were patched up in Brisbane when the US Signals Corps men 'innovated substitutes and headquarters made up a radar company using any troops within reach and training them from scratch with such odds and ends of equipment as were available'. Both pieces of equipment and crews were despatched to the Samoan Islands and Tongatabu.

Later that same source indicates that two SCR270s had been installed by the Signal Corps near Brisbane, another north of Townsville and a little later one in Darwin.

W/Cdr Pither states that there were five SCR270s located at Paluma, Ayr and Caloundra in Queensland and Gin Gin and Mundijong in Western Australia all manned by Americans. F/Sgt John Carlson, one of the first to be posted to No. 3 FS at Townsville, QLD, recalls the

American units being at Mount Spec, Cape Bowling Green, Cape Cleveland (for a very short time) and Castle Hill. To further complicate the issue we have been told that there was an SCR270 on the McPherson Range on the NSW/QLD border behind Coolangatta !!

Two RAAF operators were part of the team at Gin Gin station which took over from the Americans after about six months. This unit shifted to Kalamunda with the SCR270 and then to Geraldton when the COL was installed whereupon it became wholly RAAF as 47RS.

Apparently some US submariners were introduced to the mysteries of radar by the RAAF at Gin Gin, showing the amount of cooperation between the Allies.

CHAPTER 6

The Australian Scene

June 1942 to August 1945

After the Battle of the Coral Sea

The Battle of the Coral Sea markedly reduced the possibility of a carrier-type assault on mainland Australia and the overall situation enabled the authorities to relax slightly. Valuable experience had been gained in the previous six months and supply of equipment improved - particularly when in July 1942 the Department of Munitions took over the allocation of priorities to the various branches of the Australian services and radar was then a top priority.

Support radars for the American Fighter Groups began to arrive in Australia, the first being the 565th Signal Aircraft Warning (SAW) Battalion which arrived at Brisbane in June 1942. This battalion deployed 10 Reporting Platoons along the Queensland coast and were operational by the end of July 1942, all reporting into the Fighter Sectors.

Looking at the map showing the location of stations, it would be reasonable to assume that Australia had the longest chain of radar stations in the world. Certainly there were gaps in it but the hinterland at most of these places was extremely inhospitable and any invader would have to bring literally everything with him - including water - as it would have been impossible for anyone, apart from the aborigines, to live off the land.

With the number of stations involved on the mainland it will not be possible to tell the story of each and every unit in this overview - to do this would require another book. Instead this review will highlight incidents and topics which are seen to be important in the overall picture leaving the complete stories of individual units to Morrie Fenton and others. Many of the stories have already been published in *Radar Yarns* and *More Radar Yarns*.

WAAAF Radar Operators

Recruiting for WAAAF radar operators began in May 1942. The decision to use them was based on the women, WAAFs, manning the CH and CHL stations in the UK, which were classified as being completely successful. They also carried out the plotting at Fighter Sectors with all of them performing extremely well even when experiencing bombing during the Battle of Britain. It is generally accepted that women are more conscientious than men when an element of boredom tends to creep in when nothing much is happening.

It has to be remembered that there were limits on the number of men available in Australia for the overall war effort and the use of women freed many male operators who were needed in the forward isolated combat zones. At the time Parliament was very conscious of propriety, worrying about the moral issue of young women being cloistered with men on isolated locations. In consequence the WAAAFs did not serve on such places as Mt Surprise, Gabo Island, Wilsons' Promontory, Wedge Island and any location classified as being remote.

The first group of 23 WAAAFs started training on 18 June 1942 being No. 11 Operators Course. These girls, for they were mostly very young at the time, served on nearly all of the RAAF radar stations south of Mt Spec on the eastern coast and south of Geraldton on the western coast of Western Australia.

A group of WAAAF operators worked with CSIR scientists at Sydney University plotting ‘spotted dogs’ as part of an investigation into the effects of temperature inversion on radar performance during the war and assessing the possible application in postwar meteorology. A ‘spotted dog’ is a map showing the plots of aircraft by a radar station for a given period, normally a month. The original purpose was to determine whether a radar station had ‘dead spots’ in its coverage. It would appear that ‘spotted dogs’ were first introduced by F/Lt Hal Porter and F/Sgt Jack Fraser when they worked together immediately after No. 44 Radar Wing was formed in Darwin - they each gave the credit of the idea to the other!

Many airmen, in lost aircraft, owed their lives to radar operators who found them and put them on the right path. WAAAF operators had a very gratifying feeling when they were visited afterwards by aircrew to thank them for assistance.

Radar School, Richmond NSW

The syllabus of courses changed as more experience was gathered, for instance, while the first operators’ course was only a matter of a few days it burgeoned into a very comprehensive course. The peak of training was early in 1944 when it included filter officers (previously done at No. 102 FCU at New Lambton), Americans on LW/AW equipment and self defence courses. Supply of equipment became easier and it was then possible to send both mechanics and operators of newly formed stations to areas such as Pitt Town and Dapto on the south coast of NSW where an LW/AW set was erected and operated. Plots were reported by W/T radio to trainees in filter room and fighter sectors to simulate conditions in the field, ie living in tents and looking after themselves. These bivouacs were not considered as being operational stations and therefore have not been listed as such in Appendix III.

Instruction by the end of 1943 was a far cry from early 1942 when the School did not have an AW transmitter and receiver. The first course of Bailey Boys only had a theoretical introduction to this type of equipment and had to wait until they met one on a station before getting acquainted with the AW electronics. Sometimes this occurred when they were installing a new station in a remote area.

On the question of training, mechanics had to remember the value of each and every component in each circuit because it was said that there would not be any instruction manuals on radar stations. Much valuable time was lost in learning these details since manuals were provided at units. English equipment had very sophisticated circuits and it would have been virtually impossible to maintain them without a manual - it is considered that the time would have been better spent on more practical exercises than learning circuits by rote.

Incidentally the RAN was different in that manuals were not supplied on their ships which must have hampered maintenance particularly when obscure or intermittent faults occurred and a measure of diagnostics was called for. On a few occasions in forward areas RAAF air mechanics were asked to assist the Royal Australian Navy with their A286P models which was an adaptation of the ASV Mk II operating on the same frequency.

During July 1942 the first Americans arrived at Radar School for training as mechanics but their lack of radio knowledge was such that they became operators. It was unfortunate that the commanding officers of the US units used this, the first such course, as an opportunity to get rid of malcontents and the men on the course included even cooks and drivers - everything except radio or radar. No such problems arose in subsequent courses.

Believing that a shortage of technically trained radar officers might occur, the first Radio Officers Administration Course was held in September 1942 to train non-technical officers in

‘routine matters affecting Radio Location Stations’. This was followed by four similar courses in 1943. It was not uncommon for some radar officers to then be classified as technical officers leaving the mundane aspect of store returns et cetera to others.

In October 1944 the emphasis had moved from ground to airborne operations and training of both ground mechanics and operators ceased. To illustrate this shift, in 1944 a total of 121 courses were held at Radar School of which the ground courses comprised only a third of the total; 18 for operators, four for officers, three for mechanics and 16 for the Americans.

As Richmond RAAF Base became overcrowded, the School moved to Maryborough, Qld in November 1944 where instruction was devoted to airborne radarother than some refresher courses for senior NCOs and an introduction to centimetric radar.

June to December 1942

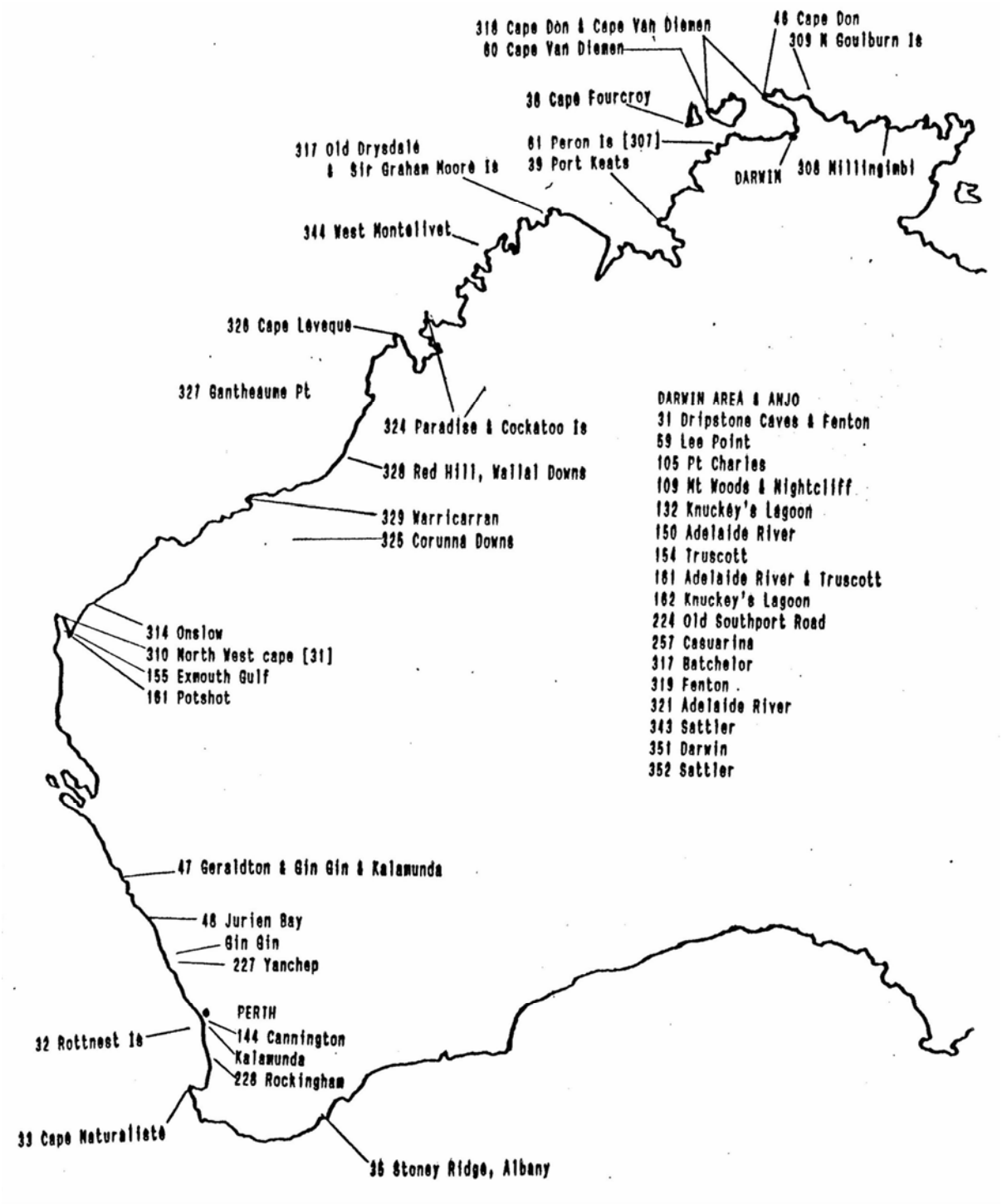
In mid-1942 RAAF Command was formed and moved to Brisbane in order to maintain close contact with General MacArthur’s Headquarters which had moved there to be closer to the war itself. From that point RAAF Headquarters in Melbourne had no responsibility in the tactical deployment of radar units concentrating on the development and supply of equipment and personnel, leaving the disposition to RAAF Command in Brisbane. It has been said that from many points of view this whole arrangement was not a happy one in 1942.

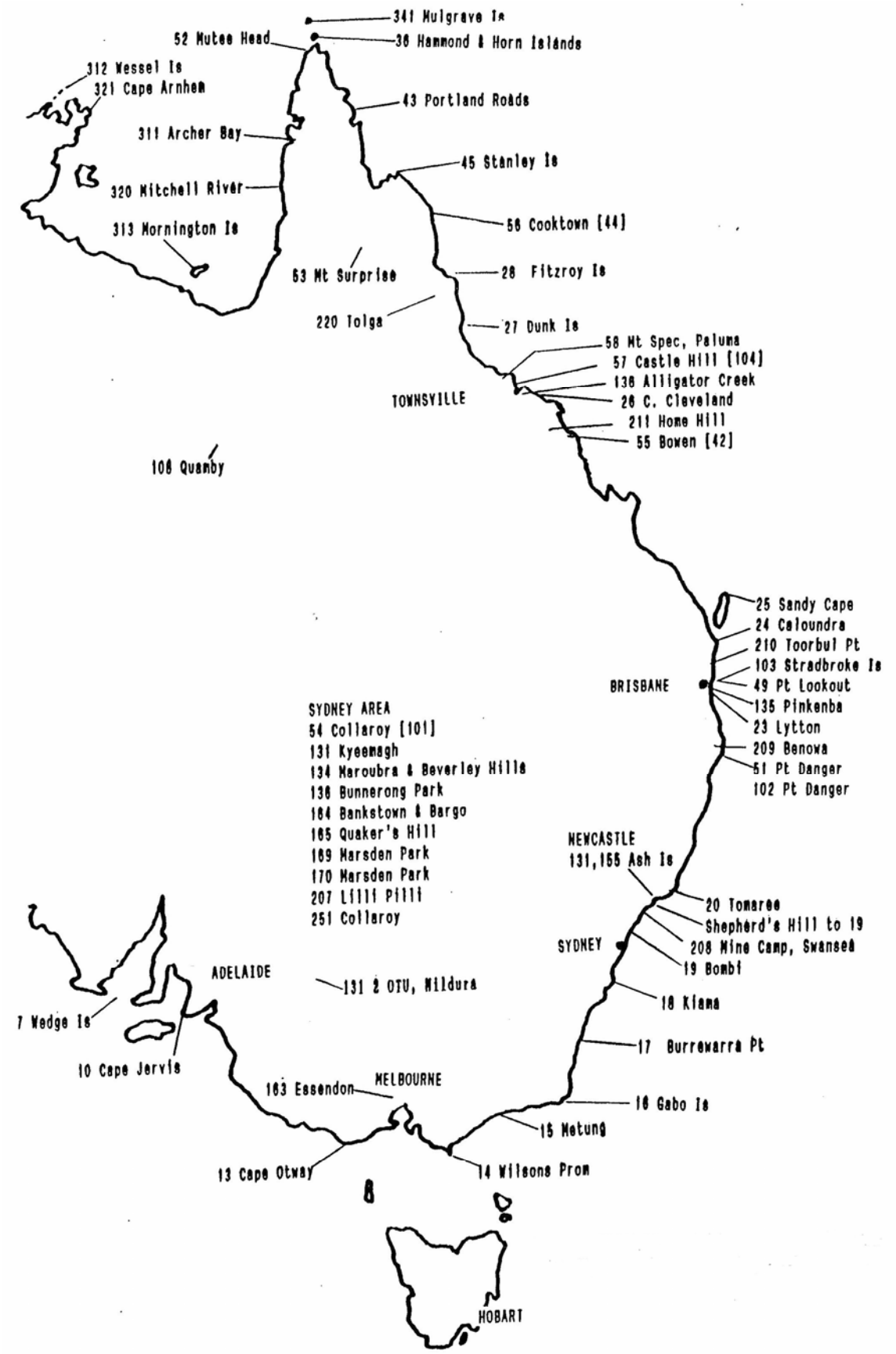
During this period, 17 stations were established around the coastline. To assist the reader, the perceived breakdown of the RAAF numbering system follows:

Nos 7-59	Fixed stations, either AW or COL - with two exceptions on the mainland and one overseas listed with the LW/AWs.
Nos 101-109	MAWDs
Nos 131-168	GCIs
Nos 207-228	ACOs
Nos 301-355, 50, 53 and 61 were LW/AWs.	
Nos 251 & 257	LW/LFCs - only two at the end of the war.

Distribution of those 17 stations within the different commands was:

North Eastern Area	26RS at Cape Cleveland, 27RS at Dunk Island, 28RS at Fitzroy Island, 43RS at Portland Roads, 44RS at Cooktown and 45RS at Stanley Island.
Eastern Area	23RS at Lytton, 54RS at Collaroy and 131RS at Ash Island.
Southern Area	13RS at Cape Otway, 14RS at Wilson’s Promontory and 16RS at Gabo Island.
Western Area	32RS at Rottnest Island, 33RS at Cape Naturaliste and 47RS using an American SCR270 at Gin Gin and Kalamunda (Mt Gunjin).
North Western Area	38RS at Cape Fourcroy, 39RS at Port Keats, 109RS at Mt Woods and Nightcliff, and 132RS at Knuckey’s Lagoon.


316 Cape Don & Cape Van Diemen
60 Cape Van Diemen
46 Cape Don
309 N Goulburn Is
38 Cape Fourcroy
61 Peron Is [307]
39 Port Keats
317 Old Drysdale
& Sir Graham Moore Is
DARWIN
308 Millingimbi
344 West Montalivet
326 Cape Leveque
327 Gantheaume Pt
324 Paradise & Cockatoo Is
328 Red Hill, Wallal Downs
329 Warricarran
325 Corunna Downs
DARWIN AREA & ANJO
31 Dripstone Caves & Fenton
59 Lee Point
105 Pt Charles
109 Mt Woods & Nightcliff
132 Knuckey's Lagoon
150 Adelaide River
154 Truscott
161 Adelaide River & Truscott
162 Knuckey's Lagoon
224 Old Southport Road
257 Casuarina
317 Batchelor
319 Fenton .
321 Adelaide River
343 Sattler
351 Darwin
352 Sattler
314 Onslow
310 North West cape [31]
155 Exmouth Gulf
161 Potshot
47 Geraldton & Gin Gin & Kalamunda
48 Jurien Bay
Gin Gin
227 Yanchep
PERTH
32 Rottnest Is
144 Cannington
Kalamunda
228 Rockingham
33 Cape Naturaliste
35 Stoney Ridge, Albany


341 Mulgrave Is
52 Mutee Head
36 Hammond & Horn Islands
312 Wessel Is
321 Cape Arnhem
43 Portland Roads
311 Archer Bay
45 Stanley Is
320 Mitchell River
56 Cooktown [44]
313 Mornington Is
63 Mt Surprise
28 Fitzroy Is
220 Tolga
27 Dunk Is
58 Mt Spec, Paluma
57 Castle Hill [104]
136 Alligator Creek
TOWNSVILLE
26 C. Cleveland
211 Home Hill
55 Bowen [42]
108 Quamby
25 Sandy Cape
24 Caloundra
210 Toorbul Pt
103 Stradbroke Is
BRISBANE
49 Pt Lookout
135 Pinkenba
23 Lytton
209 Benowa
51 Pt Danger
102 Pt Danger
SYDNEY AREA
54 Collaroy [101]
131 Kyeemagh
134 Maroubra & Beverley Hills
138 Bunnerong Park
164 Bankstown & Bargo
165 Quaker's Hill
169 Marsden Park
170 Marsden Park
207 Lilli Pilli
251 Collaroy
NEWCASTLE
131,155 Ash Is
20 Tomaree
Shepherd's Hill to 19
SYDNEY
208 Mine Camp, Swansea
19 Bombi
ADELAIDE
131 2 OTU, Mildura
18 Kiama
7 Wedge Is
17 Burrewarra Pt
10 Cape Jervis
163 Essendon
MELBOURNE
16 Gabo Is
15 Metung
13 Cape Otway
14 Wilsons Prom
HOBART

North Eastern Area

The RAF installation party played a big part in installing the six stations in North Eastern Area. Because of their experience either Cpl Wiltshire or Cpl Cheshire were in charge of the installation on many stations with everyone, regardless or rank, working together as a team.

Obviously four of these units were intended to cover the approaches to Townsville, the major assembly point of troops both American and Australian. All of these stations had heavy AW transportable towers, some had English COL electronics which meant that it was arduous manual labour getting them to selected sites, and innovative approaches were adopted. For instance, S/Ldr (then F/O) D Swan formed and established 43RS, an AW, at Portland Roads, intended to cover the Iron Range aerodrome as well as the approach to Townsville. A suitable high site was selected but the unit did not have a four wheel drive vehicle! One was borrowed from an American ack-ack unit nearby but there were strings attached. In exchange F/O Swan had 'unethically, immorally and illegally swapped the services of our team of cook, radar mechanics, operators, guards and so on to unload ships in return for the use of the vehicle' to build the road and install the gear - the operation seemed to extend to scrounging as strawberry jam appeared on the unit's menu.

Ranges in excess of 100 miles were recorded and during temperature inversions they plotted the south coast of New Guinea around the Fly River and Port Moresby regions.

Once again all stations in NEA provided valuable air warning and navigational assistance. They were not disbanded until after the war ended.

Eastern Area

As mentioned previously 54RS at Collaroy began with a MAWD which was one of the first units in Australia to encounter temperature inversion or anomalous propagation when they tracked a small fishing boat from Newcastle Harbour all the way to Sydney, a distance of 80 odd miles. F/O Swan, the first CO, who later became Professor of Physics at the Australian Defence Force Academy, was concerned that while these conditions existed the station would not have detected aircraft flying above the inversion layer.

54RS developed into an experimental station for RPL and many new types of equipment were trialled there several such as the LW/AWH which did not become operational. 54RS also served as a rest station for airmen who had served in the northern combat zones. 54RS was officially disbanded on 21 January 1947.

23RS at Lytton was an English COL with an AW aerial located at the mouth of the Brisbane River. S/Ldr (then a P/O) John Allan was the Area Radar Officer at Brisbane when he received a message that a COL set was in a railway goods yard in Brisbane still accompanied by two RAF guards who had brought it all the way from the UK. They were extremely relieved to be able to hand the gear on to someone else so that they could get back to their unit. The station had one of the original AW aerials and performed very well in the supportive role of navigational assistance, eg in October 1942 a B17 was lost in an intense thunderstorm inland from Brisbane, it was found by 23RS and directed by Fighter Sector to Amberley aerodrome where it landed with almost no fuel. This unit was disbanded on 20 March 1946.

131RS at Ash Island was the first GCI, an English mobile Mk V, to operate in Australia. Being an early model, the aerial cabin was not electrically driven so a WAAAF operator sat and hand turned the cabin and aerial with instructions being given by the operator at the

console who sent a message by a number of rings on an electrical bell in the cabin to stop, turn clockwise, anti-clockwise or just keep on turning. The cabin did not have any window so making it a somewhat claustrophobic environment. Fortunately the system was updated when a Canadian RWG/GCI, with an electrically driven aerial, was installed.

Being close to the fighter strip at Williamtown, this GCI was intended to be used in the defence of the large steel works at Newcastle but no aerial attack eventuated. The unit became very supportive of not only the fighters at Williamtown but also the Catalinas at Rathmines.

The question of secrecy even between radar stations and fighter sectors, reared its ugly head again when an operator reported a flight of planes flying low off the coast, Fighter Sector intimated that they were plotting a storm. In fact they had picked up the Sunderlands of No. 10 Squadron returning to Australia but were never told as it was very 'hush hush' at the time. This unit moved to No. 2 Operational Training Unit at Mildura, VIC, towards the end of the war to train fighter pilots in the art of ground controlled interception - but no records have been found for this period.

Southern Area

13RS at Cape Otway was the only hybrid station in the RAAF air warning network. An English Mk V transmitter with an AW receiver and an AW aerial system. Whilst the transmitter was much more powerful than the AW, the station suffered due to several side lobes producing several echoes on different azimuth bearings for the same ship or aircraft. The operator had to call on his experience before reporting to Fighter Sector at Preston.

Communications with Fighter Sector were by means of a party line telephone shared with the local farmers. Since the operators were on the phone most of the time they were privy to sometimes delicate and intimate phone calls but apparently they did not become gossip mongers.

14RS at Wilson's Promontory was the other leg of the radar coverage to the entrance to Port Philip Bay on which Melbourne is located. It was located alongside the lighthouse, as was 13RS, but access was much more difficult. Supplies were brought in by boat when the weather permitted or by Army pack horses. Unit personnel had to walk 14 miles to get to Foster, the nearest town - however, officers were provided with a horse for the journey. 'Other ranks' were not amused by the long and sometimes arduous walk in bad weather when going on leave. Reporting on convoys was an important aspect of both of these units' operations - both 13 and 14RSs were used as training stations and navigational aids to aircraft travelling to and from Tasmania.

16RS on Gabo Island, located just off the coast near the NSW border, was another AW type station. Supplies were delivered by fishing boat from the town of Mallacoota. In 1995 it is hard to believe that a station so close to civilisation could encounter food shortages but it did during adverse weather conditions. One operator was injured during a food drop. A colony of fairy penguins resided on the island and they were pressed into service when food was short to assist in fishing. The penguins went out each morning to forage for food and drove fish back towards the island in the evening. A net was used to catch the fish with the penguins being sorted out and set free - one can imagine that they may have been a little irate at losing their fish.

This unit made reports on submarines detected and occasionally sighted. On one occasion, when the submarine charged its batteries in the lea of the island, personnel went onto full

alert not entirely convinced that a .303 machine gun would have been an adequate means of defence.

All three units remained on strength until 1946.

Western Area

32RS at Rottnest Island and 33RS at Cape Naturaliste were both English COL type radars and were located to cover the harbour at Fremantle. The installation of 32RS enabled 47RS to move from Kalamunda to Geraldton in February 1943 so extending the radar network on the coast of Western Australia.

The personnel of 47RS initially operated an American SCR270 taken over from the Americans at Gin Gin in October 1942 before quickly moving to Kalamunda - also called Mt Gunjin - the following month. By this time the US Navy used Fremantle Harbour as a submarine base sometimes claimed to have been second only to Pearl Harbour for numbers.

Towards the end of 1942 about 15 permanent US Navy radio men arrived at 47RS to learn about radar - soon to be fitted to their submarines. It was an amicable arrangement which continued until about Christmas 1942.

North Western Area

The Darwin Area was really the only region which was subjected to continuing aerial attacks by the Japanese. Therefore radar coverage was of paramount importance as has been stated previously.

One of the early units sent to the area was 109RS, collected from the railway siding, at Winnellie (now a suburb of Darwin) by P/O Hal Porter. There were very few bridges over the Darwin to Birdum railway heading south but someone forgot to measure the height of the trailers containing the MAWD equipment - very little damage was done to the radar set but the Northern Territory Railways lost a bridge.

109RS was set up on the top of Mount Woods and an excellent camp was built. Unfortunately due to back radiation the screen was plagued with PEs and ineffective, so the unit was moved to Nightcliff near 31RS where its operations were much more effective.

39RS was located on Mount Goodwin at Port Keats near the Catholic Mission. The purpose of this unit was to give Darwin more coverage from the south and south western directions. Erection of the AW was just as arduous as that which occurred at 38RS at Cape Fourcroy, described later but the assistance given by Father Docherty was outstanding. Everyone who served in this station recalls him with great affection. Fr Docherty and the mission supplied native labour, timber from its sawmill for buildings and gravel for the access road and airstrip which facilitated the establishment of the unit plus of course spiritual guidance and support as when needed.

The social interchange between airmen and the indigenous peoples is still spoken off with both humour and sincere respect. This cooperation extended throughout the life of the unit including the ultimate dismantling of the station. 39RS was a valued station in the network and assisted in locating Dutch airmen who survived the crash of a Mitchell bomber some distance away.

38RS at Cape Fourcroy, Bathurst Island

Morrie Fenton has been researching the history of 38RS and has found that Cape Fourcroy, the location used in official documents, was the general area with the unit actually sited at Mitchell Head. This is not unusual since in some cases the official name referred to either the nearest town or the postal address.

P/O C J Mathieson arrived with the advance party for 38RS on 24 August 1942 but disputes arose as to siting the unit and fears of a possible commando type attack by the Japanese did not improve the situation. The Area Radio (Radar) Officer visited the unit, sorted out the question of siting and selected P/O Hal Porter as CO.

In the words of F/Lt (then P/O) Hal Porter:

> The first few weeks on Bathurst Island were indescribable. A completely untrained unit, inadequately supplied and led and fearful of an impending Japanese invasion, dumped away from all succour.

The equipment for 38RS was an AW with an AW Transportable tower. The term transportable only meant that concrete foundations were not required but the steelwork weighed about 12 tons overall, the elements of which had to be manhandled on and off boats, along tracks and up steep slopes before it was assembled - the sand dune or hill at 38RS was about 200 ft high with a slope greater than 1 in 3.

Before leaving Darwin F/O Fred Hull, CO of 31RS, assisted P/O Porter in scrounging for essentials such as a water tank and piping et cetera for the unit. P/O Porter arrived on the unit on 1 September 1942 with another batch of materials. He found that the unit was well supplied with lifting tackle but woefully short of tools - no decent spanners, only a cheap adjustable wrench which constantly slackened off barking knuckles. When two steel members did not quite fit there was only a large carpenter’s screwdriver which substituted for the usual drift - a pointed steel bar used to align bolt holes in the steelwork.

There were no riggers so the personnel learned about knots as they went along. In about 10 days the tower itself was erected and suitably guyed. Then they had to face the lifting of the array, weighing at least half a ton, to a height of 20 feet. Innovation was needed so two gum trees were cut down to make sheer legs and every man, including the natives and even piccaninnies, hauled on the rope to haul the array to the top of the tower. It was a very exhausting 30 minutes for all involved and from the description, a somewhat precarious operation.

Since the site was a navigation assembly point on the flight path for Japanese aircraft flying to attack Darwin, all work was carried out under camouflage netting including many artificially made trees. Over 3000 sandbags were filled from a pit about 150 yards from the station and the Tiwi natives carried these up the hill to the station to make a blast wall around the Doover.

The Tiwis are to be congratulated for their work assisting in the establishment of 38RS - without them the job would have taken a lot longer. Their support continued through the life of the station.

P/O Porter was told by the Area Radar Officer at NWA that getting the unit to operational status was the top priority but this did not prevent him from getting a ‘roaster’ for not having built the camp and quarters. The fact that no corrugated iron or other building materials, such as nails, had been supplied was apparently not significant.

Difficulty was met in the field of communications. The W/T set-up was moved several times and a visit from a Signals Officer was needed to position the radio gear to get signals to and from Darwin. In similar situations the US Signal Corps used either automatic repeater stations or supplied units with more powerful W/T transmitters - the RAAF did neither. There were many examples of 'message repeating' such as the one when a coastwatcher in New Guinea could not get through to Port Moresby with an urgent signal - so urgent that it was in plain language. An American ship picked up the transmission near Hawaii and promptly relayed it to Port Moresby.

It is somewhat ironic that in Darwin, in March or April 1942, F/O Northey raised the question of improving the AT5 transmitter with Col Wurtsmith, CO of the USAAF 49th Pursuit Group. Northey was sent to the AWA factory in Sydney, the manufacturer of the AT5, at the expense of the US Government to see if the AT5 could be improved. The resulting modified transmitter became the AT21 which was later issued to Fighter Control Units but, as far as can be ascertained not one was issued to a radar station - the sharp end of the radar network where more W/T transmitter power was needed.

On the question of food, F/Lt (then P/O) Cecil Blumenthal has reported that only the emergency food supplies were delivered - 20 tons of bully beef - and the normal fresh supplies were left in Darwin! Health suffered and despite a visit by S/Ldr Laver, the Principal Medical Officer at NWA, there was no improvement in conditions until such time as the CO sent a direct radio signal to the Chief Medical Officer at the Air Board in Melbourne.

On 7 October 1942 the first NCO, posted to 38RS arrived. Sgt Sands was accompanied by F/Os Higgins and Knight who took every fit man on the station for bayonet and defence drill ! An ill-timed visit when the men were keen to get the station on the air.

Even though Sgt Sands was a medical orderly he, as an NCO with more experience of service procedures, would have been able to assist in the construction of the camp had there been materials on hand - a large ship load of equipment, with much of the desired stores, eventually arrived on 23 October together with a sergeant stores clerk.

On 27 October W/Cdr Pither made an unexpected visit to 38RS and the following is a quotation from the A50 for that month:

> W/Cdr Pither, Director of Radio [radar] services in company with the Area Radio [radar] Officer paid a flying visit and subsequently called a conference at Area Headquarters to ensure that in no future erections was the radio [radar] officer, to be dumped to work out his own salvation.

The visit by W/Cdr Pither gave him first hand information to supplement the report by S/Ldr Israel on Papua New Guinea stations, submitted in support of the proposal that the arrangements for looking after radar stations in remote areas had to be upgraded; this report lead to the formation of Radar Wings.

38RS eventually became operational on 6 November 1942 and by the 20th of the month a range of 145 miles was obtained on friendly aircraft. Two days later Japanese planes were detected at ranges of 110, 120, 102 and 90 miles. Operators experienced the exhilarating sensation of an echo disappearing from the screen at a range of 14 miles while off-duty personnel saw a burning plane plunge into the sea.

Equipment failure in the form of a blown transformer in one of the power supplies put the station off the air between 28 November and 11 December 1942. Failure of the power supply engine - a 1926 Auburn car engine - in January 1943 put the station off the air for 42 hours until a replacement was delivered but this replacement alternator produced severe voltage fluctuations burning out more components.

More trouble was encountered with the coaxial cable aerial feeders which were replaced by open wire feeders at the end of December 1942.

At the time firm instructions had been issued to all units to carry out demolition of the radar installation if the enemy landed and the station was about to be over-run. To fulfil this order stations under No. 41 Wing at Port Moresby were issued with five or ten pounds of gelignite plus detonators and fuse. Not so in NWA. A large aerial bomb was placed under the Doover and wires run for a distance from the Doover to where an exploder would have been connected to explode the bomb. This action is considered to have been placing the personnel at considerable risk because Bathurst Island was prone to receive lightning strikes during thunderstorms and a strike on those electrical leads to the detonator might have exploded the bomb. P/O Porter removed the detonator which could have been put back in the bomb quickly during an emergency. On a subsequent visit to the station he found that the detonator had been put back in the bomb!

Darwin was only 60 or so miles away yet, in the early days, the unit went for a period of six weeks without mail deliveries or fresh supplies! As time progressed the performance of the gear improved and the more or less regular delivery of supplies by aircraft certainly ameliorated living conditions.

Without doubt the long delay of three months in getting 38RS on the air was NOT satisfactory from an air warning point of view. But there is no reflection on the capabilities of the personnel, rather it highlights the need for a more suitable type of equipment than was then available.

Fortunately the LW/AW was beginning to be manufactured in greater numbers and similar stories of installing heavy equipment in forward areas almost became a thing of the past in 1944 except for a couple of stations including 38RS.

In January 1944 it was decided to replace the AW equipment with a Mk V COL. Problems arose with the delivery of the equipment split into three by bad weather - other difficulties arose such as moving the transmitter weighing well over two tons up the sand dune with only a block and tackle. As a result the Mk V did not come on the air until September 1944.

Personnel at 38RS, like many other stations, also maintained the ASV beacon to assist aircraft in navigation and then in 1944 RAAF radar men manned the LORAN station near Cape Fawcett to the north of the radar. Mention should also be made of the fact that RPL located one of their experimental 10 cms sets near the Mk V COL to test its operation in the field.

1943 - The Golden Year of RAAF Ground Radar

1943 saw a more stable situation when it became possible to plan ahead. When one looks at the number of stations established on the Australian Mainland during the year and couples them with the overseas activities treated in succeeding chapters then it can be claimed to have been the Golden Year. The transformation can largely be attributed to the arrival of the

LW/AW on the scene. Furthermore, the number of personnel (1642 on 112 courses for ground radar) trained during 1943 was greater than in any other year of WWII.

Examination of Appendix II will show that it was the first half of 1943 when the peak in the number of LW/AW stations formed in a six month period occurred. Was there a coincidence between the peak in the first half of the year and the beginning of W/Cdr Pither's exchange duty with the RAF which lasted from August 1943 until the end of 1944 ? The numbers of stations established after mid-1943 dropped quite significantly.

As further support to the claim of 1943 being the Golden Year the following is a quotation from Professor Alan Powell's book *The Shadow's Edge* (page 185):

> From mid-1943 says the official Japanese history of the campaign, 'the air defence became very strict and our losses increased greatly. The RAAF defence fighters and radar system [in Darwin] became the highest level in the world.'

In all honesty, it cannot be said that Darwin's radar system was the 'highest level in the world,' but it was very good. The last raid on Darwin, the 64th on NWA, occurred on 12 November 1943.

Behind the scenes there was activity in solving equipment problems which had emerged in the field. Breakdowns had occurred in tropical areas due to excessive humidity and arcing between high tension components was reported from some stations. It was observed that these incidents usually took place after units had been switched off, even sometimes for only a short period. The fitting of a heater in the base of the cubicles of the AW, to be switched on when the unit was not on line, maintained the ambient air temperature at a level sufficient to prevent condensation.

Severe damage to electronic racks and components occurred due to moisture and the growth of fungi when they were in storage or transit. Not only was the cost of such damage high but it also resulted in serious delays in stations becoming operational. Committee L, comprising Allied Services and civilian experts, was the prime mover and coordinating force, arranging tests and recommending standard procedures et cetera for tropicalisation. Several groups including RPL, the Army and No. 1 RIMU were also involved in testing of components. This resulted in Australia becoming a leader in the area of tropicalisation with two officers, S/Ldrs Nash and Thomas being sent to the UK to pass on the information.

High tension transformers were sealed in air tight containers as an extra precaution. This, coupled with the upgrading of components found to be faulty and replacing the normal wound range potentiometer (turns moved with wear and range readings were affected) with a circular studded 'decade box', brought the Mk IA AW electronics into existence.

In mid-1943 No. 1 RIMU accepted the responsibility of modifying the AW equipment to accommodate the Mk III IFF. P/O K Blair escorted an AW from Sydney to Melbourne - it took five days in a goods train to make the journey ! This was a slight hitch as it was planned that Allied aircraft would be equipped with the new IFF in six to eight weeks time. Experts from the Postmaster General's Department were very cooperative and within a matter of days the solution was found and P/O Blair went back to No 1 RIMU.

Circuits were taken to HMV Gramophone Company, the manufacturer of the AW, who then produced the first modification kit in five days - another tribute to the Australian industry.

Several installation parties were formed with the first one led by P/O Blair going to the Markham Valley while others went to NWA and other forward areas.

Fifty one radar stations were established on the mainland in 1943. LW/AW stations which were later withdrawn from these areas, re-furbished and moved to become part of the overseas network are marked with an asterisk. Distribution of those stations was:

North Eastern Area	42RS at Bowen, 52RS at Mutee Head, 53RS at Mt Surprise, 58RS at Mt Spec, 136RS at Alligator River, 211RS at Home Hill and 220RS at Tolga, *311RS at Archer Bay, *313RS at Mornington Island, *320RS at Mitchell River and 341RS at Mulgrave Island.
Eastern Area	17RS at Burrewarra Point, 24RS at Caloundra, 25RS at Sandy Cape, 49RS at Point Lookout, 51RS at Point Danger, 134RS at Maroubra and Beverley Hills, 135RS at Pinkenba, 136RS at Bunnerong Park, 207RS at Lilli Pilli, 208RS at Swansea, 209RS at Benowa and 210RS at Toorbul Point.
Southern Area	7RS at Wedge Island, 10RS at Cape Jervis and 15RS at Metung.
Western Area	35RS at Stoney Ridge, 48RS at Jurien Bay, 144RS at Cannington, 227RS at Yanchep and 228RS at Rockingham, 310RS at Exmouth Gulf, 314RS at Onslow, *324RS at Paradise, 326RS at Cape Leveque, 327RS at Reddell's Beach, Broome, *325RS at Corunna Downs, 328RS at Wallal Downs and 329RS at Warriearran.
North Western Area	46RS at Cape Don, 59RS at Lee Point, 150RS at Knuckey's Lagoon, 224RS on Old Southport Road at Darwin, 307RS at Peron Island, *308RS at Millingimbi, *309RS on North Goulburn Island, *312RS on Wessel Island, 317RS at Old Drysdale Mission moved to Sir Graham Moore Island in 1944; 318RS at Cape Don, 319RS at Fenton moved to Drysdale, Anjo and Truscott in 1944, 321RS at Cape Arnhem and 344RS at West Montelivet.

North Eastern Area

Of the stations listed above possibly the most important in North Eastern Area were 52RS at Mutee Head, 311RS at Archer Bay, 313RS at Mornington Island, 320RS at Mitchell River together with 308RS at Millingimbi, 309RS at North Goulburn Island and 312RS on Wessel Island in NWA for two reasons. Firstly they provided the level of coverage required by the Americans to protect Townsville from a sneak attack across the Gulf of Carpentaria from the Aru Islands, a strong Japanese base. Secondly as protection of the RAAF aerodromes and Catalina bases at Millingimbi and Gove in Arnhem Land, Groote Eylandt and Karumba in the Gulf of Carpentaria.

52RS at Mutee Head, a Mk V COL station near Higgins Field, was only lightly guarded (just two guards) and could have been a target for a sneak Japanese submarine attack to gather information about our radar. The Mobile Installation Section which came to commission the equipment, installed by others, consisted of F/Sgt Pete Williamson, RAF, and Cpl Arthur Field with the two guards making up the complement of the station. They had to take it in turns to cook as well as carry out the commissioning. Even though they were reasonably close to other units they had no means of communication - no radio until the station personnel arrived to start operations.

Two transformers failed due to humidity and F/Sgt Williamson short circuited the filament windings and put 240 V onto the 400 V winding to dry them out. This was just another example of how mechanics had to resort to innovations in the field to either become or remain operational.

Together with 341RS on Mulgrave Island, 36RS on Hammond Island, 52RS at Mutee Head was needed, as mentioned before, for the surveillance of Torres Strait.

Stations in this area saw enemy action but there were severe cases of boredom plus a measure of isolation in some places. They were called on to assist with navigation of Allied planes over-flying the area, operating 24 hours a day.

311, 312 and 313RSs were formed at the same time and travelled together by train to Townsville and boat to Horn Island. Here, in the words of P/O John Bennett, 'some adjustments' were made by the men to the food allocated to the units - in other words scrounging - without which action they would have been short of food.

312RS was the last to leave Horn Island on the MV *Islander* bound for Marchinbar Island the most northerly of the Wessel Islands. In the middle of unloading there was an alert to a possible Japanese attack and the *Islander* left with most of the gear including the radar. On return the *Islander* came under attack by three enemy float planes while unloading. Out of nowhere a Beaufighter arrived, shot one down and the others departed.

Japanese aircraft flew over regularly around twice a week and Beauforts also overflew the unit at the same frequency but on different days. One day they did meet and one was seen to disappear from the cathode ray tube and years later John Bennett found that it was the Beaufort which survived.

There was possibly only one significant non-radar incident involving 313RS on Mornington Island. A very isolated station with only occasional planes landing on nearby Denham Island plus odd and irregular visits by a Burns Philp trading vessel. In order to supplement supplies and ensure a more or less regular mail service, some of the crew would sail the mission boat *Bonnie*, with an aborigine named Gully Peters as the skipper, 80-90 miles across the open waters of the Gulf of Carpentaria and up the Albert River to Burketown on the mainland.

It was on one such trip that there was an unfortunate incident with natives on Sweers Island, about half way on the trip, which occurred when the boat called in for fresh water. Spears were thrown by the natives and shots fired by the airmen, said to be over the heads of the natives, but one native was accidentally killed. The Bentinck Island men on the island thought that they may have been faced with a repeat of an incident when an Army survey vessel had called on the island and some of their women had been interfered with - so they acted in what they perceived to be self defence.

As the result of a 'hairy' take off by an Anson aircraft during an emergency flight to pick up an injured airman, an airstrip was built to cope with DC3 aircraft, this served the local mission after 313RS left the island.

Eastern Area

In addition to continuing the policy of coastal surveillance, three GCI stations, 134RS at Maroubra, 135RS at Pinkenba, and 136RS at Bunnerong Park were established to assist in not only the controlled interception of enemy aircraft but also to aid friendly aircraft approaching nearby aerodromes. The latter activity was a forerunner to Ground Control

Approach systems which have now been developed to a very high standard and are now regarded as being essential to the operation of commercial airlines and civilian aircraft.

The depth of the security blanket surrounding radar, even between services, in 1943 was incredible. F/Lt Blumenthal reported that the Royal Australian Navy started to erect new large store buildings at Bunnerong which affected the operations of the nearby GCI station. He was not permitted to discuss it with anyone from the Navy so the unit was moved to Beverley Hills where it was of no use in assisting aircraft to land at Mascot during inclement weather.

207RS at Lilli Pilli was officially formed in 1942 but did not become operational until 1943. All of the ACO units are treated collectively towards the end of this section.

Sinking of the Centaur

The sinking of the hospital ship *Centaur* by a Japanese submarine in May 1943 off the coast of Queensland, contrary to the Geneva Convention, was a severe blow to Australia. Since it was sunk not far off the coast, between 23RS at Lytton and 24RS at Caloundra, the question of radar coverage was included in the subsequent inquiry. The results of that inquiry have not been sighted, nor were there any references to the incident in the A50 History sheets for 23RS and No 8 Fighter Sector.

Walter Fielder-Gill, the President of the NSW Radar Air Defence Branch, was the young Technical Officer at the time at 23RS and he recently prepared a statement. He attended the inquiry but does not recall being advised of any findings. One theory is that his lowly rank of Pilot Officer might not have entitled him to be privy to the findings.

The following is a reconstruction of the incident based on Walter Fielder-Gill's recall and the clear memories of three WAAAF operators. Cpl Pixie Woodward indicates that 23RS did report at approximately 1500 hours to No. 8 FS the plotting of a surface vessel. Plotting continued during the next three shifts of which ACWs Kaye Hutchison (nee Rae) and Mabel Hess (nee Bromley) were members. The Technical Officer was called in the early hours of the morning as No 8 FS was not convinced of the plot and the Naval representative had still failed to identify it. The Fighter Sector's comment was that they were plotting a storm but that was identified on the cathode ray tube as a separate plot to the X-ray plot.

The slow beating of the echo was characteristic of a surface vessel or a submarine. Whilst the range of about 40 miles may have been more than the normal surface range, it was within the extended range achieved during periods of temperature inversion.

Radar mechanic Tom Buckland was the corporal in charge of the afternoon shift at 24RS at Caloundra. Around 1400 hours on the 13th of May 1943 an echo of a what they believed to be a submarine was picked up. Not that they had seen a submarine echo before on the screen, but it behaved in accordance with that which their training told them to expect as an echo from a submarine. It was reported to No. 8 Fighter Sector as a submarine. Since it was close to the shore Cpl Buckland climbed onto the blockhouse to get a better view. He sighted a submarine lying parallel to the shore and about half a mile from Caloundra Beach. No. 8 FS was told that it was a visual sighting as well as a radar plot.

Some 10 to 15 minutes later a WAAAF officer spoke to the operators and told them that they must have been mistaken because 'the Navy reports that they have NO SUBMARINES in that area'. Despite the Corporal asking if they had considered that it might NOT be one of ours, nothing more was heard from Fighter Sector and about half an hour later it turned

slowly and moved out to sea. Caloundra was much closer to the spot where the *Centaur* was sunk!

Unfortunately this was not an isolated case of nothing being done when submarines were reported. Maybe we should have adopted the French approach to legal matters rather than the British system - everyone (every echo) should have been treated as being guilty (the enemy) until proved innocent (friendly). South African radar did adopt a positive approach whereby any plot not showing IFF was regarded as a 'hostile' until proven otherwise.

Southern Area

The Navy requested the installation of 7RS on Wedge Island to monitor shipping. Reporting or telling was to the local Volunteer Air Observer Corps (VAOC) in Adelaide where they either did not know the capabilities of radar or seriously doubted reports because the lighthouse keeper on the island was invariably asked for a visual sighting and identification when the plot of a ship was sent in.

10RS at Cape Jervis was a similar case to 7RS. Radar mechanics proved their worth here when Ron Coat diagnosed and fixed a problem with the lighthouse keeper's pedal wireless. Prior to this, the keeper had to pedal backwards to generate electricity to send a message!

On the other hand 15RS at Metung played an important role as far as the RAAF was concerned. Not only did this Mk V COL perform in the same way as the others on the coast but the unit was one of the very few mainland stations which received a commendation for saving many Beauforts which had become disoriented or lost during their training flights from the OTU at nearby Sale. A good rapport developed between the staff of the OTU and the WAAAF operators who apparently enjoyed celebrating VJ day together.

Western Area

A different position pertained in the Western Area when the west coast became the stepping off and arrival point for Catalinas, followed later by Liberators and Lancastrian aircraft providing the courier service from Australia across the Indian Ocean to Ceylon (Sri Lanka).

All seven of the LW/AWs were involved in the support role of radar but also were needed in the event of a sneak attack by enemy aircraft following bombers and Catalinas returning to bases at Corunna Downs, Drysdale and even Perth and Fremantle Harbour after raids on the Dutch East Indies.

There were two incidents involving aircraft. The first occurred around March 1943 when 47RS picked up an unidentified aircraft at 70 miles or so flying high coming from the west. It disappeared in the dead zone above the radar unit, re-appeared quickly losing height, presumably to escape further detection and vanished to the west. Operators believed that it was a Japanese reconnaissance plane from a submarine but this cannot be confirmed.

The second incident was a false alarm in March 1944 when it was reported that the Japanese fleet had left its base in Truk. George Odgers reports on page 137 in *The Air War Against Japan 1939-45* that 'W/Cdr Jeffrey told squadron commanders that a Japanese naval task force was loose in the Indian Ocean headed in the general direction of the Perth area'. News of the emergency leaked out to the general public and rumours of a coming Japanese invasion or air raid spread like wildfire.

Extra aerial reconnaissance flights were carried out where possible and fighter aircraft were hastily assembled from other areas. 47RS gave reports of an aircraft which was not identified as one of ours and the air raid sirens were sounded in Perth!

It turned out that the Japanese fleet had moved from Truk because of lack of air cover. There was not any intention to attack Australia. For the enemy it proved to be a good move as the Americans attacked Truk only a matter of days after the fleet left.

310RS at Exmouth Gulf was established alongside the lighthouse on Vlaming Head in January 1943. Very little is known about this unit as no records of any consequence have been found. However, it is known that members of the civilian Allied Works Council constructed the mess, ablution block and mens' quarters. Duties of radar operators were extended when they took over the duties of lighthouse keepers.

Presumably 310RS was so located as cover to the US Navy submarine base at Potshot. But it was moved further south after some attacks were made by the Japanese because the submarine mother ship USS *Pelius* was an important part of the whole submarine operations. A small tanker remained to top up the submarines's fuel tanks before going on a mission.

More of Exmouth Gulf in 1944.

314RS was established at Onslow in February 1943 as additional cover for Potshot and the nearby fighter strip at Learmonth. The flammability of the camouflage treatment of tent material became obvious when a fire in the spinifex grass got out of control and the Doover burned down. Notwithstanding the distances involved replacement electronics arrived within three or four days.

324RS was first located at Paradise near Noonkanbah. Whoever named the place must have done it with tongue in cheek as it could not have been further away from paradise, some called it Paradise Reversed and other non-complimentary descriptions. The unit had a Mk I type tower with constricted space inside the tent. Temperatures within exceeded 45^{o}C on most days - it was alleged that one could fry an egg on rocks near the unit. Later 324RS moved to Cockatoo Island where personnel enjoyed a much better environment but had to put up with a local population of snakes, scorpions et cetera as was experienced in many other units in the north.

Four stations 326, 327, 328 and 329RSs were formed in Sydney on 15/16 June 1943 and travelled together by train to Perth frequently changing trains due to the break in railway gauges which then existed. At Fremantle all four units boarded the TSMV *Koolinda* bound for Broome which also carried fuel and explosives.

Later it was learned that prior to their departure 'Tokyo Rose' had announced that four radar stations were heading north on the *Koolinda*, but as the ship had rescued many Japanese pearl divers in a typhoon off Broome before the war, the ship would have 'safe passage'. No submarine scares were reported but it does raise the question of how extensive was the enemy's espionage system.

All four units performed well and ranges varied with climatic conditions with some long distances of about 200 miles during temperature inversion - even 80 miles on a Tiger Moth

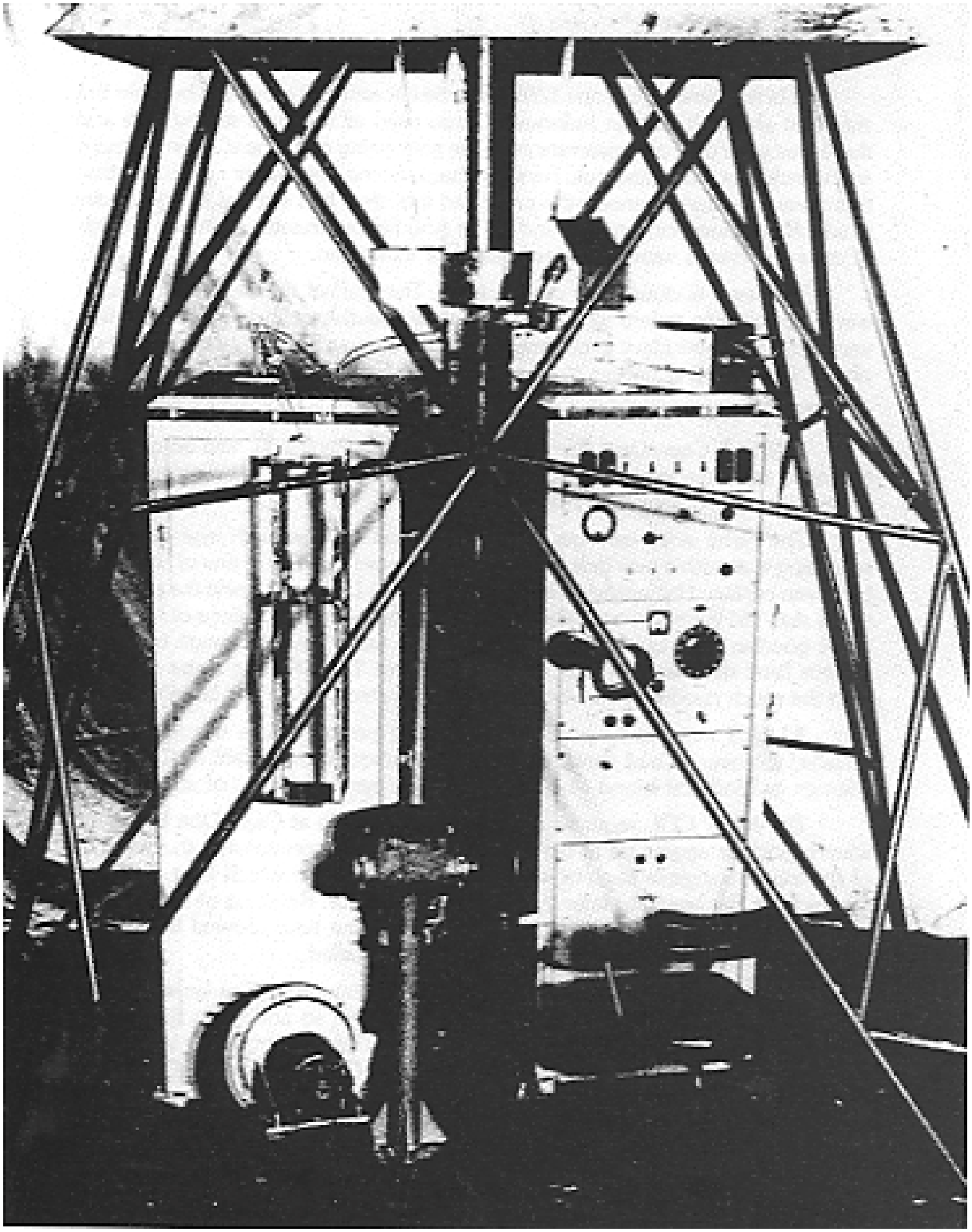


Photo: E. Bullock
Mk I LW/AW Tower. Compare the lack of space inside the tower with that inside the Mk II model on page 22. No wonder the temperatures soared under the dark comouflaged tent.

from Communications Flight. At least 327RS at Broome had other service units nearby so they were not quite as isolated as some.

326RS at Cape Leveque was unique in that it had a WWI 18 pounder gun for protection from any landing. Two Army sergeants were in charge of the gun and the radar personnel made up the gun crew. Gun drill and practice provided a welcome change from normal duties. A shot was deliberately fired across the bow of the *Bandoeng Maru* in August 1944, so showing the value of the previous gun drill. The story has been told in *Radar Yarns* on page 108.

In brief, personnel from 326RS formed boarding parties and brought the ship into shore. It was an Indonesian prau used as a Japanese spy ship and there was a fair deal of conjecture as to the nationality of the boat's complement and whether or not it had gold bars on board. Some people are convinced that there were Japanese among the crew and that they had sighted the gold bars to which no reference can be found in the A50 history sheets - no Army records of crew interviews were either requested or examined.

The issue is clouded to say the least. The staff of the nearby lighthouse were supposed to record all instances in their monthly reports yet no mention was made of the incident even though the Lighthouse Keeper was allegedly on one of the boarding parties in his as the local Customs man.

North Western Area

46RS at Cape Don, the tip of the Cobourg Peninsula, was an essential station in the Defence of Darwin. Originally an AW with the AW Transportable Tower, it was replaced by a Mk V COL in 1944.

The same story emerges of irregular food supplies with one mechanic recording that with a new delivery the diet changed - the 10 lb tins of bully beef had been replaced by smaller 6 lb ones ! Christmas 1943 came and the progress of the slow old Walrus was plotted by the operators and expectations of receiving some goodies were quickly dispelled when the water was too rough to 'land'. Guards fired shots at it in rage or frustration but 'Doc' Fenton came out later with the much needed food when the pilot reported that he had been fired on.

318RS went to Cape Don for a short period before the Mk V was installed to cover a dead spot in the AW's coverage. It then went to Cape Van Diemen on Bathurst Island so emphasising the transportability of an LW/AW.

The Mk V COL required a concrete foundation at Cape Don but there was no rock or aggregate in the vicinity. F/O Sanderson enlisted the support of the local aborigines each of whom had a sugar bag in which they collected stones from the beach to take the place of aggregate. Resiting of the Doover removed the dead spot in coverage and at the same time allowed the AW to continue operations until the COL was finally installed.

59RS at Lee Point was rather different to most RAAF radar stations in that it was a Mk V COL on a tower 135 feet high so adding to the overall height as the site was 200 feet above sea level. The vista from the top of the tower was superb and it was possible to see Point Charles and even Cape Don on the horizon. Ranges obtained were excellent with PEs at a range of 175 miles with a signal to noise ratio of 3/1 on 13 September 1943. The site is still important in 1995.

Being fairly close to Darwin, supplies and other units 59RS could not be classified as a hardship posting.

307RS on Peron Island in Anson Bay was an important radar station in the defence of Darwin. Japanese aircraft sometimes approached via Anson Bay to attack airfields south of Darwin such as Comallie Strip. Being on the enemy's flight path camouflage was necessary particularly as paths looked like spokes in a wheel with the Doover at the hub and its shadows were also rather conspicuous. No material could be removed from the site so the camoufleur, Maurice Cork, had the men gather seaweed and bits of flotsam from the beach on a two-wheeled trolley which was hauled by six men using ropes. The shadows of the aerial were substantially modified by spreading bits of seaweed painted with tar on the surrounds.

It was intended that 307RS would be replaced by a Mk V COL and therefore was renumbered to 61RS. However, this did not eventuate but the English spares were delivered ! The unit had good results and only two minor incidents of note happened. Firstly a Liberator fired at a cluster of rocks about half a mile from the shore. Then 0.5 bullets started to ricochet off the rocks where 20 or so men were sunbaking in the nude. Hastily shelter was sought behind rocks thus offering 20 white bare bottoms as targets from the opposite direction.

Secondly it is claimed that 307RS plotted the last Japanese reconnaissance flight in NWA. On 1 May 1945 the plane flew in from the north west, past Adelaide River and turned to pass to the north of the station before any interceptors caught up with it.

Nine DC3 planes were used to transport **317RS** to be sited overlooking the Bay about a mile from the Old Drysdale Mission. It became operational on 25 May and during June six enemy reconnaissance aircraft travelling along the coast at ranges from 58-96 miles were detected. On 27 September No. 58 OBU at Drysdale was raided for the first time. Adequate warning was given but there were casualties. Fr Thomas GIL, four native children and one mother were killed when a slit trench received a direct hit.

In mid-1943 two officers examined the area for an alternative site for 317RS reporting that only Sir Graham Moore Island was suitable. The unit closed down on 9 April 1944 becoming operational three days later at 1800 hours. Initial water supplies was like 344RS at West Montelivet - 44 gallon drums floated ashore.

It was at Fenton where **319RS** was established that fifth column activities were suspected. The truck engine seized when it was started one morning and sand was found in the sump; several bush fires occurred and may have been deliberately lit and finally a flare was set off on a nearby hill when an incoming raid was approaching.

Excellent ranges were achieved by this inland station, picking up enemy aircraft at ranges from 80 to over 100 miles between June and September 1943 tracking them out to 130 miles. In March 1944 the unit moved to Drysdale when the original 31RS equipment was installed at Fenton.

344RS on West Montelivet Island was one of the few LW/AW stations where a separate installation party was sent to erect the quarters, mess facilities and ablution blocks. The station was seemingly thought to be of a permanent nature and No. 44 Radar Wing had learned lessons from 38RS on Bathurst Island which explains the presence of the second installation party. This enabled the station personnel to concentrate on getting on the air.

Unloading the gear from the HMAS BOMBA was hazardous as the men stood waist deep in the shark infested waters. Lookouts with 0.303 rifles were posted on nearby rocks to frighten off any of the hungry denizens of the deep.

Recollections of the crew centre around the isolation and loneliness - about 30 men, the same men, the same faces, the same views, the same food, no mail for several months, no film shows, no fresh water and no relief of personnel for seven months. One of the first relieving party reported that the boys had tears in their eyes when the relief personnel arrived.

Early deliveries of water was in 44 gallon drums which had been previously used for petrol with the drums being floated ashore ! No fresh water was available for the Ford 10 motors driving the alternators so a cooling tower was put up and salt water used. The credit for this was given to the CO, F/O K S White, who was a builder and radio ham. A periodic chore was to clean the salt off the tower but it functioned for many months keeping the unit on the air.

Supplies were delivered every two or three months by boat until the off duty men constructed a landing strip by manually clearing thousands of stones and rocks from the selected area. The stones were scattered around the surrounds in an effort to mask the fact that the strip had been made. One can imagine the celebration which occurred when 'Doc' Fenton landed with fresh food and mail.

One afternoon, date unknown, a submarine was sighted charging its batteries near the island, frantic calls were made to Fighter Sector, urgent assembly of hand weapons and a WWI Vickers machine gun was made to repulse the enemy if they landed - they didn't. A Beaufighter appeared at noon on the following day by which time the submarine had gone.

Operation Capstan

This operation was primarily the movement of the Spitfire squadrons to Darwin. 308 and 309RSs left Sydney in December 1942 and travelled with the Spitfires on the same ships travelling up the east coast and through Torres Strait to Darwin. On arrival a check erection of equipment was made before 308RS, under the command of F/O Charles Hammer, was moved to Millingimbi and located near the intersection of the two cross strips. Later it was moved and a tower was built by an Aerodrome Construction Squadron and there is no doubt that the end product was a much more professional looking tower than those made by station personal at other locations.

An interesting innovation by F/O Hammer was the use of a spare IFF set on a launch with 308RS plotting the position of the channels around the island.

F/O Hammer showed good leadership and technical expertise. He calculated the angle of the lobes in the LW/AW transmission which provided a preliminary chart for height assessments prior to the flight of calibration aircraft. The angle of elevation of the transmission lobes in VHF radar is dependent on the height of the centre of the aerial above the primary reflecting surface which was the sea in many cases. This was valuable information which should have been passed on to other units. Across the north of Australia the range of tidal variations is of the order of 30 feet so affecting those stations more than southern units.

At least two GCI units were affected by changing water levels in their surrounds on land. F/O John Bennett acted when he found that height finding was affected at the GCI, at Knuckeys Lagoon, by a two foot rise in water level in the swamp. Another GCI in New Georgia in the Solomons also suffered in similar manner.

309RS went to North Goulburn Island further extending the radar coverage north of Arnhem Land. 321RS went to Cape Arnhem for both protection of airfields and navigational assistance to the Catalinas at Melville Bay so completing coverage of the area between Cape York Peninsula and Bathurst Island.

The ACOs

Only nine ACO stations were installed on the Mainland in 1943 even though the original intention was to erect 32 TRUs (which only differed in the type of aerial towers). The remainder were unnecessary when the war moved away. Those nine units, listed above on pages 67 and 68 were 211 and 220RSs in North Eastern Area; 207, 208, 209 and 210RSs in Eastern Area; 224 and 228RS in Western Area and 224RS in North Western Area.

Whilst the ACO was popular with operators it was very unpopular with some senior RAAF radar officers for many reasons. When compared with other sets used by the RAAF, the ACO was very expensive; both sophisticated and complex; installation was measured in months rather than weeks or days followed by further delays in matching and phasing the aerial system. Furthermore, the solid nature of the two towers (see photograph on back cover) and the height, made masking or camouflaging extremely difficult.

The sophisticated electronics were the second generation of the English CH type of radar, a 'floodlit' system operating in the HF band. The transmitter aerial system had an upper and lower aerial, upper and lower transmitter, each with four elements to cover four sectors of 120^{o} plus crossed dipoles for the receiver, also at two levels. Changing sectors and from upper to the lower transmitter aerials had 14 aerial switches on the transmitter tower relay controlled from the receiver console. The electronics contained panels and features not otherwise seen in other types or deemed to be needed in the Pacific.

In essence the ACO was totally unsuited to the fluid nature of WWII as shown in Malaya and not used in the Pacific. However, in a fixed situation it had some advantages over the 200 Mc/s VHF COLs and LW/AWs namely better penetration of thunderstorms and quick height finding ability. Fighter Sectors frequently asked operators to exercise extra vigilance during storms when other search radars could be affected. Ranges in excess of 200 miles were recorded on high flying aircraft and ACOs fulfilled the secondary role of support to Allied planes.

It may be of interest to note that one MB3 transmitter and RF7 receiver was given to the Weapons Research Establishment in South Australia to be used in the initial tests for the Jindalee or Over The Horizon Radar. Development had to wait for larger powered transmitters and computers to achieve success in this type of radar.

1944

By 1944 the war had moved away from Mainland Australia. There was a shortage of manpower in the country, both for industry and the services. RAAF Command had asked for an additional 2,000 radar personnel, including air mechanics, in its program for 1944 and the answer was that the RAAF allocation for manpower in that year was such that only 1,000 "could be produced and it was their responsibility to use them as they thought best".

But it was not as serious as some have indicated as far as ground radar was concerned. About the same time, it was decided that no more fixed stations would be erected. As a further measure many of the Mainland stations were placed on stand-by conditions only operating a few hours through the day - they were the 27 stations south of the line from Brisbane in the east to Geraldton in the west.

Only a handful of stations were established in 1944 with only two in Eastern Area namely 155RS at Ash Island for a few months before moving to Exmouth Gulf and 164RS which operated at Bankstown and Bargo. The remainder were in North Western Area namely 60RS

at Cape Van Diemen on Melville Island; 154RS on Anjo Peninsula; 161RS at Adelaide River and Exmouth Gulf and 162RS at Knuckeys Lagoon.

60RS was a Mk V COL, another remote station, being located on the eastern side of Apsley Strait between Bathurst and Melville Islands. Mail deliveries were a vexatious issue and at one stage out-going mail was soldered into a tin and natives 'paid' to paddle a canoe down the Strait to 'post' the mail at the mission !

154RS, was GCI unit on Anjo Peninsula where Liberators, Mitchells and Venturas flew from Truscott strip, Spitfires supplied fighter cover and Catalinas re-fuelled at West Bay. X-ray plots were few and 154RS acted as the eyes for the local control tower passing on plots and height assessments as they appeared on the screen within a 50 mile radius. Guidance was such that it took on the role of a ground control approach radar - or at least a step towards one. 154RS's 'big day' happened on 20 July 1944 when the last Japanese plane to be shot down over Australia was intercepted and destroyed by Spitfires from No. 54 RAF Squadron.

Three LW/AWs, 317RS on Sir Graham Moore Island, 326RS at Cape Leveque and 344RS on West Montelivet were so placed to provide early warning and it was 326RS which gave the first report of the enemy plane. The engagement was short lived but successful.

155RS went to Exmouth Gulf in August 1944 possibly as a replacement for 161RS which was burned down in the previous May. 161RS was a Mk I LW/GCI originally set up at Anjo.

According to the A50 History Sheet for the month of May an entry stated that 'it had been detached for a special mission'. Veterans were able to supply the missing details. A quick flight transported the unit to Exmouth Gulf where initially it was erected alongside the airstrip at Learmonth, then moved to a site close to Vlaming lighthouse and other radar units as it seemed to be a better site for the Mk I which had a short range.

The purpose of the special mission was soon revealed when personnel witnessed the assembly of a large fleet of American, British and French ships. This group later attacked Sourabaya in Java possibly confirming the Japanese view that North Western Australia could be the launching pad for assaults on the former Dutch East Indies.

Having become operational and practised with the Spitfires, disaster struck. The fire was accidental, a soldering iron had rested on or against the camouflaged tent covering the Mk II tower. Once again the flammability of the tent cover was at fault and the Doover was destroyed. Freshly equipped with Mk II electronics, 161RS went to Morotai.

In December 1944 submarine warnings were given and on 7 December 31RS at North West Cape tracked three submarines entering Exmouth Gulf but only two tied up at the US Naval Base. Then some hours later there were two more reports of one submarine, 9 miles from the Cape, travelling south on a bearing of 312^{o}. No further reports have been sighted !

S/Ldr Chilton wrote the following in the last A50 for No. 44 Wing which is considered to apply to all personnel who served in radar:

> ... the degree of personal service given by the individual members of the Wing has been higher than is normally expected of men who joined the Service to serve. Many have toiled under most arduous conditions to establish RAAF Radar Stations where not even the aborigine could live before. Many have maintained vigilant watch despite the extreme tedium of the job. Some have worked at high pressure for long hours every day at the Headquarters. Their

work is not glamorous, it is secret and not talked about. Their reward is their pride of accomplishment.

1945

In January 1945, W/Cdr Pither took over again as Director and he was anxious to have the Mk V LW/AW put into service as the Japanese had been jamming some units. Planning for training mechanics in the new model was programmed but only one Mk V went into service at the end of the war in Borneo.

The war front had moved well to the north and the Americans had re-captured Manila in the Philippines and to all intents and purposes the war, from Mainland Australia's point of view, was over. Not much was happening in Australia

While there was a concentration of effort in 1945 on the usage of GCI type radar only one such unit was formed and operated on Mainland Australia, namely 165RS which went to Bargo and Quaker's Hill in Sydney possibly to direct air traffic into and out of the Sydney region.

2 February 1945 was the date on which a hurricane struck the Exmouth Gulf area. On the following day the CO of 31RS stated that 'a scene of utter desolation presented itself'. The AW transportable aerial was blown off the tower, both powerhouses and trucks were filled with sand, quarters demolished 155RS's GCI trucks were overturned and personnel from both stations lived on two meals a day until the Dodge weapon carrier could be put back into service to go and collect supplies.

Many were hopeful that North West Cape would be closed down but the Americans still wanted radar so a new LW/AW Mk IA was flown in - the GCI at 155RS remained out of action until at least June 1945. The men were happy when an amphibious Catalina was stationed there for air-sea rescue because it brought back more than adequate supplies of beer from Onslow.

Summation

In view of the large number of stations operating on Mainland Australia, this chapter was the most difficult to compile - it really deserves to be a book on its own but time prevented this. There was a commonality of operations and in consequence little is written concerning some units. This does not imply or infer that they were not important as it is possible that Mainland stations saved more lost Allied aircraft than those in the Pacific.

Original planning for stations was progressively modified as conditions changed until September 1944 when it became patently obvious that many were superfluous and they then reverted to a stand-by condition.

In hindsight it might appear that the overall chain of radar stations was over-developed. But one has to look at the fact that uncertainty as to the possibility of attacks persisted in many quarters until well into 1943. One can imagine the furore which would have erupted if perchance a large attack, other than those in NWA, had eventuated and the coverage was not there.

One fact emerges that there were 'hardship' locations in areas such as NWA where personnel were both isolated and neglected for months on end. Hopefully such will not occur in the future but, even in general service, authorities should ensure that remote and small units receive adequate logistical support to minimise potentially stressful situations.

In this chapter an effort has been made to paint a ‘broad brush’ picture of the Mainland stations highlighting topics and significant incidents. Fortuitously the war moved away and the efforts involved are treated in subsequent chapters.

Finally recognition should be given to the missionaries and aborigines in the northern areas for their valued and continuing support to remote radar stations. Those efforts were given without cajoling or pressure and greatly assisted the radar personnel. It is difficult to estimate how much time was saved but it was substantial.

CHAPTER 7

Port Moresby

February 1942 to November 1945

Port Moresby was one of the most important centres in the defence of Australia. In addition it became the initial 'stepping off' point when the Allies moved from pure defence to offence. On 25 February 1942, P/O W J Scarff was appointed as Area Radar Officer in Port Moresby to liaise with local authorities and logistically assist radar stations in the region. As seen in Chapter 2 this arrangement was inadequate so Radar Wings, including No. 41 at Port Moresby, were formed.

29RS was the first RAAF radar station established outside mainland Australia. No apology is made for dealing with setting up the station in some detail, as the object in so doing, is to emphasise the lack of support afforded to the very early stations.

29RS Deployed to Port Moresby.

Four radar mechanics and eight radar operators arrived by aircraft at Jackson's Strip (airstrip) on 19 February 1942 under the command of F/O Wadsley. Thereafter it was a constant struggle to both exist and bring the radar to operational status on the top of King Spur three miles east of Moresby township and overlooking Murray Barracks.

The men were billeted in Port Moresby. The equipment, which had arrived by ship, was unloaded piecemeal as the ship had to leave the wharf during air raids. Then came the problem of finding the crates and packages as they were not adequately marked prior to dispatch - the result of the secrecy syndrome current at the time. Once the gear was moved to Murray Barracks the station personnel also took up residence in vacant quarters there. The situation is best described by one of the radar mechanics, Bill Harnath who said:

> When we finally moved into the huts at Murray Barracks, we found some new loose ends. Firstly, no one wanted to victual us. Secondly we had no cooking facilities or cooks. There was no power, no reticulated water, no guards and no sanitation.

Drastic situations demanded drastic action and the 13 radar men did what had to be done. They salvaged a stove and utensils in the town and took turns at cooking. They simply took stores from a cache dumped in a shed at the Barracks when a ship destined for Rabaul was redirected to Moresby. They did not ask permission before they tapped into the Barracks water supply line or when they made a connection to the live over-head 240 volt power lines which ran alongside the main road.

Brush was cleared up a steep ridge to the site 690 feet above sea level. ANGAU provided welcome native labour and the Royal Australian Army Engineers assisted in laying the concrete block on which the Doover was erected. It was a risky business winching the heavy turning gear to the ridge top especially when a couple of small trees used as an anchor or 'dead men' gave way and the turning gear almost careered back down the slope.

Despite the many problems encountered installation was duly completed and the station was on the air on 18 March 1942. Plots were by land line to the Operational Room at Port Moresby. A fighter sector had not yet been established. A Teleradio was kept on stand-by for emergency communication.

Meanwhile air raids were a continual menace and slit trenches (covered over as protection from ack-ack shrapnel) were regularly shared with swarms of mosquitoes.

Power tapped from the mains proved most unsatisfactory because overloading of the system resulted in very poor regulation. Suitable heavy transmission wire was not available to carry the 240 volt line the several hundred yards to the hilltop. Bare wire was used on supports attached to convenient trees. Starting and stopping the heavy turning gear resulted in high surges of current which the lines could not sustain, giving rise to not only erratic turning operation but problems with the electronics.

After scrounging around the water front in Moresby a dismantled 15 KVA power unit was discovered. With the help of the fitter from the RAAF Communications Section an emergency power supply was set up. Unfortunately when it was put into operation the voltage dropped from 240 to 180 on full load with the aerial turning gear in operation. The power line was unable to carry the heavy current. W.F. Evans, in *The History of Radiophysics Advisory Board 1939-45*, states that, 'Finally the aerial had to be rotated by hand'. The supply and transport position was such that the power problem was not solved until 3 February 1943 when two 20 KVA diesel driven units were installed adjacent to the operations room.

Life was made no easier when the personnel had to vacate the buildings in Murray Barracks so that Japanese prisoners could be held. By then thousands of Allied troops were staging in the area and water supply became another problem. Supply was maintained by a daily four mile run by the water truck. A camp boundary had to be established to refrain transit troops from using the station ablutions.

The American services took pity on struggling Australian radar personnel and helped out with transport and bulldozers which Australia was unable to supply. Of course such help was greatly appreciated. Such assistance was not an isolated incident and was repeated many times in different places.

Initially the performance of 29RS was poor.

It has to be remembered that the equipment was one of the initial six 'experimental pre-production models' about which the mechanics knew very little and had had no experience with it in operation. It had been rushed to Port Moresby at a time of great uncertainty with scant time to obtain much needed commodities. However at Moresby, with a number of responsible officers in attendance, it is difficult to explain why this station operated at low efficiency for a number of months. The mechanics did not have the necessary matching and phasing instruments to adequately set up the antenna and the aerial coaxial feeders had not been cut to the correct length.

Consequently complaints were received concerning aircraft, both friendly and enemy, arriving at Moresby undetected. Test flights highlighted the unsatisfactory lobe pattern and poor field strength of the system. In an effort to improve the performance the prototype transmitter and receiver were replaced in October 1942 by a factory made model but this was not the solution to the problem.

On 21 December 1942, F/Sgt P Williamson, RAF, and Cpl A Field from No 1 RIMU, Sydney, arrived to match and phase the open wire feeders to the antenna. This work was followed up by test flights carried out by F/O Don Kennedy on 18, 20 and 22 January 1943. The radar was, at last, operating at full efficiency. Further calibration flights by a Beaufighter, on bearings 180 and 225 degrees at altitude 10,000 ft, gave the very satisfactory

maximum range of 140 miles. However, detection of aircraft was restricted by the high mountains to the north and west.

Situated at the hub of the early Allied operations in Papua New Guinea this station was plagued by visitors both official and otherwise. Entering the operational areas of the radar distracted duty personnel and it was found necessary to place stringent restrictions on access by even high ranking personnel. On 28 May 1943 special passes were issued to all personnel allowed to enter administrative or operational buildings.

Henceforth, until its disbandment at the end of November 1945, this station provided constant and reliable information to No. 4 Fighter Sector later reclassified to No. 104 Fighter Control Unit.

The station radar mechanics regularly serviced an ASV beacon set up on a high hill just north of the radar station: an added responsibility which occurred on many stations. On New Year's Day, 1943, an unfortunate accident occurred when a guard, LAC E L Lewis, was electrocuted as he came in contact with a power line to the beacon after it had fallen to the ground from its tree support.

29RS was manned initially by one officer, four radar mechanics and eight radar operators. In contrast the first New Zealand station deployed in the Pacific was accompanied by a professor of engineering, an electrical engineer, an Army engineer, a wireless mechanic, and seven radar mechanics. Also in their case abundant skilled labour was available locally.

Later the minimum number of personnel required to successfully establish and operate an RAAF radar station was set at 30. The successful installation, like 31RS and 40RS, was an exercise in self reliance and ingenuity and a great credit to the station crews.

No 4 Fighter Sector (FS) at Port Moresby.

No 4 FS was formed on 25 February 1942 and before long it was moved from Jackson's Strip (Seven Mile) to John's Gully, about 11 miles from Port Moresby, where various elements were distributed over an area, concealed and camouflaged. Leigh Hoey, a Wireless Operator Mechanic (WOM), who served for more than 17 months on this unit, wrote:.

> The receiver room was a small building constructed of galvanised iron on a small hill and set up so that we could work with lights on during air raids. There we operated AR7 receivers (one had a bullet hole from earlier action) while the transmitters - AT13's, AT13A's and AT14's - were dispersed in huts protected by bunkers. The antennas were mostly quarter wave Marconis.
> Plots were received by landline from RAAF Radars 29RS near Moresby and 138RS at Waigani. Plots were received by W/T from American Radar RS405 at Yule Island and from the Army Spotters and Coast Watchers. Plain language was used on telephones but normally all radio traffic was in Morse code.
> An Operations Room clerk sat beside us and passed the plots by telephone to Fighter Sector plotting room as we entered them into the log book. In the Operations Room were Allied Army, Navy and Air Force personnel assessing and disseminating information to fighter aircraft, Ack Ack and searchlight positions, ships and the air raid warning system. Specially trained controllers vectored fighter pilots to their targets during enemy raids. At the ground controlled interception (GCI) unit, 138RS at Waigani Swamp, a controller was able to work directly from the radar thus eliminating the delay, however short, caused when working at the Operations Room via the communication system.

> In addition the signal section also handled inter-island and mainland traffic and the volume became formidable as the war gained momentum.
> 4 Fighter Sector played a vital role in the crucial days of the war and continued as a communication centre until the end. The Americans nearby duplicated much of the RAAF work as well as handling particularised US radio traffic

In September 1944 Lt Theodore F Karpel, historian at the US Vth Fighter Command wrote:

> At about this time [early 1942] the 4th Fighter Sector was set up at Port Moresby to effect the final coordination of the warning system. All reports from ground observers and from Radar Station 29, RAAF, were filtered into this Fighter Sector by telephone or radio and the information so given was plotted on a large plotting table. In these early stages this table was housed in a crude tin shack. Beside the plotting table and overlooking it was a raised balcony for the filter personnel. Behind them, separated from them by a glass panel, was the aircraft identification section.
> The most important individual in this set up was the Fighter Controller (mostly a pilot from some fighter squadron in those days when trained Controllers were not available) who exercised operational control of all fighter planes in New Guinea (mainly in Port Moresby at that time).
> On the basis of flights shown on the plotting board he directed friendly fighters to wherever they were needed. This was the British system working in New Guinea for the first time. All the Fighter Sectors subsequently established in the South West Pacific followed this pattern.

US Vth Fighter Command Established.

Activated at Seattle (Washington State, USA) this Command was for all Fighter Groups within the Fifth Air Force. Col Wurtsmith was appointed as its Commander. He had brought the 49th Fighter Group to Australia, led them in the defence of Darwin and then the defence of Port Moresby.

During October Col Wurtsmith appointed Lt Arthur J Wilde as Radar Officer for the Fighter Command in Port Moresby. Wilde inspected existing American and Australian radar stations and so began an harmonious alliance and cooperation that was maintained throughout the conflict.

On 5 December 1942 full responsibility for aircraft warning in New Guinea was given to the Vth Fighter Command and Col Wurtsmith chose Lt Col John Brewer to command the Signal Office in Port Moresby. Brewer was briefed on the current radar organisation by Lt Wilde who continued to work in close liaison with the Australians.

The composition of Vth Fighter Command Signal Office at Port Moresby was Lt Col John Brewer, Signal Officer in Command; Capt. Henry Timmerman, Administrative Officer; Capt. D V Harvey; Capt. Floyd Lambert; 1st Lt Stanley B Howard; 1st Lt James D. Guy; Lt Louis J Bohm, Commanding HQ Company; Lt Lowell L Cox, Radio Officer; Lt Shirley D Bollard, Supply Officer; Lt William Kelly, Telephones; Lt Theodore Zerlong and their enlisted men.

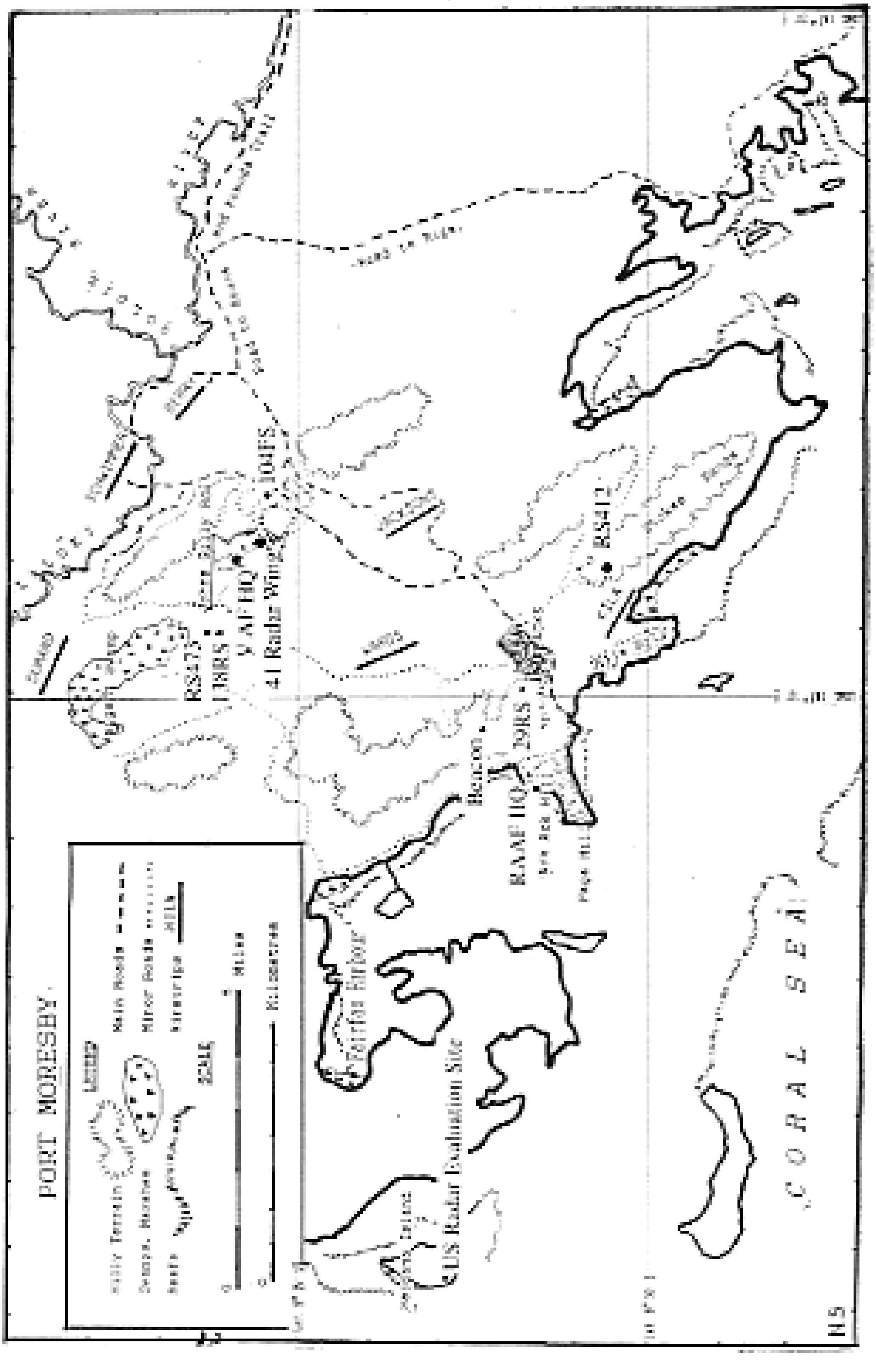
The Signal Office was charged with the responsibility of air warning, assigned to Vth Fighter Command, and worked in close association with RAAF No. 41 Radar Wing to be established a month later with S/Ldr Israel as its Commanding Officer.

Col Brewer immediately began to set down an overall plan of operation and the following quote is from one of his statements on the subject.

> The general plan which it is considered must be followed is to so locate radar equipment that an adequate early warning service will be furnished in order to provide an active defence of the vital areas involved. These vital areas of north east New Guinea are at present (disregarding Goodenough Island) Buna and Milne Bay with projected installations at Tufi.
> Phase two of the complete plan is the projected installations from Cape Ward Hunt to the north west and is dependent on land operations not now in progress. The early warning green that must be established has its limits based on the climbing speed to optimum altitude of the fighter aircraft and the distance which raiding planes may travel in the time the fighter aircraft are climbing. Three hundred and sixty degree coverage is needed and this will require ground observer teams as radar is not practical for land sweep.

The last statement in the quotation was soon proved not to be altogether the case. Nevertheless ground observers were found to be a very useful element of the reporting system and they played a valuable role throughout the war. The American observers worked in close cooperation with Reporting Platoons. On the other hand the Australian equivalent were independent Australian Army units, called Spotters, separately feeding the air warning network. The story of the Spotters is recorded in Alex E Perrin's book which was mentioned earlier. They were the first in the field and did such a good job that some of the Army, in particular, were loath to admit that the 'new fangled' radar equipment was a much more versatile instrument in the field of air warning.

As the radars moved into strategic positions the Spotters moved in more closely to centres of enemy activity and reported aircraft movements to and from the enemy airstrips. The radars, on the other hand, were able to accurately track the enemy aircraft by day or night through foul or fair weather, reporting direction and allowing speed and the ETA at a target to be deduced. Early warning radars could report an estimate of the number and approximate altitude of aircraft in a flight. When the enemy neared the major bases the GCI radar took over and reported accurate heights allowing the defending fighters to be vectored into an advantageous attacking position. If and when the enemy reached the target the fighter controller warned our fighters to break off and the ack-ack took over. At night the anti-aircraft fire was assisted by radar and radar-assisted search lights (SLCs). As the enemy cleared the target the fighters were again vectored in for attack.


PORT MORESBY
LEGEND
SCALE
CORAL SEA
Fairfax Harbour
US Radar Evaluation Site
RAAF HQ
Beacon
29RS
RS473
138RS
V AF HQ
41 Radar Wing
104FS
RS412

aatt

It was the efficient coordination of all these facilities that sealed the fate of the Japanese air power. It must be noted also that radar, both ground and airborne aided our bombers in the destruction of Japanese airfields and many aircraft on the ground. The Spotters rendered valuable service by reporting when enemy aircraft were concentrated at airstrips in preparation for strikes against Allied positions. In many instances the aircraft were destroyed on the ground by Beaufighters, Mosquitoes and Marauders bombing and strafing at low level.

First American GCI Radar in New Guinea.

In June 1942 the 565th SAW (Signal Air Warning Battalion) arrived in Brisbane (Australia) and gained valuable experience in operating at various sites in Queensland. It was not until 9 September that Lt Roscoe C Sparkes arrived in Port Moresby with the 6th Reporting Platoon of the 2nd Reporting Company of that Battalion.

This first American radar Platoon established RS473 on level ground at Waigani Swamp north of Ward's Strip. The equipment was an SCR516 - a development from the SCR268 gun laying radar modified for air warning - similar to the MAWD used by the RAAF. While the equipment's maximum range was about 60 miles it gave consistently good results. The station watched for aircraft emerging from the PEs caused by the Owen Stanley Range to the north.

Personnel were provided with Australian Army rations and neither bully beef nor M&V (tinned meat and vegetables which was called Muzzle Velocity by the Americans) were altogether to their liking. Living conditions were more primitive than those to which they were accustomed. Most contracted malaria as the swamp teemed with mosquitoes. During its six months of operation at Waigani Swamp the Platoon maintained a fine record and the personnel received a commendation for meritorious service.

Many American radar men had gained valuable operational experience in Australia and on 7 October 1942 two American radars moved to Port Moresby. The 4th Reporting Platoon of the 2nd Reporting Company and the 5th Reporting Platoon of the 1st Reporting Company of the 565th battalion arrived aboard the ship *John E Ash*. The two platoons were billeted at Murray Barracks. Unfortunately the ship disappeared unexpectedly with all their equipment aboard. The *John E Ash* turned up again ten days later after an urgent run to Milne Bay. Meanwhile the platoons had secured Australian rations and prepared generally for deployment.

The 4th Platoon transported its radar equipment, an SCR516, aboard a barge to Cape Rodney situated about 125 miles south east of Port Moresby and almost half the distance to Milne Bay. After overcoming landing and transport difficulties they established RS472 on a site previously chosen by air reconnaissance. Results from the station were far from satisfactory - the reason for this proved to be the effect of nearby high inland mountains. Not only was detection of targets among the mountains impossible but also back radiation from the same mountains cluttered the screen when scanning over the sea. Several alternative sites were tried without success.

138RS Deployed to Waigani

This Canadian built RWG/GCI unit was formed at No. 1 RIMU, Croydon, NSW on 3 August 1942 with the equipment leaving by goods train for Townsville guarded by LAC L H Tinke - the Commanding Officer P/O J Wallace and the personnel travelled by troop train.

On 3 October the whole station embarked on the SS *Taroona* and arrived under naval escort at Port Moresby four days later. By the end of the month the station was being erected on a site, suitable for a GCI, on level low lying ground near Waigani Swamp. Transporting material and even travelling over the swampy ground was a major problem during the life of the unit. There was no sand or aggregate near the site and all necessary materials, including 156 bags of cement, had to be brought in to construct the foundations for this heavy type of fixed station.

Assisted by F/Lt Keith Bishop and his team the install-ation was completed by 1 December 1942. As mentioned previously the Americans were already operating an SCR516 on the site. The American telephone line was used to send the first plots to Fighter Sector and it was a good opportunity to compare results between the two stations.

The first test flight by a Kittyhawk on 14 January 1943 was disappointing. A fault in the height finding facility was corrected by F/Lt George Day and the test flight on 13 February was very satisfactory whereupon the height cali-bration chart could be put into use.

At the end of February the Americans and their SCR516 departed.

Not only was the access road an ongoing problem but the telephone line to Fighter Sector was continually breaking down. This was caused by vehicles moving in the area, falling trees and grass fires. A Teleradio was installed for emergency use and proved to be satisfactory.

On 13 April the Vth Fighter Command provided controllers and practice interceptions were carried out. The first actual interception was on 3 May when one enemy aircraft was shot down. It was soon realised that the night fighters then in use were being easily outrun because of the superior performance of some of the enemy aircraft. Nevertheless the enemy aircraft were hounded away. During the month of October 1943 8500 plots were sent to Fighter Sector.

This was the only active overseas Australian radar station known to have had airconditioning in its operations room. It was a convenient centre for training controllers and like 29RS became a ‘show piece’ for visitors. Inter-station visits between 138RS and No. 104 Fighter Control Unit provided a better understanding of what each was doing thus leading to more efficient operations.

On 22 March 1944 the unit was alerted to prepare to move and operate similar equipment which had been installed by the Americans at Inonda near Dobodura.

On 2 April 1944 the American RS501 at Dobodura was taken over by the RAAF whereupon it became 138RS.

First American Air Warning Radar in New Guinea

The 5th Reporting Platoon established RS412 on Stokes Range at an altitude of 650 ft. This was an SCR270 radar with its antenna tower overlooking Kila fighter airstrip. Reporting was by radio telephone to No 4 Fighter Sector. Again results were disappointing.

The lessons learned from the deployment of these two American radars were:

1. The SCR516 and SCR270s should not be used in the close proximity of mountains and great care was necessary for siting radars generally.
2. Neither type was readily transportable to remote sites in New Guinea.

3. There was an urgent need for an easily transportable radar for campaigns in New Guinea and the islands where movement was hindered by steep mountains, constantly flooding rivers, swamps, dense jungles and coral reefs.

Barakau Point and Yule Island

At the end of October 1942 a new site for the relocation of RS412 was selected at Barakau Point and approved by Lt Wilde. The hill top site at an altitude of 310 ft had a sea reflecting surface to the south west. A road had been constructed to Riga with the idea of troops crossing the mountains from there to Buna. RS412 was moved to Barakau Point on 2 November in a convoy of eight trucks. The brand new SCR270 equipment was put into operation successfully soon after.

Lt Wilde also decided that the 4th Platoon should be moved farther to the east to a more suitable site and that the 7th Platoon move to Yule Island and set up RS471. He also visited Hood Point south east of Port Moresby and Yule Island south west of Port Moresby to select sites for RS473 and RS471. The 7th Reporting Platoon of the 2nd Reporting Company of the 565th SAW Battalion arrived at Yule Island in October 1942 with their SCR516 radar and established RS471. This site was important because the Japanese pilots used it as a rendezvous for attacks on Port Moresby.

On 20 November 1943 339RS took over from the Americans on Yule Island. This was one of the many occasions on which the transportability of the LW/AW was demonstrated as the unit was moved to three separate sites in order to get the best available performance.

What was expected to be an isolated outpost turned out to be a virtual holiday resort as a Catholic Mission had been established there for fifty years. Buildings were made available as quarters for the men and arrangements were made to supply the unit with fresh bread and other food.

339RS remained on Yule Island for the remainder of the war as it covered the eastern end of Torres Strait but more importantly it assisted in monitoring Allied aircraft travelling to and from Townsville. As one operator said, “They stopped planes from disappearing into the Coral Sea.”

US Siting Party at Buna.

By the end of 1942 reconnaissance parties had agreed on suitable sites for radars on Goodenough and Normanby Islands. It was also decided that the Australian LW/AW radar should be installed at these sites. On 27 December Lt Wilde flew to Buna where fighting was still in progress. There an attempt was made by Americans S/Sgt Alm and Sgt Troupe to operate an SCR521 (ASV equipment) salvaged from a crashed B17, in a jeep for radar siting purposes. However this ground reconnaissance proved ineffectual and siting by air proved unsatisfactory on this occasion.

While at Buna Lt Wilde visited 50RS which was reporting by radio to No. 4 Fighter Sector and by land line to a nearby temporary information centre. Capt. Everett King was in charge of this Combat Information Centre. He had under his command some personnel from the 35th Fighter Control Squadron and Plotting Platoon C of the 565th SAW Battalion. At that time 50RS supplied information to the plotting board from 0400 hours to 1800 hours daily. At night warning of enemy raids was distributed to all units by telephone from the Centre. Enemy flights up to 120 miles range were plotted at this centre. It should be specially noted

that Capt. King became well known to the RAAF radar network for the sterling work he accomplished in many follow-up campaigns.

Commendation by Col Paul B Wurtsmith

The following signal was sent by Col Wurtsmith to all radar units in New Guinea:

Headquarters
Fifth Fighter Command
APO929

Subject; COMMENDATION15 December 1942

ALL RADAR STATIONS - NEW GUINEA

1. It is the desire of the undersigned to congratulate members of the Radar units for the vast improvement in the warning service during the past few weeks.

2. The efficient functioning of the Radar team requires that the effort of the individual must be directed to his task. The object of each Radar team must be to continue training to approach as near as possible to perfection.

3. it is realised that at present the Radar teams are operating over exceedingly difficult terrain, and often in locations that cannot be considered the most desirable or comfortable. However it is my desire to bring to your attention the excellent work you are doing and to point out that upon the personnel of these Radar teams the entire air warning is dependent.

Signed Paul B Wurtsmith
Colonel, Air Corps
Commanding

Formation of No. 41 Wing

After F/Lt Israel's report on the sad state of the six RAAF radar stations in Papua New Guinea was read he was told that as he had found all the faults associated with radars in Papua New Guinea he could return and fix them. He was first posted as Radar Officer to No.9 Operational Group in January 1943. Soon after he was appointed to command No. 41 Radar Wing at Port Moresby and promoted to Squadron Leader. Following consultation with Air Commodore J E Hewitt, No. 9 Operational Group, a site was chosen on Razor Back near John's Gully and about ten miles from Port Moresby. The US Fifth Air Force was on an adjacent ridge so that necessary constant communication between the two was facilitated.

No 41 Radar Wing was formed on 26 February 1943 as a composite RAAF unit operating in its own right with the following personnel: S/Ldr B F N Israel, Commanding Officer; F/O B M Moss, Radar Officer; F/O R G Sheaffe, Radar Officer; F/O D J Harkin, Signals Officer; F/O King, Adjutant; F/O K N Bishop, Barracks Officer; Maj. Bolton, Defence Officer and LAC A Benson, Radar Mechanic.

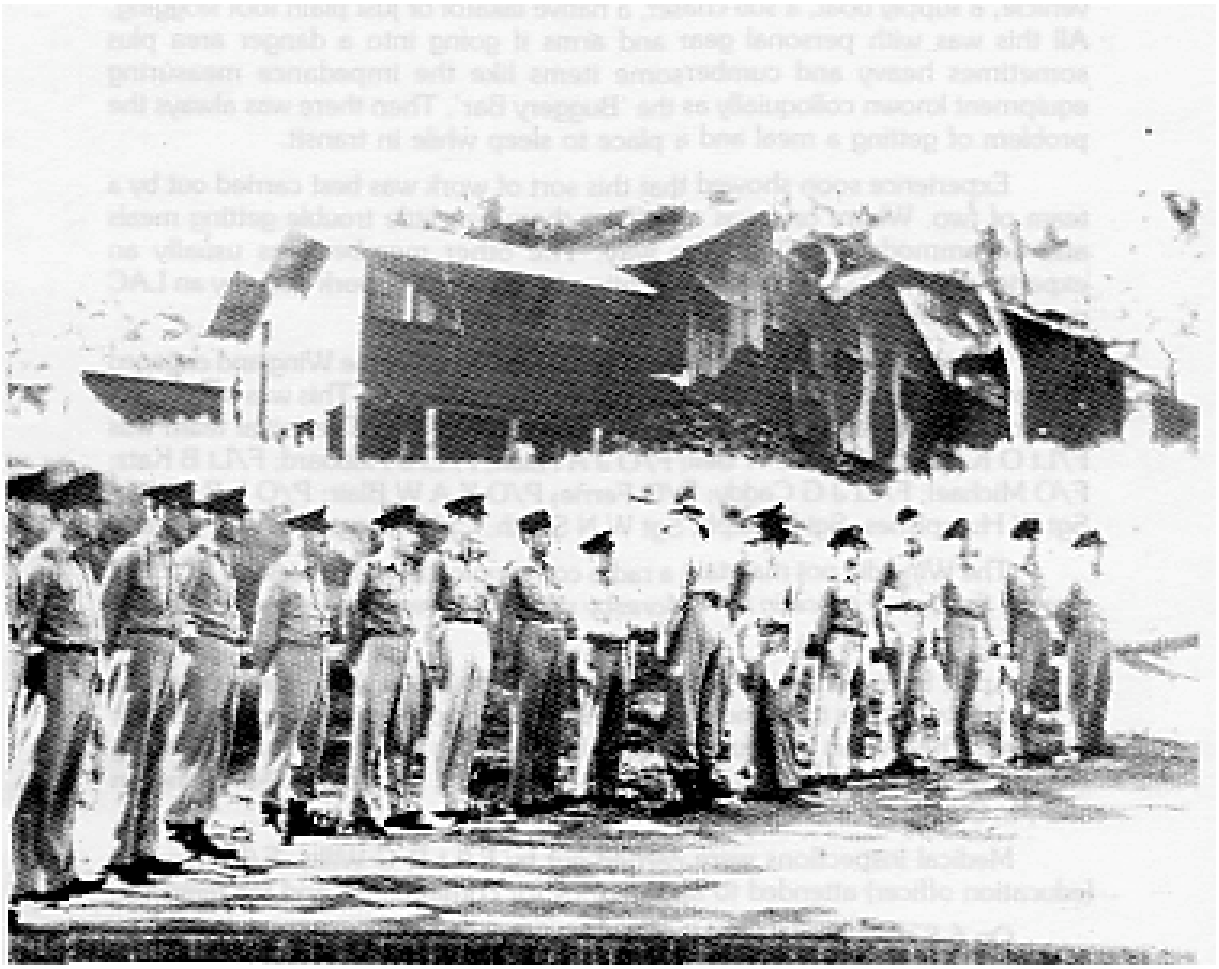
The first priority was considered to be the establishment of a store building for spare parts. A radar operator with carpentry skills was located at 306RS which was staging in tents at the head of the gully, site of the golf links at Konedobu. David Ross erected the one-roomed store at Konedobu near where today there is a sporting complex. Radar mechanic LAC Allan Benson was placed in charge of this store.At Razorback, work commenced immediately on a complex comprising administrative buildings, a large workshop, barracks and a small parade ground with flagpole. This was accomplished by a group of skilled tradesmen - carpenters, electricians, et cetera under the control of F/O K Bishop.

A base store was established. Normally expendable items were held in store and delivery to outlying stations expedited as requested without delayed requisitioning to the mainland of Australia. Thus radar stations in transit had adequate facilities for replacing, repairing and adjusting equipment as required in the workshop. When the supply of LW/AW radars became adequate a unit was installed at the Wing. Not only did it provide a training base for operators and mechanics but it was a proving place for radar racks repaired at the workshop, and the mobile maintenance mechanics could hone their skills between field assignments.

The Wing was provided with the services of:

1. A 50ft Cabin Cruiser - MV *Oomoobah*.
2. A small open motor boat - MV *Punai*.
3. An Anson aircraft for calibration flights.
4. A Gipsy Moth aircraft for transport to outlying places.

Bearing the Aboriginal name for the Newcastle district NSW, the MV *Oomoobah* was built by Morrison and Sinclair, boat builders at Balmain, in 1927 for Mr P S Arnott (of biscuit fame). This wooden launch was 50 ft long and of 36gross tons. Its two 65 horsepower six cylinder engines drove twin screws of 22 inch diameter. It was sold to the RAAF early in the war for £1250, claimed to be the value of the engines. Working out of Milne Bay the MV *Oomoobah* made many hazardous journeys delivering supplies to radar stations in Papua New Guinea from Cape Ward Hunt to Kiriwina. Subsequently it returned to the role of pleasure boat and until a few years ago was recognised, much altered topside, in Sydney Harbour and was last seen at Telegraph Point, NSW.



Officers of the No. 41 Wing meeting the Governor-General,Lord Gowrie,
during a visit in 1943

The Anson was of limited use and was transferred to Scotty Allen's transport squadron. There was no way in which the Gipsy Moth could be utilised. On the other hand the *Oomoobah* performed sterling service in supplying the needs of radar stations in the Milne Bay area. Water transport for 303RS was provided by the motor launch.

S/Ldr Israel inaugurated sound administrative policies which brought all radar stations under the Wing's control into an efficient air warning system operating as such until disbandment on 31 July 1944.

F/Lt Alan Gray took over command of the Wing from S/Ldr Israel on 5 January 1944. The Wing was ultimately responsible for 37 radar stations extending from the Trobriand Islands along the south coast of New Britain, along the PNG mainland to Aitape and north to the Admiralty Islands.

No 41 Radar Wing was under operational control of RAAF HQ in Melbourne, under administrative control of No. 9 Operational Group at Port Moresby and under tactical control of the American Fifth Air Force. S/Ldr Israel had a tough assignment meeting the wishes of all three. Often he found it in the best interests of the work in hand to modify or ignore directives issued from these higher authorities. This problem arose because many of those in top administration were not fully aware of the requirements and capabilities of the radar network.

Personnel were arriving and departing continually. Movement was mostly by air in and out of Ward's Strip which was quite close by. Radar specialist technicians were issued with AAA priority passes by the Fifth Air Force and had little difficulty flying out of Moresby to the air strip nearest to their destination.

However the last part of the journey could be a hitched ride on an Allied vehicle, a supply boat, a sub chaser, a native lakatoi or just plain foot slogging. All this was with personal gear and arms if going into a danger area plus sometimes heavy and cumbersome items like the impedance measuring equipment known colloquially as the 'Buggery Bar'. Then there was always the problem of getting a meal and a place to sleep while in transit.

Experience soon showed that this sort of work was best carried out by a team of two. Where one was an officer there was little trouble getting meals and accommodation along the way. The other member was usually an experienced NCO. The glaring exception to this was the work done by an LAC mechanic working solo. This is discussed elsewhere.

The technical personnel were at some time based at the Wing and engaged in specialised duties whenever and wherever the need arose. This was sometimes as a lone individual and at other times as a team of two. The initial team was F/Lt O K Griffith; F/O L W Bell; F/O J A Allan; F/Lt J Hubbard; F/Lt B Katz; F/O Michael; F/Lt J G Caddy; P/O Ferrie; P/O K A W Blair; P/O L R Porter; Sgt W Humphries; Sgt L Ralph; Sgt W N Smith; Cpl J Keegan; LAC J Lynam.

The Wing did not maintain a radio communication centre. All W/T traffic was via the cipher office in Port Moresby with in-between deliveries by dispatch rider.

Apart from the maintenance and installation crews there were a number of specialists such as those noted below who were not necessarily permanently attached. The civilian camoufleurs were based at the Wing and visited outlying stations as required. Among these were Mr. Billson, Mr Adams, Mr Cameron and Mr Curtis.

Medical inspections were carried out by F/Lt R C Willis. F/Lt Douglas (education officer) attended to applications for commissions and for remuster.

On 6 September 1943 Mr J G Worledge, of the NSWGR, visited to see first hand how the Mk I LW tower, fabricated under his direction, was performing in the field. He visited a number of remote stations including 315RS at Cape Ward Hunt and 305RS at Kiriwina. As a result of this and discussions with technical staff and suggestions by S/Ldr Israel, the LW/AW Mk II framework evolved. This model had more internal space and offered a much better working environment to operators and mechanics.

Radar Siting Expeditions by No. 41 Wing

S/Ldr Israel hand-picked a small group of specialists to investigate the suitability of proposed radar sites. This was often hazardous work in positions outside the protection of our forces. As an example.

In the general direction of Rabaul from Milne Bay lie the Trobriand Islands. An LW/AW placed there would be out 130 miles farther north. Adding a similar distance to this for the expected minimum detection range of high flying enemy aircraft approaching from Rabaul or Gasmata, Kiriwina offered a warning of well over 250 miles of flying time. Such a move was considered for some time and an aerial reconnaissance carried out. Ultimately Kiriwina and Goodenough Island were chosen as bases for the destruction of enemy air power in New Britain.

Vulnerability to enemy attack from the air and also the sea, especially by enemy submarines patrolling the Solomon Sea was until now the deterrent to such a move. Finally when the air base on Goodenough Island became operational in May 1943 it was decided to risk a radar in the Trobriands. MV *Oomoobah* was chosen by S/Ldr Israel to visit the islands because with its powerful engines it could effectively avoid air attacks. The journey across open water from Normanby Island to Kiriwina was under cover of darkness. While anchored off the north of Kiriwina the *Oomoobah* was spotted, circled by an enemy bomber, but not molested. It was assumed that the enemy reconnaissance plane was unarmed. This was normal practice in the quest for extreme range at the highest attainable altitude.

Bomatu Point was chosen, being by far the most appropriate radar site on the island. Although somewhat more to the south the island of Kitava offered a much better early warning radar site as its elevation was greater by a factor of nine. As the Fifth Air Force placed a radar there soon afterwards it seems the Americans had reserved the site for their own use. As soon as the radar site was cleared by native labour the *Oomoobah* returned to Milne Bay leaving F/Lt K Bishop and LAC Smith to organise the camp site for 305RS which arrived two days later.

There is little evidence that siting parties were accompanied by signals officers or that radio reception at the selected site was tested. Throughout the war there were cases where communications with Fighter Sector left much to be desired (eg if the unit was located within the skip distance). A radar station was of little use if it could not report its plots expeditiously.

Other similar communication problems will be seen later in the book. They have been included, not with the aim of being repetitious but rather to emphasise the importance of this aspect.

Port Moresby - An American Radar Evaluation Site

From some US National Archives photographs, only recently received via the UK, it is quite apparent that the US Forces used Port Moresby for evaluating different radar equipment. Yet no reports or memoranda, indicating that this did occur, have been found. However, F/O Les Bell has stated that the LW/AW Mk II was tested by the Americans on Haidana Island prior to the purchase of LW/AWs.

These US National Archives photographs show that one evaluation carried out used SCR602 electronics in a Mk I LW tower - others show variations in antennae used with the SCR602, presumably of American origin because no ex-RAAF person can recall either seeing any of the latter or being involved in manufacture of the antennae.

With regard to the use of the Australian LW tower with the SCR602 the problem was solved from the Worledge papers mentioned in Chapter 1. In late 1943, after his visit to New Guinea, Mr Worledge gave a lecture and one of his notes relating to the talk provides th following e information:

> It is claimed in New Guinea that Douglas transport, Jeeps and natives are winning the war. If RADAR was placed first, this claim would correctly represent my impression. RADAR increases the efficiency of an Air Force equivalent to five times the number of effective aircraft. Operational plans are based on RADAR cover and this explains the urgency, and frequent sudden changes in production requirements.
> The immediate, vitally urgent, demand for the LW type stations has arisen

> due to the failure of the US 602 type to meet service [RAAF] requirements in New Guinea. Arrival of a large number of these stations completely manned, apparently fulfilled immediate requirements [in landings].
> Due to the unsatisfactory results [for air warning], and to avoid dislocation of operational plans, these are being replaced with LW/AWs and LW stations fitted with US 602 type equipment.

There is no doubt that the LW aerial with SCR602 electronics, particularly the much higher power output of the transmitter, would have yielded much greater ranges but one must not lose sight of the fact that the initial purpose of the SCR602 was to provide the infantry with a light weight warning for the troops during landings and assaults.

As mentioned previously the New Zealand LRAW had two antennae one for assault conditions and another, like the LW/AW, for longer range after the immediate needs were met.

CHAPTER 8

Milne Bay Area

June 1942 to January 1944

Japanese capital ships retired to the north after the Coral Sea Battle, 4-8 May 1942, giving Australia some respite from the threat of invasion. However this action suggested that the enemy's intention was to advance to Port Moresby and Australia from Rabaul rather than from the west. To counter this move Australians and Americans hastened to garrison Milne Bay while Americans and New Zealanders pushed north to meet the threat mounting via the Solomon Islands.

There was an element of confusion when a signal indicated that a radar station was to be installed at 'Fall River' as there was no Fall River in the area. However Clive Baker and Greg Knight in their book *Milne Bay 1942* have explained it. Originally the Australians called the Milne Bay base 'Gili Force' after the 'Boston' operation was cancelled. The Americans objected on the grounds of security and adopted 'Fall River Garrison'.

37RS at Milne Bay

The LW/AW had not at that time been produced and the only radar available for 37RS at 'Fall River' was a very heavy English CHL unit designed for fixed site operation around the coast of England - hardly suitable for the purpose. At Milne Bay there was no pre'selected site, neither roads nor transport and no local infrastructure to call on for aid. The terrain ranged from mangrove swamps on the water's edge to sago swamps to low-lying jungle-clad flood plains, with any useable land being planted with coconuts, and finally to steep and heavily wooded mountains.

W/O K (Scottie) Henderson-Wilson, of the RAAF, was attached to the RAF installation party, led by F/Lt G Day, RAF, which accompanied the station personnel to Milne Bay.

In contrast to the small crews provided for 29, 31 and 40RSs, there were 27 station personnel under the command of P/O W Scarff. Sgt Les Bell was the senior RAAF radar mechanic. The full complement was four radar mechanics, 12 radar operators, one fitter/transport, one fitter DMT, two medical orderlies, two cooks, one mess steward, one mess man, a general hand and a clerk.

It must be pointed out that the RAAF technical personnel on this highly technical operation were recruits, recently trained and as yet inexperienced and averaging around 19 years of age. In the light of this their performance and behaviour under threat in the field was worthy of much higher commendation than was ever received.

The Japanese raided Port Moresby wharf area two days before the unit arrived destroying six Catalina flying boats and the MV *Macdhui*. On 21 June 1942 37RS arrived at Port Moresby aboard the SS *Swartenhondt* (Batavia circa 1924 - 7000 tons) and transhipped to the SS *Bontekoe* of approximately the same tonnage, equally filthy and reeking with the residue of rotten food in the hold.

Aboard the SS *Bontekoe* were Militia troops of the Australian 7th Brigade, American engineers, signals personnel and 37RS. The voyage to Milne Bay in company with Burns Philp vessel MV *Samarai* was under strict blackout conditions.

RAAF Installation Party, some 37RS personnel and native helpers at Gurney, Milne Bay

On 26 June the ship hove to off the shore at Gili Gili in Milne Bay and immediately began the difficult task of floating everything ashore on rafts made of 44 gallon drums enclosed in timber frameworks. The likelihood of an enemy air attack gave impetus to the unloading and dispersal of the equipment under the jungle canopy which ran down to the water's edge. It rained incessantly and the jungle floor quickly became a quagmire.

The movement of the heavy equipment from there to the chosen site was a struggle. From the abandoned Mission, where they landed, they found an old German jack-wagon - it was a sturdily built table top affair with four wheels and had in former times carted desiccated coconut from the Burns Philp factory to the wharf. The drawing pole, with a bullock on either side, was attached to the front wheels which swivelled, for steering, on a turntable. But there were no bullocks, several trips were required to get the heavy gear to the river crossing near the site. These were done by dragging it through a sea of mud using a winch anchored to successive coconut trees. Thence assistance was given by an Army armoured vehicle.

Transport difficulties determined to a great extent where the radar was installed. The site chosen was on a low ridge at the western edge of Lever Bros copra plantation about 300 yds from the Army HQ at Hagita House. It was just over a mile from No. 1 Strip.

On unpacking the crates it was discovered that no tools had been included for erecting the station and insufficient power cable for necessary distribution of electricity. A forage party commandeered a private lugger and obtained much needed tools, cable and other equipment from the abandoned township on Samarai Island. This meant sailing down the reaches of Milne Bay into China Strait and back, at constant risk from enemy air attack.

F/Lt Day, ably assisted by Sgt Bell, organised and directed the work force with rare skill. Prewar, Les Bell was an engineer and trader based in Kavieng and handled the indigenous population well. One carton of trade tobacco, for trading for goods and services with the natives, was the normal issue but as Sgt Bell knew the ANGAU storeman in Port Moresby from prewar days he was able to get two cartons.

Spurred on by bombing and low level strafing by Japanese Zeros on 4 August the station was on the air on 8 August 1942. From then on it was seldom off the air until December 1945.

The first controlled interception was that of a flight of enemy Zeros detected approaching on 11 August. P40s intercepted and there were losses on both sides. Canon fire from a Zero swept through the coconut palms near the radar station cook house.

The electronic equipment, power house and operations areas were enclosed by revetments constructed with coconut logs and hundreds of sand bags. This structure provided effective protection against strafing Zeros and shrapnel. Then native thatching was used to camouflage the whole superstructure. The antenna framework very effectively merged into the vertical pattern of the surrounding coconut trees.

Native built huts assembled as a native village under the expert direction of Sgt Bell provided relatively cool and spacious accommodation for the crew. Slit trenches were dug alongside them and were used during air raids. Often they were partly filled with water and at other times airmen in a hurry dived into the company of snakes, lizards, large spiders and maybe a rat or two.

The Americans were building air strips and roads while the Australian infantry were setting up their defences. Meanwhile the air surveillance that 37RS was expected to enhance was being performed by Army spotters at various island outposts. They had been deployed by ANGAU officers Ivan Champion and Mac Rich using the motor yacht *Laurabada*. While placing a spotting team on Cape Vinall, Fergusson Island, they alerted Milne Bay of enemy aircraft flying in that direction - the first heavy air raid on Milne Bay.

After becoming operational the station did not fail in the detection of air raids on Milne Bay. The Japanese unwittingly contributed to this good record. They obligingly approached their target from the east up the open reaches of the Bay. The radar beam was least restricted in this direction and maximum ranges of around 100 miles were regularly obtained. Some attenuation of the radar beam was initially caused by the coconut tops. By systematic defoliation of the nearby trees the efficiency was increased without unduly reducing the camouflaging effect of the trees. At that time the Japanese showed little appreciation of the capabilities or short comings of radar as an air warning device and paid a great price as a consequence. 37RS directed many successful interceptions based on the reports from radar stations and Army Spotters.

During the Japanese attempted invasion of Milne Bay (25 August - 5 September 1942) 37RS operated with distinction. Because of its proximity to No. 1 Strip the unit was repeatedly in the line of fire. It was strafed by Zeros, straddled by bombs and shelled by Japanese warships that repeatedly entered the Bay under the cover of darkness. The revetment around the radar was peppered by strafing Zeros.

NEW IRELAND
BISMARCK SEA
C. Gloucester
Talasea
NEW BRITAIN
Jacquinot Bay
Arawe Is.
Finschhafen
HUON GULF
SOLOMON SEA
SCR270 338RS
Cape Ward Hunt
RS411 305RS
RS403 305RS
308RS
USN SCR270
Kiriwina I.
Dobodura
Oro Bay
Tufi
PAPUA NEW GUINEA
Port Moresby
Goodenough
Woodlark I.
Normanby
Milne Bay
37RS
NS

When the Japanese had advanced to No. 3 Strip, a little more than four miles away, the demolition charges were prepared and all members moved about armed and with emergency kit close to hand. If the station were overrun the withdrawal was to be south west to Mullins Harbour and along the coast towards Port Moresby.

From 30 August to 24 September No. 76 Squadron was billeted at 37RS as a severe storm had demolished the Squadron's camp near the strip. Fortunately the spacious huts of 37RS huts built by natives were not damaged.

Was the Radar Targeted by A Japanese Cruiser?

Heavy cloud cover concealed the enemy ships from our bombers during the day and they entered the Bay under cover of darkness firing at our installations at about five minute intervals. Knowing the speed of sound and light, it was a simple mathematical problem to assess the distance away of an enemy cruiser that came up the Bay during the night. Seeing the gun flash and counting the seconds gave the approximate distance away of the ship. Members of 37RS began such an exercise one night and the estimated distance was six miles. The first shell exploded between Hagita House and the radar and it appeared that the Army Headquarters was the target. However the next one landed in the swamp on the other side of the radar. The third landed within 20 yards of the radar but failed to explode.

Realising that the radar was the probable target it was immediately put off the air. Thereafter the shelling was directed elsewhere perhaps indicating that the cruiser had been homing in on the radar transmissions. The unexploded shell was dug up next day and defused.

Some Problems at 37RS

Condensation from the very humid atmosphere caused problems in equipment designed for a very different climate. Unsealed transformers were most vulnerable. The first transformer failed when the receiver was turned on for the first time. F/Lt Day immediately put raw alternating current direct from the alternator onto the rectifiers bypassing the failed HT transformer. The resulting DC voltage was slightly lower than the designed level but the receiver worked and the station was on the air. Another normally reliable transformer for which there was no replacement developed a short to earth. Thereafter it operated while supported and insulated from the chassis by pieces of glass. Problems due to humidity continued with F/Lt Day almost completely rewiring the indicator unit with standard household type electrical cable.

The breakdown of a very high voltage rated capacitor in the radar was a major problem as no spare was available. A local, Mr Henderson was contacted and a forage expedition to Samarai arranged on 7 July. A number of Philips dual wave radios were collected and stripped of parts likely to be of use. Back at 37RS capacitors of similar rating were connected in a series-parallel combination as a suitable replacement in the radar. Sgt Bell said, 'The end result was like a great string of sausages'. Feeding the 'sausages' into the confined space available was a challenge.

One Ford V8 driven power unit was struck by lightning and the other ran for several months without relief. Oil changes were made during periodic maintenance of the radar. It became so worn that petrol and oil had to be poured down the spark plug holes before the engine could be started.

With two resident medical orderlies and field hospitals set up in Milne Bay, health care was, under the circumstances, reasonably good. No member of the station was injured because of

enemy action. One airman accidentally stuck a bayonet into his own foot. Accidents occurred such as cuts on sharp coral and while lifting heavy drums and the like.

Working at night, in this jungle clad wetland, with bare arms and head plus the lack of insect repellent meant that every member of the unit was at continual risk of mosquito bites. Most suffered with malaria. At first quinine was taken regularly as a preventative but later atebrin was used.

Diahorrea and dysentery were common illnesses. All had skin diseases despite the use of all measures available for cure and the most meticulous hygiene practices. Food was adequate and augmented by trade with the locals for bananas, paw paws and sweet potatoes.

No 4 Fighter Sector Detachment at Milne Bay

Early in the conflict a detachment from No 4 Fighter Sector at Port Moresby organised fighter aircraft control at Milne Bay. The American Plotting Platoon of the 694th Signal Reporting Company - later to become Company E of the 565th SAW Battalion - arrived at Milne Bay. A comprehensive control system was set up communicating with radars, Australian Army Spotters and American Ground Observers on the mainland and the surrounding islands. The system was fully activated on 25 September 1942 and operated until relieved by the Australian No. 9 Fighter Sector on 18 February 1943.

Initially plots were handled by the No. 4 FS detachment which was connected to 37RS by a land line strung between coconut palms. This line was broken on a number of occasions by the numerous heavy vehicles and machinery in the area. One such incident occurred during an air raid and led to speculation about possible sabotage. An explanation was forthcoming in 1993 when Mr Len Brooks, of Murwillumbah, NSW, said that he was directed to transport the wing of an aircraft from Gili Gili wharf to the airstrip. The only means of carrying it on the truck was in an upright position. He belatedly apologises for pulling down a few lines strung between the coconut trees in his haste during an air raid.

To ensure continued communication at all times the senior radar mechanic at 37RS, Sgt Bell and Technical Sergeant Atwell, an American at Fighter Control, constructed two simple transceivers working at about 144 Mc/s, each based on a single CV6 valve using lecher bars. A morse key was used to transmit the short distance between 37RS and Fighter Control if needed. This American technician also made history by using teletype equipment with a radio link between Port Moresby and Milne Bay.

No 9 Fighter Sector (later No 109 MFCU)

No 9 Fighter Sector was commissioned at Edge Hill camp, Cairns, in October 1942. Fighter control equipment was installed and rigorous operational practices were performed in conjunction with 75 Squadron.

Aboard the vessel *Francis Lewis*, and in convoy, the Fighter Sector arrived Milne Bay on 13 February 1943. No 9 FS took over operations from the US 8th Fighter Group on 18 February and issued its first yellow alert next day at 0800 hours when a Mitsubishi 96 was detected over Fergusson Island. The first red alert was issued at 2016 hours on 21 February when the enemy dropped six bombs near No. 3 Strip of which three fell into the Bay.

During its life at Milne Bay this Fighter Sector performed a vital role in a crucial phase of the air war. Plots were being received from 37RS at Milne Bay; 303RS at Tufi; 304RS at Normanby Island; 305RS at Goodenough Island and reports from a number of Army Air

Warning Wireless stations on the mainland of PNG and among the islands to the north. Its role was the protection of the very active and important base of Milne Bay.

Japanese Air Raids - 1943.

The enemy paid much attention to Milne Bay during 1943 sending over reconnaissance aircraft regularly. These were usually Dinah-type aircraft flying at around 30,000 ft and the following is a typical report taken from the records of No 9 FS:

> Two P40's in the vicinity of Cape Frere at 27,000 ft sighted Dinah at 28,000 ft and gave chase. P40s were quite unable to overtake enemy and Dinah disappeared in cloud. Next sighting ten miles west of Cape Pierson by second flight of P40's. Two P40's subsequently took up attack getting in bursts at 500 yds and 700 yds. Enemy did not return fire at any time.
> Air raid No. 22 alerted by No. 9 FS. 305RS reported planes thirty miles north of Trobriand Islands and proceeding south. Yellow alert at 0040 hours followed by red alert at 0053 hours. Track of enemy split at East Cape. One track to the west was lost at Cape Ducie whilst the other track approached up the Bay. Searchlights located and ack-ack engaged firing 144 rounds. Nil observed effective. In the cloudless moonlit sky two P40's were unable to intercept the enemy. Two Army officers were killed in the raid. No damage was incurred by installations.
> Two nights later 304RS reported three enemy aircraft approaching from direction of Dawson Island up the Bay at 15,000 ft. Nineteen bombs were dropped before the enemy departed to the north.
> On 11 April 305RS reported unidentified aircraft 195 miles north of Milne Bay at an altitude of 25,000 ft. No. 77 Squadron scrambled 11 P40's and No. 75 Squadron scrambled 12 P40's at 1159K. The enemy split into two tracks 160 miles north of the Bay. An estimated thirty aircraft flew south west towards Dobodura. Twenty aircraft proceeded towards Milne Bay at 28,000 ft. Both attacks were broken up and one Zeke was shot down from each enemy flight. Damage from the raids was superficial.

RAAF Radars 303, 304 and 305 (see Chapter 10 for their deployment) reported another attack developing from the east on 14 April. The attacking force was comprised of 10 Val type dive bombers at 12,000 ft, 36 medium bombers types Sally and Betty escorted by 30 fighters type Zeke and Hap at heights ranging from 12,000 - 25,000 ft. The attack was pressed home in face of interception by 75 and 77 Squadrons and an American Pursuit Squadron. The medium bombers made high level attacks on shipping in the harbour and continued their run towards Turnbull Strip. The dive bombers made individual attacks on shipping. In the harbour the SS *Van Heemskern* was a total loss, fires on the SS *Gorgon* were brought under control while damage to SS *Orthorn* was slight. On shore a fuel dump was destroyed. Approximately 30 heavy bombs were dropped, five of them causing craters on Turnbull Strip.

Allied fighter interception accounted for seven enemy medium bombers, one dive bomber and four fighters. Ack-ack shot down three medium bombers and one dive bomber. Fire from the Navy brought down four dive bombers bringing the total certified enemy losses to 20 with another 12 'probables'.

Allied losses were one fighter shot down and the pilot killed, one pilot missing, one fighter lost due to forced landing on sea, one fighter crashed and burnt on landing, two fighters damaged after landing and six fighters suffering minor damage.

Enemy air activity continued unabated during April and May. American RS403 which had replaced 305RS on Goodenough Island, regularly reported enemy reconnaissance aircraft in the vicinity of the D'Entrecasteaux Islands, the Trobriand Islands and Milne Bay. Early April, 303RS moved by sea to Milne Bay and then proceeded to Boirama Island off East Cape to resume air warning operations. It was during the period 10 May to 17 May that 305RS moved aboard the vessel *Will Watch* to Kiriwina. Both 303 and 305RSs were fortunate to escape detection by the enemy.

As the year 1943 passed, enemy raids diminished in frequency and there were less and less aircraft in the flights. On the other hand the Allies' attacks escalated with more and improved aircraft. Additionally Mark III IFF was installed and there was seldom need to scramble fighters to identify our own aircraft. Before this, yellow and even red alerts often occurred when lone Catalinas and other friendly aircraft were returning from operations in the north.

The Milne Bay Specials

High vantage points at the entrance to Milne Bay where the Army Spotters operated were also excellent radar sites. It would have been impracticable to attempt the installation of cumbersome CHL equipment at either location. However forward-thinking officers saw the installation of ultra lightweight experimental sets at East Cape and Kanokopi. These stations were supposed to give warning of enemy surface vessels entering Milne Bay especially under cover of darkness as they were in the habit of doing. Short range warning of hostile aircraft was also a possibility. Deployed too late, these stations were unable to achieve the first aim and there is no evidence that their air warning efforts were taken seriously by the Fighter Control at Milne Bay.

Two compact radar sets were assembled in Melbourne possibly inspired by the idea of using ASV sets mounted on trucks put forward by S/Ldr (then P/O) Israel on his return from Singapore. The concept was to provide a radar which five men could back-pack, if necessary, into the field and operate in isolation.

Already proven compact airborne ASV radar was the logical starting point. It was convenient to use batteries for power so a Briggs and Stratton charger was added. Identical six element Yagis were provided - one for transmitting and one for receiving. These were mounted on a pole which could be turned by hand to a stop at the end of one revolution and then reversed. The coaxial cables prevented continuous rotation. A box of spares completed the equipment.

Cpl Morrison and Cpl Harry Spry were summoned to St Kilda Road Barracks, Melbourne and there appointed NCOs-in-charge of 301RS and 302RS respectively. Transport to Townsville was aboard a DC3 without any other cargo or passengers - in other words a special flight so the deployment was initially considered to be urgent. At Townsville radar operators were assigned to each station and Cpl Colin Knight replaced Cpl Morrison. All were made aware of the vital need for tight security. The equipment was tested at Kissing Point and proved satisfactory. The restricted range was as expected. Nevertheless Harry Spry reports that Japanese aircraft which raided Townsville at the time were tracked during the testing.

301RS at Kanokopi.

A crew of four with Cpl Colin Knight, mechanic-in-charge, and operators LAC Rex Bramleigh, LAC Les Percy and LAC Jim Grimmett took this station to Papua New Guinea.

Transport was firstly by rail to Cairns where the gear and personnel went aboard the Empire flying boat *Coriolanus* on 23 August 1942. The flight was via Port Moresby to Milne Bay, arriving on 24 August.

After staging at 37RS for almost two weeks the personnel boarded a boat controlled by Mr Cecil Abel from the Mission at Kwato to be transported to Kanokopi on the south east reach of Milne Bay. Also aboard were an American Army sergeant and two enlisted men. These signallers were to set up communication with the Fighter Control Group at Milne Bay.

Kanokopi offers a small deep anchorage protected by reefs and a small island. The first of the gear was unloaded and manhandled up the steep jungle covered hill behind the jetty. One man, Jim Grimmett, was left to guard the remainder. During the night this operator noticed flashes and heard loud noises which he thought was a thunderstorm on the north western horizon. Subsequently it was discovered that he was watching the attack by the Japanese cruiser which sank the *Anshun* at Gili Gili wharf. The Japanese ship would have passed within a hundred yards or so of Kanokopi passing in and out of the Bay. Had 301RS been operational the cruiser may have detected its transmission as was suspected to be the case at 37RS. If so the fate of 301RS could possibly have been sealed.

When the radar was operational the signallers were unable to contact the Fighter Control. This was unusual as the transmission was unhindered across about 25 miles of water. About a week later Australian Army signallers replaced the Americans and communication was established without trouble. The radar was only required at night as during daylight hours all ships moving into the harbour were spotted visually.

302RS at East Cape.

Harry Spry reports that once the radar was packed ready for departure the operators were attached to the LW/AW at Kissing Point while he spent the time working on ASV installations on Catalinas at the flying boat base.

After some three months in Townsville the station moved by troopship to Milne Bay with the equipment as deck cargo under tarpaulins, arriving on 16 October 1942. Two Bren guns were provided by the Army and advice received from Sgt Les Bell on matters necessary for their survival. An officer delivered the crew of Cpl Harry Spry, mechanic-in-charge, and operators LAC Norm Sperring, LAC Bill Meuller, LAC Jack Whitlock and LAC Tony Martin to East Cape by chartered lugger under cover of darkness.

Ample accommodation was found in the abandoned mission buildings. Native labour, paid with trade tobacco assisted in transporting the gear to the top of the high point at East Cape and clearing an area for the radar to operate. There it was erected and camouflaged by building a native type hut around it. The battery charging motor was dug into the hillside to muffle the exhaust noise. Two beds were arranged to facilitate all night surveillance. Since there was only one mechanic he was on duty every night.

Soon after arrival an enemy Zero pilot inspected the Cape from low altitude. This caused some alarm and urged caution and care with camouflage. Moreover it prompted the need to set demolition explosives in place in case the Japanese arrived. Furthermore a lakatoi was loaded with survival equipment and food and hidden in the mangroves in case a speedy

withdrawal became prudent. Communication was established with Milne Bay on the fourth day and the station was ready to pass plots. However there seemed to be little interest shown when air and sea movements up the reaches of Milne Bay were reported. Regular visits by the RAAF as promised by the officer did not eventuate and they had to rely on the Navy for mail and supplies. Later when the *Oomoobah* began working out of Milne Bay about January 1943 it called regularly at East Cape.

Being perched at the tip of a narrow wedge of land harbouring Japanese, who were hungry and desperate, made the tenure of the radar station rather precarious. After two months someone decided to send six American Infantry to guard the station. Anxious hours were spent one night when a couple of unidentified barges came in close to shore. A report that a small party of Japanese were in a nearby village prompted an attempt to ambush them. When the Americans and Australians arrived they found the enemy had left. On one occasion the station alerted Milne Bay of a Japanese ship which was in full view, hove to over near Fergusson Island presumably to pick up fleeing Japanese troops. No action eventuated.

It can be said that these two units were for much of the time 'unwanted and neglected'. Weeks passed and no enemy ships entered Milne Bay. It seemed the danger had passed and gradually the stations, not being of further use, were more or less left to their own devices. The days were spent swimming, fishing, paddling lakatois and shooting sharks or writing letters. It would have been a very different and dangerous situation had the enemy ships returned.

All members suffered from malaria and without medical care it is no wonder that the general conditions in the camps deteriorated. In February 1943 LAC Bramleigh contracted blackwater fever. He was moved to a hospital at Gurney and his life saved by a direct blood transfusion.

On 8 December radar operator LAC Keith Hinchcliffe, one of the originals at 37RS was posted to 301RS. On 23 November Sgt Bell who was stationed at 37RS, proceeded to 302RS to overhaul the equipment. Then on 10 December he visited Kanokopi.

301RS was finally withdrawn and arrived at No. 41 Radar Wing, Port Moresby on 20 March 1943 and 302RS was disbanded at about the same time.

In retrospect it was a great pity that the idea of an ultra light weight radar was not pursued further. The need was there and the RAAF failed in this regard. Instead what was considered an unfortunate mission was swept under the carpet. There are no official records on either station only one brief reference in a list of stations which acknowledges the existence 301 and 302RSs indicating that they were LW/ASVs.

Cpl Spry's comment seems to have been the last expression of interest in the operations at Kanokopi and East Cape:

> On arrival at Milne Bay I was immediately paraded before the RAAF CO of 9 Ops Group, G/Capt. 'Bull' Garing, who asked me for a few specific details but seemed primarily interested on my comments and opinions on the effectiveness of this particular ASV operation.

No 9 Operational Group.

Milne Bay expanded rapidly into a large base early in 1943. No. 9 Operational Group at Port Moresby was expanded to form two Wings of which one went to Milne Bay. No. 41 Radar Wing was under the administrative control of the Group and S/Ldr Israel received a directive

to move it to Milne Bay also. Such a move was strongly resisted by Israel and his refusal received marked disapproval.

However he was adamant and pointed out the disruption that would be caused if the workshop were out of operation even for a short time. Also the war was already beginning to move to the west away from Milne Bay so far as deployment of radars was concerned.

S/Ldr Israel achieved a compromise with his superiors by appointing F/Lt O K Griffith as a liaison officer to be stationed with 37RS at Milne Bay. This officer had already proved his organisational and leadership skills in relation to the successful operation of the pioneer LW/AW radar unit at Dobodura.

Griffith's duties were threefold. He was required to liaise with No. 71 Wing at Milne Bay, supervise all radars in the area and keep No. 41 Radar Wing up to date on all radar activities in the area. He carried out these duties in a most satisfactory and efficient manner.

Milne Bay as a Supply Base.

In the beginning supply of essentials to units was an extreme problem. Transport about the Bay was difficult even though several Missionaries, who had not joined the general exodus from Milne Bay, controlled and used vessels in the Bay and for travel to the outer islands. One such vessel was the two masted ketch *Tieryo*, called the *Eo* by the locals, owned by Mr Laurie Henderson who was a pre-war friend of Sgt Bell.

The construction of three air strips and harbour facilities enabled Milne Bay to be developed into a major Allied base so providing direct links with the mainland of Australia and a rapid build up of supplies. When a transport squadron, No 33 RAAF Squadron equipped with Dakotas, was based there and the regular flights to and from Australia were running, the supply problem was not as great as on most radar outposts. It became expedient to supply the needs of outlying radar stations in the area from the Bay.

Sgt Alan Kesby (later W/O) was posted from No 2 Stores Depot, Sydney to join 37RS in June 1942. The muster sheet shows him as clerk, stores at 37RS until January 1944. On request he prepared notes in December 1988 relating to his work as stores clerk at Milne Bay:

> A bright lad in RAAF administration, probably on the mainland, got the idea to disperse or 'spread' equipment on hand through various sites so that, in the event of one site being severely bombed, all of any one type of equipment would not be destroyed. This resulted in utter chaos as records of such 'spread' were virtually nil. The Biblical method was used. 'Seek and ye shall find'. I did much seeking in those days. Successful 'borrowing' trips to the little island of Samarai at the mouth of Milne Bay helped to ease the burden of my job.
>
> From late 1942 onwards 37RS which was still operat-ional on a twenty four hour basis, became an increasingly important part of the radar network in that area of operations. Radar stations were formed on the mainland and proceeded via 37RS to their final locations at Kanokopi and East Cape on the reaches of Milne Bay and the islands of Normanby, Goodenough and Kiriwina. These units were then supplied through 37RS and a regular service of both material and men came into being.
>
> I was responsible for the supply arrangements using the MV *Oomoobah* to ferry them out to the islands...It transhipped personnel as well as visiting technicians.

Items for the ‘Doover’ were ordered from lRIMU in Sydney and later from 41 Wing in Moresby.

Not all supplies were delivered to outlying stations by the MV *Oomoobah*. There was a large fleet of small boats engaged in delivering a wide variety of cargo to all sorts of out-of-the-way places. Luxury goods were often unaccountably lost en route. The station at the end of the line fared the worst. The members of 305RS on Goodenough Island and later Kiriwina, did not sight a loaf of bread for over a year. These small boats and the *Oomoobah* sailed in open waters over-flown regularly by enemy aircraft and were at continual risk of attack.

Great importance was attached to keeping the radar equipment functioning. Urgently required spare parts were dropped by parachute from a light bomber sent specially for the purpose. It was not unusual for such deliveries to be wide of the mark and sometimes in the sea. If they were not retrieved by the station personnel they would materialise anything up to a week later delivered by a smiling native sure of his tobacco reward. Such a reward was grudgingly given for a package of meat that had spent several days putrefying in the jungle.

CHAPTER 9

Dutch New Guinea

February 1942 to February 1945

The Threat from the West

Concurrent with the attacks on Darwin and other mainland targets commencing in February 1942 the Japanese seized the crescent of islands from Timor through Tanimbar to Kai and Aru. Permanent bases and airfields were established in these areas and the Japanese occupation extended to Timuka and Kokenau in Dutch New Guinea (Irian Jaya). It then appeared that the enemy's intention was to threaten the full length of Australia's northern coast line by moving along the south coast of New Guinea.

Merauke, the main Dutch town along this coast, is on the banks of a large river of the same name and several miles from the mouth. It is also the gateway to Tanah Merah, some 200 air miles north on the Digoel River. This isolated settlement was the Dutch equivalent of Alcatraz. About 200 political prisoners - many Javanese and Ambonese - suspected of subversive activities were held in virtual exile there.

Both Merauke and Tanah Merah had basic airstrips on flat ground which could be extended in a relatively short time. For the Japanese the occupation of the area would provide a link-up with their troops in Hollandia, to the north, which was within easy flying time. Such occupation by the enemy would have threatened the eastern seaboard of Australia and put Port Moresby in a precarious position.

Initially, in the light of demands elsewhere and the shortage of equipment at the time, the Allied Command doubted its ability to defend the Merauke area successfully. However the outcome of the Coral Sea Battle, 4 to 8 May 1942, enabled more optimistic planning to be carried out. In July 1942 the Allied Command initiated Operation AUGUSTA aimed at the construction of an airfield and support facilities at Merauke.

40RS at Merauke

W/O Fred Robjant, radar mechanic, provided the following details of the movement of 40RS to Merauke. The AUGUSTA party left Townsville on the Liberty Ship *John Day* on 9 July 1942. The station transhipped to the SS *Bidelia* at Horn Island and then again, to SS *Baralabar* a day later. It headed into the Arafura Sea towing a barge which was to be used for landing purposes at Merauke. Unfortunately the tempestuous Arafura claimed the barge. Unloading at Merauke was a tricky business as the normal tidal bores changed the river level by some 20 ft. A number of servicemen lost their lives in the treacherous currents during the occupation.

A suitable radar site was found on a sandy knoll at Lampo Satoe on a beach several miles south of Merauke. The American Construction Unit was anxious for radar warning and provided a truck and a jeep to transport gear. A track was cleared across swampy ground. Coconut logs provided bridges and corduroyed track across boggy patches. Erection of the gear on the 45 ft hill began on 18 August and it was operational on 7 September 1942. Thereafter the station maintained adequate air warning for the area and in particular for the Americans who were constructing the airstrip and working with blazing lights at night.

40RS was successfully set up by just 11 personnel lead by P/O Fred Hull. The array was English MK V COL with an AW Transportable tower and turning gear - weighing around 12

tons. Fortunately the Americans provided a block and tackle to raise the heavy elements. Since the English transmitter and receiver were not available at the time, the Australian made AW electronics were used. Some improvisation was necessary to match these to the English array. Later the station was brought up to a normal complement of around 30 men but the 11 men who completed the installation without the help of an installation party are to be complimented. The original party consisted of CO, P/O F Hull; radar mechanics Tom Devany and Fred Robjant; radar operators Bill Neville, Wal Parker, Kev Wheeler and Bob Chilcott; motor mechanics Allan Saunders and Les Barnes; cook Clive Downes and guard Sam Bold.

The unit was not supplied with a 'Buggery Bar' and the array was matched and phased through the skill of the CO and his mechanics who had been 'Ham' radio operators in civvy life- they resorted to their experience in maximising performance in short wave transmission.

The first track plotted was that of a Short Empire Flying Boat at 32 miles, flying at 150 mph at a height of 200 ft. Two operators, one mechanic and a medical orderly arrived on another Short Empire flight during October. Dutch intelligence advised that there was evidence of Japanese intentions to take Merauke. The Americans supplemented the radar station defences with a trench mortar and four Thompson sub-machine guns.

On 19 November the station was ordered to start packing in preparation for movement. By the end of the month the personnel had moved to a camp near Merauke with most of the equipment. Then on Tuesday 8 December a Japanese reconnaissance seaplane flew over Merauke. A Catalina and a Dutch Dornier flying boat arrived soon after to search for the enemy seaplane base or suspected seaplane carrier.

At 1405 hours on Tuesday 22 December a Japanese recce float plane flew low over Merauke dropping two small bombs causing no damage. As it was full moon that night a major air raid was anticipated. It did not eventuate. However the float plane appeared again four days later and tried, unsuccessfully, to bomb a ship approaching Merauke for the purpose of taking 40RS and other units to Port Moresby.

Next day, Sunday 27 December, the persistent Japanese float plane glided in and dropped a single 250 lb bomb on the ship at the wharf killing three and injuring four others of the crew. The first warning of the aircraft's presence was when its engine burst into life as the bomb exploded. All defences were caught by surprise and evidently pertinent questions were asked in high places as to why the radar had been pulled down. Significantly that evening 40RS was instructed to become operational again forthwith.

Despite patrols by Beauforts and other aircraft there were three major enemy air raids on Merauke before the radar was operational again on 18 January, at Lampo Satoe. Had the radar been operating, early warning would have enabled fighters to engage the enemy and greatly reduce the damage inflicted.

W/O Robjant recalled that they were resting after lunch on 30 December when they heard the drone of aircraft and the alarm sounded. Many (confirmed as 22) twin engined enemy aircraft were clearly visible approaching from the NW at about 20,000 ft. First bombs landed in the main street of Merauke and the nearest to the Doover about a quarter of a mile down the road. Then the bombers returned at approximately 12,000 ft, out of Bofors range, and smashed installations with canon and machine gun fire. Personnel of 40RS were unscathed in their slit trenches as explosive bullets popped all around. High explosive bombs and daisy cutters had transformed the town centre into a mangled mass of debris around gaping craters. The devastation left everyone with the expectancy of an imminent Japanese land attack.

The raid next day was an hour earlier as 18 aircraft dropped bombs on the air strip and further pulverised the town in an attack lasting half an hour. Concern that the radar was needed on the air was evident when W/Cdr Minchin visited the radar site on 2 January 1943. The daring float plane flew over and circled the area at midday on 9 January. Diving low the pilot dropped a bomb narrowly missing the transport ship *Bidelia* at the wharf. After disappearing to sea as the Beaufort on regular patrol came in very low from the south, the enemy plane returned again and flew through a barrage to drop another bomb near the ship before disappearing once more in the clouds.

On 12 January 1943 the Doover was almost ready to go on the air when 9 Japanese bombers came in at 12,000 ft dropping bombs on the town and near a small vessel at sea. On the morning of 13 January a lone Japanese recce flew over in the morning to be followed by 9 bombers which again targeted the town. This was the eighth raid on the area without an early warning radar in operation. When the Doover went on the air officially on 19 January it immediately picked up the Japanese float plane which was given a warm welcome by the alerted Bofors gunners.

A year later, actually on 9 January 1944, the Australian made AW radar set was replaced with English MK V electronics making it a complete English designed early warning station. As such this unit continued to give efficient service until October 1945 a period of more than three years continuous service.

No 13 Fighter Sector (later No 113 FCU).

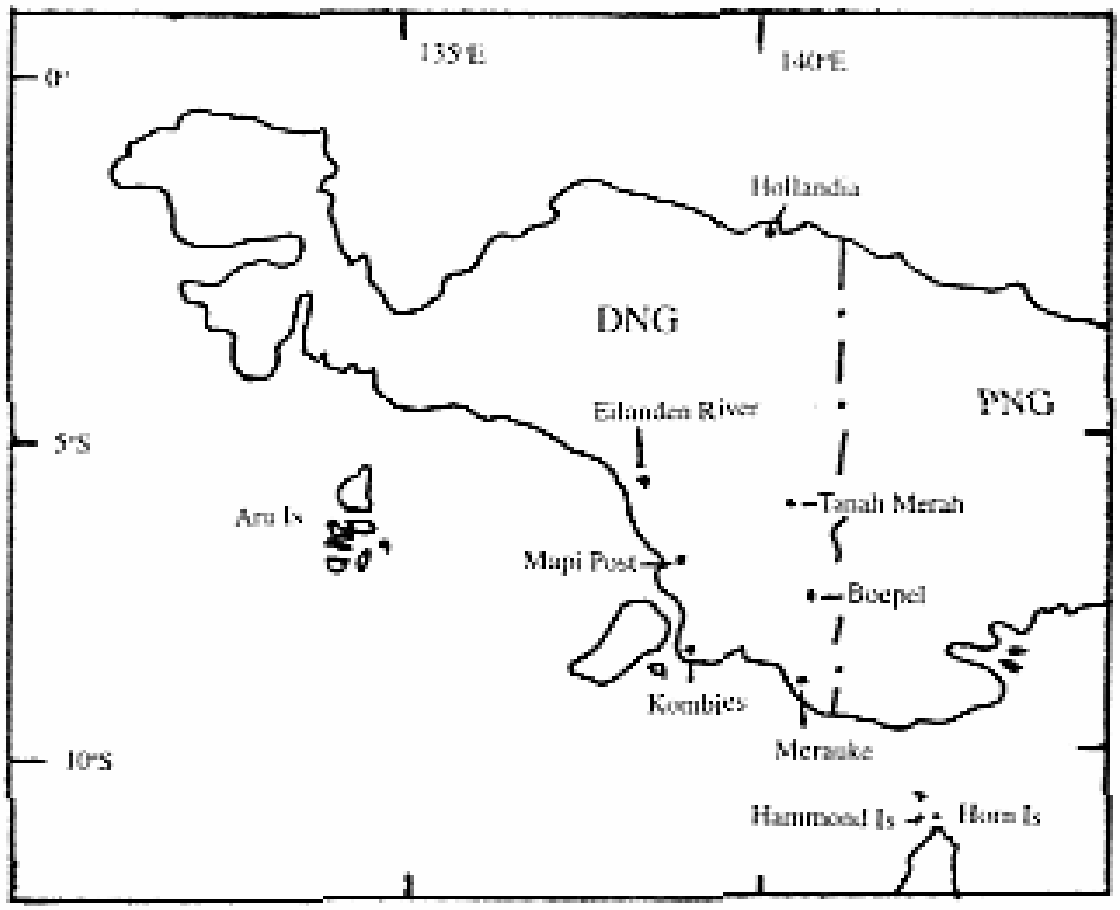
When F/Lt John Kingsford-Smith was posted from 24 Squadron (Wirraways) to be a controller at Bankstown he had never undergone any kind of course on Fighter Sectors and knew nothing about radar. Six weeks later he was promoted to Squadron Leader and directed to establish No 3 Fighter Sector at No. 23 OBU located at Garbutt Air Base, Townsville, Qld.

Then on 18 May 1943, at his own request, he returned to Sydney to complete an intensive course in Ground Control Interception (GCI) conducted at Maroubra by S/Ldr Darnton, of No. 1 Fighter Sector. Several weeks later he flew with his second in command, F/Lt H. Snowden, in a single-engined Walrus seaplane to land on the Merauke River. There he found American engineers constructing an air strip, a small Navy detachment with a harbour defence motor boat, an RAAF medical unit, a small RAAF OBU and 40RS operating.

Equipment and personnel of No 113 FCU arrived at Merauke aboard the MV *Janssens* on 2 July 1943 and was soon operational and became the nerve centre for a number of radar stations soon to be deployed from Merauke. The unit took over fighter control from F/Lt Boyd who, up to this time, diligently operated a one-man control from a tent connected to 40RS by a landline.

LW/AW Radars in Dutch New Guinea

Bounded on the north by the high mountainous spine of New Guinea and west of the Fly River lies one of the world’s greatest flood plains. Incessant tropical rains fall on the jungle-



Dutch New Guinea
Location of stations: 40RS & 151RS at Merauke; 316RS at Kombies;
322RS at Tanah Merah; 323RS at Boepel and Mapi Post; 342RS at Eilanden River.

clad mountains, cascade down to form soil-laden rivers that meander southward for hundreds of miles depositing debris and silt onto lowlands and into the Arafura Sea. Many thousands of hectares of rain-drenched land ranging from sea-level to a couple of metres in most parts and low ridges on rare occasions support a bewildering variety of trees and plants. Beneath the canopy in semi-darkness rises the malodorous continuous decay accelerated by the high temperature of the region.

Rivers, congested with water plants and debris from the jungle, are tidal for 100 miles and more. With each rising tide the water is constricted progressively by the banks, especially during abnormally high tides, and becomes a formidable wall of water, churning logs and other debris along in its wake. These bores are to be feared by all who frequent the area. Rising tides cover much of the low lying ground spilling into swamps and lakes. The presence of these last features, the boggy nature of the ground, and dense jungle with entangling vines armed with vicious spikes determine that the rivers are the best ready means of transport in the region.

Crocodiles in their thousands menace the visitor; there is a mosquito population to rival any other place in the world so malaria and dengue fever are rampant; deadly scrub typhus lurks in the kunai grass; native head-hunters whose claim to manhood and marriage demands the taking of two heads (whose being of little consequence) roam throughout the jungle.

While there was no determined invasion of the Merauke area by the Japanese they infiltrated with patrols on landing barges and float planes which hid in estuaries and along the rivers and channels emerging at unexpected places and times with guerrilla-like tactics. Small Australian and Dutch units patrolled the treacherous waterways skirmishing with them.

In view of the topographical conditions described above there was only one type of transportable radar which could be utilised in Dutch New Guinea - the LW/AW. So, four RAAF LW/AW radar stations were sent to various places in the very heart of this fetid inhospitable region to report on the incursions of the Japanese - a danger to add to the others - and there they worked, sweltered and existed for, in most cases, many months without relief.

As the threat of invasion intensified early warning 316RS arrived by motor vessel on 28 June and 322 and 323RSs arrived by C47 at Merauke on 24 July 1943 escorted by Boomerang fighter aircraft from Horn Island.

On 8 March 1943 this station departed Sydney aboard SS WANAKA in convoy calling at Brisbane 11 and 12 March, Townsville 15 to 23 March, Horn Island 25 to 27 March and arriving at Merauke at 0800 hours 28 March. While unloading proceeded, temporary accommodation was found in a house near the wharf and messing was with No. 44 OBU.

316RS equipment was transported to a site near 40RS. The station in transit became a ‘lodger’ unit at 40RS on 1 April. Because of spoilage during transport from Australia all gear was checked and discrepancies made good. Then the station had to wait for transport to the chosen site.

Meanwhile some of the members of 316RS found employment with the American unit constructing the airstrip. One of the radar unit’s Ford 10 power supplies was also used for a short period on the same project. At the same time the radar operators began shift work at 40RS.

On 9 July the advance party left aboard MV *Sylvia* for Cape Kombies near the mouth of the Kombies River. The site was chosen to cover the entrance to the Princess Mariana Straits and the approaches to Merauke over the sea from the Japanese bases in the Aru Islands. As no high ground existed in the area the station had to be placed on the edge of a great expanse of jungle clad mud flats.

It was necessary to build all accommodation above ground level as these mud flats were under water during king tides. And of course these covered platforms offered alternatives to trees for all the denizens of the undergrowth seeking refuge from the rising tides. Again it was obligatory to construct timber walkways across the oozy surface connecting all facilities.F/O J W Carter arrived at this dank, mangrove and jungle-clad environment with the final contingent of station personnel on 16 August bringing the station strength to two officers and 47 airmen.

The nature of the terrain meant an existence confined to camp and the sea shore. A great deal of work was done to improve the living quarters. Native labour was hired to assist. The mechanics soon had electricity to every hut. A better foundation was required when one generator set began to subside into the morass.

It was not sufficient to raise the footings of the radar above tide level. A platform of about 20 ft was required for the antenna to clear the tree tops. As was done at other radar sites on this great mud plain, a suitable anchor tree was used as a basis for the tower. Selected trees were

felled, cut to size and manhandled to the site. Digging holes in mud criss-crossed by roots was difficult enough without the water problem. Stability was achieved by bolting the uprights, bearers and stays at crucial points. The work was commenced on 2 August, the tower was not completed until 28 August due to broken drills and blunted bits but the Doover was operating on 2 September 1943.

Disaster struck on 5 October when a huge explosion and fire destroyed No 1 generating set and hut. No 2 generating set was in continuous operation until it succumbed to the burden on 19 October necessitating a major overhaul which took a few days. Calibration flights were carried out on 27, 29 and 30 October at 8,000, 10,000, 12,000, 14,000 and 18,000 ft. The resulting charts were useful in estimating the heights of targets. After an urgent signal to Merauke a Dutch vessel arrived on 16 November with a replacement generating set and petrol supplies. 24-hour operation was recommenced on 22 November 1943.

Radar performance was normal and efficient. Aircraft activity was confined to the occasional Japanese recce and Allied patrol planes. Enemy reconnaissance aircraft were soon seen to be using Cape Valsch as a departing point for the Australian mainland. 316RS could detect these aircraft but Merauke was too far away for an interception to be carried out by Allied fighters. When the pattern of Japanese flights was established the Fighter Sector, on 22 January 1944, directed duty fighter pilot F/Lt Stuart in his P40 to the Cape Valsch area at a time the enemy aircraft was expected to appear. A Japanese Betty bomber appeared as anticipated and S/Ldr John Kingsford-Smith was delighted to watch the interception displayed on the Sector plotting board and the subsequent destruction of the enemy aircraft.

Next day the commander of 84 Squadron, F/Lt Bob Whittle, and his No. 2, F/Sgt Kerrison, both flying Kittyhawks, proceeded to a point just south of Cape Valsch. Soon, another Betty escorted by two Zekes, appeared. The following extract from F/Lt Whittle's log book describes the ensuing action which was observed on the radar screen at 316RS and passed on to the Fighter Sector.

> Jumped one Betty escorted by two Zekes. F/Sgt Kerrison and self attacked escort simultaneously from astern. Self shot down in flames one Zeke before the poor fool had time to jettison his belly tank. Zeke fell into the sea twenty miles south of Cape Valsch. Kerry missed his Zeke on the first attack so we got together and hounded him away. We attacked Betty from astern and left her burning on sea 60 miles SW of Cape Valsch. One Zeke might have got home to tell the tale. Self returned with five gallons of fuel.

Subsequently it was learned from an Intelligence Report from NWA dated 10 April 1944 that the surviving Japanese pilot had, on landing at Kai Island, 'complained his plane had been jumped by a squadron of Kittyhawks'.

316RS was seen to be open to an enemy attack and on this subject, Jack Ellis, who was a guard on 316RS, had this to say:

> We were always led to believe that an attack from the enemy could happen at any time and I don't think any of us doubted this aspect. One afternoon a boat was detected slipping past us on the southern side of Princess Mariana Straits. Our CO - F/O Carter - put us on alert but all we had was a Vickers machine gun, two Thompson sub-machine guns and the rest 303's. Although the station was never attacked, a twenty-four-hour watch was necessary and the nights were fraught with tension.

A frightening experience occurred when a severe earth tremor shook the area. Taken by surprise the personnel rushed down to the beach. The folly of this action was explained to them by a Catholic priest temporarily at the station. Often an undersea disturbance caused a tidal wave or tsunami which hit the coast driving inland, tumbling all before it. However because of the low level of the land thereabouts evacuation would necessarily need to be swift for survival. Fortunately for those on duty the radar survived on the platform. Personnel were less than enthusiastic with the new found knowledge that earth tremors were commonplace.

316RS performed its duty well in Dutch New Guinea and returned on 27 January 1945 to Castlereagh near Richmond, NSW for refurbishing after a period of 20 months in the tropics.

322RS at Tanah Merah.

322RS and 323RS were formed at Mascot in early May 1943. Radar operator LAC Eric Penfold reported that the two stations left by train for Garbutt Air Base at Townsville the following month. There final acquisitions were received and preparations made for deployment to Dutch New Guinea.

The chosen site was the village of Tanah Merah some 200 miles north of Merauke, isolated by continuous jungle covered swamps. Access to this garrisoned village was by water craft along the winding Digoel River. During the period 6 - 16 July 1943, 322RS was air lifted to Tanah Merah aboard Catalina and Short Empire flying boats. Hazardous landings were managed on the Digoel River cluttered by floating jungle debris.

W/T communication was established with Merauke on 19 July and the radar was operational four days later. Unit defences were organised by F/O Wilkeson.

LAC Doug Boag has given the following description of station life at Tanah Merah :

> Food was always a major problem. Bully beef, pickled beef, ghastly grey potato powder and ‘dog’ biscuits were an unsavoury staple diet. During one two-and-a-half-months period we didn’t even receive the pickled beef. Things were compounded when the tins of bully beef began to expand - threatening ptomaine poisoning. Some black currant juice appeared at times to combat vitamin deficiencies. At one time we were virtually reduced to canned beetroot.
>
> Salt tablets and atebrin were taken daily in unsuccessful attempts to prevent skin diseases and combat malaria. We were one of the one hundred per cent malarial units. Weight loss, tinea and tropical ulcers were more the rule than the exception. The latter were scooped clear of puss with a teaspoon and dressed with sulphanilamide powder. After forty years my leg ulcer scars still occasionally become sensitive.

Japanese aircraft were detected on 2 and 4 September 1943. At 1034 hours on 4 September nine enemy aircraft dropped 41 bombs in the town area, one landing within 150 yards of the RAAF barracks. Enemy air activity intensified with aircraft detected in the vicinity on 9, 12, 13, 18, 22 and 23 September. It was believed that the Japanese might attempt to take the area and use a rudimentary airstrip in order to attack Merauke. It was a period of grave uncertainty.

Maintaining a supply line to this unit was not easy. At first Army barges and small vessels proceeded from Merauke by sea to the mouth and along the Digoel River to Tanah Merah.

When the river route was rendered unsafe by Japanese incursions a float plane was used for emergency supplies.

All available labour was employed to repair and upgrade the airstrip. Off duty Army and RAAF personnel and hundreds of the local inhabitants were led and directed by the 15th Field Company Engineers. The first plane to land was a DH84 - A34/28 - on 18 January 1944. Thenceforth regular supplies arrived direct from the mainland rather than from Merauke.

Development of the airstrip meant the relocation of the radar installation. A 25 ft tower was erected using local timber. The radar was transferred to the platform on the tower between 0001 hours on 6 April and 0345 hours on 8 April 1944. This difficult task was carried out successfully despite continuous rain. Detection of low flying aircraft was significantly improved by the increased elevation of the radar antenna. A further improvement was evident with the installation of an English manufactured receiver preamplifier.

Transmitter output valves, type 100TH, were always in short supply and failure of these often put the station off the air. The problem became acute resulting in the Mk 2 AW transmitter being replaced by a Mk IA model using more easily obtainable VT90 transmitting valves.

By July 1944 the threat of a Japanese invasion had passed and the Army garrison began to evacuate the area. No enemy aircraft were being detected but the Allied air traffic increased enormously with the regular shuttle service between Merauke and Hollandia, which was captured by the Allies in April 1944. The radar continued to give valuable support to these aircraft through 1944. By January 1945 the timbers in the tower supporting the radar had deteriorated significantly. As a number of severe earth tremors had already been experienced, plans were drawn up to erect another tower and buildings. These plans were submitted to No. 113 MFCU. However this unit ceased to function at Merauke on 29 January 1945 and the projected construction cancelled despite the threatened collapse of the tower. 322RS began ‘telling’ to ADHQ at Higgins Field and looked to No. 44 OBU for non-technical supplies.

On 24 February, with the collapse of the radar tower imminent, the crew worked all night to remove the radar gear. Work commenced on 28 February to construct a new tower, a power house and a W/T hut. The unit became operational again on 8 March.

Like most outlying radar stations there were problems with W/T communications. Various styles of antennae and operational frequencies were tried with varying success. The unit was ordered to close down on 31 May, and be prepared to move immediately with a possible destination of Borneo being mentioned. The unit was flown to Townsville where it was decided that the health of the crew was such that there were not enough fit men to take the unit north again. It then proceeded in July to Pitt Town, NSW where it was de-commissioned on 15 January 1946.

323RS at Boepel and Mapi Post.

On 21 July 1943 an advance party proceeded by Army barge approximately 70 air miles up the Merauke River to Boepel. The meandering of the river extended the journey by water to well over 200 miles. Cpl Neil Trainor remembers that they anchored mid stream during the night in an attempt to avoid the myriads of mosquitoes on shore. Movement of the station was completed and the Mk II LW/AW radar operative by 2 August.

Calibration tests flown by two Kittyhawks from Merauke indicated a less than desirable performance of the radar. Consequently it was relocated on a nearby hill and installed on a

raised platform as was done by 316RS at Kombies. The performance was greatly improved on an unhindered 360 degrees sweep. Plotting room and other facilities were installed beneath the tower. The construction was camouflaged as a native building using atap thatching.

Aircraft were detected on a fairly regular basis but it was not known at the radar station which were hostile until the IFF equipment was installed. The positioning of this station was primarily to give warning of enemy aircraft converging on Merauke from the north. This it did effectively on Christmas Day 1943. LAC Eric Penfold relates what happened.

> On Christmas Day 1943 we plotted a flight of Japanese that had obviously come down from Hollandia. The formation followed the PNG border down to the Torres Straits and on reaching the regular flight path of Allied aircraft from Horn Island to Merauke wheeled and approached the latter. Evidently the enemy wished to give the impression of the approach of friendly aircraft. However the ruse failed with the destruction of three Japanese aircraft by our fighters.
>
> Ranges in excess of a hundred miles were common but low flying planes were difficult to detect. When emergency supplies were required the aircraft bringing them from Merauke often flew at near treetop height. Unannounced they appeared on the screen at about thirty miles causing some consternation. We also observed WINDOW dropped by Japanese aircraft. It caused little disruption to the tracking.

W/T operator Kevin McConnell revealed two incidents which occurred at this station. Firstly there was an Ambonese spy in their midst. He was very popular with both the RAAF personnel and natives but a coded signal was received and everyone was rather shocked when the Army came and took the man away. The second was more the reason why 323RS went off the air. They had run out of yeast and the new supply was dropped in to the unit. Unfortunately the drum hit the centre of the aerial and put the station off the air.

By April 1944 when the Allied forces had neutralised the Japanese air forces along the north coast of New Guinea it was deemed that 323RS would better serve from a site farther to the west. Accordingly that month an advance party returned to Merauke by barge to proceed to a new site at Mapi Post. In view of the fact that the station was about to be withdrawn from Boepel only sufficient rations for immediate requirements were taken from the victualling barge. However, movement of the station was delayed and normal food supplies were exhausted except for an oversupply of spaghetti. The report says that:

> From that day on until we reached Merauke we ate spaghetti for breakfast, spaghetti for lunch, spaghetti for tea. We ate spaghetti with sauce and spaghetti with jam. On the way down the river we ate the stuff dry.

In June 1944 a Catalina flying boat landed on the Digoel River at Mapi Post with the advance party. This was an extremely hazardous mission for a large craft of this nature. A landing had to be made among the floating debris that regularly moved back and forth with the tides. There they found an Australian Army outpost in charge of the area of bombed-out buildings which had been a Dutch Police post.

Meanwhile the remainder of the personnel and equipment vacated Boepel aboard an old Dutch freighter arriving at Merauke on 13 June 1944. The essential equipment left Merauke aboard the Army boat AM70 on 20 June and arrived at Mapi two days later. The freighter

with its tug followed westward through the Arafura Sea, past Cape Kombies where 316RS was operating, into Princess Mariana Straits and up the Digoel river for about 70 miles to Mapi. Besides the danger of detection by Japanese reconnaissance planes the journey was fraught with hazards. The unseaworthy freighter traversed part of the notoriously rough Arafura Sea, the treacherous currents and mud banks of the Straits and the floating logs and tidal bores of the Digoel River. The move was completed in July 1944.

Here, like other low-lying sites, it was necessary to accommodate the radar on a raised platform. When set up on its 25 foot tower the radar gave efficient results with 360 degree sweep. It began operating 24 hours a day on 5 August. August and September records show well over 1000 plots on more than 200 tracks for each month. The efficiency of the station plotting was commended by 113 MFCU. After the radar receiver was supplemented with the standard English pre-amplifier the radar's maximum range improved considerably. Fighter Sector cast doubt when a plot of 180 miles was passed. Actually they told the duty crew 'to get off the grog' but had to retract when the track was eventually picked up by other radars as it neared base.

As for all the remotely sited radars the personnel were normally confined to the camp area. Movement abroad could only be in an armed party. Headhunters inhabited the jungle and camp fires found by patrols indicated the presence of Japanese in the area. Activities on the river were restricted by the crocodile population. Similar unpleasantries of climate and disease were experienced on all these stations. The cook was faced with the universal problem of making the food palatable. Considering the conditions and the supplies available they did a commendable job.

342RS at Eilanden River.

P/O R J B Castle formed 342RS at Mascot in November, 1943. After completing formation at 42 Radar Wing, Townsville and trial operations at Mt Spec, Qld, the station moved by C47 transport to Merauke.

On 13 May 1944 personnel and equipment went aboard the 150 ton barge *Daphne* en route to the Eilanden River. After a break-down in the Princess Mariana Straits where they had to wait two days and nights for a repair launch, always in danger of being discovered by Japanese patrols, the station finally arrived at the allotted site, Army Post No. 6 well inside Japanese contested territory. Comprehensive notes on the operation of this station have been supplied by ex-radar mechanic Cpl Bob Mainon.

> The station was situated on the north bank of the river about five miles from the mouth. The area was tidal swamp land in the river delta and subject to inundation espec-ially during neap tides. East and west boundaries were defined by small creeks. This Post, the farthest west of Merauke, had been established a short time before by the 31st/51st Infantry Brigade who had arranged for the erection or acquisition of a few native style thatched (atap) huts and these became the crowded temporary living quarters of the airmen and soldiers. About a mile wide at this point the Eilanden River was very deep and had steeply sloping banks. This enabled the boat to berth very close in and with the aid of her derricks we were able to unload supplies and equipment. Thereafter it was heavy work man-handling it to storage areas and at the same time keeping it dry. Above ground platforms were a necessity for both equipment and troops for which purpose much timber was felled in the

nearby jungle.
Surrounding the Post was an immense coastal plain, extending far to the east and west and northwards for about eighty miles where it rose into the central mountain range. The mountains rising 15,000 to 16,000 ft provided prominent PEs in the northern sector of the 360 degree sweep.
A few days before 342RS arrived a barge containing a number of Japanese troops approached Post 6. Informed of this approach by friendly natives an ambush was set up by the Army resulting in the complete destruction of the barge and its inmates as the perimeter of the Post was encroached.
An Army patrol was dispatched in a collapsible boat equipped with outboard motor to search the area. After travelling a short distance down the river the patrol entered a creek where it came under fire from Japanese troops. During the brief engagement several of our soldiers were killed. Other patrols established the existence of several pockets of enemy troops within a few miles of our Post.
A party of our troops travelled on a Dutch patrol boat to the mouth of a tributary of the Eilanden River into which the Dutch captain would not venture. The Australians continued up the stream in a collapsible motorised boat and were ambushed by the Japanese some being killed and the others captured and beheaded. The Japanese commander was later found guilty at a War Crimes Trial.
Due to the Japanese presence it became prudent to increase the defence capabilities of the post. This was done under the direction of Capt. Chiltern who was in command of the Post. Army and RAAF men cleared jungle to extend the perimeter. Pill-boxes constructed of logs and mud (any holes dug immediately filled with water) were built above ground to a plan at strategic positions within the Post. Each pill-box had a port pointed in a predetermined direction and all troops available, both Army and Air Force, had an assigned position in a pill-box. If and when the alarm was raised by the firing of a Very pistol, personnel were allowed three minutes to man their positions whereupon firing commenced through the ports as targets presented themselves. Thus the whole Post was protected by crossfire. Mounted on the rotatable radar aerial was a spotlight which, in the event of a night attack, was to be pointed in any desired direction. During one period when attack was expected the fortifications were manned continuously in shifts.
RAAF camp and technical equipment were confined within the perimeter and the sketch by F/Lt R J B Castles shows the general layout of the defences. One of the problems in this situation was the information given by natives either to the Australians or the Japanese depending in which direction their sympathy or greed was directed at the time. The position was serious and the RAAF whose training had been very basic were given sound instruction by Sergeants of the Army ack-ack Battery AIF Practice shoots and grenade practices were organised. On 18 August RAAF launch *003* arrived with supplies, six more guards and Wing Defence Officer, F/O Greene. The latter left for Merauke next day to report on the situation and taking with him medical orderly Cpl J Aliman suffering a persistent unknown illness.
It had become established practice in this low-lying boggy region to erect a platform and raise the radar antenna above the surrounding vegetation. Since there was no nearby substantial tree to anchor such a framework great difficulty

was experienced and a temporary 4 ft high log stand was constructed and the radar erected to become operational at 1100 hours on 15 June. Two Vultee Vengeance aircraft were immediately plotted to 100 miles. A week later the repaired preamplifier was attached to the receiver giving a significant improvement in results.

The station provided surveillance of air activity within its area and air raid warning for Post 6. Most Allied air activity was directed towards the Aru Islands. A lost American Liberator was detected one night far to the west at extreme range. Flying at a very high altitude the aircraft was possibly attempting to come into range of some Allied radar. Estimates vary as to the range when it was first detected but it exceeded 100 miles. The Liberator was guided through 342's sector, handed on to 323RS at Mapi Post thence to 40RS at Merauke. The event was subject to acknowledgment from No. 113 MFCU, mention also appearing in the newspapers of the time. After the initial objective of becoming operational was achieved attention was turned to extending facilities to the radar and personnel.

An atap hut was attached to the Doover as an Ops room and sleeping quarters. Board walks constructed of small logs were laid between the Doover and the huts. The program of expansion and consolidation was initially very vigorous as a permanent base for about 80 Army and Air Force men had to be established on a difficult site. Natives were employed to build extra huts and help clear the surrounding jungle. Finally each spacious and cool hut accommodated eight to ten men in reasonable comfort.

Meanwhile work was proceeding with the higher platform for the Doover. A suitable support tree was selected and three large 30 ft poles felled in the jungle, trimmed and manhandled through water, mud and undergrowth to the site. These poles were erected in the ground in a configuration compatible with the base supports of the radar framework. Cross members and stays obtained from the jungle were bolted and spiked to all supports including the tree and a platform placed on the top with an access ladder from the ground.

With preparations complete and permission for the changeover granted from the Fighter Control Unit, Merauke, the transition was quickly and smoothly completed in a couple of days. The radar framework was set up on the high platform with the side towards the tree open for the installation of the array which was assembled on the ground. A block and tackle was attached far enough up the tree above the platform for the array to be lifted vertically to its intended operating height. With steadying guy ropes attached, the lifting process commenced, to be dramatically halted when the rope broke and disaster averted by quick action of those involved. Unexpectedly a suitable wire rope was discovered and the raising process completed.

Another long rope was attached to the array near the centre of gravity and 15 men at ground level were able to pull it laterally into position where it was secured by the mechanics. The radar gear was installed, covering, waterproofing and camouflage completed by inexperienced 20 year olds reflects great credit on all concerned. Justification for the effort was upheld by the much better detection of low flying aircraft.

The river was patrolled by two Navy launches and a mine sweeper which called in passing. An Army patrol reported the presence of 14 Japanese barges near Japero on 2 September. A range shoot was organised and those classified in 'first class shot' category were F/Sgt Dunstan, LAC Gibson, LAC Dunning and LAC Algie.

L/Cpl Phillips of the Army Field Security commenced Malay language classes on 1 September. He also gave a lecture on his experiences as a guerilla against the Japanese in Timor arousing great interest among the personnel at the Post.

On 16 September a fire broke out when an electrolytic condenser short-circuited in the receiver power supply which was extinguished by LAC P H Bennet using a Pyrene extinguisher. Senior radar mechanic Cpl Mainon completely rewired the rack and the station was back on the air within five hours.

Rumour of an attack by hostile natives caused the guard to be doubled on the last day of the month. During the next night the unit 'stood to' all night but nothing eventuated.

On 20 September hourly weather reports were called for by the Fighter Sector. An annoying electrical interference in the radar receiver was cured when the coupling pins in No. 1 power unit were reversed. The station was directed to revert to daylight operation from 0600 to 1800 hours on 8 October as there had been no Japanese air activity at night for some time.

F/Lt L V Dickson took command of the radar station on 21 October and the defences of the Post were upgraded. RAAF guards were placed under the Army Post Commander for defence purposes. All natives with the exception of a few used as interpreters were excluded from the Post as there was evidence that some had been carrying information to the Japanese. Also Navy patrol launches ML1322 and ML1323 visited native villages to seek information about numbers and position of Japanese in the area. After a patrol into enemy territory on 15 November Navy boat ML 1322 and Minesweeper SMEROE feared they may have been observed and requested that the radar operate until 2359 hours each day for warning in case an air attack was mounted on them. At 2130 hours on 30 November, following reports of hostile activity in the vicinity of the Post, the alarm was fired and the Post defences went into action but the all clear was given half an hour later. It was learned subsequently that the Kepala of a native village known to be friendly to the Japanese had been killed and one other Kaya Kaya native wounded.

One of the Army personnel who was stationed at Post No. 6, NX 141098 Gunner Edgar B Langford, C Troop. 154 Light AA Battery AIF reported:

> I was a Bofors Gunner at this particular outpost which was a Radar Station operated by members of a small RAAF detachment, and later reinforcements of a small Infantry MG detachment from the 20th Motorised Regt. arrived. My time spent there was from Sept. 29th '44 to Jany. 4th '45. Whilst stationed at the Eilanden River we lost some of our personnel in a patrol action some miles up the river. Other members of a patrol from the 20th Motorised Section were machine gunned in an ambush. Only one native interpreter returned, wounded, to report what had taken place.

At the end of November 1944 the station strength was one officer and 36 other ranks. The radar had performed well reporting 182 aircraft tracks with ranges up to 120 miles. As Japanese air activity had ceased in the area a signal was received to prepare for movement to another site and operation ceased at 1800 hours on 21 December all equipment being packed by Christmas Eve 1944. The station had been at Post No. 6, Eilanden River for a little more than seven months working under extreme conditions and in an atmosphere of tension caused by the presence of the Japanese and hostile natives.

The performance under stressful conditions was first class but the writers have found no commendation in official records, only a complaint from North Eastern Area Headquarters

dated 25 July 1944 to the effect that the Station monthly report and the CO's report had not been received in accordance with AFO 18/F/5 para. 5 (F).

Evacuation of the site was achieved by Martin Mariner aircraft of 41 Squadron. They landed in the middle of the river and anchored. Loading was assisted by a small motor launch which had been sent up from Merauke complete with derrick for the purpose. The outward journey ended at Castlereagh west of Sydney where it was refurbished to be taken on the invasion of Labuan, Borneo, by F/Lt Bruce Aldrich and a new crew.

151RS at Merauke.

As the base developed so did the need for a GCI radar to deal effectively with expected attacks by enemy aircraft. F/Lt G P Phillips was directed to form 151RS, a mobile GCI, at Richmond in June 1943. The English-made technical equipment mounted on trucks and trailers had been prepared at No 1 RIMU.

The station moved by train to Townsville. Personnel were given training in defence and the operational crew was strengthened by experienced operators and mechanics from 136RS. Transit was by road to Cairns where the equipment was put aboard the SS *Babinda* en route for Merauke. Personnel arrived in Cairns by rail and embarked on the SS *Islander* on 21 December for Merauke via Thursday Island and arrived thereon 27 December.

Next day a suitable site was selected for the station by S/Ldr J Kingsford-Smith (CO of No. 113 FCU) and F/Lt J Uren (OIC 42 Radar Wing, Merauke Detachment) and the CO of 151RS. A site was chosen on a flat grassy plain in order to fulfil the necessary 'siting conditions' for the operation of this height-finding radar. The level nature of the ground in a high rainfall area meant the access tracks were soon churned into mud strips. Coconut poles were extensively used for corduroy construction or in pairs to provide wheel tracks.

F/O F E Bound arrived on 13 January 1944 to assist with the installation. He said that they had to build an earth platform in order to raise the gear above local flooding level. As PEs for tuning the radar were non-existent an artificial one was contrived by suspending wire mesh between two coconut palms some distance away. On 22 March an AT5/AR8 communication system was set up for ground-to-air control of fighters. Three calibration flights were carried out on 29 July. Following that, height charts were prepared.

Enemy air activity was on the wane by this time and there was diminished need for a Controller at the GCI. However 151RS was able to assume the early warning role while 40RS went off the air for a complete overhaul. LAC Neil Trainor said that when VHF communication was installed it was decided to try working the Dutch aircraft from the radar. This idea was abandoned when it was found that no Australian spoke Dutch and the heavily accented English of our Allies was barely recognisable.

During 1944 a plague of rats, already known to be the hosts of scrub typhus-carrying fleas, invaded the Merauke flats. Reaction was swift. Rat baits were set and great care was taken with the disposal of rubbish. Fire breaks were burned around camps and all tent floors were raised above ground level on boards brought from Townsville. Scrub typhus is a highly infectious disease characterised by acute prostration often followed by death.

While all the radars mentioned in this chapter were telling to No 113 MFCU the control of the radars was vested in No. 42 Radar Wing at Townsville. Following an organisational change the Radar Wing was disbanded on 1 October 1944 and control of the radar units was passed to No. 113 MFCU. The Commanding Officer of the unit, S/Ldr Kingsford-Smith said

that the outlying stations 316, 322, 323 and 342RSs were so isolated that he was able to visit each once only during the occupation of Merauke.

Photo: Bob Mainon.
342RS at Eilanden River. Note searchlight at centre of aerial to scan the perimeter at night; the electronics, operators and operations room were immediately below the aerial

Air Activity Merauke - 1944.

The Fighter Sector record states that on 8 June three plots were received from 316RS (Cape Kombies) approximately 130 miles from base. As no definite track was indicated no fighters were scrambled. These plots were assumed to be meteorological interference. However the next entry for that day reports that 40RS and 151RS (a GCI) picked up a series of plots SW of Merauke and followed them in an easterly direction. Four fighters were scrambled and vectored to the indicated position. They identified the 'bogey' as a Beaufort on convoy patrol - a movement signal for which had not been received by the Fighter Sector.

Subsequently an enemy recce was seen at 26,000 ft above the base. On investigation and re-filtering of plots afterwards it was seen that the enemy aircraft flew on a very similar track to the Beaufort at approximately the same time. The filter personnel, not expecting two traces on a similar position at once assumed it was the one aircraft weaving.

Apart from the occasional reconnaissance aircraft enemy air activity died away and there was no role for 151RS to play and so it was put on stand-by. Calibration flights and general maintenance became the norm. During this period living conditions in the camp were raised to a very high standard.

Radar operations in the Merauke area wound down by the end of 1944 and by the end of February 1945 No. 113 MFCU had disembarked at Townsville with mission accomplished.

Comment

The personnel who served in Dutch New Guinea had to endure such hardships as isolation, poor food and mail deliveries like many other radar stations. But the exposure to skin diseases, malaria, dengue fever, mosquitoes, the constant rain and humidity et cetera created a very stressful environment. Even today some still bear the mental scars from that period.

The Americans recommended that no man should serve for more than six months in isolated units such as the radar stations in Dutch New Guinea but this recommendation or advice was not heeded by the RAAF.

Some operators, recruited in Townsville as 'volunteers' for Dutch New Guinea, were promised that they would be relieved in three months. Yet many served a year or more while Commanding Officers were relieved at much shorter intervals. This led some of the men to believe that the top echelons regarded 'other ranks' as being expendable.

To further exacerbate the situation, a commendation to the unit or even a 'well done' were almost unheard of. It is our hope that those who read this book will now belatedly recognise the service given by those 19 and 20 year old lads in an inhospitable country.

CHAPTER 10

Strengthening and Expanding the Network

July 1942 to March 1943

In anticipation of the first Australian designed and manufactured light weight air warning (LW/AW) radar station coming off the production line F/Lt O K Griffith was given the task of forming 50RS at Townsville in July 1942. As a top secret and independent RAAF unit the CO and his men had difficulty in procuring approximately 30 tons of supplies and equipment deemed necessary to prepare a radar station for field service. Their enthusiasm was such that they became known as 'OK and his Forty Thieves.'

50RS at Dobobura

This unit was the second of the LW/AWs to be deployed overseas. When the personnel of 50RS went aboard two C47 transport planes at Port Moresby on 1 December 1942 they were unaware of their impending 'trial by temperature'. Leaving the stifling heat on the strip at Moresby the aircraft entered the extremely cold air over 'The Gap' at 9000 ft before descending to the airstrip at Dobodura, where climatic conditions are similar to Port Moresby, was an unexpected trial for them. As the Dobodura strip at that time was constantly strafed by Zeros the American pilots demanded a three minute unloading time. This was further complicated as the aircraft kept moving along the apron of the strip so as not to become a sitting target. While doing so it passed a number of aircraft that had previously been strafed while unloading.

There, about 500 yards from the airstrip and within audible distance of the battle for Buna the station was in operation within 48 hours. The effective air warning provided to the American Kittyhawk squadron lifted their morale greatly. The radar station reported by telephone to 9 Sub-Sector operating from a tent. Ranges were restricted by the surrounding ridges but all raids were detected. When a squadron of P38s arrived it was not long before there were no more strafing Zeros to chase the men into slit trenches. There is no doubt that the radar station played an important part in the success of the Buna campaign.

The Americans were reluctant to allow the radar station off the air even for scheduled maintenance. When the overtaxed Howard power units gave trouble the Americans provided a much more substantial Onan power unit. This meant modifying a radar designed for 50 cycle operation to 60 cycles per second. This was not a simple task as the timing sequences within the radar depended on the steady 50 cycles per second AC power supply. However it was well within the capabilities of mechanics like Bill Humphries and John Fraser and operation of the radar was maintained.

The success of this radar and its recognition by the Americans was a compliment to all concerned from the drawing board to Dobodura. The organisational ability of F/Lt Griffith was recognised and he was withdrawn and sent to 37RS to act as adviser and Radar Liaison Officer to No. 9 Operational Group in the Milne Bay area.

303RS at Tufi.

Outstanding work accomplished by Army signallers of New Guinea Air Warning Wireless Company stationed at Tufi showed that this was the obvious place to locate a radar to cover the northern approaches to Papua New Guinea.

F/O W J Scarff, chief Radar Officer at No. 9 Operational Group, Port Moresby, made an aerial reconnaissance of Tufi and decided to site the station at Mitereta about three miles from McLaren Harbour. Then radar officers Scarff, Campbell and Sheaffe flew to Wanigela and travelled by barge to Tufi to pinpoint a suitable site for 303RS.

303RS, which arrived at Port Moresby, was under the command of F/O Campbell. The equipment was erected and tested at Waigani on the outskirts of Port Moresby. The unit was flown across the Owen Stanleys in five C47 transport aircraft. From Wanigela the gear was carried with the help of natives four miles overland through swamps and jungle and across unbridged creeks to the sea. To get to the trawler *KING JOHN 1* outside the reefs the gear was loaded on platforms formed between pairs of native canoes lashed together. The trawler arrived at McLaren Harbour on 30 October 1942. This harbour is in the form of a fiord with cliffs rising about 200 ft above sea level. The gear and all supplies were manhandled up more than 100 steps cut in this near vertical cliff with no hand supports available. It was then carried about three and a half miles to the only feasible site on the promontory. Great assistance was given by the ANGAU indentured local labourers. They also constructed the station accommodation to resemble a native village similar to 37RS at Milne Bay - less obvious than tents and much more suited to the climate.

W/T contact was made with Milne Bay on 7 November and the Doover went on the air the following day. This was the near perfect early warning radar operating site. It was situated several hundred feet above sea level with an unobstructed sweep over the sea in the path of enemy aircraft. Sixty miles away and a little south of east was visible the towering volcanic plug of Goodenough Island, just perfect for monitoring the performance of the radar. The W/T hut was located a quarter of a mile away on the far side of a small gully to avoid interference by the radar pulse.

The results obtained by this station had to be very good but it is strange that there is practically nothing in RAAF official records to show that this was so. It is difficult to understand why so little was reported on the very purpose for which the station was put there. However S/Ldr Bert Israel and others vouch for the important role played by this radar.

The next two LW/AWs to become available allowed the completion of the outer chain of three early warning stations so positioned that it was practically impossible for enemy aircraft to approach from bases in New Britain without detection.

These three stations - 303, 304 and 305RSs - backed up by others that followed, became the stumbling block of the Japanese Air Force in 1943.

In December 1942, Stations 304 and 306 went by ship to Port Moresby while 305RS went by flying boat. Here they made their final preparations for deployment. The voyage to Milne Bay aboard the MV *Muliama* lashed by the fringe of a cyclone in the Coral Sea left all aboard physically distraught on arrival.

Despite this they had to toil all day and into the early hours of the next morning transhipping the equipment of the two stations into the shallow-draught SS *Tung Song*. Attached to 305RS was an installation team of five in the charge of F/Lt K Bishop and Padre F/Lt John Rundle who had worked as a missionary in the D'Entrecasteaux Islands. He was attached to liaise with the indigenous people and earnestly seek their cooperation.

The SS *Tung Song* was a product of the Taikoo Dockyard and Engineering of Hong Kong. It was graced by a bridge of distinct oriental design. Its shallow draught made it suitable for transport among the reefs and shallow waters of the islands north of Milne Bay. Living

conditions below deck were anything but pleasant. The mainly Chinese merchant crew carried live food supplies below deck in the form of poultry and pigs. Steam escaping into the hot atmosphere mingling with the various nauseating odours was most objectionable. As a result 304RS and 305RS personnel remained topside and ate bananas bought in Milne Bay as sustenance during the trip.

304RS at Normanby Island.

The short trip to Cape Pierson was uneventful, Normanby Island was through waters frequented by Japanese submarines and under clear skies regularly flown by hostile aircraft. A prefabricated raft consisting of empty 44 gallon petrol drums and planks, was carried for landing purposes. 304RS was successfully ferried ashore bit by bit on the raft under the watchful eye of Radar Installation Officer F/Lt Bishop. Petrol in 44 gallon drums was simply pushed overboard and floated to the shore. A drum of flour for cooking was also dropped into the sea and, to the consternation of the cook, plunged to the sea bed. The gear was deposited above water line near a crystal clear stream that tumbled down from the wooded mountains.

The first night was spent in a camp on high ground near the site selected for the radar. During the night a spectacular tropical storm in all its fury deluged the island. Water cascaded down the mountains and the peaceful stream of yesterday became a yellow turbulent torrent. Much of the equipment and supplies was soaked and some isolated on the far side of the stream.

Helped by native carriers, equipment was taken inland to ford the swollen stream and up onto the plateau. Steps were cut up a hill 200 ft high and the Doover was operational on top by 22 January 1943. Initially plots of targets could not be passed as all endeavours to contact the Fighter Control at Milne Bay failed.

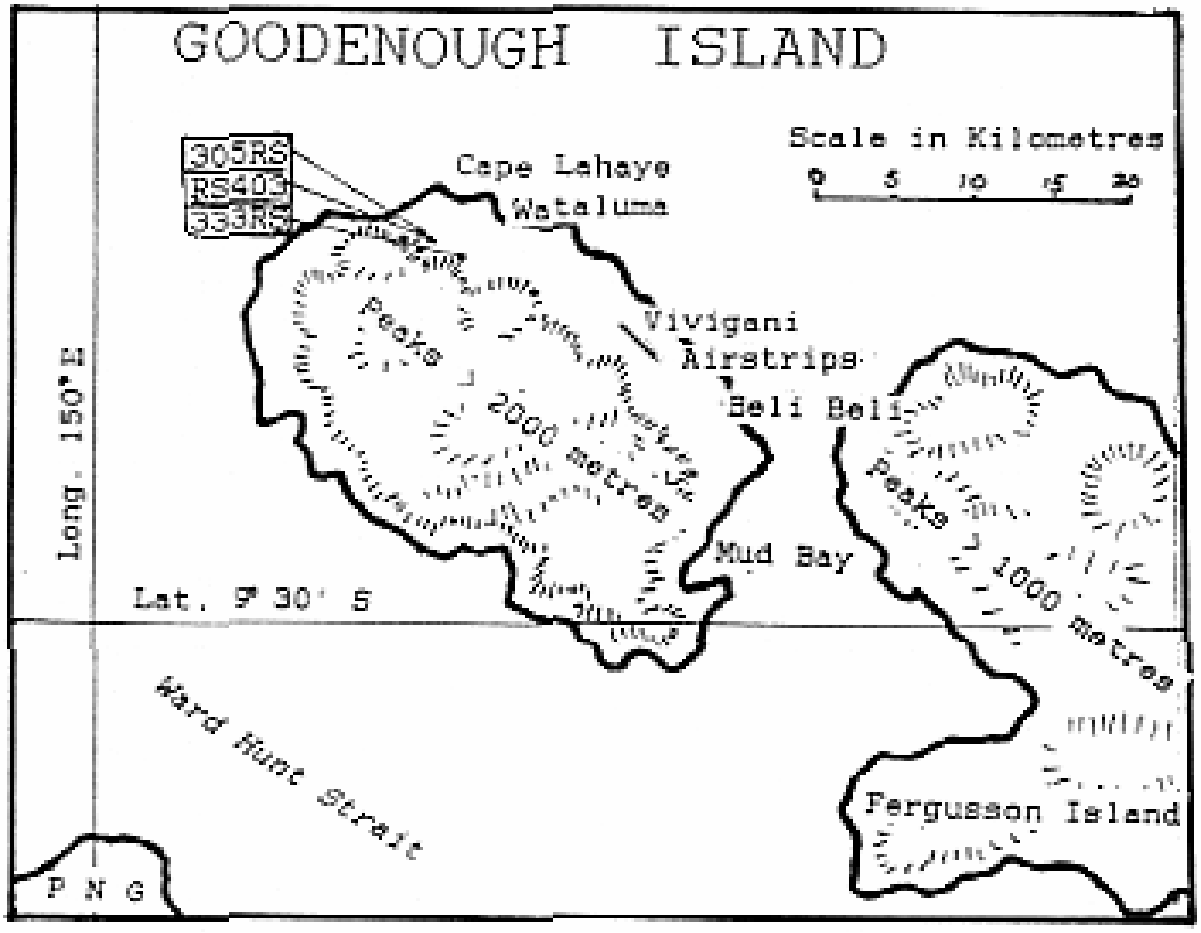
It was a serious situation and G/Capt. Wiggins visited the station on 27 January accompanied by the Signals Officer F/O Houghton to rectify the communication problem. They decided that another W/T set should be sent to the station forthwith. It is interesting to note the comment by F/O Young in the station records:

> After his [Wiggins'] departure it was found that the W/T calibration was out by 40 K/Cs. Allowance was made and contact established proving that W/T operators at Milne Bay had not searched the band as requested but listened on fixed frequency.

It must be pointed out that the 30 as yet inexperienced men of 304RS did not have the help of a technical installation party. There is no doubt that the extra assistance afforded 305RS by F/Lt Bishop, his five man team and F/Lt Rundle contributed significantly to the beginning of its outstanding record in the field.

305RS at Goodenough Island.

Having delivered 304RS, the TUNG SONG proceeded next day to Dobu Island and on the following day to Mud Bay on Goodenough Island. Most of this near-circular island some 20 miles across is a volcanic mass with peaks well in excess of 7000 ft. Along the eastern fringe is a rugged jungle-clad flood plain skirted by extensive coral reefs extending across to Fergusson Island. Mountain streams tumble among water-worn boulders strewn across the plain.



Map of Goodenough Island Base

The skipper of the *Tung Song* refused to attempt a passage through this treacherous strait where the water rushed willy- nilly with the tidal changes. In addition the merchant seamen who boasted that they were receiving danger money added to normal pay during this mission refused flatly to man the steam winches for unloading. This did not endear them to the radar men. Two radar mechanics, Bill Humphries and Norm Smith operated them successfully after several attempts in which the winches were almost dislodged from the deck. One winch lifted the cargo from the hold, held it supported on the brake while the second swung the load to suspend it over the side of the ship. Then the first controller allowed the load to descend to the waiting raft. Nice timing was the essence of the exercise.

So a line was run ashore and the raft dropped into the bay. 305RS was deposited on the south east of the island, separated from its proposed site by about 20 miles of rugged coastal plain. The ship left immediately for safer waters. The station was from then on isolated well outside the protection of Allied forces.

Two mission launches that had been hidden from the Japanese at Goodenough were engaged with their native skippers to transport the equipment to Cape Lahaye at the north of the island. Large crates containing the array sections were trans-ported balanced precariously on the roof of the small cabin launch. The reefs were safely traversed due to the skill of native pilots positioned at the bow of the boat. While the radar personnel and the natives carried the equipment to the site about a mile inland the local natives erected living quarters resembling a native village as was done for 303RS at Tufi. The radar was erected and operational on 25

January 1943. A target at 127 miles was immediately detected and plots passed to Fighter Control at Milne Bay by W/T.

American Radars Advance in Papua New Guinea.

RAAF LW/AW radars utilised an antenna system which exhibited no back radiation problems whatever and because of their portability became established as the preferred early warning system in the SWPA. However the Americans had radars that performed well if correctly sited. Lessons were quickly learned and a number of these radars were moved forward in the first months of 1943 to suitable sites where the LW/AWs were operating. In some cases the LW/AWs then moved farther afield and in other cases the two radars supported each other at the same place giving better coverage as they operated at different frequencies giving rise to vertical lobe patterns that did not coincide.

During March 1943 American RS406, using a type SCR270 was set up on Aran Island on the south coast of Papua New Guinea about 100 miles west of Milne Bay where 37RS was operating. The American RS473 was relieved at Waigani Swamp by 138RS and the Americans moved over the Owen Stanley Ranges to provide height finding information from Inonda in the Dobodura area. RS473 resumed operation there on 25 March. Also RS410 arrived at Oro Bay manned by the 1st Reporting Platoon of Company A and went into operation on 15 March.

As conditions at Tufi appeared favourable for the American early warning stations it was decided to move both an SCR516 and an SCR270 into that area. RS411 manned by the 2nd Platoon of Company A was operational at Tufi on 1st March using an SCR270. It was joined by the 3rd Platoon with an SCR516 which went into operation on 27 March.

Stations operating in the Dobodura and Tufi areas comprised all the units of the 10th Fighter Sector. The radar sites had been selected by Capt. Lambert and Capt. Wilde.

At the end of March 1943 the 5th and 6th Reporting Platoons of Company B arrived at Cape Lahaye, Goodenough Island aboard the old Sydney ferry *George Peat*. Because of its shallow draught it was able to carry the heavy trucks over the reefs at full tide. Using steel matting the trucks were able to be driven inland to the site of 305RS at Mwonanoia. Stations RS403 using an SCR270 for early warning and RS475 using an SCR516 for close-in warning were to replace 305RS which went off the air on 26th April.

Major Japanese Air Raids - Early 1943.

Towards the end of 1942 most of the enemy aircraft flying out of Rabaul were diverted to the Solomons in an attempt to stem the American advance there. Raids on New Guinea diminished and some complacency existed.

On 27 January 1943 the newly established early warning station on Goodenough Island tracked a flight of enemy bombers and fighters towards Milne Bay. Poor communications and late scrambling of fighters resulted in a failed attempt at interception. The enemy proceeded to bomb the base where six Hudson aircraft were destroyed on the ground, the main petrol dump destroyed and the air strip damaged. This raid jolted the fighter control network into top gear from then on.

The heavy bombers on these raids usually came from Rabaul while fighters and dive bombers were based closer to New Guinea at places like Gasmata, and Talasea. Invariably there was early warning on these attacking aircraft and the controllers at each Fighter Sector were faced with the decision of where best to deploy the fighters under their control. This did not always

go smoothly and one of the reasons as has already been seen was difficulties in communications.

On 6 March 305RS picked up enemy aircraft at a range of 120 miles flying south and No. 9 Fighter Sector at Milne Bay was informed. It was then a matter as had become customary , to watch the track and decide if Milne Bay, Port Moresby or the Buna area was to become the target. However the bombers flew directly over the RAAF radar station in typical V formation and bombed the wharf facilities being developed at Beli Beli on Goodenough Island. The bombers returning north disappeared from the screen at 135 miles.

On 11 March a flight of 24 dive bombers from Gasmata escorted by 20 Zeros were detected by 305RS. They headed towards the Allied positions in the Buna area. The controller dispatched P40s to intercept the enemy at 20,000 ft and a patrol to orbit over Buna. The attack developed on Oro Bay where two P38s were destroyed on the ground and some casualties suffered by our forces. Nine enemy aircraft were destroyed with five 'probables' without loss to our 24 aircraft.

18 Japanese bombers escorted by 32 Zeros attacked Porlock Harbour on 19 March. First, 305RS detected the south bound raiders at 1158 hours, estimated the number as 30 aircraft and reported to No.9 Fighter Sector at Milne Bay. These plots should have been monitored at 10 Fighter Sector at Oro Bay and No. 4 Fighter Sector at Port Moresby. The controller at No. 9 Fighter Sector, Milne Bay, scrambled 20 P40s but they were unable to intercept as the enemy turned away to the south west. They were then picked up by the SCR270 American radar at Tufi and reported 95 miles out at 1216 hours to 10 Fighter Sector while the other two Fighter Sectors monitored. The controller at 10 Fighter Sector failed to scramble fighters as the W/T communication with the radar station at Tufi was very difficult and intermittent reception did not give a clear pattern.

The Controller then failed to check with either of the other two Fighter Sectors which could have supplied vital information. The enemy attacked Porlock Harbour and dropped about 50 bombs. Fortunately Liberty ships in the harbour escaped and little damage was done. 303RS, which had tracked this flight in and out to 135 miles, lost its mail from home when the supply launch was demolished near the wharf by a bomb.

When the failure to intercept on what seemed clear and adequate information was examined it was attributed to communication problems. The whole scenario was clearly revealed at Port Moresby where all signals were monitored and understood. The confusion was at 10 Fighter Sector and some firm directions were issued on the coordination of information between Fighter Sectors and its use by controllers.

The Japanese made an all-out attempt on Oro Bay on 28 March using 40 bombers escorted by 50 Zeros. Plots by RS410 beginning at 125 miles out indicated Porlock Harbour as the target. The controller at 10 Fighter Sector scrambled 29 of our fighters and directed them to Porlock Harbour near Tufi. The enemy aircraft, evidently on a prearranged plan, suddenly changed course and attacked Oro Bay. The ruse allowed the 15 Val dive bombers to attack the new wharves and sink two ships. Thirteen enemy planes were confirmed shot down with another 12 badly damaged.

The tactic of approaching a target and then suddenly changing direction to another or splitting into two or more flights that went in different directions, first seen at Darwin, was exploited with some success by the Japanese. Another ruse was to approach a target and alter the ETA by circling and thus depleting the fuel of our fighters which had been scrambled

earlier than required. Again at times part of a flight would make a run across the target while the other delayed its attack. However the intentions of the enemy were mostly revealed on the plotting boards. A new potent weapon was appearing in increasing numbers. The hard hitting, swift, high flying and long range Lockheed Lightnings took increasing toll of the Japanese aircraft.

Operational Problems Associated with the Pioneer LW/AW Radars.

The capabilities of radar were lost without a reliable power supply. The air cooled Howard Rotary Hoe engine coupled to a 2.5 KVA 240 volt alternator was quite adequate for the LW/AW. For satisfactory continuous operation in a much hotter climate than that for which it was designed, constant and skilled attention was called for. Only one fitter/DMT was assigned to perform this function at each station. Great credit must be paid to these men for the manner in which they carried out their duties. They were assisted when needed, by the radar mechanics. It was found that the dry sump motors overheated after about four hours continuous running, pre-ignited and ran erratically. It was imperative that they be changed over regularly at four hourly intervals. The exhaust valves and seats burned out persistently when 80 octane petrol was used whenever lower octane fuel was unprocurable. The fitter was required to install and seat new valves between engine changeovers and this sometimes happened at midnight.

At 305RS LAC J E Groome, Fitter/DMT, although suffering from repeated attacks of malaria, lived under the tarpaulin that protected the chattering machines from the never-ending rain.

305RS was never without power at Goodenough. It was a similar case of a dedicated fitter at 303RS where W/T operator Rowland Will said this about their fitter:

> Frank Paton really had a touch for Howards and the radar boys were pleased he was there. He lived in a hut alongside and the roar of the Howards was in his ears all the time.

At Buna the Americans solved the problems with Howards by replacing them as already recorded. Suitable fuel for the Howards was not easy to obtain to obtain and 303RS went into the field with insufficient supplies. When fuel was dropped by parachute from aircraft some of it had to be retrieved from jungle filled gullies. 304RS and 305RS took sufficient petrol with them to last for three months.

Wireless Communication Problems

The value of the radar depended on the efficiency of the W/T link from these outposts. Equipment supplied was the new AT5/AR8 basically designed for use in aircraft. Here it was chosen for its portability and generally was adequate for the need. The problems that arose with communications were more to do with the influence of the terrain on signals, the frequencies used and the planning or lack of it before the station was deployed. Radio operators were also sometimes at fault as already noted. But this was rare as these people were specially chosen for this important work and set a high standard of performance.

Thunderstorms caused very high noise levels in the equipment and lightning posed a threat to operators. Deep valleys and high mountains sometimes hindered transmission by ground wave and the distance between points of communication and the frequencies being used sometimes made use of the sky wave impossible. It was not always possible to have a universal frequency that suited all reporting stations and fighter sectors at any time of the

day. It was normal to use a day frequency and a night frequency. Plots were transmitted by morse code and administrative traffic in enciphered morse code groups of five letters and figures. This cipher was known by the acronym RADMIN (radar administration).

305RS began reporting to No 109 MFCU when it relieved the American Fighter Control at Milne Bay, on 18 February 1943. At first there were problems apparently with the watch being kept at the Fighter Sector. F/0 Katz remonstrated and there was a marked improvement on 22 February. However in March there was more difficulty prompting W/Cdr Minchin, C0 of 10 Signals to visit the unit.

Then on 4 April F/Lt Roby of No. 109 MFCU came to look into the matter of early morning fading of signals. After three days of testing it was found that a frequency of 2 to 3 Mc/s was necessary to maintain contact with Fighter Sector at that time of day.

The first LW/AWs were deployed with the standard AT5/AR8 aircraft W/T set with power derived from a genemotor power unit driven from accumulators. Consequently a petrol-electric charging plant was also necessary. In view of the fact that the radar was inoperative without a 240 VAC power supply it was an astounding oversight that the units were not provided with a simple power unit using the 240 supply for normal use. The battery/ genemotor system would then always be ready in case of emergency. In addition it would have been easy to provide a battery charger operating from the 240 Volt supply to keep the batteries topped up without running the Briggs and Stratton charger for long periods.

At 305RS the genemotor powering the AT5 transmitter began arcing excessively at the commutator and giving reduced voltage. Breakdown was imminent and the four radar mechanics considered their options. No power transformer among the spares was in any way suitable. Rectifier spares were plentiful as were filament transformers and filter capacitors. So the 240 VAC which was not earthed was rectified and voltage doubled in a standard circuit. The voltage output was a little lower than desired but had good regulation and more importantly was not prone to break down. It was not long after this that a special Type S power supply became available to do the job.

Maintenance of LW/AW Radar Stations.

Regular maintenance periods were allowed on a daily basis on approval from the Fighter Sector. This was not allowed while enemy aircraft were being plotted. The LW/AW circuits were well metered and station mechanics kept a meter reading log as was done on all RAAF radar stations. Changes in circuitry were detected by watching for changes in the log readings. Circuits were studied and the likely causes pin pointed. During the routine maintenance period the developing fault was corrected. This sort of preventative maintenance was practised at 305RS with outstanding results. It operated for twelve months without a major break down.

Supply of Rations to outlying Radar Stations.

Initially a station took with it sufficient food supplies for a three months period. The rations were normally eked out by astute cooks through trading with the local natives. Payment for bananas, paw paws, yams et cetera was with trade tobacco specially carried for the purpose and at other times bully beef and other commodities were bartered.

Where the unit was near the sea, as was mostly the case, ample fish supplies were obtained either by fish traps or the use of explosives. Such things as fresh meat or bread were not part of the menu. Often stocks of sugar, powdered milk and the like were exhausted before fresh

supplies were received. With no refrigeration the mainstay of food was in tins. An interesting situation arose at 305RS when paper labels fell from the tins because of the humid atmosphere or were filched by the native helpers in the cookhouse who delightedly adorned their persons with the colourful wrappers. In the tropics salt tablets and anti-malarial tablets were distributed by the medical orderly at the evening meal. The former were large for pills and quite nauseating when swallowed. Atebrin tablets permeated the system, stained the skin yellow and any clothing which came into contact with one's body.

The Australians, Americans and New Zealanders developed a network of small ships which roved the Pacific delivering supplies to outposts. In cases of extreme emergency items were parachuted from aircraft.

Defence of RAAF Radar Stations.

Because of the urgency with which radar technicians and operators were recruited and sent to operational situations many of them barely knew how to fire a rifle and were ill equipped to defend themselves. They were expected to attend to the equipment and only when it was threatened to be overrun could it be destroyed with explosive charges set for that purpose. In order that secret documents such as ciphers as well as the Doover could be destroyed each station was assigned five guards usually under the charge of a sergeant. Once the station was established these guards were expected to give instruction and practice in the use of firearms, bayonets and explosives including grenades. The manner in which this was done was at the discretion of the commanding officer.

The personnel of the three important radars recorded in this chapter were armed with .303 calibre service rifles with bayonets, Thompson .45 calibre sub-machine guns, Bren guns and grenades. Gelignite and a box of TNT, fuses and detonators were part of the defensive armaments. As time went on individual stations acquired other weapons. 303RS successfully installed an old Vickers gun and 305RS personnel became proficient in firing a Boyes anti-tank rifle.

Special Protection for Forward Sited Radar Units.

It was expected that counter attacks would be mounted by the Japanese against these stations and accordingly a platoon of experienced Australian or American Infantry was sent to set up defensive patrols about the perimeter of each installation.

Early March 1943 a large convoy left Rabaul with reinforcements for the hard pressed Japanese troops along the north coast of Papua New Guinea. The convoy was shadowed by Allied intelligence sources and at the place and time selected a destructive attack was mounted by aircraft and the fast torpedo boats based at Oro Bay. The radars reported a great amount of air traffic but no one bothered to tell them, in their isolation, of what was going on.

At 1600 hours on 7 March 1943 an agitated native runner reached 305RS on the northern escarpment of Goodenough Island with the electrifying information that a very large number of Japanese had landed from a big boat at a beach about four miles from the radar station.

Station Commander, F/O Bernhard Katz reacted immediately, rightly expecting a concerted effort by the Japanese to destroy a station that was contributing greatly to the destruction of Japanese aircraft.

All personnel not on duty went to the prepared defensive positions with arms and emergency kits in the event of a withdrawal. A command post was set up in the plotting tent where the W/T operators and radar plotter worked. From there W/T communication was available with

Fighter Sector at Milne Bay, a telephone line to the Doover and another to the Army garrison fifteen miles away at Vivigani. TNT explosive charges were placed in the Doover according to instructions and secret documents prepared for destruction.

Thereafter followed hours of drama. During the night Capt. McWaters arrived with reinforcements after a forced march from Vivigani. Before daylight he sent Lt Baker out with a patrol to ascertain what the enemy was doing. And, as there was no news from Lt Baker's patrol towards daylight the secret documents were destroyed and the noisy Howard motor was silenced. The radar went off the air to await the expected attack at daylight.

An hour after daylight no attack had eventuated. Perspiration soaked the clothing of the men crouched in the slit trenches under the blazing sun. As no enemy appeared the motor was restarted, the Doover went on air again and normal operation resumed. Later in the day Lt Baker's patrol returned with three Japanese prisoners who had survived the attack on a party of about 30. It soon became known that these enemy were survivors of the Bismarck Sea Battle which was one of the biggest and most crucial in the Pacific war. Many more survivors were to land on Goodenough Island which was in the path of the sea current from where the action had occurred.

Lack of information from those in a position to give it and false or misunderstood information from a native had caused the 305RS to carry out the emergency routine stopping only at the final act of demolition. Later the station was commended for continuing operations in the face of the emergency.

Enemy survivors also landed on the north coast of Papua New Guinea and a similar but less dramatic situation arose at 303RS. 304RS was beyond the influence of these events.

CHAPTER 11

A Surge Forward

April 1943 to August 1945

Cape Ward Hunt - an Outstanding Radar Site for 315RS.

Allied radar siting officers were long awaiting the time they could have a station placed on Cape Ward Hunt which, from air photographic reconnaissance, indicated it being equal to Tufi as a prime radar site. Just north and well in sight of this high prominence the large Mambare River poured its mud stained-waters into the Solomon Sea. On the western side of this river were entrenched thousands of Japanese soldiers who had withdrawn from the Buna - Sananda - Gona area. In addition to reporting aircraft activity a radar placed on this prominence could detect surface vessels ferrying supplies to the beleaguered Japanese.

American troops captured the Cape which was protected from the sea by a continuous coral reef just off the shore. A narrow passage was blasted through the coral for access to the land. Negotiating this narrow passage with a high sea running was a very hazardous operation. S/Ldr Israel, Maj. Bolton and party reconnoitred the place for the best radar site and examined tentative sites already chosen from aerial photographs.

A Mk II LW/AW radar was allocated to the crew of 315RS for the Cape Ward Hunt operation. The station was flown to No. 41 Radar Wing, Port Moresby to be made ready for installation. One American transport pilot lost his way and ended up at Milne Bay. Guard Sergeant, Charlie Watkinson, in charge of the men and cargo languished on the edge of Gurney Strip beneath a large borrowed tarpaulin awaiting air transport to Port Moresby. Sgt Watkinson was fearful of being officially attached to another unit as it may delay them reaching the rest of their unit so they maintained a low profile, remaining as inconspicuous as possible, until such time as transport could be arranged. Food was obtained by dispersing in twos and threes among the many units in the area and joining the meal lines.

As the radar at Cape Ward Hunt would be surrounded by Japanese, the personnel of 315RS were given intensive training in the use of Bren guns, Thompson sub-machine guns, rifles and grenades at No. 41 Radar Wing. It was expected that the American troops in the area would prevent infiltration by the Japanese surrounding them.

On 12 April 1943 the first seaplane-load of personnel and equipment was escorted by fighter planes to MacLaren Harbour and so began the tricky business of rafting everything through the narrow reef passage. Petrol drums were simply pushed into the sea and coaxed ashore on the incoming tide by strong swimmers. These operations were carried out within spotting distance by the enemy and at some risk of air attack.

Initially the radar station shared the camp, messing and medical arrangements with the American soldiers who had cleared the Japanese from the area. Finally the radar camp was established under canvas sheltered by trees between a swamp and the base of the high point.

Before the technical gear could be put on site the guards carried out the arduous job of cutting about 350 steps up the steep hillside and securing the earth with stakes and poles. No native labour was available because of the recent fighting and all the personnel on the unit helped in carting the gear to the site. The fitter dismantled the Howard units and reassembled them at niches cut in the hillside below the radar. Thereafter each person going on duty carried a four-gallon drum of petrol which took more than half an hour to carry to the top.

Sgt Watkinson and his guards had the unpleasant duty of collecting the Japanese dead for burial. This meant handling bodies in an advanced state of decomposition, many of them still suspended by cord to the tree top perches from which they had sniped at the Americans.

The station went on the air on 26 April and reported 134 plots up to a range of 124 miles to No 10 Fighter Sector on that day.

Maj. Bolton, attached to No. 41 Radar Wing arranged an RAAF defence system independent to that of the Americans who were continually changing units. The guards established defensive fire positions which could be manned by the whole station in the case of an emergency. Training by Sgt Watkinson raised the defence capabilities of the unit to a high level. Camouflage was an essential part of the defence. Most of the surrounding hills had bare patches which had been cleared for native gardens to each of which was a foot track. To fit in with the general landscape it was decided that it was only necessary to make the radar appear like a native hut and the single track to the clearing was no different to any of the other clearings.

On the night of 20 May a single enemy aircraft dropped two bombs on nearby Douglas Harbour. Next morning at 0645 hours 12 Zekes bombed and strafed Douglas Harbour sinking two boats causing casualties. Then on 26 May eight Sally bombers escorted by seven fighters again caused considerable damage to the Harbour but this time there were no casualties. No attempt was made during these raids to target the radar station. It seems that the Japanese were oblivious to its presence.

The detection of aircraft from this site exceeded expect-ations. High flying Japanese bombers from the direction of Rabaul were often plotted in excess of 200 miles. Telling was to No. 10 Fighter Sector on 3450 kc/s but fading was experienced from 0200 to 0630 hours. Fighter Sector had not advised 315RS of the night working frequency shift to 3920 kc/s and contact was lost for 14 hours. Then a frequency of 2285 kc/s was settled on for night use.

Suddenly the radar succumbed to condensation. It was off the air on 11 July for eight hours, on 12 July for 19 hours, on 16 July for over four hours and on 31 July for three hours. P/O Les Bell was sent to see what could be done to help. A wood fire in a tin can was placed in a hole underneath the radar in an effort to dry out the components. As soon as possible better heating and drying modifications were installed and a steeper roof arranged to ensure rain could not enter the enclosure.

However once moisture had penetrated windings in trans-formers and relays it was difficult to remove. During August 9 hours and 50 minutes were lost due to breakdown of components.

Radar mechanic Sgt John Fraser benefited from considerable experience with 50RS, the LW/AW at Dobodura. He was sent to help the malaria ridden and less experienced crew at 315RS. He was put into a row boat off the point from a small coastal supply boat during the night. After bobbing about until daylight, desperately sea sick, he was rowed through the narrow passage to the shore. This was the manner in which all supplies and visitors came to 315RS. This senior mechanic spent three months helping to raise the efficiency of this very important station.

315RS had to use tents which were rotting and leaking within four months. By that time local help was available and much better housing in the form of native style thatched houses, which were better suited to the climate, were provided.

As the Americans moved away the supply position became acute. A Johnson outboard motor was obtained and attached to a captured Japanese pontoon. This was used to intercept shipping off shore carrying supplies. Rough seas made this a very dangerous exercise but one of necessity. No 41 Radar Wing finally recognised the supply difficulties being experienced by 315RS. A supply NCO, Jimmy Sue, was stationed at Oro Bay with orders to see that whatever was required at the station was put aboard a small coastal supply boat and the station alerted on the time of arrival off Cape Ward Hunt. Thereafter the needs of the station were well provided. Later, in December, W/O Black visited the station and gave advice on the baking of bread.

At the same time the defences of the station became serious without the American presence. On 13 September the 17th Platoon of Don Company, of the Australian 36th Battalion moved in to protect the perimeter. Also during September there was a marked increase in enemy air activity.

Records indicate that 315RS suffered more malfunctions than most other LW/AWs in the New Guinea campaign. It was located in an extremely high rainfall area. During December 1943 it was off the air five times for a total of 2 hours 45 minutes. During April 1944 it was out of action six times for a total of 56 hours 53 minutes and in May the total time off air was 105 hours 55 minutes.

315RS ceased operation on 30 July 1944 and F/O L O Oakley made this final comment in his report.

> And so ends the service of No. 315 Radar Station at Cape Ward Hunt after 15 months of continuous operation. Much good work was done in the detection of enemy aircraft in the first nine months of its stay. Many aircraft were picked up at long ranges up to 200 miles. During the month of December 1943, 12,000 plots were sent through to 10 Fighter Sector. It is true to say that the station has been successful, and that this success is due in no small measure to the airmen that operated it, especially some who came with it and are now helping to take it away.

Bold Leap Forward by 305 Radar Station.

Both the Japanese and Allies had their eyes on the flat coral island of Kiriwina in the Trobriand group as an ideal air base. It also lay in the flight path from Rabaul to Papua New Guinea and a radar station there would increase the air warning in that direction by about twenty minutes. The strategic advantage in the occupation of the island was great and 305RS which had been relieved at Goodenough Island was ordered to move to the north side of Kiriwina.

Early May 1943 S/Ldr Israel and F/Lt Bishop proceeded to Kiriwina aboard the *Oomoobah*. After selecting the radar site at Bomatu Point, Israel returned to Milne Bay leaving Bishop and LAC Smith to supervise the construction of a native style camp for 305RS personnel who were due to arrive two days later.

On 10 May a two masted ketch-rigged ship of 93 tonnes gross, *Will Watch*, anchored off Cape Lahaye, Goodenough Island. On 12 May all 305RS equipment was transported on borrowed American trucks to the beach, rafted aboard and stored in the hold. Thirty RAAF men under P/O Bruce Aldrich and an Army Defence Platoon commanded by Lt Walters with personal gear and arms took up all the available deck space. Auxiliary diesel power eased the vessel through the channels among the reefs to Vivigani. Army stores were taken aboard and

the night spent at Mud Bay. The following night was spent at Dobu Island. Anchor was dropped opposite 304RS, Normanby Island next day to pick up a member of F/Lt Bishop's party.

Will Watch departed Cape Pierson at 0200 hours on 16 May bound for Kiriwina. The sky was overcast and the sea moderately rough. Tension aboard was high as this small overladen timber craft was blundering into hostile waters unescorted. The low cloud cover was an enormous relief for the journey was along the flight path from Rabaul to Papua New Guinea. During the period that 305RS was in transit to Kiriwina enemy aircraft launched attacks against Vivigani, Milne Bay, Dobodura, Wau and Port Moresby. So at least some of the aircraft heard to pass over the ship were unfriendly but fortunately unable to spot it.

Landfall was late evening at Losuia, Kiriwina, where the night was spent. Under a cloudless sky and with renewed apprehension the vessel proceeded to Bomatu Point next day arriving at 1100 hours. Anchor was dropped in deep water outside the reef and unloading and rafting gear ashore commenced with urgency and completed by 1400 hours on 18 May. *Will Watch* was gone in less than an hour.

No technical installation party accompanied 305RS to Kiriwina. The surface of coral on which the radar was to be placed was pitted with cavities, many up to a meter deep. A base was required for the four feet of the radar frame. Suitable hard timber that did not rot quickly was pointed out by the local people who helped in snigging four suitable logs to the site. Two were bedded into the coral and the other two scarfed and spiked to form a solid square base for the radar. W/T contact had already been made with Milne Bay when the radar commenced operating at 1300 hours on 28 May. That night the first target was detected at 120 miles.

Under the command of 19 year old F/0 Bruce Aldrich, the station continued the highly successful operational record it had established on Goodenough Island, where it had never been off the air with a major breakdown. Despite the fact the radar was only 50 ft above sea level - the highest point on the island - ranges of far in excess of 100 miles were common as the Japanese persisted in flying at high altitudes. And they were suffering as a result of the early warning afforded to our defences.

Disaster struck at midnight on 23rd June when, during changeover and refuelling of the Howard motors, the power house was engulfed in flames partly destroying the power units and severely burning the fitter, Cpl Allen Browne. Lack of power put the radar off the air and as the battery charger had been dismantled for maintenance the W/T was also off the air. Fighter Sector was oblivious of the state of affairs on Kiriwina. They feared the worst as the station was very vulnerable to attack by the enemy.

The radar mechanics worked through the night and after a break of 14 hours and 40 minutes had rebuilt one of the Howard units, added electronic ignition, and had the Doover on the air again. An oil drum was used to replace the dry sump system for the burnt-out engine and a guard was given the task of keeping the drum topped up with oil. This modification provided a heat sink or oil cooler for the Howard which run beautifully thereafter - the station crew had solved the major fault in the Howard but the information was not passed on to other units.

When W/T operator Cpl Dick Trotter called Milne Bay he was asked to give the name of his mother to prove that he was not being forced to transmit under duress by the Japanese.

American Forces Invade Woodlark Island and the Trobriand Islands.

In the early hours of the following morning a further crisis arose. Surface vessels were detected on the radar and it was thought the previous night's conflagration had attracted enemy attention. Defence positions were manned and the infantry followed along the shore as the vessels made their way to a break in the reef more than a mile from the Doover. There they observed American troops invading the island. On contacting them the Americans said they were not aware any Australians were on the island. The capture of Woodlark and the Trobriand Islands by American forces 'with little or no resistance' became the subject of a widely distributed newsreel at the time and a 4th of July announcement over radio station KWID San Franscisco.

Kiriwina was quickly developed into a major base for fighter refuelling and rendezvous for bombers in the major attacks that were launched on Rabaul towards the end of 1943. No. 114 MFCU and 79 Squadron flying Spitfires were stationed there. Plots were sent to that Fighter Sector by land-line from 305RS.

To be successful, the telephone at the other end of a land-line had to be answered quickly. On one occasion when Noel Lynam, an operator at 305RS, felt that his urgent call was not being treated in a proper way, he disconnected the two wires from the phone, quickly jabbed the two wires into a power point, and sent a burst of 240 volts down the line. It had the desired effect because when he reconnected the wires to the phone he immediately heard the chap at the other end of the line say, "What the bloody hell was that ?"

No 114 MFCU - Goodenough and Kiriwina Islands.

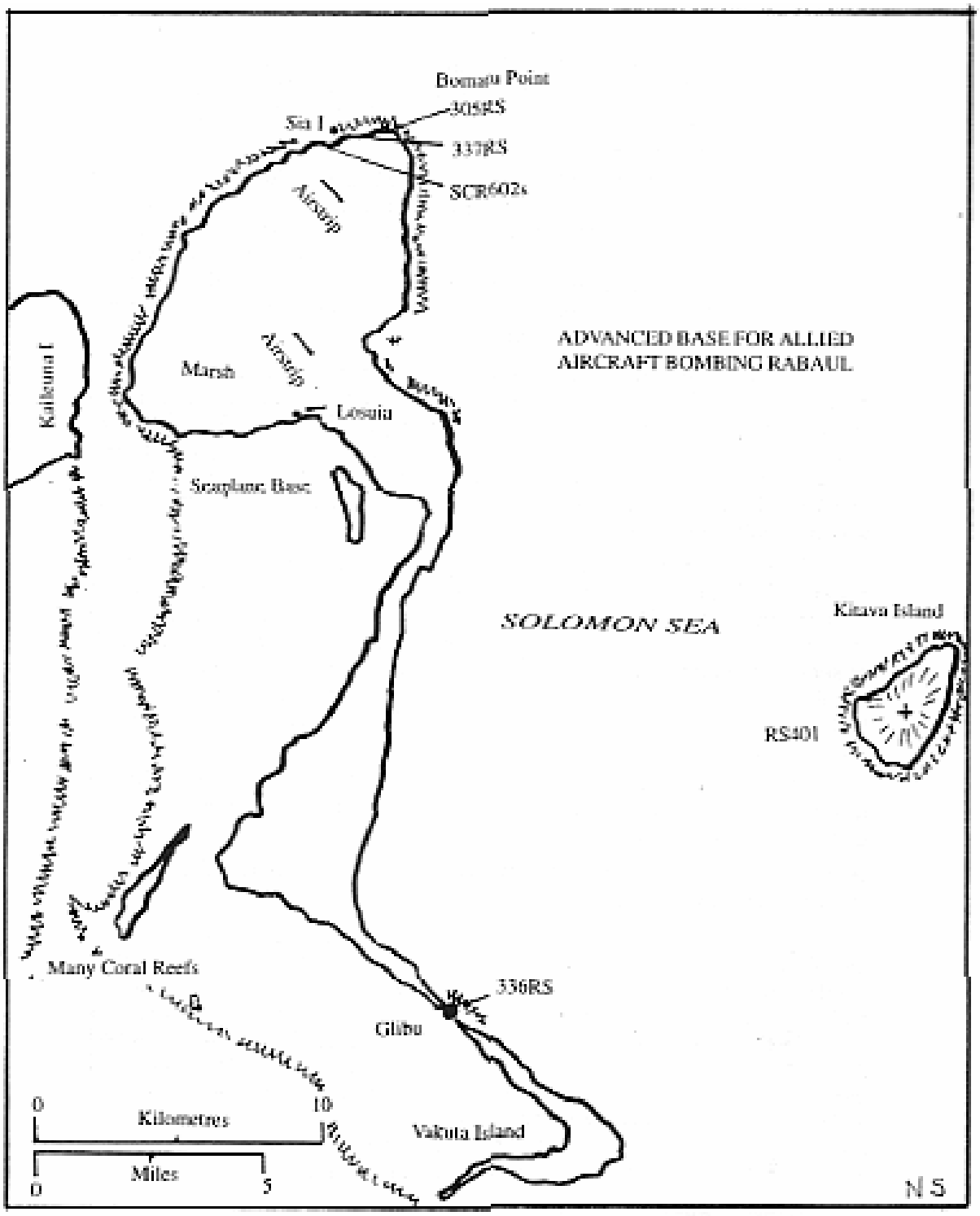
No 114 MFCU arrived on Goodenough Island on 16 June 1943 with 71 Wing, RAAF supplying the first meal. The unit became fully operational on 27 June with place of operation code name of GINGER. Much of the work carried out by the sector during June and July was to provide cover for Kiriwina Island during the landing operation. There was much aircraft activity and many communication problems with which to contend. Radio jamming was suspected to be of Japanese origin.

On 13 August 1943 No. 114 MFCU moved to Kiriwina Island. The last of the unit arrived at BY PRODUCT as a lone enemy bomber infiltrated to drop eight bombs in dispersal bays near the main strip. Radio communication at Kiriwina was much better than that experienced at Goodenough. Aircraft activity was continuous.

American Radar in the Trobriand Islands.

On 25 June 1943 two days after the American landing on Kiriwina the 3rd Platoon of the 710th SAW Company landed from a destroyer. For the first time Light Weight Reporting Units using SCR602s were deployed in the SWPA. Unfortunately some of the equipment was lost, much of it was soaked with water and break-downs were frequent. There was poor coordination with the Army and the SCR602 radars were allotted unfavourable sites away from the shore line. However many lessons were learned and the SCR602s moved out in July to the mainland of Papua New Guinea.

The island was enjoying much superior radar coverage by 305RS than could have been supplied by the SCR602s.



Map - Kiriwina

Japanese fliers were at last aware that it was difficult to give early warning on low flying aircraft especially if the radar was operating near sea level as was the case at Kiriwina. A few miles to the east of Kiriwina lies Kitava, the only high island in the Trobriand group. The Americans decided to place an LW/AW Mk II radar there to get earlier warning on low flying enemy aircraft for Kiriwina had quickly become a very important and active base. Like the SCR602s the gear had suffered water damage and when erected would not function. Accordingly two experienced personnel were sent by PT boat from 305RS to assist. The RAAF radar mechanic and radar operator adjusted and calibrated the station successfully. This was one occasion when Australians were able to return one of the many favours received from the Americans.

American Radars on Woodlark Island.

When the Americans invaded Woodlark Island they took ashore a lightweight SCR602 radar and set up a small plotting board in the jungle and a telephone line to the ack-ack positions. However the old set suffered many malfunctions.

A comprehensive defence organisation was soon established on Woodlark operated by the US Navy ARGUS 1 under the control of the 6th Army, the Naval Base on the island and Vth Fighter Command. Two SCR270s, one SCR602 and an SCR268 anti-aircraft radar fed information to the plotting board in a Combat Information Centre.

This centre was probably the most comfortable and best protected fighter control centre in the SWPA. It was a two-storey air-conditioned building sunk into a hole in the coral. Shipping movements in the area were monitored as were the movements of the PT rescue craft.

When no information from this centre was being received by the Fifth Air Force plotting boards a visit by Capt. Wilde in July 1943 established the reasons why. The limited staff available had difficulty in handling the increasing volume of information coming to hand. Again the procedure being used differed from that of the Fifth Air Force and to complicate matters the plotting grids used on the maps differed. For these reasons full cooperation between the Fifth and Thirteenth Air Forces did not eventuate.

Bombing Raids Across the Solomon Sea.

The trial of strength between the Allied air forces in Papua New Guinea and the Japanese in New Britain and the Solomons reached a climax towards the end of 1943. During the last half of the year many hundreds of aircraft, from both sides crossed the Solomon Sea, northward and southward, laden with bombs and protected by fighters. During this period the radar and fighter control network in the area worked incessantly.

Woodlark Island is about 275 miles south of Rabaul while Kiriwina is about a hundred miles west of Woodlark and 250 miles south of Rabaul. Japanese air raids directed from New Britain against Woodlark were plotted by 305RS on Bomatu Point, Kiriwina. However the largest raid on Woodlark came from Buka in the north of the Solomon Islands. On 11 August the Japanese raided Woodlark in two waves and Kiriwina at the same time. Two days later long ranges were reported on another moonlight attack on Woodlark. The enemy aircraft being then at a latitude south of Kiriwina, flew westward and then northward to make a surprise attack on the airstrip on Kiriwina.

Thereafter the radar operators on 305RS who had been ordered to sweep the northern sector only, made every fourth sweep a full 360 degree turn.

A night time raid against Kiriwina on 5 October 1943 was detected by 305RS at a distance of 185 miles. Three service men were killed and some damage done. During the next two weeks the Japanese attacked the islands of Goodenough, Kiriwina and Woodlark and Finschhafen, Lae and Dobodura on the Papua New Guinea mainland. During this period also the Japanese made rather unsuccessful attempts to use WINDOW. Early warning of these raids resulted in a some of the raiders being shot down. The Allies now had more and superior fighter aircraft flown by well trained pilots. On the other hand the Japanese pool of veteran pilots was fast disappearing.

On 12 October the Allies mustered more than 300 aircraft including Liberators, Fortresses and fighters to attack the Japanese stronghold at Rabaul. A similar devastating blow was delivered on 29 October. In between these major attacks Mitchells and Beauforts continually attacked Japanese bases and Beaufighters (Whispering Death) attacked supply vessels and troop concentrations. For the attacks on Rabaul, Kiriwina was the rendezvous of the Allied air armadas and refuelling point for the long range Lightning fighter escort.

Consequently 305RS plotted aircraft continuously and reported ranges sometimes in excess of 200 miles. The high flying Lightnings gave these distant echoes. An important function during these raids was to pinpoint where any returning damaged aircraft was ‘ditched’ so that crew rescue procedures were carried out immediately. All the information was, of course, disseminated from No. 114 MFCU.

336 and 337RS fly in to Kiriwina.

These two radars arrived by air at Kiriwina the last week in November and staged at No. 41 OBU. 337RS was set up near sea level on the tiny island of Sia just off the North Beach of Kiriwina and about two miles from 305RS. There was an exchange of half the radar operators between 337RS and 305RS. Thus the efficiency of one station was increased and the other maintained.

During its short operational life on Kiriwina 337RS helped to carry out several interceptions of enemy aircraft - excellent training before being deployed to the Admiralty Islands.

336RS was transported in a barge, normally used for dumping garbage at sea, to the southern tip of Kiriwina at Glibu. There the surface of the island was very rough coral devoid of soil. However tree roots reached down through the porous surface for nutriments beneath, resulting with the southern end of the island being heavily wooded. The under-canopy growth had to be cleared before the camp was built. Great difficulty was experienced in getting across the extensive coral reef to shore. 336RS and 337RS were installed so that the crews could gain experience in an active theatre rather than to fill a need at Kiriwina. They were soon to be deployed elsewhere.

Every radar station experienced unexpected incidents. Some were humorous, some serious and some downright frightening. Christmas Eve 1943 at 336RS was a rather quiet night with a little moonlight filtering through the clouds. LAC Bray Bagust recorded that natives reported a strange vessel picking its way through the reef. They were really afraid as some of the Japanese survivors of the Coral Sea Battle had taken up residence there before being captured by ANGAU officers and native police.

Men were dimly discerned aboard plus a flag that appeared to have a red centre on a white background. A searchlight came on and swept the beach and voices could be heard. Faintly at first and then clearly, “How goddam deep is it here ?”

Christmas turkeys and fresh vegetables had arrived. The boat crew who were about to give up the search were told, “They’re down there somewhere.”

“Thanks Yanks for fresh food and thanks again !”

That flag - well it was the personal flag of the pinnace Commander who sent the Christmas fare.

Relocation of 303RS to Boirama and Meimeiara Island.

303RS ceased operation at Tufi on 26 April and moved to Milne Bay aboard the SS *Maiwara*. There the station was regrouped and joined by F/O Sawford. Two days later, aboard MS *Nanagai* and a flat bottomed barge, it moved out of Milne Bay to Boirama Island to the east of Nuakata Island. This was an excellent radar site but a very poor camp site - it had no fresh running water on the island and no boat harbour; only shallow-draught vessels could reach it.

The motor launch *Punai* was provided so water could be obtained from Nuakata Island where a small jetty was constructed out across the coral to navigable water. The MV *Oomoobah* called there regularly with supplies. On 2 September 1943 natives reported a barge floating abandoned. It was secured using the *Punai* and used for ferrying the water supplies in relatively large quantities each trip.

Boirama was also vulnerable to attack especially from the sea. Japanese submarines were likely to be searching for Allied shipping visiting Milne Bay. Station defence incorporated four sandbagged Bren gun posts strategically placed to cover all approaches. Five roomy grass huts were constructed - one being a completely fly-wired kitchen. The operations room was sand-bagged. Practice shoots with Brens and Thompsons were carried out on the miniature rifle range twice weekly. Camouflaging was carried out. These measures were necessary because Japanese air raids against Milne Bay usually approached up the Bay from the east and flying over Boirama Island.

Innovative reporting was introduced at Boirama by seating the W/T operator to the right of the plotter so that he began sending immediately the coordinates were recorded. The time lapse from the time of siting to receiving ‘R’ from Fighter Sector was reduced to 30 seconds.

At Boirama, around the month of July 1943 there was less enemy air activity and many more Allied aircraft in the sky. On 13 July a naval engagement was observed at a distance of 20 miles. The gunfire from one force came from behind Normanby Island !

On 12 August two natives were travelling between Boirama and Nuakata at 1930 hours when they saw a submarine. They first spotted the periscope travelling through the water a few yards from their canoe. When about 50 yards away it surfaced so that the deck was awash for about two minutes before submerging. The sighting was immediately reported to Fighter Sector. All personnel not on duty went to action stations where they remained all night. On 16 August a written report came in from Beurama Mission, Normanby Island, to the effect that a submarine entered Beurama Bay at approximately 1700 hours on 12 August. Following that there was another report from natives of a submarine off Nuakata at 1600 hours on 15 August the day after 303RS personnel had completed the 120 ft long jetty at that island.

An ASV beacon was installed in September and failed within a week for the want of spare 9072 valves. On 22 February 1944 the station ceased operating and all personnel except a skeleton crew went to Port Moresby. W/T operator Rowland Will recalls that the skeleton crew were required to keep the Howards running and the beacon on the air. A new crew returned to the station and commenced operating on 23 March sending plots to 37RS.

Enemy activity in the area had ceased when the station was moved to a more convenient site on Meimeiara Island across a narrow channel from East Cape. This site was suitable for the supportive role it now carried out and was much more easily maintained and serviced.

330RS at Koitaki.

During 1943, the air traffic through 'The Gap' across the Owen Stanley Range was continuous. As the mountains were normally covered by cloud it was decided that the risk of losing aircraft would be diminished if a radar station was installed in a position from which aircraft could be tracked across the mountains. Those pilots who were disorientated, especially in the violent thunder storm activity that was common in the area and for other reasons, could then be guided in safely.

A rough narrow road existed running north east from Port Moresby, met and followed the turbulent Laloki River. In those days the track snaked its way up the cliffs at Rouna Falls with two narrow switch-backs cut into solid rock. To negotiate these sharp corners ascending trucks were required to back until the rear wheels were near, and the back of the vehicle overhanging the precipitous drop. Descending the driver was given a clear view of when to stop and what would happen if he didn't. The writer noted that the door had been removed on the driver's side of the truck. 330RS and its 'rookie' crew were transported up this road to Koitaki Rubber plantation. P/O Les Bell and Sgt Bill Humphries accompanied them to assist with the installation.

The station was erected near the road through a cleared area within the rubber plantation owned by a Mr Sefton. The Australian expatriate population in Papua New Guinea was considerable before the war. There were also many missionaries of various religious persuasions. Many remained there during the conflict protecting their own interests, many became members of ANGAU, some became Coastwatchers and others joined the Australian armed forces while women and children were returned to Australia. P/O Les Bell was one who joined the RAAF and wherever he went he met acquaintances who were able and willing to assist him in his work. There were no great problems for 330RS at Koitaki for Bell and Sefton were old acquaintances.

Across a small gully was the very large house of the owner. It had been taken over to set up a hospital and convalescent depot for wounded and incapacitated troops. A further bonus for the radar men was the chance to attend the movies and other entertainment organised for those convalescent personnel. It was at this centre that the scrub typhus victims from 340RS at Bat Island recuperated. And to top that off there were nurses and other hospital staff who were not on duty all the time.

Koitaki is more than 20 miles from Port Moresby and climate-wise most pleasant as the nights are cool due to the altitude. This station was to operate in what could best be described as a holiday resort. Nearby was a large clear swimming pool with natural rock diving platforms at one side. Regular supplies from Moresby were assured.

A site was chosen in a clearing of Sefton's rubber plant-ation and 330RS was installed early in September 1943. The operators at this station worked with PEs on the screen at all times.

Mr Sefton was living in a small shack about 100 yards from the Doover on the other side of the road. In appreciation of his aid in establishing the radar a cable was run underground to his hut to replace his kerosene lantern light with electric light.

330RS personnel enjoyed this Shangri-la until the station moved to Madang via Port Moresby in August 1945.

333RS at Goodenough Island

In May 1943 the Americans established RS403 at Mwononoia on Goodenough Island so allowing 305RS to proceed to Kiriwina. An SCR270 was used for early warning and an SCR268 for short range gap filling. In November 1943 F/Lt K Bishop and his installation party assisted the personnel of 333RS in the establishment of the station on the hillside a short distance from the old 305RS site. The camp was about half a mile inland from Utiab plantation. A tree was felled across a mountain stream to act as a footbridge as the camp was on the opposite side of the creek.

333RS took over from RS403 at 0800 hours on 4 November 1943 and reported by W/T to No 9 FS at Vivigani - later a land line was used.

On 19 November F/O Katz, with an assistant, used a Buggery Bar to match and phase the aerial system to maximise the unit's performance. F/O Katz recommended that a nearby tree in the normal arc of operation should be removed as it reduced the radar's efficiency. This was not done, however, a fierce electrical storm flattened it on 29 April 1944.

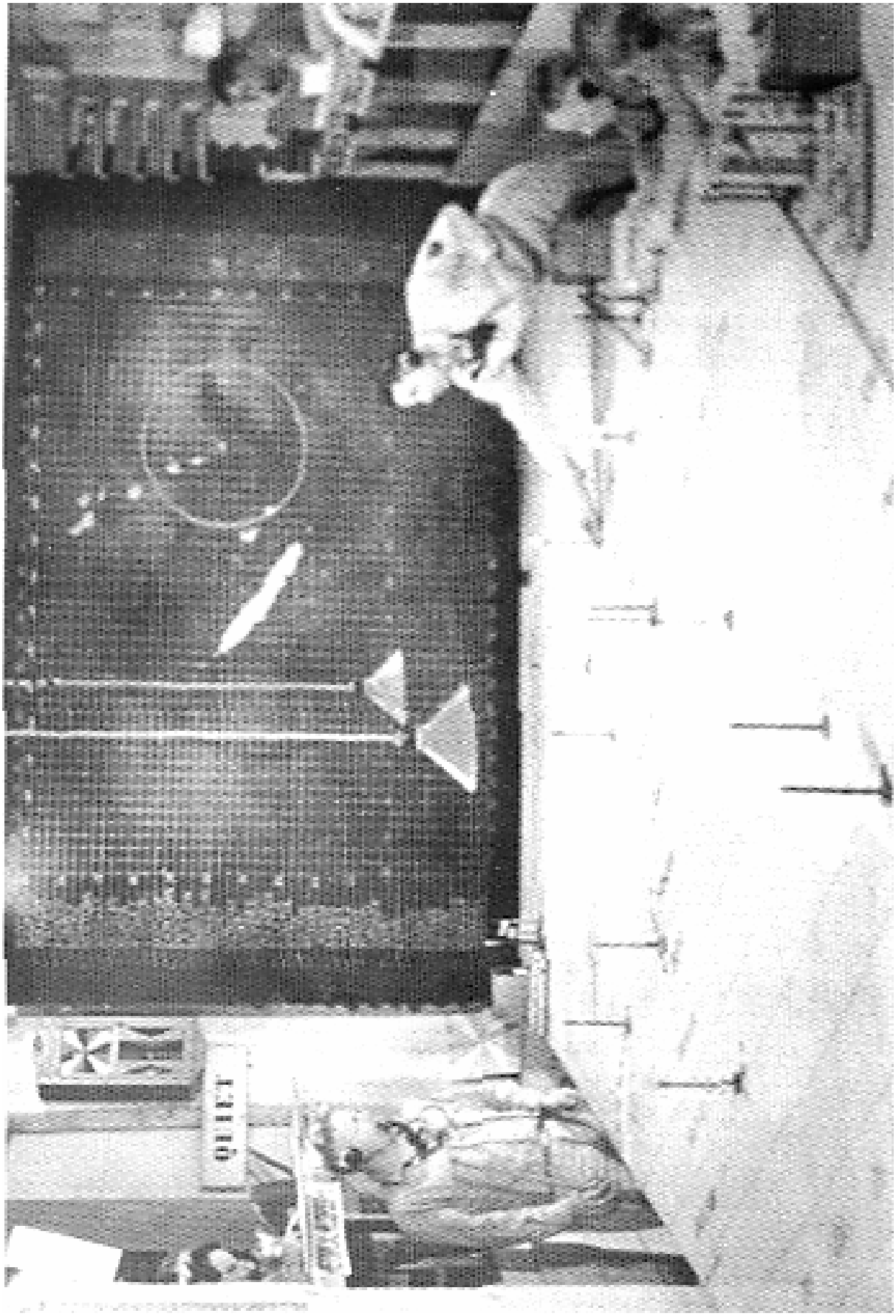
This station performed a typical supportive but nevertheless important role on Goodenough Island. Emergency IFF could often be received from aircraft beyond the normal range of radar. The personnel also maintained and serviced the ASV beacon - as did many other units. Heavy rain squalls appearing on the screen were reported to the weather men. That is why this unit was maintained until the end of the war.

Violent electrical storms are a common feature of the tropics but none more so than those thunder heads which tower over the steep volcanic crags of Goodenough Island. After each storm the creek became a seething maelstrom smashing along the boulder strewn creek bed. So it became a barrier for the changing of shifts at the Doover. But during dry periods the level fell until water ran beneath the boulders so damming and digging was required to maintain the station's water supply.

Power and telephone lines were brought down by storm activity. Buildings were damaged and on one occasion the tree supporting the ASV beacon was toppled. The rugged boulder strewn terrain and the frequent creek crossings played havoc with the unit's transport because it was regularly bogged or broken down as the result of abnormal usage.

Despite the difficulties the station maintained efficient operation until it was withdrawn. A flying fox was rigged to bring the technical gear down from the hillside and across the unpredictable stream.

Departure was aboard the *Betty Jane* in November 1945 after a stint of two years.



CHAPTER 12

American and RNZAF Radars North of NZ

August 1942 to January 1944

Efforts of both the Americans and New Zealanders in air warning was hampered by the types of radar equipment available to them. The Americans never regarded their stations, except for the SCR271, as fixtures on a site and moved them when a more favourable site became available due to enemy dislodgment or some other reason. The difficulty was the weight of equipment on the trucks and trailers but unlike the RAAF they usually had cranes, bulldozers et cetera available to assist them. This led to the increasing use of the very portable SCR602 which was used throughout SWPA by advance echelons in close support of assault troops. One surprising aspect is that the Americans had conducted trials using an LW Type I tower with the SCR602 which would have materially increased the range of their stations and still maintained a light weight transportable system - yet it was not put into practice.

The English CHL or COL stations that the New Zealanders brought into the islands to boost the radar coverage were very much fixed in nature and not suited to a fluid situation - similar to the SCR271. Careful siting procedures were required - there was no room for trial and error. The RNZAF realised the need for GCI capability and their RNZAF 56 and 59RSs, which were English GCI units, had the added advantage of being mobiles.

Lts Adams and Romano were assigned the task of selecting locations for stations as they had been among 20 officers who had received specialist training in England and America.

From their recommendations ten sites were chosen in Fiji and seven in New Caledonia were approved utilising English equipment.

Unfortunately our research has not confirmed whether any of the above stations were actually installed.

US Forces in the New Hebrides (Vanuatu).

By May 1943 the US forces had established a presence in Efate. A Navy shore base and airstrip were at Havannah Harbour to the north of the island and a Marine Corps aerodrome at Quoin Hill. The island defences were under the command of Col George J Schulz, Commanding Officer of the 198th Coastal Artillery. Air defence was charged to the 44th Fighter Squadron. Four trained air controllers of the 13th Air Force's 320th Fighter Control Squadron were assigned to Schulz's command.

A fighter and ack-ack control centre was set up with land-line and radio links to the two established radars. This centre was administered by the ack-ack personnel. Aircraft available were two P39s and one P40 at Vila Drome and 12 unserviceable aircraft at Quoin Hill.

An old SCR271 operated from a hill overlooking Havannah Harbour. Its northward sweep was across a sea scattered with precipitous volcanic plugs. Consequently the radar screen was cluttered with PEs. A 13th Air Force report of 12 May 1943 states, '- it is problematical whether any radar, however advanced in design, would detect enemy aircraft approaching in that direction.'

Opposite page:
Photo: US National Archives 111-SC 209989S
Filter Room. 1st Island Command Headquarters, Noumea, 1943.

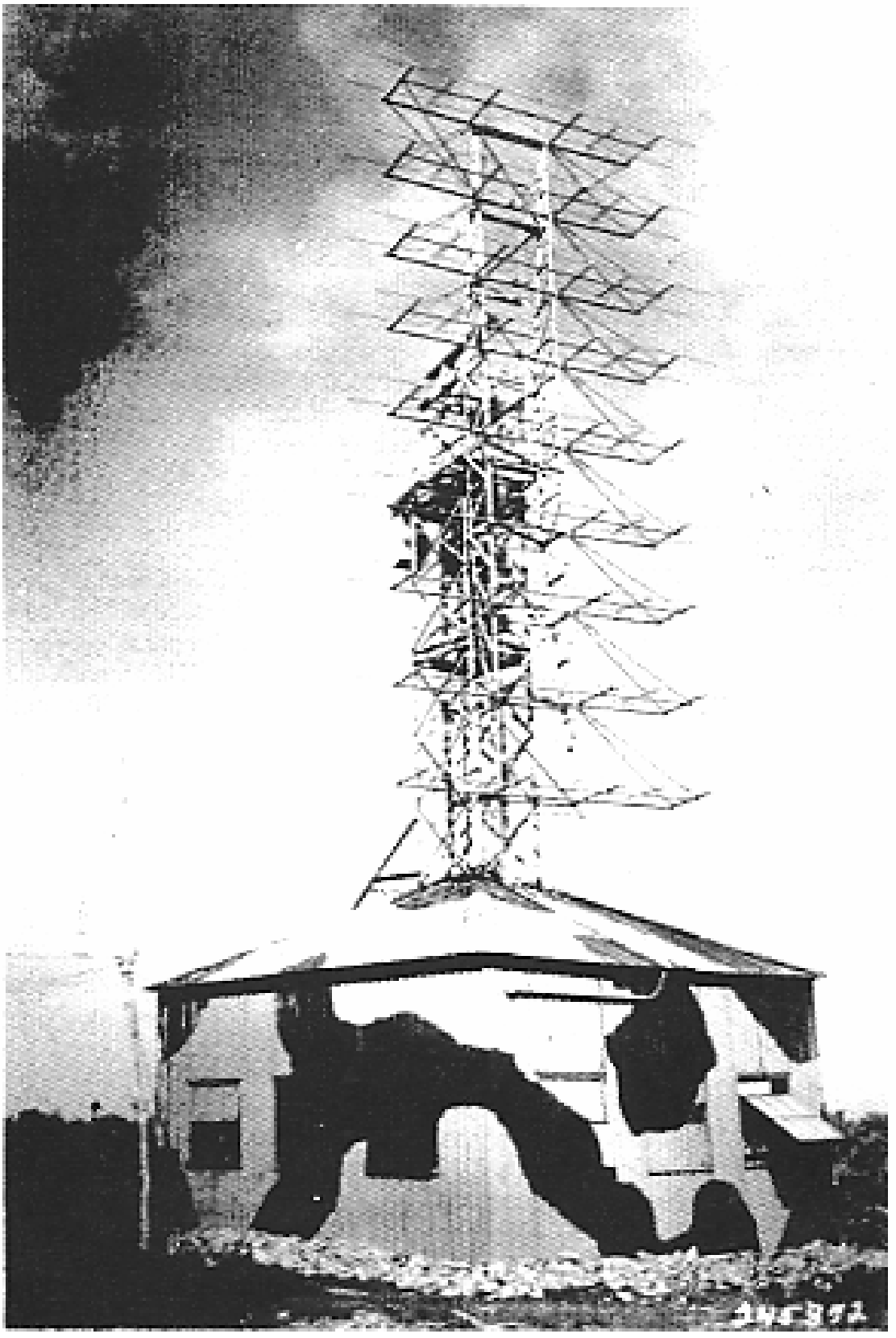


Photo: US National Archives 111-SC 245872
An SCR271 operated by 579th SAW Batallion, New Caledonia, May 1943

The second radar was an SCR270 situated in a swamp at Quoin Hill. Untrained in the application of radar, personnel of the Marine Corps had attempted to make some use of the SCR270 and unfortunately chose a site surrounded by mountains.

The mistakes were rectified when, towards the end of June, the 689th SAW Battalion arrived at Efate. A conventional Fighter Control Centre was established with the usual plotting board. Radio and land-line communications were established with all defence and rescue teams.

At Quoin Hill an SCR270 was installed on high ground and performed much better than the one in the swamp. A monitored radio link was set up with lVth Island Air Command on Espiritu Santo about 200 miles to the north.

Tactical Command remained with the Interceptor Command but the cooperation between Commands remained remarkably good. Joint tactical exercises were conducted with satisfactory results. The defence system was never put to the test by the enemy but the complex was in place should the need arise.

RNZAF Radar Personnel at Tonga.

American troops established two radars on Tonga, one on low lying ground and the other on the highest point of the island. When the American radar personnel were required in Guadalcanal an RNZAF radar party was sent in December 1942 to replace them and work with the 15th Fighter Squadron.

The New Zealanders were instructed on the use of the American radars and had no difficulty in taking them over as well as the fighter control and air warning centre. These New Zealanders were replaced by American personnel in April 1943 and proceeded by LST to Guadalcanal to again replace the original Americans who had previously been on Tonga.

RNZAF 51RS on Norfolk Island

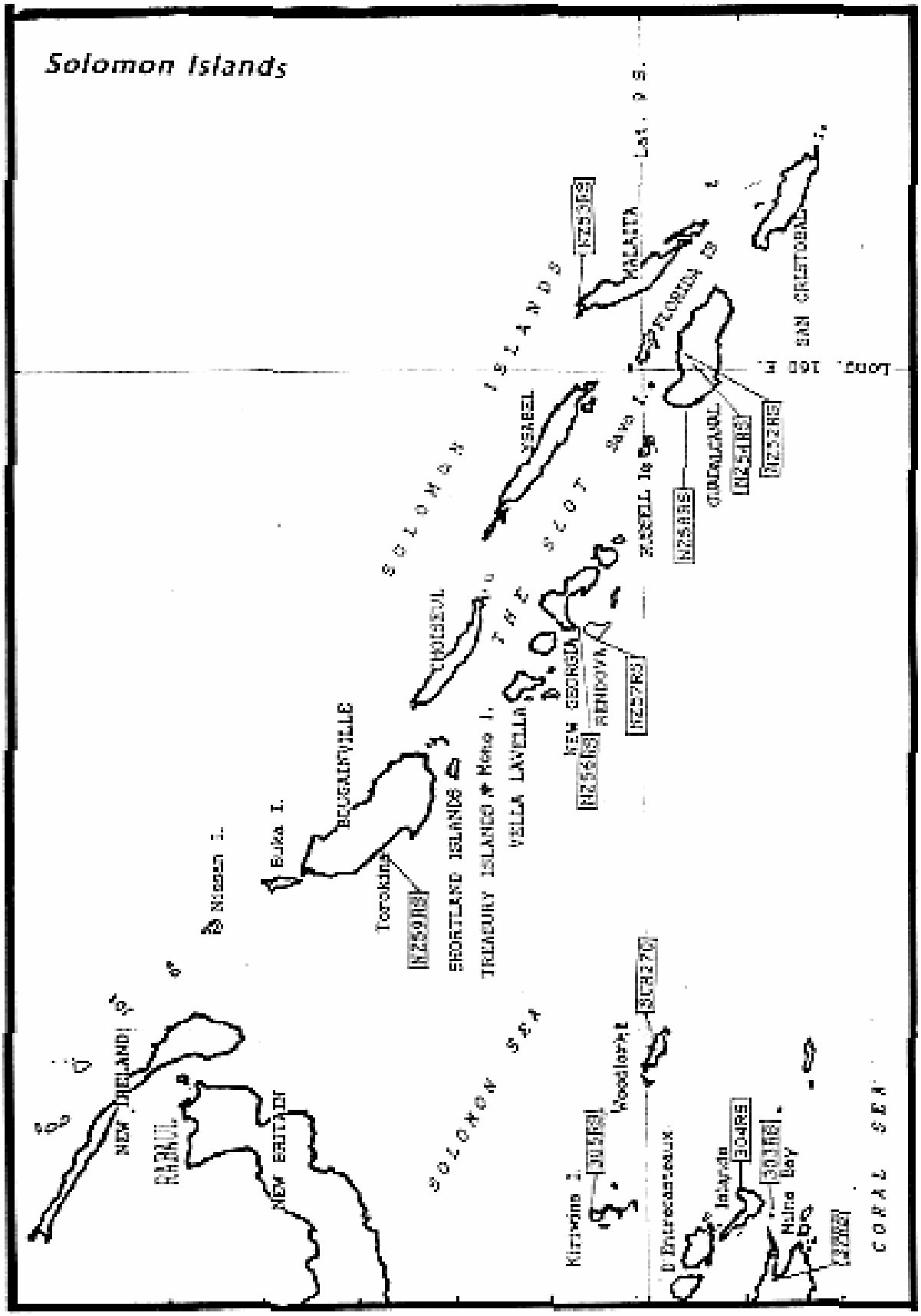
A COL Mk V was installed on Norfolk Island by the RNZAF becoming operational in May 1943. The galvanised iron clad tower supporting the English COL antenna was an Australian AW Transportable Tower - 21 such towers were supplied to the RNZAF. Located on the summit of Mt Pitt at an elevation of 1000 ft it provided navigational assistance to Allied aircraft, particularly those in difficulties; it was retained until the end of the war.

On one occasion during extremely bad weather, with heavy rain and no visibility, a plane was detected by this station. It was flying round in circles - obviously lost. Directed in by radio the incident changed the pilot’s mind about radar. He had never had faith in radar beforehand but now had entirely new ideas on the subject and so joined the ‘club’ of the many other converts.

The Push into the Solomon Islands - Guadalcanal.

Rabaul fell to the Japanese on 23 January 1942. A powerful Japanese base was established and a two-pronged threat to the Allies developed: to the south led via New Britain and New Guinea to Australia,and to the south-east was via a 600 mile chain of the Solomon Islands, threatening to cut off the vital supply line between America, Australia and New Zealand.

Swift action by the Japanese hounded the British Administration out of Tulagi in the Florida Islands and Aola in Guadalcanal by July 1942. Soon after landing at Lunga Point on Guadalcanal they began clearing Lunga Plain as the first stage of constructing an airstrip.


Solomon Islands
Lat. 0 S.
Long. 160 E.
ISLANDS
SOLOMON
SEA
CORAL SEA
NEW IRELAND
NEW BRITAIN
BOUGAINVILLE
Buka I.
Nissan I.
Torokina
SHORTLAND ISLANDS
TREASURY ISLANDS
Mono I.
VELLA LAVELLA
CHOISEUL
NEW GEORGIA
RENDOVA
SANTA ISABEL
MALAITA
SAN CRISTOBAL
GUADALCANAL
Honiara
Kirivina I.
Woodlark I.
D'Entrecasteaux
Alotau
Milne Bay
PAPUA

LOCATION OF RADAR STATIONS NORTH OF NEW ZEALAND

Fiji	RNZAF 59RS - Mk V COL - Malolo Island
Norfolk Is	RNZAF 51RS - COL
Tonga	two US *SCR268s
New Hebrides - Efate	
	*SCR270 - in swamp near Quoin Hill
	*SCR270 - on Quoin Hill
	*SCR271 - overlooking Havannah Harbour

SOLOMONS (Please refer to map on opposite page)

Guadalcanal	
	*SCR270 - Pagoda Hill near Henderson Field
	*SCR270 - Radar Hill, 1 mile SE of Henderson Field
	*SCR270 - Koli Point
	*SCR270 - Beaufort Bay, S of West Cape
	RNZAF 52RS - RWG/GCI - SW of Koli Point
	RNZAF 58RS - Mk V COL - West Cape
	RNZAF 59RS - GCI - relieved NZAF 52RS for m'tenance
Malaita	RNZAF 53RS - COL MK V - Cape Astrolabe
Russell Is	
	*SCR270D - NE of Pavavu I.
	*SCR270B - High mountain on Banika I.
	*SCR270B - West coast of Banika I.
New Georgia	
	*SCR588 - GCI - Kokohale I. - Munda
	RNZAF 56RS - GCI - Kokohale I. - Munda
	*SCR270 - Visu Visu Point
	RNZAF 57RS - West coast of Rendova
	*SCR270D - On small island off Rendova
	*SCR270D - N of Rendova
	at Segi - *1/SCR271, *1/SCR588B, and *5/SCR602s
Vella Lavella	
	*SCR270 - Biloa Mission
	*SCR270 - Boko Mission
	*SCR270 - Pakoi Bay
	*SCR527 - Pakoi Bay
Treasury Is.	*SCR270 - Mono I.
Bougainville	
	Torokina - *4/SCR270s
	RNZAF 59RS - Cape Torokina
	RAAF 320RS - Puruata I.
Green Is.	
	*SCR270 - E coast of Nissan I.
	*SCR527 - Pokonian Plantation, W coast of Nissan I.
	*LRAW - W of Tangalan Plantation
	*LRAW - SE of Tangalan Plantation
	*2/SCR602s E coast of Nissan I.
	RAAF 313RS - SE of Tangalan Plantation
	RAAF 311RS - W coast - Pokonian Plantation
Emirau	- St Mathias Group
	*LRAW - SW of airstrip
	RAAF 335RS - replaced the LRAW

* Un-numbered American radar station

The foresight of Lt/Cdr Eric Feldt of the Royal Australian Navy provided valuable assistance during this phase of activities. Mountainous jungle-clad interiors of these islands afforded ideal locations and places of refuge for his intrepid Coastwatchers. From their Teleradios came regular terse reports on Japanese activities. Due to the fortunate breaking of the Japanese message code the Allies were well informed on the deployment of Japanese forces and aware of their intentions.

The Americans decided on a bold move**.**

As the Japanese were congratulating themselves on the completion of the airstrip on Guadalcanal, Operation CACTUS was launched. Taken completely by surprise, the lightly defended airstrip was soon captured by the US Marines late on the afternoon of 8 August 1942 - the strip was renamed Henderson Field. The Marine General Vandegrift counted himself lucky that the Japanese had offered little resistance for the landing was a shambles. Supplies were dumped on the beach in hopelessly mixed-up piles and men wandered about waiting for orders.

Guadalcanal was the first land victory by American Forces over the Japanese. In our opinion Guadalcanal was the turning point in the war in the Pacific.

During the invasion fighter control was from the command ship and the fighters flew from carriers. Finally both operations were land based.

A 10 mile perimeter was established to meet counterattacks. The Japanese reacted violently and the American grip on Lunga Plain was tenuous for some months. Enemy troops were withdrawn from other war zones to augment the all out attempt to recapture the airfield.

From this time the American and New Zealand radars began to play an increasingly important role in the recapture and defence of the Solomon Islands.

Early warning radars and coastwatchers forewarned each time ‘the Tokyo Express’ raced down ‘The Slot’ (New Georgia Sound) under the cover of darkness. Successive desperate attempts were made by the Japanese Navy to support their troops on Guadalcanal with supplies and reinforcements. In the series of encounters, on land, sea and air, from August until November 1942 the losses on both sides of shipping, aircraft and highly trained men were horrendous. During the Battle of Savo Island the HMAS *Canberra* was sunk. The US Navy lost some 14 ships, ranging from aircraft carriers to destroyers, with another eight or so being damaged before the overall campaign ended !!

The performance of American shipborne radar during these actions is well documented in Geurlac’s *Radar in World War II* commencing at page 942. Therein he states,

> In these night actions not only was surprise maintained by our surface radar but all firing was done by radar controlled guns. Shortly after midnight the search radar on the Washington detected the enemy force and our battleships opened fire. The opening range on the main battery was 16,000 yards and the first target was sunk on the first salvo.

Returning to the use of land based radar during the Solomons campaign, the following is a brief chronological account of the training and deployment of the second air warning SCR270 to set up on Guadalcanal. Three technicians and six radar operators under command of Marine Corps Lt Dermott M MacDonnell were attached to Marine Aircraft Group (MAG)

12 at Camp Kearney, California. After four weeks training during June and July 1942 they were considered ready for active service.

The 10 personnel and equipment joined Group 23 at Oahu, Hawaii, on 3 August 1942 and immediately proceeded aboard ship to the island of Efate in the New Hebrides. Transhipping called for close supervision as the longshoremen handled the radar equipment like ‘So much scrap metal’.

On arrival at Guadalcanal on 28 August they found that the Third Defence Battalion had already installed an SCR270-B on Pagoda Hill near Henderson Field. The new station arrived when the usual morning Japanese raid was imminent so the men went ashore and the vessel took all the gear with it to the safer waters of Tulagi Harbour. There the radar gear was unloaded and it took a week to retrieve using LCTs.

Meanwhile a site had been selected on a hilltop 75-100 ft above sea level and a mile south east of Henderson Field. Dense jungle immediately below the brow of the hill spread away to the south but ground looking across Henderson Field and to the north was bare. The Japanese lines were about 500 yards to the south but the Marines were between the radar site and the enemy.

> We moved the tower into position with a Caterpillar tractor. The other two vans which were considerably lighter were dragged from Kukum Beach to ‘Radar Hill’ with two ten wheel trucks. This was no small feat in itself as the road leading from the beach was just a deep rut through the coconut trees.

Two days after the radar was in position it was on the air and recorded a range of 120 miles. Night bombings by the enemy followed by nuisance bombing and strafing by day interfered with proceedings but also reinforced the urgency for the radar to remain operational. The old battered SCR270 on Pagoda Hill was difficult to keep on the air by this time. Soon after it was put out of commission by Japanese naval shelling.

It is known that an SCR270, code-named Radar 1, was set up in the Aru area in early October. Of two other SCR270s that were landed one was damaged by a naval shell and the other damaged by bombs. Radar 2 was built from the remains of the two and went into operation near Henderson Field in October 1942. Unlike most forward radar stations this one had ample spares from the salvaged parts. This was a real windfall as the supply line was very thin indeed.

Enemy air raids were constant, a near miss of the radar by a string of bombs led to all available Marines and natives pitching in to sandbag the installation. Even after sand-bagging, the radar was put off the air whenever bombs fell nearby as the concussion caused relays to open. A strafing attack did no damage to the personnel or equipment.

Once on the air the radar operated 24 hours a day except when it was absolutely necessary to go off the air for maintenance. With a station complement of 11 personnel, only two were available for each four hour shift. While one worked on the CRT the other did all the other necessary jobs. Relief from operating occurred after a maximum of 30 minutes. RAAF practice in NWA area was that the operator who picked up a raid stayed on the cathode ray tube throughout the raid wherever possible.

Large daylight raids were tracked in and the last plot given at five miles. One more sweep of 360 degrees was made followed by a dive for the nearby slit trenches.

However, all of the men lived reasonably well in a large storage tent. Sleeping was under a mosquito net in the open during fine weather. Food was obtained by joining the chow line of the nearest marine unit. The diet was generally dehydrated vegetables, Spam, corned beef, Vienna sausage, sauerkraut and rice.

Use of Air Warning Information.

Radar information supplied by the two radars at Guadalcanal in August 1942 was used quite differently from that provided about a year later by 305RS on Kiriwina Island at approximately the same latitude but 400 miles to the west. The RAAF station fed into a complete fighter control network so that a number of fighter control units had access to the information.

Initially at Guadalcanal it was a closed system. The two radars fed information by land-line to two 90mm gun batteries, two or three command posts and to Col Baylor, fighter director (controller), stationed at Pagoda Hill. A radio equipped command car was used as a communication centre following the landing and was known as RECON. The centre was later established in a hillside dug out near Radar 2 and a plotting board set up. Both radars fed information to it by land-line. The crew was made up of a driver and a radio operator.

Alerted by the approach of an unidentified aircraft the fighter director with his two helpers proceeded immediately about a mile to a special spot near the fighter strip. There he could plug into the telephone line to receive verbal plots from the radar stations. Interceptions were controlled from that point.

In the middle of October 1942 MAG 14 arrived on the island to take over Radar 1 and Radar 2. At the same time the 9th Marine Defence Battalion landed and set up another SCR270 at Koli Point. It, too, reported into RECON.

These were the American Marines' radar men fighting the battle for Guadalcanal and being in every way self sufficient. Once the task in hand was completed they were to retire, regroup and move on to another assault against the enemy. Following them came a more complete air warning system set up by one of the SAW Battalions.

Early Japanese Raids on Guadalcanal.

The tendency for the Japanese to operate in a stereotyped manner has already been noted in their attacks on Milne Bay. They did much the same in the Solomons. Most of the raids on Guadalcanal came down 'the Slot' at high altitude (25-30,000 ft) from Bougainville. Scarcity of pilots, aircraft and fuel denied the luxury of standing air patrols. Radar early warning of around 40 minutes allowed fighters to gain this altitude about the time the raiders were dropping their bombs. Interception usually took place immediately afterwards.

However the Japanese became aware that they could approach Henderson Field by flying around the Russell Islands and coming across the mountains from the south. Thus the Americans had only a few minutes warning. What was needed was an air warning station in the Beaufort Bay area. As the Japanese still had strong forces in that part of the island an infantry battalion accompanied the MAG 14 Reporting Platoon which took an SCR270 there. Beaufort Bay and Koli Point reported to RECON by W/T on 5700 k/cs.

During February the 670th SAW Company arrived on Guadalcanal with two Reporting Platoons and a Plotting Section. The 1st Platoon took over the idle Radar 1 and relocated it at Vigale on the northern tip of the Island where it began operating on 15 February. The 2nd Platoon took over Beaufort Bay.

The Plotting Section of the 670th SAW Company set up a board near ComAirSols and it received plots from all radars at the same time as RECON. Aircraft control remained with the navy at RECON but received assistance from the 670th plotters.

New Zealand Radar to Guadalcanal.

Meanwhile because of the shortage of equipment and trained personnel (Radar 1 was now on stand-by only) the Americans appealed to the New Zealanders for assistance in both areas. RNZAF 52RS, a GCI, was established and the personnel trained in January 1943. Three American officers and an NCO joined the unit for training purposes before moving.

Most of the radar sites on Guadalcanal, up to this time, had been selected by Lt Adams. Towards the end of February 1943, S/Ldr C J Banwell of RNZAF led an advance party to Guadalcanal and selected the site for the British GCI. The advance party included F/Lt C A Mills RCAF, three American Controllers, one New Zealand Controller with ten RNZAF airmen.

The main contingent landed from the USS *George Clymer* on 1 March 1943 and the GCI was operational on its substantial concrete foundations on 21 March. The radar crew had yet to develop a working system with the intercept fighters. While this was happening the radar coverage was expanded to the surrounding smaller islands. This increased the warning time so that fighters could be scrambled in time to be placed in a position of advantage.

Warning from Russell Island Radars.

A platoon of the 579th SAW Battalion began operating an SCR270-D on the north east of Pavuvu in the Russell Islands in March. At about the same time the 10th Marine Defence Battalion took an SCR270-B into the Russells and operated it unsuccessfully on a high mountain on Mbanika. Continuous cloud cover causing moisture problems in the equipment and supply difficulties resulted in the station being re-located on a hill on the north eastern side of the island. The US Navy placed an SCR270-D on Mbanika looking west. All these stations reported by W/T to Guadalcanal on 5,700 kc/s. Traffic became very congested during heavy raids. Eventually a plotting board was set up and only filtered plots were sent from the Russell Islands to RECON.

Now that there was an effective air warning network in operation more and more Japanese aircraft set out on a one way sortie. The last of the regular large daylight raids was the 100 plane raid of 7 April 1943. Later in June there was a big raid during the American landing on Munda. The Japanese turned to night raids and the Allies placed greater reliance on the GCI radar for interceptions.

Both the fighter pilots and controllers had to gain expertise in the art of aircraft interception. For this reason there were many failures at first. The Japanese planes came in at 18,000 ft or above and the P70s had difficulty getting to that altitude and were often outrun. The SCR540 AI equipment gave problems at high altitude mainly with break down of high voltage insulation. Gradually a night raid procedure evolved and took the general pattern as follows.

Guadalcanal

GCI Operations on Guadalcanal.

The GCI radar RNZAF 52RS on Guadalcanal was appropriately code-named KIWI. The Controllers were from the RNZAF, US Marines, US Navy and US Army. Finally they got their act together to the detriment of the Japanese, working in harmony using the following procedure:

1. Outlying early warning radars reported an approaching raid to ComAirSols and a yellow alert was sent out so that hospitals and all GCI radars, searchlights and ack-ack positions came to readiness. P70s were scrambled at the appropriate time.
2. As the raid developed the red alert was put out and sirens sounded. Meanwhile the Duty Controller at KIWI directed the fighters into a favourable position for interception.
3. As the raid appeared on the screen of the GCI radar the controller at KIWI attempted an interception.
4. As the raid neared the target the Controller warned off the P70s, ordered the searchlights on and ordered the P38 fighter to attack. This attack was controlled from RECON.
5. As the raiders arrived at the target the P38 was warned off and the ack-ack released.
6. As the raiders left, RECON controlled another interception by the P38 followed by another attempt controlled by KIWI.

All the above action was concurrent with the information being continuously fed into the plotting boards by the various radars plotting the enemy.

Accurate plots and heights received from the GCI radar contributed greatly to the destruction of 33 enemy aircraft during a daylight raid of dive bombers and fighters on 7 April 1943. It was also claimed that most of the Japanese planes in the June raid were shot down.

Relief for Papua New Guinea.

The Japanese used many of their Rabaul based aircraft on missions in the Solomon Islands. This reduced the number of air raids against the Allies advancing in Papua New Guinea, particularly in the occupation of the Trobriand and Woodlark Islands. 305RS was established on Bomatu Point, Kiriwina without any opposition. Similarly the American Navy operated SCR602s and an SCR270 on Woodlark Island with little hindrance from the Japanese.

More RNZAF Radars to the Solomons.

Despite the acute manpower shortage New Zealand responded to the American plea for help and prepared two more mobile GCIs and four COL sets for forward areas. To support these radars in the field No. 62 Radar Squadron (RNZAF) was established in Guadalcanal during August 1943.

RNZAF 53RS was deployed to a very isolated position on Malaita at Cape Astrolabe. The set was an English COL Mk V similar to that taken to Milne Bay by the RAAF. Many comparable difficulties were experienced in the installation phase. Most of the technical troubles were traced back to damage to the equipment during transit. Once ashore on the reef bound coast, swampy terrain and streams impeded progress to the foothills. While the RAAF

sited their 37RS on a low rise at Milne Bay, the RNZAF were able to make their way up Tolbaita Hill with this heavy equipment to 635 ft above sea level.

The location was not a health resort. Radar personnel were involved in the construction of the access road - even to moving viscous clay literally by hand while on all fours. Dysentery struck within 10 days quickly followed by malaria, jaundice, ear infections and tropical ulcers were also very prevalent. Eleven men were evacuated over several days during the first half of September and the daily sick report for the unit ranged from 13 to 23. Health did improve when the men shifted to the healthier hill top camp moving away from the filthy conditions associated with the construction of the access road.

RNZAF 53RS operated there with Army protection from 20 October 1943 until February 1945. Like many other Allied radars in the Pacific this one performed a sentry and support role. It served as a navigational aid and directed rescue missions to downed aircraft. For January 1944 2,260 aircraft tracks were plotted.

RNZAF 56RS, a mobile GCI unit similar to that used at KIWI but was mounted on US Army International six-wheel drive trucks. As no suitable site was available near Munda airstrip a flat coral cay named Kokohale was chosen and the camp placed about 400 yards away on Kilivirae Island. The station was operational on 30 September 1943. A number of successful interceptions were performed. During one interception the operators observed the use of WINDOW in the Solomons for the first time. A fixed American GCI was being installed on Kokohale Island at the same time but did not operate satisfactorily. The New Zealand station was eventually handed over to the Americans in February 1944.

RNZAF 57RS, a COL unit, became operational on north side of Rendova Island in November 1943. This station was sited on a bluff 300 ft above sea level and within view of Munda airstrip. A GMC truck carried the shift workers to and from the camp on the coast. This station was also transferred to the Americans on 15 July 1944.

RNZAF 58RS, a COL unit, was operational at West Cape of Guadalcanal in January 1944. This was a very isolated location on jungle-clad terrain above the reef fringed shoreline. During foul weather the supply LCM was unable to approach the shore and air drops became necessary.

RNZAF 59RS, a mobile GCI, was set up on Guadalcanal to replace RNZAF 52RS (KIWI) while that station was being overhauled. Later it went to Torokina.

Because of the necessity of relief of personnel and the unpredictable onset of malaria the interchange and relief of personnel was constant. In April MAG 12 relieved MAG 14 and operated Radar 2. In May New Zealand personnel trained on the SCR270 came to Guadalcanal to operate at Radar 2. A New Zealand contingent took over the SCR270 which the 9th Marine Defence Battalion had relocated from Koli Point to Windmill Hill in June. These sorts of changes had to be made as seen to be expedient at the time.

The distribution and installation of the Mk III IFF, a vitally important piece of equipment, began in the middle of May 1943. Apart from the technical problems that had to be ironed out operational procedures were not always adhered to. For instance, responses were often received from our aircraft long after they had returned to base. The self destructive responder carried in the aircraft also caused some apprehension on the part of the crew.

The New Georgia Push - June 1943.

When the 578th SAW Battalion arrived at Guadalcanal aboard an LST its SCR270-D was damaged in a bombing raid. Replacements were obtained from Florida and the Battalion set up on a small island off Rendova. The 9th Marine Defence Battalion set up their SCR270-D on Rendova looking north. Argus 11 arrived at Guadalcanal in readiness for the New Georgia operations. They had an SCR271-D, an SCR588-B and five SCR602s. The airstrip at Segi Point was protected by SCR268s and SCR602s. In July a SCR270-D was get up at Segi by Lt Squiros of Argus 11.

After the capture of Munda airstrip Lt Eggleston took an SCR270 to the north west tip of New Georgia. In September the 670th SAW Company began to install the SCR588 GCI at Kokohale Island just off Munda. It has already been noted that while this was being done a New Zealand mobile GCI was set up and operated with American Controllers of the 319th Fighter Control Squadron.

A comprehensive supply of equipment was received about this time by the 670th SAW Company to set up an elaborate air warning system combining ComAirSols and RECON. But this was not done as the Japanese had ceased attacking Guadalcanal.

During the handover-takeovers and shuffling about of radars to various sites a variety of code names were used for individual stations. The code names of stations were often changed, for instance that of the station on the north western tip of New Georgia was first known as BULLDOG but later as POLARIS. Towards the end of the Solomons Campaign most of the radars had names like SIRIUS, JUPITER, POINTER, POLLUX, VENUS and so on possibly reflecting someone's concern with astral navigation.

Defence of Vella Lavella.

The 4th Marine Defence Battalion took an SCR270 radar from Russell Island for installation at Vella Lavella. After it and the replacement that followed were damaged by bombs at the beach-head one workable unit made from the two was set up and installed at Biloa Mission. Its code name was VENUS. To improve the cover another SCR270 was set up at Boko Mission in September. The 578th SAW Battalion relieved the 4th Defence Battalion and set up another SCR270 at Pakoi Bay by October. The last two installations were known as SIRIUS and JUPITER respectively. A Marine Night fighter outfit operated successfully at Pakoi Bay in October using an SCR527. Its name was MOON.

An Argus unit took two SCR270s in and one was operated satisfactorily at Mono but little is known of this operation.

Bougainville Operation - October - November 1943.

The 3rd Marine Defence Battalion and Argus 11 took four SCR270s into the landing at Torokina. They were followed two weeks later by the RNZAF 59RS, a GCI, that had operated at Bougainville while KIWI was being overhauled. When the siting party led by F/Lt G Goetz RNZAF arrived they found a very confined beach-head cluttered with all types of equipment, supplies and troops. No ideal site was available but a location was selected near the sea and the fighter strip. The radar equipment was landed from an LST at Torokina on 4 December 1944 and was operational on 10 December. Despite the presence of dense jungle in the main direction of sweep the results obtained were good. To make matters more difficult the area was bombed regularly, shelled several times by Japanese batteries and also suffered several earthquakes.

In January the New Zealanders were able to move to a better site on the top of Cape Torokina. Hostile aircraft were detected much earlier and the incidence of successful interceptions increased. During January 1944 the unit plotted 103 enemy aircraft of which 24 were contacted by American fighters. Five were shot down and there were two probables.

The Japanese used WINDOW on many occasions in an effort to avoid detection. In August RNZAF 59RS was handed over to the Americans. By this time the Japanese air activity had been reduced to an occasional single aircraft on moonlight nights.

Many changes took place towards the end of 1943. Previous deployments had been Reporting Platoons or Companies from certain Battalions. The 551st SAW Battalion arrived at Guadalcanal as a complete operational unit. It took over all the air warning facilities north of the Russell Islands except the GCIs on New Georgia, Vella Lavella, Treasury and Bougainville.

By this time the radar chain was complete and working well. Mark 111 IFF was installed and working. All plots were passed as friendly or enemy. The major information centres were at Guadalcanal, Munda and Bougainville while the subsidiary centres were at Russell, Vella Lavella and Treasury Islands. Land-lines were used where possible and powerful transmitters installed in places with which communication proved difficult. These transmitters were often of New Zealand manufacture.

The northern fortress of Torokina was secure. The area held was small and vulnerable. Outer defences were manned by Marines. Backing them were infantry from the Pacific Island Regiments. Crowded within this double defensive ring were all the trappings of war with a very active airstrip and all its support facilities.

The Japanese who controlled the remainder of the island were not unduly harassed by the Allies and there developed a situation of ‘live and let live’. So far as the Pacific war was concerned the Japanese in the Solomon Islands were now neutralised.

CHAPTER 13

Central New Guinea

February 1943 to April 1944

Radar Warning for the Infantry

Absence of any back radiation problems and the advantage of portability made the LW/AW radar the best available in early 1943 for operation within a land locked area surrounded by mountains. As the Allied troops progressed westward through inland Papua New Guinea radar was to serve three very important functions. A few minutes warning of the approach of enemy aircraft given by the firing of three shots whether from a rifle or Bofors was sufficient to save many lives among the infantry in action. Secondly troops in the 'roadless' and mountainous interior depended on aircraft for supplies. Dropping points were more often obscured by clouds as were the airstrips where constructed. Radar was able to guide the aircraft to any predetermined point. Also warning could be given to incoming air transports of enemy fighter activity in the vicinity of their destination. It has already been shown that 50RS carried out these functions very well at Dobodura.

306RS at Bulolo.

P/O R L Harrison formed 306RS at Townsville, Qld, on 20 October 1942 and after a submarine scare in the Coral Sea arrived safely at Port Moresby aboard HMT *Taroona*. A camp was established under canvas at the head of the gully near Konedobu. While billeted there the operators had shift experience on 138RS, the RWG/GCI, at Waigani.

On 25 February 1943 all equipment was loaded aboard eight Douglas transport aircraft at Ward's Strip. Storms over the Owen Stanley Range delayed take off until next day. Finally 306RS landed on the strip at the recently recaptured and deserted gold mining town of Bulolo. Aided by the USAAF with transport and the local ANGAU-recruited workers the station was erected on a small plateau about a quarter mile from the strip. Nearby across a small gully was an American Bofors gun emplacement.

Operations began at 1325 hours on 7 March with plots going by land-line to 11 Fighter Sub-Sector and by W/T to No. 4 Fighter Sector in Port Moresby. Surrounding mountains limited detection to about 80 miles. On 9 March 24 Mitsubishi bombers and 24 Zeros escaped detection by flying from Lae to Wau screened by the 9000 ft mountains to the east. The operators improved their skills in tracking aircraft through mountainous country so much that they were soon to be congratulated by the Fighter Sector.

All kinds of building materials were ready to hand in the town. Well trained and innovative mechanics soon erected a vertical quarter wavelength radio antenna made from a length of heavy aluminium power line. They even became plumbers and gravitated water to the quarters through salvaged galvanised pipes. Electric power was distributed to all surrounding military units provided from a gold dredge electric motor doubling as an alternator driven by a resurrected truck engine. The truck engine was minus its carburettor so one was requisitioned from No. 41 Wing and surprisingly enough supplied without question.

On 15 May 20 Japanese bombers were detected flying towards Wau. Two days later 22 enemy bombers were plotted in the same direction. On 6 June Wau was warned of the approach of 18 Japanese bombers.

306RS spent its whole operational life at Bulolo. As the land war moved away the airstrip remained a vital supply point and the radar continued to perform a valuable navigational role. However there were plenty of Japanese wandering in the surrounding hills and there arose a defence problem as the infantry moved out. Supplementary guards were provided from No. 41 Radar Wing, Port Moresby.

Some personnel became entrepreneurs. Gold was extracted from the riffles in the abandoned dredges, melted down and cast in the shape of spanners. These items were then painted black and brought home after the war and converted into cash.

Speedy Relocation - 50RS - from Dobodura to Tsili Tsili.

Army commanders, by this time, had come to realise the great importance of radar in their planning. A special approach was made to S/Ldr Bert Israel for the location of a radar to cover the operations in the Markham Valley leading up to the capture of Lae. Following are statements made at interviews with the leaders in this action. The first from S/Ldr Israel:

> The Allies' objective was to take Lae which was a major base for the Japanese at the time. And to do that the intention was to land troops in the Markham Valley and approach from the land instead of from the sea which the Japanese had prepared for. To get a large number of troops into the Markham Valley was going to be a very big parachute drop with equipment as well.
> Again, General Whitehead refused to move into this area without radar cover having been established in advance. The only one available was the one at Dobodura, No. 50. The station had to be dismantled, transported and erected at Tsili Tsili where it would give a reasonable coverage of the Markham Valley in the shortest possible time. From the time it ceased operation at Dobodura until it was operational at Tsili Tsili was three and a half days. For this work we received a congratulatory signal from the Vth Air Force.

Two very experienced officers were chosen by Israel to supervise the movement of 50RS to Tsili Tsili. They were F/Lt Keith Bishop who had already assisted in the installation of many stations and P/O Les Bell whose knowledge of the locality and conditions was invaluable. F/Lt Keith Bishop has stated:

> Together with some of the installation party we left Port Moresby in a DC3 and flew to Dobodura with the authority to arrange for the movement of Radar Station No. 50 from its existing site to a new location at Tsili Tsili with as little delay as possible. After a short discussion with the Commanding Officer, F/O Smith, a start was made to dismantle all technical and barracks equipment and have it transported to Dobodura airstrip by jeep and trailer and have it loaded into aircraft which had been dispersed on the outskirts of the airstrip.
> Early in the morning the flight took off with all equipment and personnel aboard and headed for Tsili Tsili. Along the way we received a message to divert to Port Moresby due to Japanese air activity up front. When we landed at Port Moresby we were instructed to remain in our aircraft until the all-clear was received. After remaining on the ground for some time we continued the flight to Tsili Tsili without further incident.

From F/O Les Bell:

The site of the radar was at the headwaters of the Marilinan River, a small fast flowing tributary of the Watut River which, in turn, flowed into the Markham River. I met an ANGAU chap there whom I had known pre-war and he transported me everywhere in his jeep.

The station jeep and trailer were used to transport the radar gear to the site. At one point the track went along a siding, down a bank and then around a curve. On one occasion the trailer tipped over while rounding this curve and F/Lt Bishop was lucky to escape. After crossing the river there was about half a mile of dense sago swamp after which was high ground where we put the barracks. About another thousand yards away from the jungle, on the edge of the kunai grass, we put the Doover.

Just after the radar was operational there was an air raid. A Zero was shot down and went into a power dive heading it seemed straight for the Doover. It went into the swamp no more than a hundred yards away. We went over and there were a few broken branches and a pool of muddy water with blood spreading on the top with a few pieces of debris. We were unable to reach the wreck with a long bamboo pole.

Extract from Official Records of Move to Tsili Tsili:

16.8.43 F/Lt K Bishop arrived to initiate move. No. 50 Radar Station off the air at 0940 hours.

17.8.43 Flight of transports departed Dobodura 0700 hours. Arrived Port Moresby 0800 hours to pick up fighter escort.

Attempted flight at 1015 hours aborted because of enemy air activity.

Attempted flight at 1215 hours aborted because of bad weather.

18.8.43 Departed Port Moresby 0750 and arrived Tsili Tsili 0915. F/Lt Willis and F/0 Moss accompanied the station.

19.8.43 All equipment transported to site.

2300 hours equipment on the air for testing.

20.8.43 at 1306 hours station was on air and in communication with Fighter Sector by land line.

Despite the unavoidable delay overnight at Port Moresby the station had been dismantled, transported to and loaded on aircraft and flown more than 250 air miles, unloaded and transported two miles, reassembled, and began operating again in the space of 61 hours and 20 minutes. It should be noted that 23 hours and 10 minutes of this period was idle time at Port Moresby.

The anticlimax to all this good work by 50RS was that the station was off the air from 1453 hours on 25 August until 1435 hours on 27 August (47 hours 42 minutes) because of the lack of a replacement high tension transformer for the indicator unit.

The main purpose for setting up 50RS at Tsili Tsili was to monitor the air drop into the Markham Valley on 5 September. Everything was going well on 4 September and previous test flights had been satisfactory. Then, at 0020 hours on the crucial 5 September one of the Howard generator sets burst into flames. The motor was unserviceable but damage to the alternator was prevented by use of a fire extinguisher. A replacement for the damaged power unit was flown in next day. The other Howard was undamaged so the radar was operational.

It has already been seen that the Howard power supply units could not operate continuously in the tropical heat. To ensure satisfactory performance during the parachute operation the station went off the air beforehand (0613 - 0735 hours) allowing the Howard to cool down. The parachute drop went according to plan between 1000 and 1200 hours and the radar screen was so cluttered with targets that it was impossible to report all of them.

The Commanding Officer of the US Vth Fighter Command, Brigadier-General Paul B Wurtsmith, was impressed by the speed of the re-deployment of 50RS and sent a commendation to No. 9 Operational Group which read, in part:

> The willing cooperation, speed and efficiency of all personnel involved in over-coming a serious tactical disadvantage is an example which other radar units will find extremely difficult to follow but which should prove an inspiration to them.

General Wurtsmith was one of the outstanding officers in WWII and it can be said that all Australians who worked with him had a very high regard for his attitude to air defence and his achievements both in Darwin and New Guinea. His leadership left nothing to be desired and his belief in praising individuals and units, where it was due, was a definite morale booster. His rank at under the age of 30 years shows that the US High Command also held him in high esteem. Sadly, he was killed in an aircraft accident shortly after the war ended.

On 6, 8, 13 and 21 September enemy aircraft attacked Tsili Tsili with bombs and strafing. During the last of these raids, at 1115 hours, several bombs fell within the camp area causing casualties and damage to equipment. Four airmen were seriously wounded and four had slight shrapnel wounds. Gordon Ellis, an operator reported that 50RS had picked up unidentified echoes coming in from the east but Fighter Sector treated them as friendly so the units's first warning was the arrival of the 'daisy cutters' which made a mess of the native vegetation and left the unit somewhat exposed as much of the natural cover was stripped away. Nevertheless operation was maintained and warning of enemy air activity passed on to the forces.

American SCR602 Radars - Bulolo - Markham - Ramu.

The 710th SAW Company had learned many lessons from the fiasco at Kiriwina in June 1943. It reorganised into six Reporting Platoons in preparation for projected operations. Commencing on 7 July the 1st, 2nd and 3rd Platoons were air lifted from Port Moresby to Wau, Bulolo and Tsili Tsili respectively to support American ground forces and the Australian 7th Division infantry.

Jeeps and trailers of the 1st Reporting Platoon negot-iated treacherous trails to deliver their SCR602 radar to its high altitude site at Ballams about 5000 ft above sea level. The Platoon remained there until October giving air warning to the Australian troops advancing on Salamaua. The Platoon was isolated from regular supplies and relied heavily on the indigenous people to supplement their rations. There were advantages too for the nights were cool and blankets were necessary.

SCR602 T6 Hut and Aerial

At the end of July the 5th and 6th Platoons of the 710th SAW moved into Bena Bena and their Plotting Platoon set up the 17th Fighter Sub Sector. They received much help from the native population.

Americans Train at Goodenough Island.

In September a Plotting Platoon and four Reporting Platoons arrived at Goodenough Island. This area was well covered already by American and Australian radars. However the Plotting Platoon set up the 14th Fighter Sub-Sector there and the Reporting Platoons with their SCR602s reported into it from various sites mainly for training purposes. Two platoons remained on Goodenough, one went to Urasi Island off the north of Fergusson Island and the fourth onto Fergusson Island. These Platoons were later absorbed into the 583rd SAW Battalion as the 9th, 10th, 11th and 12th Platoons.

7th and 8th Platoons of 711 SAW Report to 19 FS at Gusap.

When it arrived at Port Moresby at the end of July 1943 this Company also reorganised itself with six of its platoons for operating radars. Of these the 7th and 8th were air lifted to the Ramu Valley. The 7th Platoon operated near and reported to the 19 FS at Gusap until the Infantry cleared the way for it to be air lifted to the emergency landing strip at Faita. From there it moved to a site where it operated less than 100 miles from the large Japanese base at Madang. Its sweep included the lower terrain between the Finisterre and Albert Ranges, looking north towards the sea. Thus it gave advanced warning of enemy aircraft flying from Madang and Wewak.

The 8th Platoon went to Dumpu and set up near the air strip. The Australian Infantry were battling with Shaggy Ridge and the southern slopes of the Finisterre Range. Malaria proved to be the greatest threat to this Platoon as practically all of the 32 men were afflicted. This radar operation was greatly hampered by the surrounding high mountains. The two radars gave good service while the air bases were being developed at Nadzab and Gusap.

The 18th Fighter Sub-Sector at Nadzab.

A detachment of the 710th SAW Company, two officers and 88 men flew to Nadzab on 13 September, eight days after the paratroops landed. Nineteen C47s were employed to move the plotting equipment, communication equipment and personnel. As no radars moved in with them they set up and monitored the 10th FS Dobodura and 17th Fighter Sub-Sector at Goroka.

Soon after the 4th Platoon of the 710th SAW Company and an SCR516 from the 709th SAW Company set up to report to 18 FS. Then the 3rd Platoon moved from Marilinian (Tsili Tsili) to Amami to watch for enemy aircraft out of Madang. Also reporting to 18 FS were two American observer teams stationed in the Kaiapit area.

Re-organisation of American Radar Units in Papua New Guinea.

Some rearrangement of personnel was made about October 1943 as more equipment and personnel arrived from USA. The 710th and 711th SAW Companies became Company A and Company B of the 583rd SAW Battalion with headquarters at Port Moresby. The newly arrived 715th SAW Company became Company C of the 583rd.

While the very portable SCR602 radars were taken into the attack by advance echelons for immediate warning of air attack against the infantry it was found desirable to have a radar of better capabilities set up during consolidation in the area. The LW/AW equipment was the best for the purpose mainly because like the SCR602 it could be airlifted to forward areas and it had a superior performance to the SCR602 because of the much larger and therefore much higher gain antenna system.

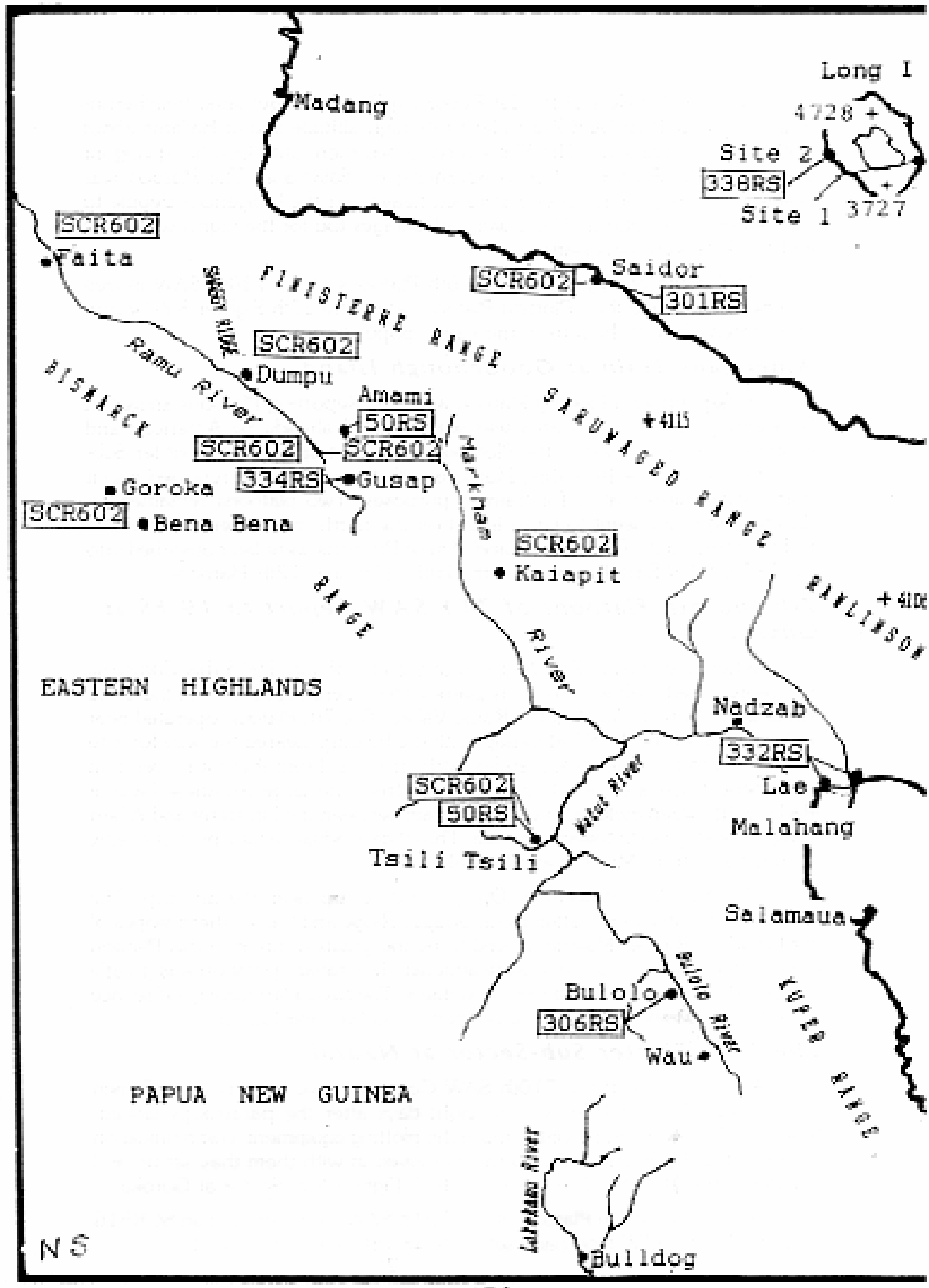
334RS at Gusap.

The airstrip at Gusap was still within the range of enemy ground fire when the C47s landed with 334RS on 25 November 1943. P/O L Bell and Cpl Knight were attached as an installation party and Mr Adams was the camoufleur. Communication was established with No 19 Fighter Sector and the station was operational at 0900 hours on 29 November.

On 12 December at 1034 hours an unidentified target was plotted at 49 miles bearing 40 degrees and tracked to 28 miles bearing 54 degrees at 1042 hours. Red alert was sounded and at 1050 hours an enemy formation dropped bombs on the air strip four miles away. Zeros strafed a petrol dump half a mile from the radar station.

A visit by F/Lt D Swan of Section 22 was made to investigate the jamming of both the W/T and the radar presumably by the enemy.

16 April 1944 as No. 2 Ford 10 engine was unserviceable with a broken piston ring, and No. 1 was only running on three cylinders, permission was sought to go off the air for engine maintenance. Permission was refused and the radar was ordered to search for aircraft which were returning from a mission and had encountered an extremely violent storm. The deluge of


Madang
Long I
4726 +
Site 2
338RS
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SCR602
Taita
Saidor
SCR602
301RS
FINISTERRE RANGE
Ramu River
SCR602
Dumpu
BISMARCK
Amami
50RS
SCR602
SCR602
Gusap
334RS
Goroka
SCR602
Bena Bena
Markham
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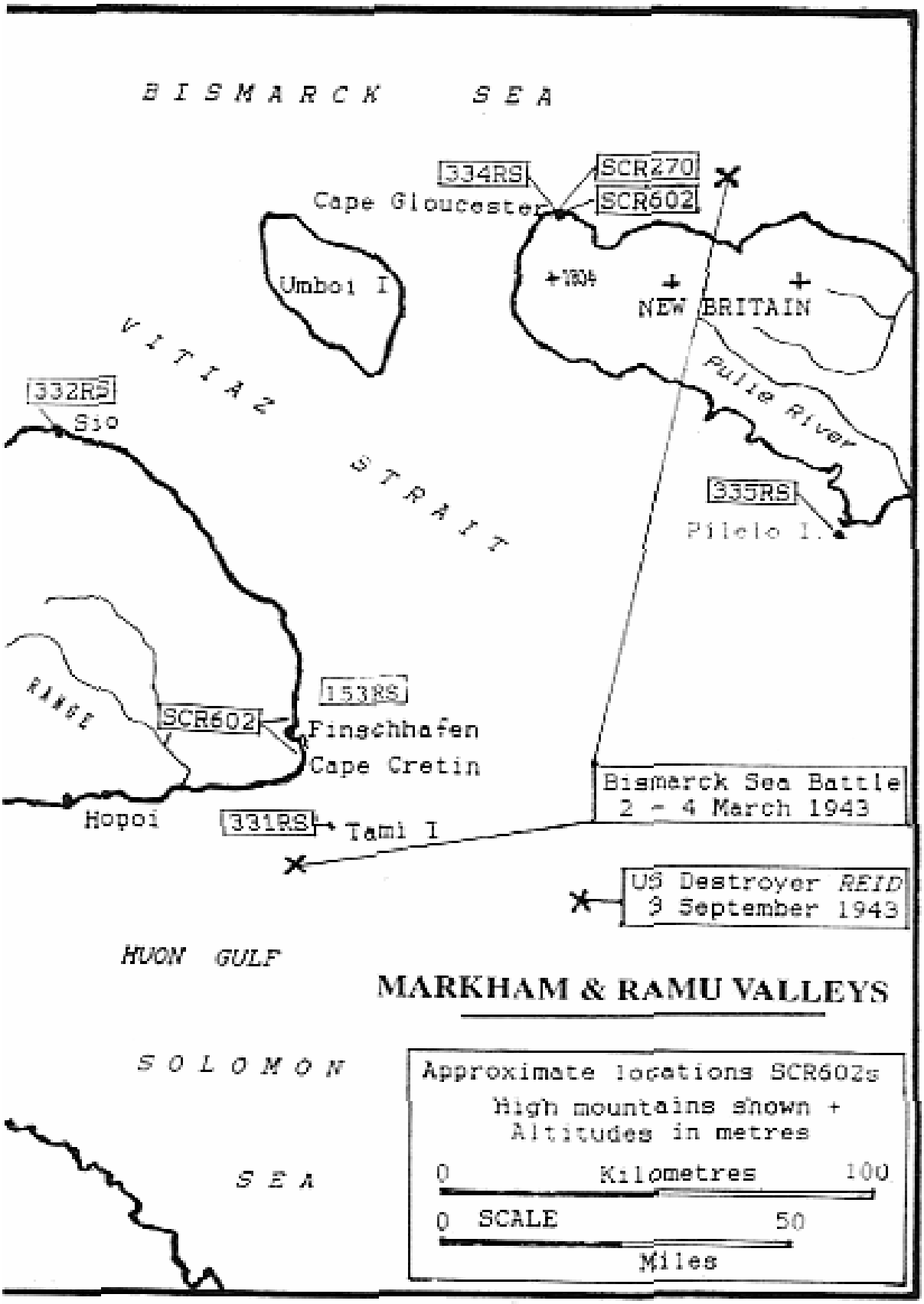
+415
RANGE
River
EASTERN HIGHLANDS
Nadzab
332RS
Lae
SCR602
50RS
Tsili Tsili
Malahang
Salamaua
Bulolo
306RS
Wau
PAPUA NEW GUINEA
Bulldog
N 5


BISMARCK SEA
334RS
SCR270
SCR602
Cape Gloucester
Umboi I
+1804
NEW BRITAIN
VITIAZ STRAIT
Pulie River
332RS
Sio
335RS
Pilelo I.
RANGE
153RS
SCR602
Finschhafen
Cape Cretin
Hopoi
331RS
Tami I
Bismarck Sea Battle
2 - 4 March 1943
US Destroyer REID
3 September 1943
HUON GULF
MARKHAM & RAMU VALLEYS
SOLOMON SEA
Approximate locations SCR602s
High mountains shown +
Altitudes in metres
0 Kilometres 100
0 SCALE 50
Miles

rain from the storm caused difficulties on the radar screen also but strong IFF responses became discernible at 80 miles. Plots given enabled Fighter Sector to give the aircraft their position and bearing to the nearest airstrip. Unfortunately many aircraft were so short of petrol due to adverse flying conditions that 15 were lost or forced to crash land. Those that landed safely had very little fuel left in their tanks.

CHAPTER 14

The Lae Campaign

September 1943 to April 1944

While the 7th Australian Division and American troops pushed up the Markham and Ramu Valleys towards Madang and Wewak other troops were leap-frogging along the northern coast line of New Guinea. The 9th Australian Division was given the task of taking Lae. As usual, after reconnaissance, sites had been chosen for fixed radar stations to be established during the consolidation period. 331RS was allotted a site on Tami Island, off Finschhafen and 332RS was to set up at Lae.

REX 1 Communication Centre.

The Fifth Fighter Command decided to establish a very close liaison with the Australian 9th Division HQ and all elements concerned in the landing against the Japanese at Lae. To do this they chose the experienced Capt. Everett King, (hence Operation REX 1) to go ashore with the troops, maintain contact with them and report to the Fighter Sector which was to be set up aboard US destroyer *Reid* standing off the landing point. Capt. King had previously been in charge of the Fighter Sub-sector at Dobodura.

Capt. King and his team, nine men all told, trained at Milne Bay with the 9th Australian Division establishing practical working procedures. There were no RAAF personnel in this team as it consisted of American observers and an Australian from the Army Air Warning Wireless Unit in charge of one Observation Post. An important member was a native Police Boy included for his knowledge of the area where the landing was to be made.

Immediately after the landing, warnings relating to aircraft movements around the beach heads were handled by the REX 1 Fighter Control Liaison. Spotters, members of the New Guinea Air Warning Wireless Company, fed information to REX 2 Operations which passed it on to RAAF Fighter Sector and also to REX 1 which alerted 9th Australian Division Headquarters, all ack-ack positions and the USS *Reid*. The latter exercised control of our fighters where and when it was expedient to do so. This was the first time this sort of coordinated effort was attempted - the organisation chart is on the following page. In practice it worked very well and unforseen difficulties were overcome on the spot.

REX 1 in Action.

On 1 September 1943 all personnel and equipment embarked on an LST to join the assault on Lae. Capt. King led the first REX party ashore onto Red Beach with the third wave of Australian Infantry at 0630 hours and the others followed at 0803 hours. Impassable terrain prevented transport by jeeps so the equipment was back-packed to the site chosen earlier by photographic aircraft reconnaissance. The relay station was operating by 1430 hours.

Next day telephone contact was established with 9th Division HQ and was maintained throughout its movements during the operation.

Three Australian Spotter teams were sent to REX 1 on 5 September for deployment ‘as near Finschhafen as possible’. One team was transported to a high strategic position at Hopoi Mission. The second attempted to reach Cape Gerhardt aboard a salvaged Japanese barge. Caught in a storm the equipment was rendered unserviceable by damage and salt water. This team was withdrawn. A third attempt, led by Sgt Parmiter, of the New Guinea Air Warning Wireless Company, staged about three miles from Aluki village awaiting transport to Tami

Island. Two teams selected by the Fifth Air Force to go to Gerun and Blucher Point were prevented doing so by Japanese occupation. Capt. King placed them where they could be of most use.

REX 1 remained at Aluki village for eight days and all the above teams reported to it there. The 9th Infantry moved swiftly towards Lae followed by the Headquarters. REX 1 had to follow in order to maintain contact. One day's trek took them to Apo fishing village, the second to the Bunga River and on the third day they set up on the west bank of the Burep River. As communication lines were being laid, notes and visual signals were used to nearby gun emplacements and others. The normal radio contacts were maintained. Climbing irons were used to place aerials high in convenient trees.

Anticipating another move by 9th Division HQ REX 1 moved on 22 November to the Malahang wreck area. In a rather audacious move one spotter used the wreck as his point of operation. As the HQ did not move up, after four days REX 1 returned to the old site on the Burep River. At this point the fighter control liaison team left the push towards Lae and joined the 20th Brigade HQ involved in the Finschhafen operation. After landing on Scarlet Beach on 1 October it moved to and was established at Kolem Point on Langmak Bay on 9 October 1943.

331RS at Tami Island.

Prior to the operation S/Ldr Bert Israel considered the possibility of erecting the LW/AW on an LCM, as was done later by the Americans, at the landing site to provide long range early warning at the beach head. He decided not to proceed with the idea after P/O Les Bell pointed out that the sea would be too rough in the area. It was then planned that the station should be erected temporarily at the beach head and moved to Tami at the appropriate opportunity.

331RS was air lifted to Dobodura and transported to Oro Bay where it was taken aboard three barges provided by the Americans. Orders were for the barges to leave the day before the landing, travel all night to be off the landing point at 0600 hours the next morning. Installation Officer P/O Bell was especially assigned to the operation for his knowledge of the poorly charted coastline with its many reefs. He piloted the leading barge while the others followed safely to their destination.

On approaching the landing a message was received that a destroyer would provide the necessary air warning near the beach. The station was to land and be prepared to set up if the destroyer happened to be knocked out by the enemy. The Army went ashore near Lindenhaven Plantation after a short bombardment of the area. P/O Bell had this to say:

> I went ashore to find the Army HQ. There was fighting nearby while low cloud and drizzling rain made everything wet and muddy - a miserable aspect generally. I came up to a chap with a rough shelter over him. He had a primus stove boiling water and was dishing out hot coffee to all who passed by. This Salvation Army Officer even apologised because he was out of biscuits.
> About half a mile down the beach in the direction the Army was fighting its way towards Lae I came upon Capt. King and Sgt Parmiter. The Army signaller had his Teleradio and an aerial strung between two trees. He was exchanging information with Fighter Control aboard the destroyer.
> A Japanese air raid was coming from Rabaul at the moment and a general

alert was given. The bomber formation was intercepted and the raid was broken up and did little damage.

The radar equipment was taken ashore and stacked awaiting transport to Tami Island. The beach was bombed on several occasions by the enemy. Capt. King was able to arrange special naval craft and a military escort to take 331RS to Tami which was known to be garrisoned by the Japanese. On arrival it was found the Japanese had fled the previous day.

Shallow water and coral reefs made it difficult to run the barges ashore except beside a coral cliff more than 100 ft high with a narrow beach at the base. Using a double and triple block with tackle attached to convenient trees the technical equipment was hauled to the top of the cliff. Native carriers then moved the gear to the selected site. On the highest point, Installation Officer, F/O Bishop and his men erected a structure of coconut logs on which the radar was placed with its antenna above the surrounding tree tops. From this prime position the radar gave excellent results on a sweep of 360 degrees. When the station was ready to pass plots to the Fighter Control the RAAF W/T was not functioning. Sgt Parmiter had already set up W/T contact and was able to pass the first plots.

A large native outrigger arrived at Tami Island carrying a deeply sun-tanned white man and a native crew. Since he wore no uniform the Americans seized the white man and subjected him to intense and none too friendly interrogation. Fortunately the captive recognised P/O Bell as an old acquaintance and called out, “Hey, Les! Come over here and get these bastards off my back!”

The wanderer turned out to be Bill Money, one of the original finders of the Bulolo gold fields. Burnt almost black by the sun - wearing shorts and a battered old Australian slouch hat - a service revolver on his hip - it was no wonder the Americans wondered who he was and ‘what he was up to’. Fearless and alone with his native crew he was island hopping - working for Allied intelligence and seeking out and reporting on pockets of the Japanese forces. He stayed one night, collected some provisions and continued his perilous mission.

The RAAF personnel refloated a motor boat sunk in shallow water by the Japanese. They fitted a scrounged jeep engine into it and thereafter had water transport to and from Finschhafen when supplies were required or deliveries were needed for the ‘Foreigner trade’.

332RS at Lae.

As soon as Lae was taken 332RS was allocated to the area. Administrative Officer Teasdale had the station transported from Mascot to No. 41 Radar Wing at Port Moresby.

The station was joined by Technical OIC F/O Hubbard, BL4 expert F/O Ferrie and technical installation Sgt Bill Humphries who provided the following account of the installation.

> To get to Lae we had to do a lot of moving about the country. We flew from Moresby to Buna, thence by truck to Oro Bay and boarded an LST. Sgt Eric Arndt was there to assist in movement of equipment and the establishment of the camp. We arrived at Lae two days after it was taken and found the place devastated and the stench nauseating. Open tunnels in the scarp were a mute reminder of where many Japanese chose to be entombed rather than surrender. The Americans moved in, sealed off the tunnels and generally cleared up the area. Australians were setting up a cemetery and we were able to service their technical equipment when required.
> The station was erected on top of the scarp, all gear being manhandled up

there by the RAAF personnel as no ANGAU labour was available. Sgt Eric Arndt expertly directed the men in the efficient movement of the heavy Ford ten power supplies. Movement about the area called for extreme caution because of the danger of booby traps set by the Japanese.

An American Mitchell bomber, a B25, arrived to flight test the radar's performance. F/O John Hubbard sat up front with the pilot to direct flight requirements and take records while I, after several minutes instruction, was left in the rear as the gunner for the flight. The other American crew members, regular gunners, went off on a souvenir hunting trip. The whole operation was hazardous as the air strip was subject to Japanese raids and the Douglas transports or 'Street Cars' as the Yanks called them were landing and departing all the time. The strip was built for fighter operation with a restricted runway ending at the shoreline and the B25 literally ran off the end to become airborne. We all breathed a sigh of relief when the calibration flight was completed.

Soon after the landing the fitter of the radar station found an Australian military map of Bendigo, Victoria, Australia, among discarded Japanese possessions. The map, still in my possession, had been oiled and evidently intended for use when the mainland of Australia was invaded.

After six weeks operation a decision was made to move the station to the vicinity of the unused airstrip at Malahang where lack of local knowledge led to a disaster. The camp and radar were set up on a grassy plain which belied the fact that during the wet season it became a racing waterway. When the wet season arrived the camp was washed out.

American SCR602s at Finschhafen.

The 23rd Fighter Sector was set up at Finschhafen by the 4th Reporting Platoon and a Plotting Platoon of Company A in the middle of November 1943. After landing from the barges they were bombed but no casualties were sustained. While the Fighter Sector was being set up, the 2nd Platoon landed at Dreger Harbour just to the south. This Fighter Sector operated there from the end of November to 18 April 1944. Four platoons with SCR602s were able to give 360 degree coverage and to give 30 mile warning of enemy aircraft which normally came in across the sea. A very close liaison was formed with the Australian 9th Division operating in the area.

CHAPTER 15

Invasion of New Britain and Containment of Rabaul

November 1943 to August 1945

Need for Containment

After establishing by far the largest base of armed troops at Rabaul in the SWPA - some 80,000 troops - the Japanese infiltrated the whole island setting up strongholds at strategic points. In order that General MacArthur's island hopping campaign could develop properly it was necessary to minimise the threats from air bases in New Britain.

At the end of 1943 the Japanese heavy bombers in Rabaul were still a force to be reckoned with and Gasmata was still a hornet's nest of fighters and dive bombers. The first plan was a direct assault on the last mentioned stronghold.

In November 1943 Company B Headquarters of the 583rd SAW Battalion at Port Moresby moved to join the Plotting Platoon and four Reporting Platoons training on Goodenough Island. They were alerted to prepare to land with the first amphibious assault wave of American troops on Gasmata. Then followed a sudden change of plan. Cape Merkus and the Arawe Islands became the target in lieu of Gasmata. It was also decided that an Australian LW/AW would provide the radar coverage at the landing and the American support team would be a Plotting Platoon, two radio communication teams and six ground observer teams.

The proposed landing spread over the Arawe Islands and Cape Merkus was more than a diversionary feint for the main landing at Cape Gloucester. The Allies saw in that area a suitable site for an early warning radar for the Cape Gloucester operation which was to follow in less than a fortnight. S/Ldr Israel and P/O Bell had flown over the area to check Bell's suggestion that from Cape Merkus looking along the valley of the Pulie River, aircraft flying along the north western coast towards Cape Gloucester could be detected through the gap in the mountains and aircraft attacking Cape Gloucester from Gasmata would be under continual surveillance as their normal flight path would be across the Arawe Islands.

Forces for the landings at Arawe and Cape Merkus were assembled at Goodenough Island early in December 1943. American assault troops were A, B and C Companies of the 1st Cavalry Division. The LW/AW replaced the SCR602s in this operation because of its longer range advantage and was to be used in conjunction with the American radar support group as stated above.

335RS, commanded by P/O J G Colley, was the first Australian radar station to be landed with assault troops in the face of the enemy. And for this important operation P/O Les Bell was specially attached to the station. His pre-war experience in the area enabled him to advise both the Americans and Australians how best to avoid many of the hazards they were to encounter. Senior technical officer F/Lt Katz was in charge of the technical installation assisted by radar mechanic Sgt W N Smith. This allowed P/O Colley to concentrate on administration and the establishment of the station.

At Goodenough Island Maj. Werner, Maj. King and Capt. Laird met with F/Lt Katz, P/O Colley and P/O Bell, studied maps and conferred on the operation. P/O Bell lectured the American troops on what to expect. The plan was to go ashore clandestinely before daylight in rubber boats and secure positions from which to attack at daybreak. The lectures were followed by a practice landing at a point on Goodenough Island with similar conditions.

335RS with support equipment, supplies and ammunition for the assault cavalry went aboard LST 470 and sailed at 1630 hours on 12 December 1943. P/O Bell with RAAF guard LAC M L James remained to accompany the first wave of the assault force. Following a stop at Buna the convoy arrived at Finschhafen at 0830 on 14 December. Temporary camp was set up in the jungle off Tare Beach, Cape Cretin.

American Cavalry land at Arawe.

A, B and C Companies of the 112th US Cavalry left Goodenough Island aboard the USS *Humpheries* accompanied by the USS *Sands* and the USS *Carter Hall*. P/O Bell, LAC James and an American press photographer were aboard the first of these special LSDs (modified LSTs) and transferred to the *Carter Hall* before the landing. The convoy arrived off the Arawe Islands, New Britain, during the pre-dawn darkness on 15 December 1943 and took up positions east of Pilelo Island. The invaders realised that the Japanese were unlikely to be caught off guard as Cape Merkus and Pilelo Island had earlier been subjected to intense bombardment by US and Australian warships including HMAS *Shropshire*.

As they came into position a lone RAAF Beaufort bomber roared in from the south west only to be greeted by a hail of tracer bullets and Bofors shells from the Allied fleet. In a state of shock and great haste the pilot fled to the south-east passing close to the HMAS *Westralia*. The photographer on the USS *Carter Hall* filmed the incident and the commentator on a subsequent newsreel said, “A Jap plane attacks the convoy and is driven off by ack-ack fire !”

According to plan the front gates of the special LSDs were opened and water flooded in to float the amphibious tanks and LCMs loaded with the assault troops. The alligators emerged under their own power. When they reached a pre-determined distance off-shore the troops scrambled with minimum noise via rope nets into the rubber boats. They paddled shoreward over the reefs in three separate directions hoping to gain footholds without detection by the Japanese.

The trio of P/O Bell, LAC James and the US photographer went aboard an LCM which was taking a bulldozer ashore. It followed B Company which landed unopposed on House Fireman Beach on the mainland of New Britain, on the western side of Cape Merkus.

When A Company was approaching Umtingala it was spotted by the Japanese who opened fire on the rubber boats from their vantage point on a high coral reef. 12 Americans were killed, four went missing and 17 were wounded. The USS *Sands*, being the nearest, opened fire with its twin Bofors guns and silenced the enemy position. Survivors were then rescued by the US Navy.

Capt. Laird led B Company through Pilelo Passage intent on the easy landing through a break in the reef immediately on the western side of the northernmost point of Pilelo Island. On observing tracer bullets pouring out from that direction he recalled P/O Bell’s earlier advice. While the rest of the island is surrounded by extensive reefs, Bell knew from his trading days in these waters that the reef could be crossed at high tide around the next point. Bell had further suggested that there was a track over the point by which the enemy could be taken by surprise from the rear. This Laird proceeded to do.

Meanwhile at House Fireman Beach Bell had decided that the best available site for the radar was on Pilelo Island. The LCM ferried Bell and James to the open beach where Laird and his men had attacked the small enemy wireless crew. Unfortunately one American was killed by a charging Japanese guarding a shed containing a store of rice. The Japanese was in turn shot

and Bell placed LAC James on guard over the rice which later supplemented the rations of the hungry radar men.

The other six members of the Japanese wireless station holed up in a coral cave and opened fire with a machine gun placed near the entrance. Unable to approach near enough for a flame thrower to be effective a bazooka was brought into action. The six Japanese were buried in a crater caused by the bombardment of the island a few hours previously.

P/O Bell chose a site for 335RS and surveyed a track to it from the landing point - construction was agreed to be done on the following day. As this was the only easy landing place on the island the Japanese dive bombers and strafing fighters made it a prime target for weeks to come.

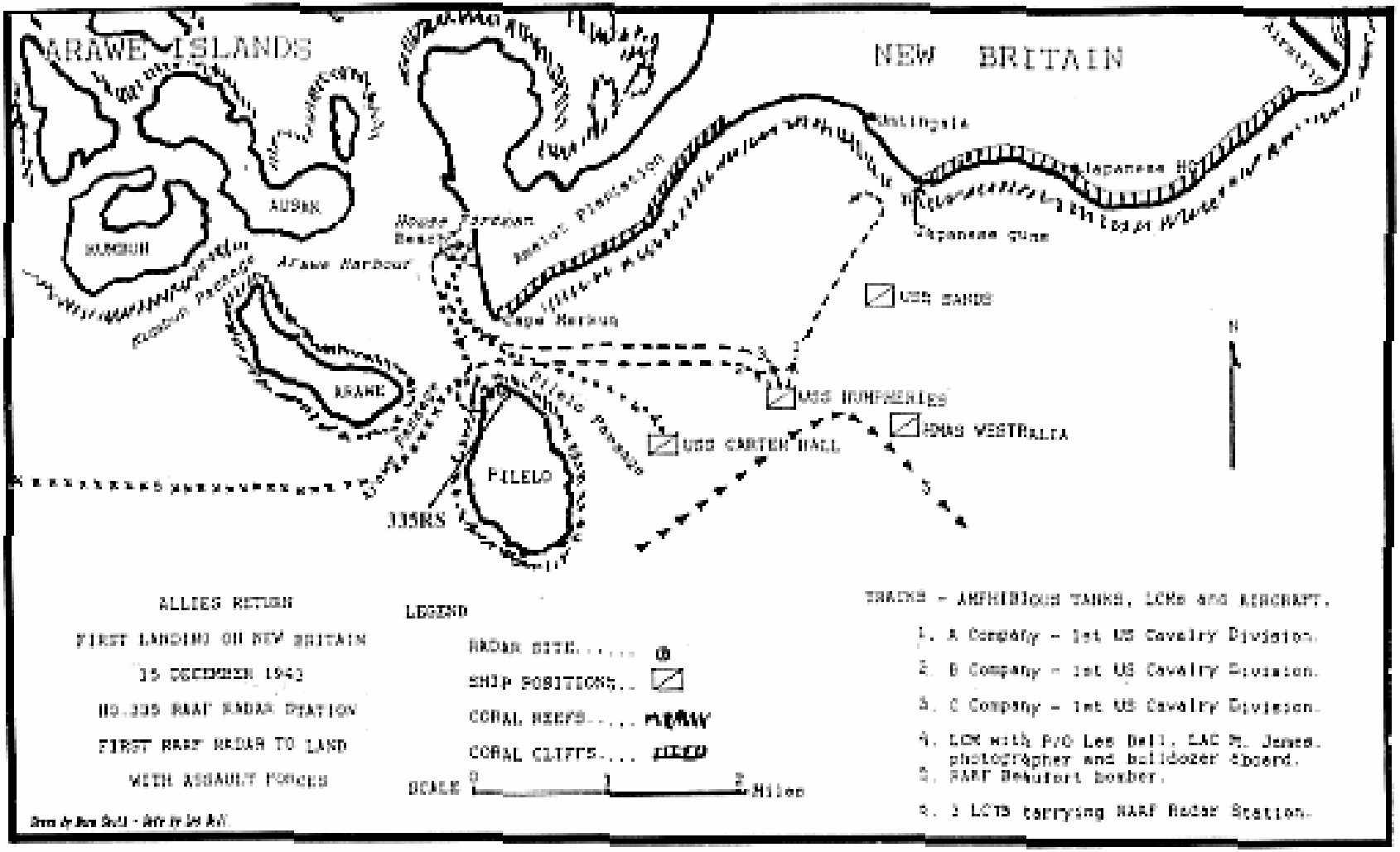
The Japanese reaction to the landing can best be covered by the following extract from a translation by American Intelligence of the diary of Maj. Komori, the Commander of Japanese forces at Arawe:

> 14 Dec. 43 Heard heavy explosions since early morning.
> 16 Dec. 43 Naval air Intelligence report from Regt HQ as follows, 4 DD's and three transports E off Merkus at 0300 hours on 15th. Bombarded for about thirty minutes. Makes me realise how pressing the situation is near Merkus.
> 17 Dec. 43 Received orders to attack enemy that landed at Merkus on 15th. Learned of withdrawal of Merkus garrison unit. Decided on forced march.
> 19 Dec. 43 Heard from 1st Lts Fukushima and Mishina of situation concerning enemy landings. Made decision for unit action. It seems that the enemy situation has been grossly overestimated.
> 20 Dec. 43 Issued orders to attack.

335RS Landed on Pilelo 16 December 1943.

The radar unit was loaded on LCT88, LCT382 and LCT386. Only essential gear was loaded, the remainder being left under guard to go forward when required. At 1930 hours, 15 December the unit sailed in a convoy carrying troops, ammunition and supplies to Arawe. At 0300 hours next morning the convoy was ordered to return to Finschhafen. When within 15 miles it was ordered to turn about and head for the original destination. It arrived off Cape Merkus at 1730 hours and the radar barges ran onto the beach at Pilelo Island.

When unloading had commenced and without warning the whole area was bombed and strafed by Japanese aircraft. Barges immobile on the beach are easy targets and they were reversed into open waters before the unloading was completed. Not enough planning preceded the loading of the barges. Or perhaps it was the supervision of the loading process. There is no doubt that all technical equipment should have been aboard one barge. This was not the case and the erection of the radar was delayed unnecessarily. A search had to be made among barges scattered over a wide area. An attempt to find and recall the barges at nightfall resulted in the search barge being stranded on a reef for the night. Not until next day was all equipment retrieved and collected at the beach head.


ARAWE ISLANDS
NEW BRITAIN
AUSEN
KUMBUH
Arawe Harbour
Cape Merkus
KRAKE
PILELO
335RS
Japanese Guns
USS SANDS
USS HUMPHREYS
HMAS VESTRALIA
USS CARTER HALL
N
ALLIES RETURN
FIRST LANDING ON NEW BRITAIN
15 DECEMBER 1943
HQ.335 RAAF RADAR STATION
FIRST RAAF RADAR TO LAND
WITH ASSAULT FORCES
LEGEND
RADAR SITE.....
SHIP POSITIONS..
CORAL REEFS.....
CORAL CLIFFS....
SCALE 0 1 2 Miles
TRACKS - AMPHIBIOUS TANKS, LCMs and AIRCRAFT.
1. A Company - 1st US Cavalry Division.
2. B Company - 1st US Cavalry Division.
3. C Company - 1st US Cavalry Division.
4. LCM with P/O Lee Bell, LAC M. Jones, photographer and bulldozer aboard.
5. RAAF Beaufort bomber.
6. 3 LCTs carrying RAAF Radar Station.

Pilelo Map

It was little more than 100 miles from Arawe to the Japanese base at Gasmata. As soon as Allied planes ceased patrolling the landing area the Japanese defenders called in their own aircraft. It appeared that the Japanese intelligence believed the headquarters of the invasion force was on Pilelo Island as it suffered the brunt of the air attacks. Dive bombing and strafing interrupted proceedings during daylight hours.

Nuisance bombing by float planes kept the troops awake all night. 'Washing Machine Charlie' - a Kawanishi flying boat - would arrive early in the night, drop several small anti-personnel bombs and depart out of earshot for an hour or so only to return and drop another string of 'daisy cutters'. No airman was wounded but several American observers were killed by this bombing near the only fresh water soak on this coral island.

On request the Americans had provided a truck and driver on which was loaded the radar equipment with the exception of the antenna crates. Unfortunately these were loaded onto another barge altogether with the messing gear. The truck was able to negotiate bomb craters and coral outcrops to deliver the radar gear to the chosen site near the old mission house. Despite constant attention from enemy aircraft every person worked assiduously at their allotted jobs.

Spotters nearby called out when to take cover on the approach of aircraft. There was no time for identification so everyone dived into the nearest of the many shell craters. Care was needed not to drop into one filled with water from which it was extremely difficult to emerge as the shell blast pulverised the coral which when mixed with the water formed a thick soup.

The negro truck driver always ran to a special refuge under a banyan tree during raids. This was irrespective of the location of the truck at that time.

As the supply of American K rations was depleted, captured Japanese rice was added to the menu. Everyone toiled from daylight to dark and only sought refuge in slit trenches when 'Washing Machine Charlie' made a run across the island at night. When the Doover went on air at 1650 hours on 19 December all personnel were showing signs of intense fatigue. All those not essential to maintain operations were stood down at 1650 hours for the first period of relaxation since the landing. For some time the radar operators carried on their duties in a most vulnerable position as it took several days to build the sand-bag revetment around the Doover.

335RS reported to the small Plotting Section of Company B by landline. The American signal section fed the information into the radar net. On Christmas Day, 1943 the radar station began sending plots direct to 18 Fighter Sector, Nadzab by W/T. After that the American radio teams and plotting team were relieved to prepare for the Saidor operation. The ground observer teams were not able to move far afield and were not effective until the perimeter was extended. In March they transferred to Company B at Oro Bay.

The radar escaped damage from the bombing and strafing, suffered no major malfunctions and performed its job very well. Of the many actions in which the radar was involved two are briefly reported here from official records. On 26 December 1943 dive bombers attacked our barges near Pilelo Island. Five enemy planes observed shot down. Then on the next day - interception of Japanese bomber formation and fighters going towards Cape Gloucester. Zeros left formation and strafed Pilelo Island and barges. Our fighters engaged Japanese bombers and then fighters. 61 enemy planes reported shot down. As a result of this action 335RS was congratulated by 18 Fighter Sector and Capt. Christian of 21 Sub-Sector.

General Cunningham, Commander of the Task Force, was concerned with the safety of the radar men as most bombs dropped in the area were dropped on Pilelo Island - 433 bombs in the first 15 days. On a special visit to the radar he noted and expressed much satisfaction to the way in which P/O Les Bell had laid out the camp to the best advantage and P/O Graham Colley had taken all possible precautions and taken advantage of natural camouflage. While the work of both of these men has rightfully been recognised no credit either individually or collectively has been given to the other ranks by the RAAF.

The nearest the men came to recognition was when Mr Drakeford, then Minister of Air, was quoted as having replied to a question in Parliament, :"RAAF guards took part in the invasion of Arawe. This is the first time ground personnel have taken part in an invasion of this kind and are doing a magnificent job under the most hazardous circumstances."

The word ‘guards’ was used because of the veil of secrecy over radar and despite the fact the ‘Tokyo Rose’ directed some of her remarks to the RAAF boys on Pilelo Island. That alone indicated that the Japanese intelligence knew of the presence of this lone RAAF unit with the Americans. Veterans’ Affairs officers could well take note that there was no relief from the bombing and strafing of Pilelo Island for many weeks and all would have been near breaking point when it eased off. Several behavioural problems occurred before relief arrived and all members would have neared the end of their endurance.

Two long range LW/AW radar stations were placed to cover enemy air attacks on the projected landing at Cape Gloucester on the western end of New Britain. The main threats were seen to be from New Britain in the east and north and from the north of New Guinea in the west. 335RS was assigned the surveillance of the east and north while 338RS was to cover the southern and western approaches.

With Lae secured 332RS had outlived its usefulness at Malahang and was moved on 24 February 1944 to Sio. Here it considerably improved the cover for Cape Gloucester where the Allies were now strongly established.

There was a constant stream of air traffic between New Guinea and Cape Gloucester for 332RS to monitor. 331RS on Tami Island was giving excellent coverage along the sea ways separating New Guinea and New Britain.

However, problems arose once again with communications. The low powered equipment issued to radar stations was, on its own, a big enough problem but the situation was exacerbated by the fact that several stations were instructed to work on the same frequency in ‘telling’ to No. 109 MFCU. 332RS, when reporting to No. 109 MFCU, could not make reports because 335RS was ‘hogging the line’ - some plots were not reported as they were 20 minutes old before they could be passed on. After some representations 332RS was given another frequency.

One wonders why the MFCU did not transmit on one frequency to the stations with each having its own frequency for transmission so enabling everyone to know what was going on during a raid, with a quick transfers of plots and at the same time avoiding congestion on one channel.

338RS at Long Island.

338RS was to occupy a doubly important site on Long Island as this was in a favourable position to cover the landing at Saidor. Long Island was some 100 miles inside Japanese patrolled waters.

Following established practice, all final preparations of equipment and briefing of personnel was completed at No. 41 Radar Wing, Port Moresby. Thereafter the station was to meet the requirements of the American task force in its field operation. Technical supplies and maintenance remained the responsibility of the RAAF. The station was airlifted on 11 transport aircraft from Jackson's and Ward's Strips and flown to Finschhafen on 22 December 1943 to stage with the Sixth American Army at Dreger Harbour.

At this point F/O J Hubbard was attached to assist with the installation. He was assured by the Americans that he would receive a complete weather forecast for the sea journey and landing as the island was known to have difficult landing approaches. Despite assurances the forecast was never made available. As the American Marines were already committed to the landing at Cape Gloucester there could be no delay in the installation of this vitally important radar. Equipment was loaded aboard two LCMs and moved to Finschhafen to stage with the American 592nd Amphibian Engineers. A convoy of seven barges left there at 1450 hours on Christmas Day bound for Long Island. Aboard were 150 Marines whose mission was to capture the island and then protect the radar station.

Two unidentified destroyers were sighted at dusk. Full speed ahead was ordered and during the night the barges lost contact through poor visibility in rain squalls. F/O Hubbard recorded the following on 23 October 1944 when he was radar officer with No. 111 MFCU at Tadji.

> We were scheduled to land at Long Island at dawn but at 1000 hours units of the convoy were still being sorted out.
> We finally got together at about 1100 hours when we were right opposite Malola village. Long Island was extremely rugged and we had considerable difficulty finding a suitable landing spot. At midday eight enemy aircraft were reported on their way from Madang to Gloucester (Long Island lay in their flight path) and the barges rushed the shore.
> The barge containing RAAF personnel and their radar gear filled in heavy surf and personnel were tipped into the water.

There were no casualties among personnel but all technical equipment was soaked in salt water. The gear was piled on the beach one mile south of Malola village and the Marines set up a protective perimeter for the night. All slept on the ground that night. Next day the gear was moved south to the base of a 300 ft cliff on which it was decided to erect the radar.

A relatively clear and level gravel strip running to the sea seemed a convenient place to stack the gear in preparation for transporting it up to the point next day.

During the night the island suffered a deluge which was the start of a wet period of 26 days. This dry river bed turned to a raging torrent; the equipment guards sought precarious perches by shinning up nearby saplings and half of the stores were washed to sea. For the next three days attempts to raise Nadzab by radio were foiled by jamming from an enemy radio. To compound the problems the RAAF crew were temporarily isolated by the stream from the Americans who had all the food.

Barges were used to salvage gear in the surf while other equipment was relocated. Radar equipment, which had already been cleared of salt water in the stream, was further washed in clear rainwater. While the tower was being erected the electronic panels were dried out. The radar went on the air for ten minutes on 4 January, for two hours on 5 January and then continuously until 12 January when it broke down completely. During the whole time there were severe electrical storms and great difficulty was experienced in reading morse signals from 19 Fighter Sector.

Before the breakdown, plots were recorded from 89 miles up to 117 miles and a 7:1 permanent echo was recorded at 117 miles. Cpl Ralph and the other mechanics attended constantly to malfunctions in the equipment finally reaching a constant state of near exhaustion.

The day the radar went on the air F/O Hubbard left aboard a Catalina to collect new equipment and food supplies at No. 41 Radar Wing. When he returned on 27 January the personnel had been living on native foods for a week. Cpl Kemp, (Fitter DMT) and LAC Joe Keegan (radar mechanic) arrived aboard an American PT boat with fuel supplies, two power units, radar transmitter, radar receiver, test equipment and spares. The replacement gear was installed and in operation by 1 February. All unserviceable (U/S) gear was despatched to the Wing escorted by Cpl Ralph, Cpl Kemp and LAC Keegan.

The new equipment worked well and 5,011 plots were recorded for February 1944. On several subsequent months the total approached 7,000. The maximum range was 182 miles and the longest track was 178 miles during February. Thereafter ranges of around 190 miles were common. The best shipping range due to temperature inversion was 82 miles on 29 March. Sightings were made of action both in the air and at sea. Considerable difficulty was experienced with communications. Nevertheless the station made a reliable contribution to the air warning system. When the reserves of motor fuel ran low the Americans retrieved some abandoned Japanese fuel still on the island.

By this time the appalling living conditions began to take their toll. About one third of the crew was disabled by malaria. Others went down with dengue fever. F/O Hubbard was flown out on 1 February in a semi-conscious state with malaria. Living conditions were well below expectations at Long Island considering the number of specialists that accompanied the station. However nobody could be held responsible for the incessant rain, the malarial mosquitoes, the thousands of blow flies or the typhus carrying mites. Four American servicemen and one RAAF radar mechanic died from the effects of scrub typhus. From the records it appears that this station was avoided by many who visited stations operating in more favourable situations.

There were no Japanese to contest the landing on the island. However enemy surface craft patrolled the coast opposite the radar station until American PT boats were contacted. They sank several enemy barges but the armed vessel escorting them managed to escape.

Relocation of 338RS at Matafuma Point.

A number of senior ranks attended the first installation of 338RS so that success could be ensured. It was somewhat of a surprise to find that when it was decided to relocate it on the western side of the island an LAC radar mechanic was put in charge of the operation. LAC J E Lynam was accompanied by a radio operator and a fitter DMT.

The installation transfer crew of three flew to Saidor where LAC Lynam appealed to the Americans for help which was freely given. An American officer soon had a bulldozer

aboard a barge and ferried the party to Long Island. Circumnavigation of the island revealed a suitable site. Approved areas were soon cleared for erecting the radar and the new camp.

Returning to the eastern side a flying fox was installed to carry the technical equipment from the high point to sea level. Transfer to the new location went smoothly. The radar had a satisfactory sweep from south through west to north. The properly cleared campsite eliminated the scrub typhus danger and offered much improved living conditions. On return to Saidor LAC Lynam was flown by the American pilot of a spotter plane to check the effectiveness of the radar station's camouflage.

> Radar performance at the new location was equally as good as before. The equipment was calibrated and test flights carried out by the 8th American Calibration Detachment. Then in May No 3 Mobile Maintenance Section (MMS) arrived to make more performance checks.

The American defence unit was replaced by Australian Infantry in May. Since there was now no threat from the enemy the Australian soldiers also departed the island in May. An American radar which had been on the island for a short time had also gone. Left alone the Australian radar had extreme difficulty in maintaining supplies. The small ships on which they relied had moved farther forward. A two week's supply of rations had to be eked out to six weeks on several occasions. Urgently required items took two weeks from Port Moresby. The following quote is taken from a station record sheet.

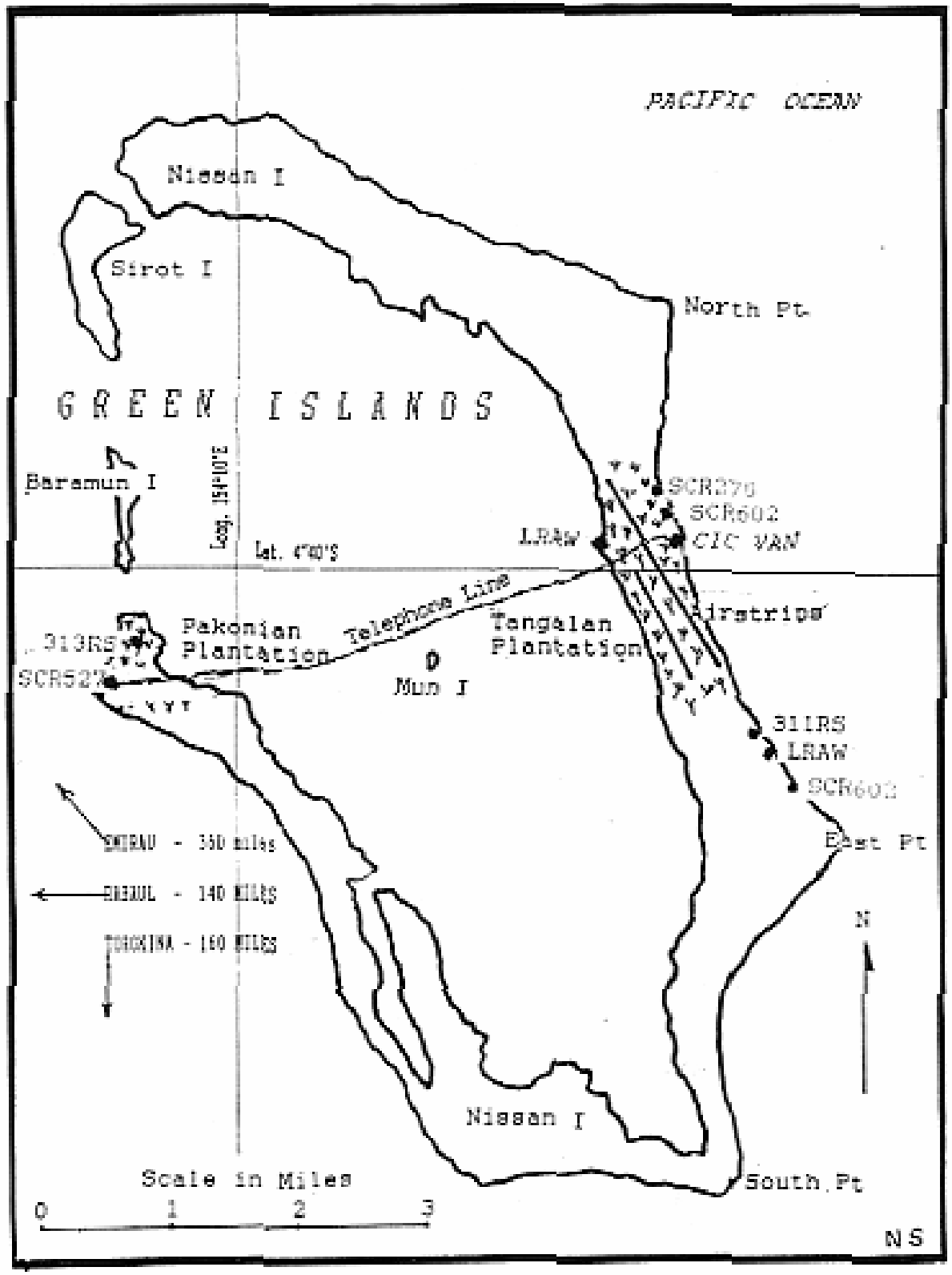
> That such conditions should exist after a period of twelve months is, to say the least, unsatisfactory. At no time has a regular service been organised.....The majority of the personnel have been on the island - an uninviting and practically uninhabited one - for more than twelve months. During that time there have been fourteen inward mails with intervals of up to five weeks...The consensus of opinion is that the unit has been neglected.

From the western site 338RS was transmitting plots to 21 Fighter Sector. On 17 August an order was received to cease operation and prepare to move. Next day an order was received to commence telling to No. 109 FCU at Madang forthwith. As no contact could be made with No. 109 FCU, No. 110 FCU took control. In October a maintenance team from No. 3 RIMU serviced the equipment. Finally the radar ceased operations on 28 January 1945 but it was not until April that it was transferred to No. 3 RIMU at Kranket Island.

American Radars to Cape Gloucester.

The Cape Gloucester landing was an all American affair occurring on 26 December 1944. Company C of the 583rd SAW Battalion received equipment from the USA delivered to Oro Bay.

A radar assault echelon to provide air warning for the Marines was composed of a Plotting Platoon and an Observer Platoon. Christmas Day was spent aboard an LST. On the following day after the shelling and bombing of the landing site the Marines charged ashore. The air warning advance echelon followed shortly after and dug in about 25 yards from the beach. Telephone lines were run by the observers to the best vantage points available for visual spotting of enemy aircraft.



Nissan Island Map

Radio and telephone communication at the plotting board was hampered by the noise from nearby artillery and telephone lines were being broken by moving equipment. The 14th Observer Platoon landed on a beach remote from the plotting board and was unable to establish contact at all.

The 13th Platoon and a Plotting Platoon landed on 27 December. The Reporting Platoon set up on a nearby island where it effectively reported aircraft up to 60 miles away. The units of the 565th landed at Cape Gloucester on 5 January.

The Headquarters of Company C arrived the second week in January along with the 15th and 16th Reporting Platoons. The Commander immediately brought all observer teams and radars under a central control and coordinated the Cape Gloucester operation. This Company was wholly committed to the air warning defence of Cape Gloucester when the 17th and 18th Reporting Platoons arrived in February.

It carried out its operations in a sea of mud sustained by torrential rain. On one occasion personal equipment was washed away by flood waters. This went on a few hundred yards from Japanese positions. Enemy bombing of the area was frequent but the Company suffered no casualties from enemy action. However life was far from pleasant.

Company C moved out leaving only the 14th and 15th Platoons reporting to 20 Fighter Sector. The l9th Platoon set up an SCR270 for long range reporting and was known as RS414. They had as a stand-by an Australian Mk II LW/AW. All units went into operation without delay and reported to the 20th Fighter Sector which was run by the 23rd Fighter Control Squadron and Plotting Platoon F.

As at Arawe the bombing of the beach head was savage for some weeks. There were 86 red alerts in a period of four days. Fortunately there were no serious casualties among the radar personnel. Those operating the radar were the first to know of an impending raid and slit trenches proved to be very good protection against attacks.

Capture of Green Islands.

To the east of New Britain, more than 350 miles from Cape Gloucester and less than 150 miles from Rabaul, lie the Green Islands to the north of Bougainville. The Allies' next step in neutralising the main enemy base of Rabaul was to capture and set up an air base on Green Islands. As well as providing an air base capture of Nissan Island, the largest in the group, cut the Japanese barge route to Rabaul.

The responsibility for capturing the Green Islands was given to the 3rd New Zealand Division under the general command of operation SQUAREPEG. This invasion took place on 15 February 1944.

ARGUS 7, the unit responsible for radar and fighter direction, made a reconnaissance before the landing to choose radar sites, temporary and permanent. This unit operated and maintained the following equipment.

One SCR270 radar. (long range)

One SCR527 radar. (GCI)

One New Zealand radar - LRAW - (long range air warning)

Two Mark XV1 radars (centimetric surface search sets)

One SCR602 combination radar.

One NZ experimental early warning radar.

Radar telling circuits, information centre and fighter control.

The fighter network, including the maintenance of two large VHF radios.

Whilst coastal defence is not within our ‘terms of reference’ mention should be made of the fact that the US Navy utilised centimetric radar for detection of shipping at many locations such as Harengan Island, Momote and Green Island (the two Mark XVIs mentioned above) but, to the best of our knowledge, those stations did not report into Fighter Sectors.

A landing approach was made through the five mile wide lagoon to the western side of the Tangalan Plantation. There was little enemy opposition and 27 officers and 147 enlisted men took the gear ashore at about 0800 hours. A bulldozer cleared a track through the plantation to enable the SCR270, the SCR602 and the Combat Information Centre (CIC) van to move to the eastern side of the island.

The CIC van reached its destination on the eastern shore at midday and installation and sand bagging commenced immediately. By 1715 hours communication was established with Bougainville, the Fighter Director Ship and the aircraft overhead.

At its site just north of the CIC van the SCR602 was operational and in communication with it by telephone at 1630 hours.

New Zealand LRAW radar moved to its initial site on a 40 ft elevated point just north of the landing point. It was able to arrive on site without help when the bulldozer for clearing a track did not arrive. The LRAW radar was operational by 1900 hours and reporting to the CIC van by 2100 hours.

The SCR527 was set up just south of Pokonian Plantation on the most westerly point of the island. It reported in to the CIC Van at 2130 hours.

When the SCR270 crew arrived at the initial site it found an SCR602 in occupation of its allotted site and had to set up at an adjacent spot. This long range radar was operational at 1558 hours on the second day.

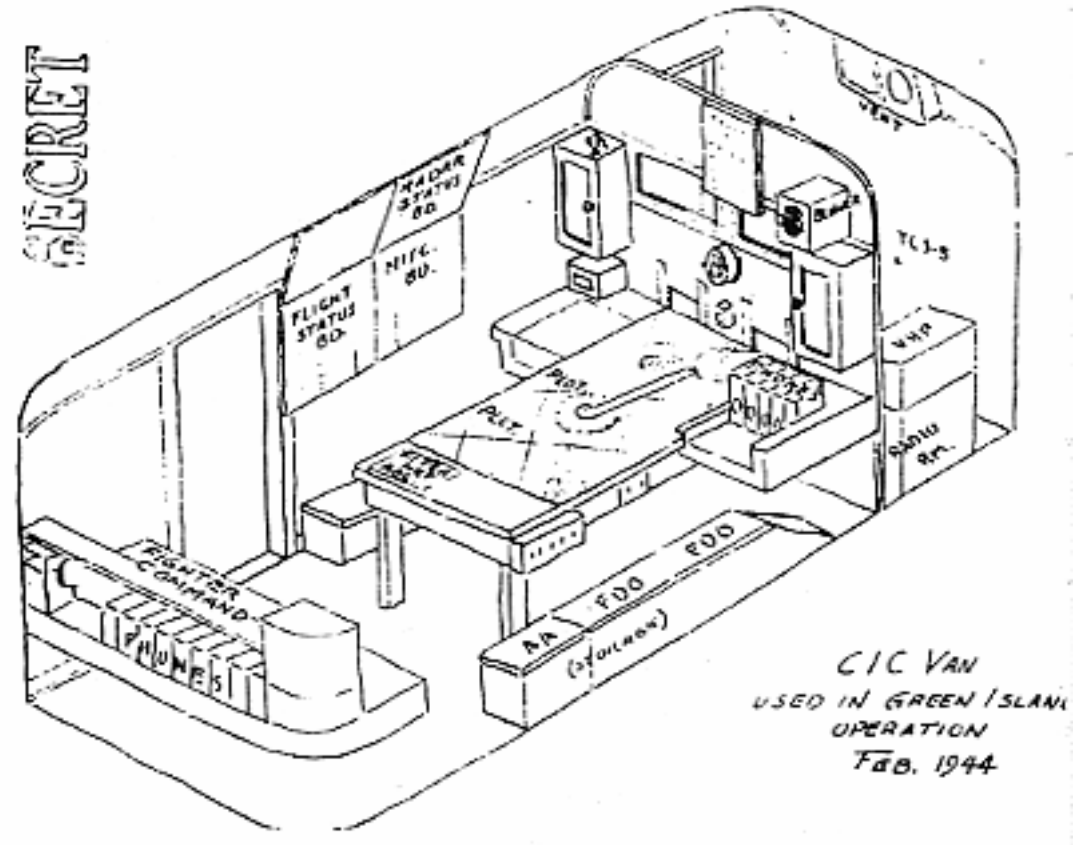
The Green Islands are typical coral formations low to the sea. In places these coral formations have been, during past subterranean activity, raised somewhat but seldom to 100 ft. This meant practically unhindered operation for most of the 360 degrees sweep. Accordingly results of all of the radar stations were consistently good.

During the first night five RED alerts were sounded and each time ample warning of the raid was given by the LRAW and the SCR602. Many bombs were dropped and strafing from Zeros experienced.

No enemy aircraft appeared during the second day while Allied fighter cover was maintained. That night four more RED alerts were sounded and the Night Fighter Controller at the SCR527 (GCI) station directed two successful interceptions whereby two Jakes were shot down. Some bombs were dropped.

On the third day a telephone line was completed across the lagoon to the CIC van from the SCR527 radar. The next night a raider was successfully intercepted but escaped when the guns of the interceptor refused to operate.

CIC Van Used at Green Island - Source Microfilm from USAF Historical Research Center, Maxwell Base, Alabama.



Microfilm from USAF Historical Research Center, Maxwell Base, Alabama
CIC Van used at Green Island

Being so close to Rabaul it was expected that the island would be heavily attacked by enemy aircraft. Only a few night raids eventuated. No doubt this was because the Allied air armadas flying north via Goodenough Island and Kiriwina had crippled most enemy airfields and aircraft. Now the Americans and New Zealand aircraft had only a short distance to fly from the Green Islands base to harass Rabaul and keep it under control. Meanwhile the base was protected and Allied aircraft assured of navigational assistance in adverse weather conditions by an efficient radar coverage.

ARGUS 7 gave the following report on the success of the radar stations on Green Island:

> Coverage by the radars has been excellent and all sets have performed exceptionally well. The LRAW has proven to be a fine set and is highly recommended for an operation of this kind. Once in position it can be on the air and functioning in about thirty minutes. It can pass plots too fast for the plotter and with its rate of sweep can sweep 360 degrees and pass plots for an accurate track at about 40 second intervals.

The local Army Command recognised the work of those radar stations by saying:

> Congratulations all concerned for efficient work in quickly installing and successfully operating radars and bringing down two Japanese planes on the first night's operation. Good Work.

By early 1944 the Japanese bases in New Britain and the Solomon Islands were contained and rendered *hors de combat* in the Pacific War. Many Japanese service personnel were trapped and the policy of the Americans in occupation was to leave alone if left alone by the beleaguered Japanese. In their anxiety to get on with the island hopping policy the Allies decided to give the Australians the role of 'gaoler' for thousands of the enemy.

Having seen service in the north west of Australia, No. 111 MFCU arrived at Milne Bay on 16 February 1944 aboard the SS *Katoomba*. Thence it moved to Lae three days later and staged at No. 48 OBU before moving to Nadzab. There it encamped but remained non-operational. It was ordered to an operational site at Cape Gloucester and completed the move there by air and ship by 19 March.

No 111 MFCU was on stand-by ready to take control of air warning and fighter direction in the area on 31 March. On 27 April a signal was received to the effect that the unit would not function operationally. Equipment was to be dismantled and prepared for movement from Cape Gloucester to Finschhafen en route to Tadji. While frustrating to the members of this unit the decision was, no doubt, the result of the accelerated advance of the Allies along the north coast of New Guinea.

334RS at Cape Gloucester.

By July 1944 334RS had fulfilled its commitment at Gusap in New Guinea and was ordered to replace the American radars preparing to pull out at Cape Gloucester.

On 13 July three transport planes left Gusap at 0745 hours and landed at Cape Gloucester two hours later with the advance party and some of the station equipment. A site was selected near the American operated Mark II LW/AW and about 200 yds from their SCR270. The site was on a hill 200 ft above sea level and a mile from the sea.

Where the camp was sited many nearby trees had to be felled as they had been riddled with bullets during the invasion, were now rotting and in danger of falling. On 15 July a bulldozer was made available by the Americans to prepare the areas for the Doover and the camp.

Erection of the radar commenced on 15 July in dry dusty conditions with strong winds blowing. Dipoles broken in transit were resoldered and the array hoisted with the aid of an American crane. At 1400 hours on 17 July the set was on the air and reporting to 20 Fighter Sector by land line.

A malfunction in the IFF interrogator took two days to clear. On that day, 19 July, 20 FS closed at 2002 hours without warning. In the general rearrangement of services the radar station was first directed to send plots to 20 Fighter Sector by land-line on 17 July, then to US Army Gun Control Room by land line on 19 July, to 21 Fighter Sector at Saidor by W/T on 27 July and to No. 109 MFCU at Dobodura by W/T on 23 August. Little wonder the radar station personnel were becoming frustrated. There seemed to be little interest in any quarter as to what they were doing.

No 41 Wing was disbanded on 31 July 1944 so 334RS came under the administrative control of No 114 MFCU stationed at Momote in the Admiralty Islands. For major maintenance it was to look to No. 3 RIMU established on Kranket Island off Madang.

After a period of dry weather and dust enveloping everything high winds struck the area on 1 September. Wind reached gale force on 4 September and the radar antenna had to be tied down. When it abated next day it took several hours to clean the dust from the radar cabinets.

During the wind storm the five feet high kunai grass to the north of the station caught fire. Wind drove the fire through the bomb dump 300 yards from the camp and a quarter mile from the radar. All nearby American and radar personnel were at considerable risk fighting this fire and cleaning up afterwards. Disciplinary Warrant Officer (DWO) 30200 Sgt A E Quarrell collapsed after running a quarter mile in tropical heat to get aid. American Lt Col Wright was awarded a Bronze Star for his part in fighting this fire but no Australian received any recognition for doing the same job.

For the period 9 to 22 September No. 1 MMS from No. 3 RIMU visited the station and made a major overhaul of the equipment leaving it operating at full efficiency when they moved on by barge to Finschhafen.

Due to the long lines of communication and supply almost every unit was faced with what at times seemed to be an insurmountable problem which was in most cases solved by the unit's technical airmen. 334RS was no exception. By October 1944 each Ford 10 power unit had run for over 4000 hours without a major overhaul. When the block of No. 1 engine became unfit for further use the fitter salvaged a block from a Ford 8HP car and pressed it into service.

Incessant rain fell during the last two months of 1944 and well into 1945. Tropical conditions had rotted the tents. New tents were not procurable nor was water-proofing compound available. The tents leaked so the inmates lived a miserable existence in permanent dampness, mould blanketed everything and skin diseases flourished.

As the army garrison moved out a security problem eventuated as there were plenty of Japanese in the surrounding hills. It must have been very reassuring indeed when only five additional guards arrived from the non-operational 350RS at Finschhafen.

On 1 January F/Sgt J E Williams carried out five calibration flights successfully. On 2 February one only new Ford power plant was received. On March 14 F/O Les Bell OBE and three men arrived from No. 3 RIMU, Kranket Island, to install an ASV beacon. Then on 24 March W/O D F White and Sgt J Spearritt of 2 MMS arrived to overhaul all equipment.

Of the 1106 plots recorded for January 1944 about ten per cent were unidentified but most of such cases were proved to be due to the failure of the Allied aircrew to switch on their IFF sets. Also the BL4 interrogator had malfunctioned on several occasions. By then the station was only operating in a supportive role as needed. Furthermore, as only one new power unit had been received the station normal operating hours were from 0500 to 2220 hours daily.

Continuous rainfall was a problem. At Cape Gloucester the station log reported that 14 inches of rain fell on 18th and it had been raining at that rate for four days. That was followed by a violent storm the following day. The radar antenna was struck several times by lightning without damage to the radar. Four bridges between the camp and the watering place were washed away by severe flooding.

RAAF Radar in the Solomon Islands.

When the Americans and New Zealand radars were ready to vacate their sites in the Solomon Islands the RAAF assigned the air warning responsibilities for Bougainville and the Green Islands to No. 112 MFCU. This unit originally formed at Townsville as No. 12 Fighter Sector in March 1943 and moved to and became operational at Horn Island in June of that year. After disbanding in April 1944 it was reactivated, as No. 112 MFCU, the same month and moved to Stuart near Townsville to prepare for the Solomon Islands assignment.

Three LW/AWs namely, 311, 313 and 320 RSs, had already seen service in the Gulf of Carpentaria, were withdrawn to Townsville in September to be refurbished for service in the Solomons under the direction of No. 112 MFCU.

The MFCU and the three radars left Townsville aboard the MV *Fairisle* on 1 January 1945. The vessel skirted the eastern tip of Papua New Guinea to arrive off Torokina in Empress Augusta Bay three days later. Unloading, sorting and transhipment of equipment was done in pouring rain.

320RS was transferred on 9 January to Puruata Island which is 1200 yards offshore. This coral outcrop was roughly 400 yards in diameter with a mean height above sea level of only four feet.

The island was congested to say the least with the unit personnel having to 'elbow' their way in among a US Boat Repair Unit, the 13th AIF Small Ships Unit and the 42nd AIF Landing Craft Unit. For privacy fences were erected. The radar was on air by 17 January and was communicating with No. 112 MFCU in Torokina by a telephone line laid underwater. In May this line was severed and thereafter W/T was used.

Due to the low elevation, performance was poor so the radar was erected on a disused Japanese observation tower which yielded satisfactory results.

Few plots were recorded by this station.

311RS at Nissan (Green) Island.

The personnel of 313RS loaded their own gear then assisted in loading 311RS's gear aboard an Army vessel. Anchor was dropped off Hall's Beach, Green Island, on 11 January 1945 and barges were used to get ashore. As the island had been developed by the New Zealand and American forces there was little difficulty with transport, bulldozers and cranes for lifting. The Americans were somewhat staggered to see that the RAAF had provided little more than machetes and shovels to install the station. Sgt H T Tolhurst reported that the American reaction was immediate and a bulldozer, scraper, trucks and a courtesy Jeep were provided.

The installation was a leisurely straight forward affair on a site on the eastern side of the island near the airstrip.

W/T contact was made with No. 112 MFCU on 14 January and the radar was operational 19 January at 2200 hours telling to SHEPHERD Base.

With a view to lowering the lobe and increasing the range it was decided to place the radar on a raised platform. Suitable trees were felled and the platform constructed. Native labour was arranged by ANGAU and the American Army supplied a crane and lifting tackle. The radar was operating on the platform by 22 February.

Raising the height of 311RS was immediately justified by a range to the south east of 147 miles. Then on 27 February a raid by 24 aircraft on Rabaul was tracked out from 14 to 152 miles and was picked up at 145 miles on return. Most raids on Rabaul from Green Island at this time were mounted by the RNZAF. On 18 April a presumed hostile aircraft was tracked for 200 miles in a southerly direction from Rabaul. The need for air surveillance in the area was nearing an end and the useful operational life of the radars on Nissan Island ceased in May.

313RS at Nissan Island

F/Lt John Jones was the CO of 313RS when it was taken to Green Islands aboard the Army vessel POOITA and then went ashore by LCT. The landing was on BLUE BEACH, where US Boat Pool No. 1, 9th Special USN Seabees and US radar type SCR527 were located. These gave the Australians every help in establishing the LW/AW on site. A daily boat service was maintained across the lagoon to the east where the airstrip and many facilities were available.

The radar was erected adjacent to the American GCI (code named MONGREL) which was about to be withdrawn. It was at the north west tip of Nissan and the Pokonian Plantation on the peninsula. The radar tent was lost in transit but an American bell tent proved to be an admirable substitute.

It was normal practice for a radar station to make W/T contact with base at the earliest possible moment, that is, within hours of landing. This exercise had none of that urgency or danger and the AT5/AR8 combination with aerials on 30 ft collapsible masts was installed 12 days after the landing. The station was operational and telling commenced at 0800 hours on 30 January. The American GCI ceased operation on 10 February at midnight.

It was decided to raise the radar on a platform as was done at 311RS. A 16 ft square platform was set on 20 ft high poles 9 inches in diameter set in the coral. Holes were blasted in the coral by LAC Smith using gelignite and safety fuse. Heavy rain and high winds coincided with the period of transference to the tower. The station was back on the air on 26 March after being off air for five days.

As the Americans moved out the Australians were left with amenities never before enjoyed by an Australian radar station in a theatre of war. Quarters were well ventilated bell tents erected over raised wooden floors. Electricity was distributed throughout the camp. The mess vacated by the Americans was designed for 300 men not 30. Food supplies were adequate, mail arrived regularly and the sea, due to its proximity, ameliorated the heat from the tropical sun.

Personnel found much time to indulge in sport while many acquired craft of some sort and enjoyed sailing or fishing in the protected waters of the lagoon. The Americans had cleared an area for baseball which was used by the Australians as a cricket and football ground.

Nearby was an American PX store where the prices were reasonable. Two canteen stewards visited the canteen on the other side of the lagoon on Mondays to purchase members' requirements.

Health of personnel was a major concern. The swamps were sprayed with oil to kill malarial mosquitoes. Grass near the living quarters was kept short by burning. Buildings were sprayed with 'Mortein' to kill vermin. The kitchen was fly-proofed and had a concrete floor by courtesy of the US Navy with the floors in mess and kitchen being washed daily with phenol.

Order of dress was long-sleeved shirts, long trousers with boots and gaiters. Mosquito repellent was applied at 1700 hours. All this was in stark contrast to the dress, say on Goodenough Island early in 1943 when day time dress was hat, shorts and boots. Long-sleeved shirts were not available and mosquito repellent didn't become available until the end of that year.

Weekly church parades were held and movies shown three times a week using a projector provided by the American Special Services. To ensure that everyone took part in some activity unnecessary gun pits were dug although no ammunition was available for the guns.

To quote an official comment, held in the RAAF Historical Section:

> "Morale is particularly high. This is attributed to the ideal situation, good living quarters and general good will. In addition mail is received every few days from the mainland although not a great deal of second class mail is received."

The RAAF stations on Nissan were visited by F/Lt J Elliott, Education Officer from Torokina. On 16 April 1945 trade tests were given to radar operators wishing to train as radar mechanics.

However the sojourn in this Utopia only lasted for four and a half months.

311 and 313RSs at Jacquinot Bay.

On 14 May 1945 the radars at Green Islands received instructions from Northern Command (NORCOM) to proceed to Jacquinot Bay, New Britain, and stage. 313RS was to prepare to proceed to a site at Crater Point on the east coast 50 miles north east of Jacquinot Bay.

F/Lt Jones flew to Jacquinot Bay by Catalina to prepare for the move to Crater Point. With F/Lt Dallimore and six men he departed Jacquinot Bay on 29 May with 12 tons of building material aboard a barge. Unable to land at Crater Point because of high seas they proceeded north to Kiep in Wide Bay. They arrived back at Crater Point at 0700 hours next morning to find a high surf still running. In an attempted landing at Sampun about 6 miles north of Crater Point a large wave flung the barge high on the beach. Efforts to refloat it were unsuccessful.

In the afternoon the two officers walked to Crater Point and established that the track was traversable and the rivers fordable by truck. Crater Point was found to be a satisfactory radar site. Darkness overtook the officers on the return journey and the night was spent in a native hut at Mesetwoi. On returning to the barge the officers explored the track in the other direction towards the suitable landing place at Kiep. lt was found that land transport was impracticable from that direction.

On 11 June an attempt was made to salvage the equipment at Lampun by ferrying it to Crater Point on a raft made of empty petrol drums. After floating two loads out, the raft was destroyed by heavy seas so the effort was abandoned: the party returned to Kiep and reported.

Instructions were received on 12 June that the problem of landing and later supplying a station at Crater Point was not practical. A new site was to be chosen near the airstrip at Jacquinot Bay for limited coverage only.

311RS and 313RS sailed with No. 112 MFCU from Torokina aboard an LST on 17 July 1945. Heavy seas were breaking across the vessel for the whole voyage to Jacquinot Bay. The majority of the personnel, including the crew, were sea sick.

Two days later the LST was beached at Jacquinot Bay and the equipment unloaded and stacked in a compound during torrential rain. Every item of equipment including clothes and personal items was dank and sodden. Mould was growing profusely on everything. There followed an extended period of sorting, reclaiming, repairing, replacing and drying, drying, drying. Service men in the tropics often found it expedient to construct special boxes and

install heating for drying out electronic equipment. Such a hot box was constructed by the radar mechanics at Jacquinot Bay.

311RS was to be installed on Heath Island but nothing eventuated. 313RS was now to be erected on Cape Cunningham at a height of 175 ft overlooking Jacquinot Bay.

F/Lt John Jones reports that 313RS operated satisfactorily at its new site tracking aircraft flying out of the nearby airstrip. No hostile flying was encountered. The only Japanese aircraft seen were those flown from Rabaul to Jacquinot Bay by Japanese pilots under RAAF and RNZAF escort after the surrender.

335RS at Emirau

By October 1944 there were no more Japanese aircraft in the skies over Arawe and 335RS was withdrawn aboard the RAAF sailing vessel *Ena* to Milne Bay for refurbishing. Arriving on 8 November good accommodation was readily available as Milne Bay had been abandoned by many units as the war moved inexorably towards Japan.

Replacements were requisitioned through No. 109 MFCU direct to No. 17 Stores Unit. NORCOM advised that the station Jeep be overhauled at No. 43 OBU. No. 3 RIMU workshops were available to the unit for overhauling the gear.

During this rehabilitation period the unit was visited by S/Ldr Rodding and W/O Spicer to obtain an account of the stations activities at Arawe. If any account was written by them it has not been found. However Sgt W A Vawdrey, a station member and radar operator, wrote an eyewitness account which may be read in *Radar Yarns*.

As 335RS was to move to Emirau Island in the St Matthias group and report by W/T to Torokina on Bougainville, more than 400 miles away, F/O Alder flew there on 16 January to discuss future operations.

The advance party flew from Milne Bay to Emirau on 17 April 1945 with a full load of equipment. Sgt Vawdrey was left to see that the remainder of the gear was sent forward. As Emirau was a long established Allied base there were no installation problems and transport was available on made roads.

Barracks left by the American SAW Battalion were taken over. The radar installation proceeded without urgency and it was on the air by 11 May. Aid was provided by No. 112 MFCU and No. 7 Aerodrome Construction Squadron. ANGAU provided native labour to construct a cool sac-sac cover around the radar and over the mechanics' workshop.

335RS was to maintain the surveillance net around Rabaul in particular as well as aiding the navigation of Allied aircraft in general. A suspected hostile aircraft was detected near Kavieng and tracked out to 183 miles on 20 June. A week later another detected 130 miles from Emirau was tracked to 195 miles in the direction of Rabaul.

Early in May 1945 the RNZAF and the US Marine Air Group began preparations to vacate the island. Following their departure there was very little air activity in the area and radar operation rather pointless. After the cessation of hostilities a signal was received from NORCOM on 17 August wherein the Chief of Staff expressed great appreciation of the loyal service of all ranks. F/Lt J Elliott, Zone Education Officer, arrived to lecture on demobilisation and rehabilitation.

CHAPTER 16

Admiralty Islands Campaign

February 1944 to August 1945

The Capture of Seeadler Harbour

Manus, the main island in the Admiralty Group, is about 50 miles long east to west and nearly 20 miles north to south. At the eastern end of Manus, Seeadler Harbour, due to its vast expanse of deep and protected waters and its strategic position, was chosen as the assembly point for the large fleet of ships for the invasion of the Philippines. Hollandia on the north coast of Dutch New Guinea was used for the assembly of the land forces. Los Negros Island, east of Manus Island, was also important because it became the air base for the supporting bombers and fighters needed in the invasion.

Prior to the invasion normal reconnaissance by aircraft indicated that Manus Island had been evacuated by the enemy as there was no sign of Japanese aircraft on the ground, no washing lines or smoke from cooking fires and no ack-ack firing on the recce aircraft - the landing looked as if it would be a pushover. That is until the Signals Intelligence Service (SIGINT) proved that the enemy's intention was to foster the idea of Manus being evacuated. Intercepted messages intimated that the enemy intended to withhold fire until the landing took place.

Seeadler Harbour was in fact strongly defended by the Japanese when the US 1st Cavalry Division was charged with Operation BREWER - the capture of this stronghold. The first landing occurred on Los Negros on 29 February 1944. Defensive structures and gun emplacements indicated that the Japanese expected the assault to come through Seeadler Harbour to Salami Beach which they perceived to be the logical place for a landing.

The Americans surprised the enemy by slipping through the narrow passage into Hyane Harbour and capturing the air strip.

Company C of 583rd SAW Battalion Deployed.

Having been relieved by Company A of the 565th at Cape Gloucester, Company C of the 583rd SAW Battalion had ample time to prepare for the Admiralty Islands mission scheduled for 1 April 1944. When this action was advanced to 29 February urgent action was required.

The 14th and 15th Platoons, which had not shut down, were left behind at Cape Gloucester. An LST transported the rest of Company C from Cape Gloucester to Finschhafen. The 19th and 20th Platoons were flown in by C47s to join them.

All elements required to give air warning at the landing were aboard the LST by 29 February. Two days later Company C Headquarters, Ground Observers, the Plotting Platoon and the 13th and 16th Reporting Platoons landed on Los Negros at 1000 hours. The narrow beach-head was about 500 yds long and under sporadic small arms and mortar fire from the enemy. Zeros randomly strafed the beach wounding one Company C officer.

The American aircraft warning personnel were assigned the task of clearing enemy opposition from the positions which the radars and plotting complex were to occupy. Quite a number of Japanese were killed before this was achieved. Master Sergeant Garvin and Pte Zoeller were awarded the Silver Star for gallantry in this action.

At 1500 hours operational status was attained by the 13th Platoon. It closed down at 1800 hours because engine noise from the power plants at night would be a guide to infiltrators and snipers. All personnel retired to fox holes for the night. An expected Japanese counter attack did not reach Company C. Next morning one power unit was found to be damaged by small arms fire and the plotting tent riddled with bullet holes.

Ground Observers and the 16th Reporting Platoon, with its SCR602 type radars, remained inactive until the perimeter was extended. However the 13th Platoon assumed 24 hour operation on 4 March. Both radars detected a 'bogey' on the night of 8 March at a range of 20 miles resulting in a RED alert. The aircraft was successfully tracked by the radars and ground observers as it circled the island for an hour and a half before making its bombing run.

On 9 March the 17th and 18th Platoons arrived from Finschhafen. They were operational on 20 March but there was no enemy air activity. Services of the 19th and 20th Platoons were not required and remained at Finschhafen - the nearest large Allied base about 300 miles from Los Negros.

The Japanese base at Wewak was just over 250 miles away and the enemy at Rabaul a little farther than Finschhafen. Los Negros was liable to be attacked from these two enemy strongholds and possibly from carrier based aircraft. There was therefore a need for a complete radar encirclement of the Admiralty Islands.

RAAF LW/AW long range radars, already proven ideal for this purpose, were assigned this protective and supportive role. To fill the time gap before the radars could be deployed two American observer teams, one of seven and one of six men, were deposited by Catalina flying boat on Bipi and Bat Islands on 3rd March. For communication to the Plotting Board on Los Negros they took with them the more powerful SCR188 W/T equipment. They were able to report useful information on aircraft activity and enemy movements. Those Americans together with the personnel of 340RS on Bat Island were later to experience tragic health problems.

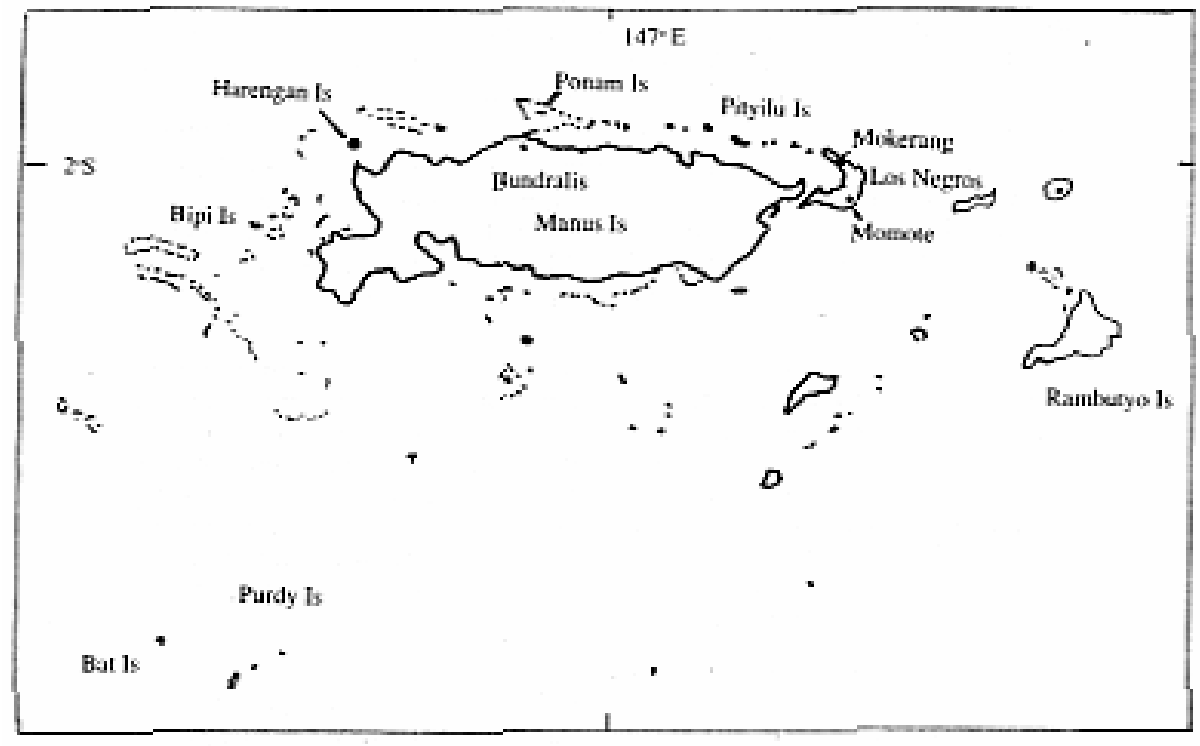
No 114 MFCU at Los Negros.

RAAF Radars 337, 345, 346 and 347 arrived in Seeadler Harbour, Los Negros, on 9 March 1944, nine days after the initial landing and seven days before No. 114 MFCU arrived. Although the airstrip was quickly captured the perimeter had not been extended far beyond.

On landing the RAAF personnel moved through an area of devastation with the lifeless bodies in grotesque postures, reeking with the sickly odour of decaying human flesh. American guns were pounding the Japanese entrenched in a coconut plantation across a narrow strip of water. Daylight movement was a hazard because of snipers and night time wanderings invited death from either foe or a trigger happy friend.

On 5 March 1944 No. 114 MFCU departed from Kiriwina aboard MARCUS DALY for transport to Milne Bay and on arrival staged at No. 10 RSU. On 12 March it left aboard the same ship to arrive Los Negros on 16 March. The only cover available was that part of the jungle canopy not destroyed by bombardment so all members slept on ground sheets for four nights. A mobile cooker provided meals. Camp construction was completed by 28 March.

Installations were completed and the unit commenced operation, with the Americans, as 26 Fighter Sector on 2 April. Cooperation between the two units was 100%. Company C closed down in mid April for the move to Nadzab to prepare for further operations. No. 114 MFCU



Admiralty Islands
Locations of stations: 153RS at Momote; 349RS at Bat Island;
345RS at Bipi and Harengan Islands; 347RS at Mokerang

then took over the full responsibility for air warning at Los Negros from the Plotting Platoon of Company C of the 583rd SAW Battalion.

The Americans were in charge of loading, transportation and unloading of all equipment for the Los Negros landings. At Finschhafen there was no attempt to keep one station's equipment together on one ship. Unloading was by means of LCMs with Australians and Americans each being given a section of beach on which to put everything. The end result was equipment being scattered along Red Beach, Salami. Parties were formed to search for equipment and stores belonging to each unit. Equipment for 347RS was nowhere to be found! Since that station was urgently needed at Mokerang the set belonging to 346RS was given to 347RS.

337RS at Los Negros

337RS was unable to move to its site at the southern point of Los Negros until 20 March because of enemy opposition. In order to gain more height for the antenna, the LW/AW was mounted on a supporting framework of coconut logs. Telling to the Americans at 26 Fighter Sector began on 28 March. It was the first Australian radar to become operational in the Admiralties.

The only Mk III LW/AW to be tested in a combat zone during the war was erected alongside 337RS and performance compared. The pulse power output was 150-200 kW as compared with 10-15 kW of the Mk I and IA models. Mr T B (Bruce) Alexander, of RPL, was responsible for the development and initiated two RAAF mechanics into the Mk III. Bruce Alexander succeeded in getting permission to visit the site but authorities insisted on him wearing an RAAF uniform. Despite an increase in range the production of the Mk III did not proceed.

347RS at Mokerang

F/O J Hatty landed with a survey party at Mokerang Plant-ation from an RAAF launch. 347RS moved to the beach looking over Seeadler Harbour at Mokerang and commenced establishing the camp on 29 March. Assistance was given by F/O L B Soden and his installation party. Station operational status was attained at 1900 hours on 4 April. The construction of a fighter strip at Mokerang meant that the station would need to be relocated. On 12 May it went off the air at 0900 hours, was moved 200 yds along the beach and resumed operations at 1700 hours. This speedy movement was possible because 346RS had returned from Bundralis and, being inactive, was able to exchange its antenna and supporting structure for that of 347RS.

After the strip was completed, the area came under artillery fire from Manus Island. The Japanese had man-handled a 75mm gun up into the hills and dug it into an emplacement of coconut logs and sandbags. From this position they rained shells onto Mokerang. US artillery, comprising three 105mm howitzers and a 155mm cannon, retaliated unsuccessfully. A spotter plane marked the enemy area and an RNZAF Lockheed Hudson bomber dropped depth charges on it. There was no further trouble from that direction.

345RS at Bipi and Harengan Islands

To complete the protection towards the south-west, 345RS was deployed to Bipi Island, then manned by an American Observer Team. Two LCMs transported the whole station, and a month's supply of fuel and rations to Bipi some 15 miles west of Manus on 5 April.

An enthusiastic native population greeted the station's arrival. Willing helpers soon had the barges unloaded. A larger than usual group included the unit personnel, Mr Cameron, camoufleur, Cpl N Young of ANGAU plus F/O L B Soden and an installation party, who were there to complete the installation. The radar was operational on 10 April, the BL4 interrogator on the next day and the first plot transmitted to Los Negros on 15 April.

However, the coverage afforded by 345RS at Bipi Island was not what the Thirteenth Air Force desired and it was decided to seek a site somewhat farther to the north. On 28 May orders were received to close down and proceed to Los Negros by 1 June.

At the same time 346RS was instructed to close down and also move to Los Negros. Both stations were overhauled and personnel received training and lectures on such matters as enemy interference to our radar and radio networks. Early in July both radars were erected at Los Negros and operated alternately on a 24 hour basis.

By July two new airstrips were operating, one on Ponam Island and the other on Pityilu Island. The Thirteenth Air Force then considered that extended radar coverage was required resulting in the redeployment of 345 and 346RSs.

On 15 July F/O W F Gill and F/O R Beatson reconnoitred Harengan Island by Catalina flying boat. 345RS staged overnight at Bundralis en route to Harengan where it arrived on 27 July 1944. The radar was operational on 2 August. The array was estimated to be 150 ft above sea level and the designated sweep was 180 to 360 degrees.

The station was operating efficiently in idyllic surroundings at Harengan Island, with P/O W F Gill having everything under control. If there was a problem on this unit then it could only relate to the number of visitors, bordering on the status of 'day tourists', who came by all means of available transport.

346RS at Bundralis.

A siting party, S/Ldr Thurston, F/Lt Thompson and P/O Harris left on 14 April and chose a site two miles from Bundralis Mission. [While Aheyos Point was a better site, access was difficult.] On 20 April P/O Harris lead the advance party to prepare the camp. The installation party followed three days later and the rest of the station under P/O Zahara the day after that. The unit was operational on 28 April 1944.

The only access to Bundralis was by barge; there were no roads or tracks into or out of the place so 346RS was isolated and vulnerable to attack by enemy forces. Many Japanese were alive and free in the jungle clad mountainous interior of Manus Island. So a detachment of 18 American infantrymen joined the unit to assist in its defence. These men remained with the unit until 7 May.

Bundralis was very good radar site but the presence of the enemy, and some minor incidents involving them, the unit was instructed to close down on 31 May and move to Los Negros with 345RS.

The joint activities of 345RS and 346RS at Los Negros and their redeployment to Harengan Island and Bundralis respectively have been mentioned previously.

On 23 July the radar personnel and equipment together with an officer and 10 other personnel of the No. 41 Radar Wing Detachment returned aboard an LCT. The old Lutheran Mission buildings were used for accommodation.

The radar was operational at 2030 hours on 26 July. F/O R Beatson left next day with the installation party to assist in the relocation of 345RS to Harengan Island.

LAC Merv Beitz, in his unpublished account of ‘The Admiralty Island Campaign’ gives the impression of the 346RS camp site being almost an idyllic setting, lovely surroundings with cool nights due to a cool breeze dropping down from the mountains. A group of American spotters was on a nearby hill, observing the results of an American barrage aimed at pockets of suspected Japanese troops farther up the valley - the shells seemed to be whistling only a few feet above their heads.

A more complete account of the difficulties encountered by this unit can be read in *More Radar Yarns* page 174 but in essence the men were largely isolated and neglected after the Americans moved north. Operations were hampered by fuel shortages, power plant breakdowns et cetera plus another report of the close proximity of a party of Japanese soldiers on 16 September 1944 when American troops were sent to assist.

On 15 January 1945 instructions were received for the unit to close down and be prepared to move - no further instructions were received until 29 April during which time the station was not operational and did not have a CO for two or three months. Imagine the reaction of the men, after suffering for months from many late and spasmodic food deliveries, when a signal was received on 23 April 1945 saying ‘there is little likelihood of transport being available to deliver rations in the future.’

This statement is hard to believe when the RN base on Ponam Island was only six miles away, and a barge passed Bundralis once a fortnight to supply 345RS on Harengan Island to the west. The plight of the men was only recognised when F/Lt J Hatty came to get the indicator unit for 347RS because that unit had suffered a lightning strike and there were no spares available. F/Lt Hatty thought that the men had gone ‘troppo’ and the unit was somewhat quickly withdrawn from Bundralis. The fact that the RNZAF sent a barge with

food supplies on one occasion and the RN, on learning of their predicament, offered to help on their last day at Bundralis, should have left egg on someone's face.

Possibly the biggest indignity the unit suffered was being shelled by the USS *Nashville* during a practice shoot on 4 October 1944.

Aircraft Activity - May 1944.

No 114 MFCU records show that 1,117 aircraft flew out on strikes, patrol or reconnaissance during the month of May 1944. Aircraft were constantly departing and returning to the airstrips. Among these were USN B24s, B25s, P40s, Spitfires and Catalinas. Their missions varied between bombing, strafing, patrolling the base, convoy duties, reconnaissance, photography, snooping and in the case of the Catalinas, rescue.

Japanese aircraft were conspicuous by their absence and there was little call for interception scrambles.

During May there were 20 major strikes of 20 to 40 aircraft against such places as Biak to the west and Guam and Truk to the north. Radars on the Admiralties plotted these aircraft out and in and were often of assistance to those aircraft in distress whether it be due to enemy action, weather conditions or malfunctions of the aircraft. No. 114 MFCU maintained constant communication with the American Thirteenth Air Force and the American 7th Fleet. US Navy aircraft and RNZAF Corsairs flew regularly from Momote airstrip.

Reverend Gordon Powell in his book *Two Steps to Tokyo* has attributed the following quotation to US Army Corps Brigadier General William A Matheny in a commendation to the RAAF Air Officer Commanding. The statement relates to the performance of all the RAAF radar stations in the Admiralties:

> I would like to express my appreciation to the officers and men of your organisation for the excellent work they have performed during the past two months in assisting Liberators with bearings and fixes when they were in trouble.....they have operated effectively and used initiative and judgement... in many instances action was begun prior to our request for assistance. I take pleasure in commending your units for their cooperation, willingness and high degree of skill.

While the four radar stations were all gathered on Los Negros the opportunity was taken by No. 114 MFCU to second their radar operators to the Sector for a week with the aim of improving the efficiency. This training was completed by 18 July 1944.

As expected the radars were continuously busy covering such an active base and the work was carried out in a most efficient manner. Any criticism falls into the category of the exception rather than the norm. Aircraft activity was such that radar stations found it difficult at times to report all aircraft on the screen. The distant targets tended to take priority and this resulted in the operators from 337RS and 345RS being called to No. 114 MFCU to discuss the failure of their radars to track a special test flight. The operators agreed that some inattention had been paid to aircraft within 30 miles of the base due to the large number of aircraft being plotted. The fighter control received no less than 22,192 plots from the four LW/AWs for the month of August. The following is the Radar Efficiency Report for October 1944.

> 114 MFCU reported on the four LW/AW's. No. 337RS - this station is very reliable. Breakdowns are nil. No. 346RS - Early this month, because of

continual breakdowns in receiver, power supply and BL4, this station could not be relied upon to give 100% operational performance. While No. 346 is non-operational, 345 and 347 radars fully cover its sweep. No. 347RS - general efficiency has been satisfactory, both operationally and technically.

Enemy Raids on Momote.

There were two incidents where raids on Momote occurred without warnings being given by the Fighter Sector. Fortunately Henry Sakaida, an aviation historian in California, who has been investigating the activities of the last Japanese squadrons in Rabaul was able to supply information regarding both incidents.

The first incident was on 9 November 1944, 337RS picked up a target, not showing IFF, at 80 miles bearing 118 degrees from Los Negros and tracked it in to 18 miles. At 1503 hours three enemy aircraft - probably Tonys or Bettys (conflicting reports but Henry Sakaida stated that they were Zeros) - dropped three sticks of anti-personnel bombs and strafed the area. There were minor injuries to six personnel including one from the RAAF. Aircraft on the ground and installations escaped damage.

The aircraft were identified by the Movement Section as ‘friendly’ en route to Momote from Carney Field (Guadalcanal - Solomon Islands). Complete surprise was achieved by the enemy who retired at high speed in the direction of Rabaul. 337RS tracked them out to 190 miles and 334RS at Cape Gloucester carried the track on to 220 miles from Los Negros.

Confusion here may be attributed to a combination of wrongful assumptions. In the first place a friendly flight was expected from this general direction and evidently at about that time. It was not unusual for some Allied pilots to fail to switch on the IFF responder. Unfortunately the ‘black box’ was not immune to malfunction.

At this stage of the war, there were very few Japanese fighters in Rabaul. Interceptions were rare and in consequence some Allied aircraft, flying between Guadalcanal and Momote, often flew close to Rabaul. As there had been only a few raids on Manus Island and none for a considerable time before this event, Fighter Sector had translated these X-ray plots into friendlies.

On 20 and 21 December 337RS detected hostile aircraft at ranges of 112 miles and 109 miles. Four Corsairs were scrambled and in each case the Japanese turned back for Rabaul when within 20 miles of Momote. Later on 24 December four Corsairs were scrambled to intercept an aircraft suspected to be a bogey although showing IFF. It proved to be a C47.

The second incident was much more serious as two American floating docks were torpedoed in Seeadler Harbour. It should be pointed out that No. 114 MFCU had moved from Los Negros and radar stations were then reporting to Sub Sector of No. 109 MFCU at Madang but that did not have any bearing on the event as it turned out. Fortunately Henry Sakaida was able to supply information, including a copy of the US Navy report of the attack, which made it possible to give the details which are summarised hereunder.

On 22 April 1945, a two seater Zero made a reconnaissance of Seeadler Harbour and reported that an American fleet was there. The decision was made to attack and a second recce confirmed that the ships were still there on 28 April.

Two Kate torpedo bombers (reported as Jills by the US Navy) were involved and the crews were a makeshift combination who had not previously flown together in combat conditions.

The attack was made on the night of 28/29 April 1945 with bad weather thrown in for good measure.

In view of the apparent lack of Japanese air activity the Americans were complacent and the harbour was lit up like a Christmas party; certainly no one would have expected the midnight torpedo attack which occurred.

The US official report states that there was no anti-aircraft fire, no radar warning and that one plane seemed to have lost control and ditched. Efforts to locate it by diving and dragging in the harbour failed which is understandable because this aircraft accompanied the surviving Kate for a distance of about 30 miles on the return flight until they lost contact in bad weather. Some eye witnesses said that it was a kamikaze attack but the Japanese Admiral Kusaka stated that such was not the case because on this occasion 'it was not necessary.'

For the last 40 miles of the approach run the two aircraft flew at only 150 feet; a very successful approach as it turned out. 337RS was in a position to detect the Japanese aircraft but, since it was only a few feet above sea level, it would only have had a range of about 20 miles for an aircraft flying at that low altitude - maybe 10 minutes warning if immediately, but there is no evidence that they were picked up by the radar.

Both floating docks received a torpedo hit, suffering only moderate damage and there were 37 minor casualties among the Americans. One plane, piloted by Ensign Tokuya Takahashi returned safely to Rabaul but no explanation for the loss of the other was put forward by the Japanese. Pilot Takahashi reported that they had hit an aircraft carrier and a battleship - hence the claim by Tokyo Rose on the radio a night or two afterwards. The mission leader, Ensign Chuhei Okubo who flew as the observer, was still adamant three years after the war that such was the case.

340RS on Bat Island.

A site was sought for an early warning station to the south west of Manus to provide protection against enemy air raids emanating from Wewak and directed towards Los Negros. Bat Island, one of the Purdy Group, lies about 75 miles south west of the Admiralty Islands. Although it is a flat coral atoll a station there could provide adequate warning.

Information regarding the Purdy Islands (Mulatau) was supplied by S/Ldr Thurston of Alamo Forces Intelligence for briefing 29 February 1944. S/Ldr Thurston described Bat Island in some detail as being a small area with no permanent water, the highest point being six feet above sea level and having some problems for access. His advice contained nothing about health hazards.

On the other hand P/O Les Bell knew that there was a history of sudden deaths associated with this island since occupation by a mission and the development of a coconut plantation. At the siting conference he strongly advised against its use and suggested an alternative island which had the advantage of higher ground. This junior officer was overruled and the deployment of this station proceeded.

340RS with F/Lt Walther in command, was well prepared at No. 41 Radar Wing, Port Moresby for this mission. The senior technical officer, F/Lt B Katz, F/O Ferrie (technical), F/O Fairchild (technical) and F/O Howell (security) all lectured the station personnel. Equipment was arranged into aircraft transportable lots of 5000 lbs. Camoufleur Mr Adams and installation officer P/O Bell were attached.

The station was flown to Finschhafen and on March 4 was loaded on the vessel US F15. Next day it proceeded to Dreger Harbour to pick up a water distillation plant from Arawe where it had been used by 335RS. P/O Bell had sailed this coast line many times pre-war and his knowledge of these poorly charted waters was most providential. At the request of the captain of the escort ship P/O Bell navigated the convoy to Bat Island. On the morning of 8 March P/O Bell piloted the F15 to the open sea and transferred to the escort ship SC736.

Six American Observers from Company C already on the island were taken by surprise when the ships anchored off the north west side of the island at 0200 on the morning of 11 March. Guns were manned but fortunately no shots were fired.

Next morning a difficult landing was made during foul weather on the south west side of the island. The installation of camp and technical equipment was on copy book lines. On 13 March, 26 Fighter Sector, No. 114 MFCU, was contacted by W/T and on 14 March at 1800 hours the radar was on the air operating satisfactorily on its coconut log stand. Lack of permanent echoes posed a problem for fine tuning of the radar. Innovation was clearly called for so an artificial PE was provided by placing galvanised iron sheeting up in a coconut tree on nearby Rat Island.

It was not long before P/O Bell's concern about the suitability of Bat Island as a radar site was vindicated as shown by the following signal (41 Radar Wing Detachment Signal No RS/26).

14 March	F/O Walther ill and AC1 Moffitt, appendicitis, evacuated by PT boat.
15 March	F/O Walther now very ill - signal to Momote.
16 March	F/O Walther evacuated to Momote by float plane.
17 March	Senior radar mechanic ill - dengue fever.
19 March	75% men ill and fatigued.
23 March	WO Clayton of ANGAU evacuated - dengue fever. US Observer evacuated - scrub typhus.
25 March	Three men off duty - dengue.
27 March	Two US MT boats take off F/O Howell, ANGAU and US personnel all very ill.
30 March	One sick airman evacuated by float plane.
31 March	Two more dengue patients to 26 MSC by RAAF launch. P/O Bell and 3 airmen off duty suspected dengue fever.
2 April	P/O Bell very ill - scrub typhus.
3 April	P/O Bell taken Momote by S/Ldr Harrison. RAAF flying boat used.
4 April	More airmen off duty.
5 April	10 ill airmen evacuated on RAAF supply launch.
7 April	2 airmen admitted sick quarters - one with dysentery.
8 April	1 airman admitted sick quarters - dysentery.
9 April	P/O H C Cairns and Sgt Bickford admitted sick quarters.
10 April	2 more airmen to 26 MCS by flying boat.

12 April STATION ORDERED TO CLOSE DOWN.

The crew of this station must be commended for they carried on their duties in a situation which resulted in the deaths of six American and Australian servicemen from scrub typhus. The effects on survivors who had the illness were far reaching. Fifty years afterwards, one such survivor who spent many many months in hospital at the time, still has to watch his health and diet.

Despite being short handed because of illness the station had operated successfully for 30 days in a most efficient manner. So much so that Signal No. P305J from Vth Fighter Command insisted that the station remain operational to continue the valuable work. This signal was evidently ignored by No. 41 Radar Wing.

During the Bat Island operation the command had passed from F/O Walther to P/O Bell and F/O Howell conjointly, then to P/O H C Cairns. He was replaced by F/O C C Siegele who later handed over to F/O G Colley when the station returned to Los Negros.

RAN Corvette HMAS *Stawell*, towing a barge, transported a sergeant and 26 men of 346RS, which was staging at the time, to assist the withdrawal of 340RS. All of the men from 346RS volunteered to go on the mission to 'assist their mates'.

High seas made beaching the LCM very difficult. Eventually this was done on the side remote from the equipment. The gear was manhandled aboard in rising seas. All heavy equipment was left ashore stacked and covered. The corvette and barge departed at 1830 hours on 14 April. At Los Negros the gear was stored at 337RS and the men taken to No. 26 MCS for medical examination.

Another party comprising an officer and 17 airmen left Seeadler Harbour aboard one LCM and one LCV type barge at 0630 on 7 May and anchored off Bat Island at 1800 hours. Next day, wearing protective clothing and smeared with insect repellent, the removalists set to work. A number of items were loaded and the barges refloated. Unfortunately the LCV damaged its propeller and shaft on coral. Loading was completed next day using pontoons. Blankets, stretchers and other barracks equipment were burnt. There was little doubt that they were infested by fleas and lice carrying the scrub typhus microorganisms that had overwhelmed 340RS.

Towing the two pontoons the salvage party left at 1000 hours. Before reaching the open sea a drum of oil rolled to one side and capsized one pontoon which promptly sank. The seas were rough, progress was slowed and the LCV now in tow threatened to sink. Shelter was sought at Pig Island in the Mbuke Group for the night.

Hyane Harbour was reached late next day and the equipment taken to the 340RS site. F/O Graham Colley had arrived the previous day and already had accommodation in the shape of American bell type tents and new camp stretchers for the men.

153RS at Momote.

153RS, a mobile GCI, was brought to readiness and moved to Finschhafen. There in January 1945 it joined another station which also seemed to be headed for nowhere. 350RS on an adjacent site was seeing the war out 'in limbo' - this unit had been in existence for 15 months and never ever became operational ! A life of congenial co-existence was established. It was a case of 'static active' service suffered in tropical conditions and, hard to believe, aggravated by an acute shortage of water at that time.

NORCOM signal of 9 January ordered 153RS to set up at Momote. An NCO with three guards and five radar operators formed an advance party which left on 1 February for Momote. It was not until 5 July that transport was available to Los Negros indicating the low priority for a GCI radar there.

The complete station including a GCI transmitter truck, two diesel generator sets on trailers, a receiver/operations van, an office tender and a GMC cargo tender were transported to and set up at Momote. It was brought to operational status by 6 August and put on stand-by.

F/O W W Wellstead commented in his general report of 1 September 1945.

> This station has not been called upon as yet and with the cessation of hostilities there seems little possibility that the station will be required.

CHAPTER 17

Leaping Along The North Coast of PNG

January 1944 to January 1945

From the beginning of 1944 the leap-frogging accelerated westward along the northern coast of New Guinea. The Australian 7th Division was driving the Japanese northward from the Huon Peninsula. The American landing at Saidor cut off further retreat and bottled up thousands of the enemy. The Australian 9th Division completed the pincer movement by linking up with the Americans at Saidor.

Elements of the 583rd SAW Battalion withdrawn from Cape Gloucester landed at Saidor an hour after the first wave of troops on 2 January 1944. Enemy opposition was slight and the advance echelon of Company B Headquarters was soon estab-lished. With it landed four Reporting Platoons, the Plotting Platoon and four Observer Teams.

The 9th Reporting Platoon was operational by mid-afternoon of the landing day providing air warning and reporting to the ack-ack. Dependable warning was given of enemy aircraft approaching from the sea but difficulty was experienced when they used the Finisterre Range for cover. Fortunately enemy air raids at first were infrequent.

Muddy terrain, dense jungle and swift streams were a great hindrance at Saidor. It took three days to get the 21st Sub-Sector fully operational with two radars reporting to it.

Frequency modulated transceivers were to replace land-line for communication with the Sub-Sector but they were not altogether satisfactory. The 11th and 12th Reporting Platoons failed to establish consistent contact even when land-lines were laid. Because of communication problems with its own radars the 21st Fighter Sub-Sector established by Company B monitored both the 19th and 20th Sub-Sectors to maintain a reasonable picture of aircraft activity.

The 7th Reporting Platoon, also of Company B of the 583rd, was still at Faita in the Ramu Valley reporting into the 19th Sector and providing coverage of enemy planes from Madang approaching Saidor along the coast. Other stations reporting into 19th Fighter Sector gave some warning of aircraft approaching Saidor from the south over the Finisterre Range. The 20th Sub-Sector gave early warning of possible raids from the direction of Rabaul.

On 29 January Company B Headquarters, the 5th and 6th Reporting Platoons and Plotting Platoon B of the 565th SAW Battalion arrived at Saidor from Goodenough Island. Effective air warning was continued while the elements of the 583rd moved out to prepare for further amphibious landings.

301RS at Saidor.

Leaving Finschhafen in two barges and travelling in the open sea this LW/AW arrived at Saidor early October 1944 after the war had passed from the area. However after the captured area was secured the Japanese were left to languish in the surrounding hills. Infiltrations were a distinct possibility and round-the-clock guard had to be maintained. The radar was gutted by fire and had to be replaced. The Japanese were nominated as the arsonists. It was also reported that the Japanese came down from the hills at night to watch the open air picture shows!!

Aitape/Tadji

301RS arrived with a well trained crew and was operational some 12 hours after landing. The radar was sited on a high hill with 180 degrees sweep. Telling was to No. 109 MFCU situated on the main road between Madang and Alexishafen, about two miles north of Madang air strip. This fighter sector had moved to that location from Dobodura at the end of December 1944. There were many aircraft to track but all were friendly. Their main concern was to watch for possible enemy air raids from Rabaul. These did not materialise, consequently the eager young Australians soon dropped into the rather monotonous routine of sentry duty and support when called upon.

VJ Day at 301RS. Note the marching behind the flag, the Pied Piper and the immaculate uniforms.

While conditions were relatively good and supplies carried by a small boat service on a regular basis from Madang it was a rather boring place to exist. Earlier on at Richmond the CO, F/Lt Phil Williams, had encouraged the men to practise morse code. They carried on various activities at Saidor, one being the formation of a musical group. This culminated on VJ Day with a parade through the camp with flag flying and music playing.

At the beginning of the conflict with Japan the LW/AW was a key radar giving outstanding results while the war was in the balance and the Allies were gathering their forces for the drive towards Japan. In 1944 the war had changed character and the LW/AWs role changed also. The Allied forces were now in full cry leaping from beach to beach and island to island. Troops on a narrow beach-head wanted air warning immediately after the landing not a day or even hours afterwards. This called for a very mobile team with a very transportable radar able to be put into operation within an hour or even less following the landing.

The Americans anticipated this need and the 583rd SAW Battalion increased the efficiency of the SCR602 sets and operators and plotting platoons by training at Goodenough Island. Under combat conditions the RAAF crew at Pilelo had taken more than two days to bring the LW/AW to operational status. This was a commendable effort for this type of radar under the conditions encountered. The SCR602 radar was the nearest approach to the requirement. The Reporting Platoons often landed with the second wave of beach assault and were reporting into a small plotting board within an hour or so. Only short range warning was possible but 30 miles detection of approaching enemy aircraft gave the troops time to take cover and the ack-ack to come to readiness. The reliability of the warning was enhanced by the deployment of the ground observer teams that accompanied the assault echelon.

Then after the captured area was consolidated long range radars like the SCR270s and the LW/AWs came on the scene and took over. At Saidor 301RS took over from the Americans. Earlier, at Cape Gloucester, we saw the SCR602s replaced by the American SCR270 and a Mk II LW/AW which were in turn replaced by 334RS, an LW/AW, - Saidor saw a repeat of this. Further repeats of this approach occurred in quick succession at Aitape, Hollandia, Wadke Island and Biak Island.

301RS were still at Saidor when the war ended and their jubilation at the cessation of hostilities is evident from the photograph of their Victory Parade on VJ Day.

Aitape - Hollandia Operations - 22 April 1944.

The 500 mile leap from Saidor to Aitape and on to Hollandia on the same day took the Japanese by complete surprise. Landing at Aitape was delayed because of the need to construct an unloading ramp. The 10th Platoon of Company B was operating on the beach using a Yagi antenna six hours after the infantry landed. A ground observer team was dug in at a vantage point. An hour later the Assault Echelon with its small plotting board for ground-air control was in operation. Navy fighters filled the air but there were no enemy aircraft to which they could be directed.

On the second day of the landing the 9th and 11th Platoons were transferred from a Liberty ship to LCIs which transported them to the off-shore island of Seleo. Vehicles carrying the radar equipment were driven to the sites. The 11th Platoon was soon passing plots but the other platoon had communication difficulties for several days.

Tumleo Island, just west of Seleo, was occupied by the 12th Reporting Platoon on 25 April. Observers set up posts on both islands and reported independently to their communication centre on the mainland near the plotting centre. A lone enemy aircraft penetrated the warning net and dropped a bomb on a Liberty ship.

The Assault Echelon plotting board was relieved after a week by the Sub-Sector whose buildings had been completed and necessary telephone lines laid. In the middle of May the 7th and 8th Reporting Platoons arrived from Faita and Dumpu in the Ramu Valley. They were not required to operate.

No 111 MFCU arrived Tadji 22 May 1944.

This Fighter Control Unit departed Cape Gloucester 16 May for Finschhafen, split into two parties on a Liberty Ship and a landing barge. The complete unit, 27 officers and 297 ORs, went forward to Tadji aboard a Liberty Ship. No. 111 MFCU arrived at Aitape from Cape Gloucester on 21 May 1944. Two LW/AWs and a GCI took over the air warning for the area. The cooperation between the Americans and the RAAF was truly excellent. The Fighter Control was set up at Tadji and the GCI radar just off Tadji beach. One LW/AW went to Tumleo Island and the other to Aitape Point.

152RS was a mobile GCI radar set up on trucks and trailers at No. 1 RIMU, Sydney. On arrival at Finschhafen by SS *David F Barry* the personnel disembarked and the equipment went on to stage at Lae guarded by five personnel. Personnel and equipment arrived at Tadji on 22 May aboard SS *Marcus Daly*.

On 25 May 1944, the following report was written by F/O A K McKellar-Stewart:

> Difficulty was experienced in unloading organisational and technical equipment as all carrying from ship to shore was done by barge. Much

> equipment was pillaged in transport despite efforts by personnel to prevent same. American servicemen unloading the equipment from the hold treated it extremely roughly the consequence being that many cases were broken, the contents scattered and much equipment damaged by violence and rain. The radar equipment has not suffered badly as it is all in covered trucks which, although badly battered, afforded some measure of protection for the contents. Equipment, having been two months in tropical areas without protection has deteriorated owing to damp and heat.

Despite that plaintive report the radar was operating well by 7 July 1944. Credit must go to Cpl D G Dowe and his team of mechanics. Fighter Sector was well pleased with the station performance but due to the lack of local knowledge, the radar had to be moved to higher ground when heavy seas threatened the aerial trailer.

The Fighter Sector went into operation on 31 May and put out an alert that day but no action eventuated. On 25 July a RED alert was issued at 2130 hours. No action followed and all clear at 2204. Reporting to No 111 MFCU were 152RS, a GCI, and two LW/AWs, 340RS and 348RS. These radars did not track any enemy aircraft but were, nevertheless, very busy with Allied planes. It was inevitable with such a volume of aircraft in the sky in difficult flying conditions that emergencies would arise. To cite some incidents.

On 9 August a distress code IFF was reported 0820 hours and the rescue Catalina flying boat was vectored to the area. The aircraft identified itself and was directed to base. Again on 13 August at 1045 hours both Hollandia and Tadji radars reported a distress IFF signal 30 miles north east of Hollandia. Both reported the trace disappearing at the same time. At 1200 hours 110 Reconnaissance Squadron reported that a P39 was shot down by enemy ack-ack half a mile from Mission Point between Boram and Wewak. It was considered too dangerous to attempt a pilot rescue by either PT boat or Catalina.

The pilot of a C47 reported himself lost en route Nadzab to Hollandia at 2100 hours on 18 August. The weather was very poor with the cloud base down to 1500 ft. On this rare occasion the radar was unable to give a definite plot or track. The homing beacon was turned on and the searchlights requested to cone their lights over the Tadji airstrip. The C47 subsequently sighted the searchlights and landed safely.

At 2150 hours on 25 August an aircraft was reported not showing IFF. It was plotted 20 miles to the north west, heading towards Tadji and did not respond to a call on the R/T. The suspected enemy aircraft was reported at 10,000 ft flying at a speed of 210 miles per hour. The aircraft was again warned on R/T that if its position and destination were not notified to Tadji that a RED alert would be called. Radio contact with Wewak and Biak confirmed that no aircraft was scheduled to be flying in the area at that time. Following another R/T call at 2158 hours C47-338 identified himself north west of Tadji and heading south west. His point of departure had been Sansapore. He claimed that the IFF, which was now showing on the radars, had been on throughout the flight !

On 10 September two flights of aircraft were directed to safe landings. One flight of two C47s reported themselves lost seaward of Tadji at 1900 hours. Radar plots however reported their emergency IFF signals coming from a far different point over Wewak. The aircraft were instructed to fly west and watch for the search lights coned over Tadji. Both landed safely.

On completing its service at Tadji No 111 MFCU received a signal from NORCOM to return to Australia aboard the TSS *Katoomba*; it arrived at Sydney on the 30 September 1944.

Small areas wrested from the heart of enemy territory were at considerable risk of counter attack. In consequence all radars in forward areas were to be demolished in the event of being overrun by the enemy. To quote an example of the planning involved the following is the division of responsibility planned for 152RS. Cpl D G Dowe and four airmen, the aerial trailer; Cpl J P Dickeson and four airmen, radar receiver; LAC H H Kluver and four airmen, radar transmitter; LAC J M Miller and four airmen, spares; Cpl H F Joy and five airmen, diesels and trucks; Sgt J H Birch and four airmen, 'A' priority documents; Sgt K W Watson and three airmen, fuel; Cpl H E Cook and three airmen, the store. F/Sgt Cordes in charge of remainder of men for defence. Order to commence activities was to be given only by the Commanding Officer, or in his absence, by F/Sgt Cordes. Destruction was to be any means, ie by axe, hammer, petrol fire and explosive charges.

348RS at Tumleo Island and Hollandia.

Tumleo Island had a coral capped basalt core raised above sea level which provided an ideal 360 degree sweep radar site. The station was ideally placed to cover aircraft from Wewak to Hollandia. Radar operator/mechanic LAC I D McDonald claims his station had the best operational record in New Guinea. W/T operator Stan Williams who also served there supports him. This sort of pride in station performance was general in the forward areas.

Various American units used Tumleo Island as a staging point. The native population had been evacuated to Seleo Island. As well as 338RS, there were two hospitals, an artillery unit and an American PT Boat Squadron. The Australian radar took over from the small mobile American radar operated by the 12th Platoon of Company B of the 583rd SAW Battalion.

348RS had everything in its favour. Tropical heat was mollified by the surrounding sea, food supplies were guaranteed, hospital care was nearby for the ill and various entertainment facilities were available.

Communication with No 111 MFCU at Tadji was by W/T at first but then reverted to plain language as there was no enemy air activity thereabouts. Two of the four W/T operators were replaced by two R/T operators. This arrangement would have been satisfactory had not 'the powers that be' demanded that plots be sent by W/T to ADHQ at Madang as well. Two W/T operators, Jack Weeks and Stan Williams, had to maintain a 24 hour watch between them. Furthermore these two W/T operators had a similar task with No. 111 MFCU on shore. Despite repeated requests for relief by the Commanding Officer, F/O A H Philp, this state of affairs existed for over six months. While there were no enemy planes to report the allied air traffic was continuous. It is interesting to note that for the 22,500 plots for September 1944 not one was of a hostile plane.

On 22 July 1944, at 2130, hours the Commanding Officer of No. 111 MFCU advised of intelligence reports concerning the possibility of attempts by the enemy to land from barges in the bay area. Reconnaissance flights had detected some enemy barge activity on the south coast and it was reported that the Japanese had a concentration of barges loaded with troops and artillery near Wewak. It was assumed that the probable target was Tumleo Island from which the enemy might wish to shell the strip at Aitape. An American destroyer 'stood to' off Tumleo Island but no attack eventuated.

When the report came through to 348RS, the station and everyone else on the island, went onto full alert. Double guard was mounted and all personnel advised to prepare their arms and ammunition for possible action. Demolition crews were ordered to hold themselves ready for possible destruction work and the demolition charges were actually set in the Doover.

There was only one entrance to the island through the extensive coral reef. American infantry crossed to the island to cover this possible landing area. After a night of high tension the island defenders were greatly relieved to see the American destroyer anchored between them and the mainland. No attack occurred and it was later reported that RAAF 100 Squadron attacked enemy barges assembled near the mouth of the Sepik River and destroyed them.

The 'residents' of Tumleo Island had a grandstand view of the pyrotechnical display which resulted, according to one report, when infiltrating Japanese landed a couple of shells from a mobile gun into the ammunition dump one evening at dusk. The 'fireworks display' went on sporadically for three days.

The station arrived on 19 May 1944 and moved ashore at Tadji on 19 July 1945. A month later it moved to Hollandia where General MacArthur had amassed thousands of troops for the invasion of the Philippines. When those forces left so did the American radars. As it was still an important base for the Australian invasion of Borneo radar coverage was still deemed to be necessary. So 348RS was refurbished and moved to Hollandia from Tumleo Island. WOM Stan Williams, who was a member of the station from formation to disbandment, claims that a major part of that activity was to replace the Mk I with a Mk II tower.

The selected site was overlooking Humboldt Bay; the Americans had abandoned buildings and tents so it was simply a case of moving in. The atomic bomb was dropped on Japan while the installation and testing was in progress. Orders were received for the station to become operational as coverage was required to aid flights transporting POWs back to Australia.

Another signal followed ordering the station to be dismantled and packed in crates to be sent to Madang on an RAAF motor vessel. The crates which arrived were labelled 'War Museum - Canberra'. However, from other sources it would appear that the equipment which languishes today out of sight in the Mitchell Annex of the Australian War Memorial was presented to them at the direction of W/Cdr Pither in 1956. Doug Dowe, who assembled the gear, has said that it was made up from several sets so it cannot be 348RS's set.

340RS at Aitape - Tadji - Aitape.

F/Lt J G Colley took charge immediately after the salvage crew delivered 340RS to Los Negros after the disaster on Bat Island in April 1944. Colley set about making good shortages in equipment, much of which had been burnt at Bat Island because of the risk of infection.

However the station was still dogged by difficulties. Instructions were received on 14 May for the station to be ready for transport to Tadji that day at 1115 hours. On arrival at the strip it was found that the 12 Douglas aircraft had departed at 1000 hours leaving advice of return next day. All gear was packed ready in 5000 lb lots ready for loading but the planes failed to arrive. The unit was without accommodation but meals were provided by No. 49 OBU.

Finally on 18 May only nine Douglas aircraft arrived - insufficient to airlift the station. The jeep and trailer were left with 41 Radar Wing Detachment to be forwarded. The station was accompanied by the senior technical officer from No. 41 Wing, F/Lt B Katz and the camoufleur Mr Cameron. On arrival at Tadji the personnel unloaded the equipment and transported it to No. 10 Operational Group Staging area.

F/Lt Katz surveyed the hill above Aitape Point and found it suitable as a radar site. Gear was transported to the punt crossing of the Aitape River and a guard set. After cutting a track up the hill heavy gear was moved to the site by jeep while some light items were manhandled. At 1830 hours on 28 May the radar was on the air and calibrated by F/Lt Katz. Plots

consistently over 100 miles were being sent by R/T to No. 111 MFCU. Meantime a land-line was being laid. By 1 June an ASV beacon was installed and operating. Rations were supplied to the unit by the American 126th Infantry Unit.

This site was approximately three miles outside the defence perimeter established by the Americans. Many Japanese soldiers wandered through the outskirts of the Allied positions posing a continual threat. Defence positions had to be established and double guard set. Demolition charges were put in place and a track for speedy withdrawal delineated. Ten American guards were attached as a listening post.

The American command withdrew the guards saying they were not in a position to guarantee the safety of the station. As the enemy activity seemed to be escalating it was decided to withdraw the station.

Search for a new site was carried out by S/Ldr F H Williams, CO of No. 111 MFCU, F/O Propsting, No. 41 Radar Wing Detachment, F/O Colley, CO of 340RS and Mr Cameron, camoufleur. A search of the mainland and off shore island found that there was no site that would augment the already good coverage afforded by 152RS and 348RS.

Of course an extra early warning unit in the area was really only a back-up in the first place in much the same way as l5lRS was an embarrassment at Los Negros. An order to close down for removal on 29 June resulted in the station being transported complete to Tadji beach in nine and a half hours. There time was spent repairing and repacking in anticipation of forward movement. Operators worked on shift at 152RS nearby.

An Impudent or Imprudent Siting Party.

Official records state that Col Monteith of the US Task Force suggested a possible radar site for 340RS on Tarawai or Walis Island about 30 miles from Wewak and nine miles off the enemy controlled coast.

On 3 July F/Lt Colley and Mr Cameron departed Tadji on two PT Boats to examine the islands for Japanese occupation and possible radar sites. Also aboard was an American Army Lieutenant with a party of enlisted men and an ANGAU officer with some natives.

The islands were patrolled all night but no Japanese barges were found. Just before dawn a party landed in a rubber boat on Tarawa Island while the PTs stood off shore about a mile in case of emergency.

Several Japanese were found asleep on the beach and as the party was approaching a hut containing more, a native fired at a Japanese he saw moving. This wakened the whole camp. The party threw grenades at the hut and fired shots while retreating to the beach. The Japanese retaliated with a couple of knee mortars. Meanwhile the PT Boats were coming in with guns manned. The landing party was rescued and the PT Boats made strafing runs along the beach. On return it was decided to abandon the idea of a radar station on either island - such a move would have been bold in the extreme.

Allied intelligence estimated that on the mainland opposite the Japanese commander, General Adachi, had something like 20,000 troops under his command with another 10,000 in the Wewak area just to the south. Moreover there were signs that he was going to strongly oppose the landing at Aitape. Strong patrols began probing the Allied base and concentrations of Japanese troops were observed.

An All Out Attack by Japanese Infantry.

The desperate Japanese launched their attack against Aitape on 10 July 1944. Within a few hours a regiment of enemy soldiers penetrated the American defences near the mouth of the Driniumor River. They advanced threateningly towards the Tadji/Aitape area and the reaction of the Allies was one of savage opposition. Unhampered by enemy aircraft, Australian Beaufort bombers, Beaufighters and American Airacobras flew non-stop sorties out of Aitape air strip less than 20 miles from the action. On 14 July the RAN Task Force commanded by Commodore Collins consisting of the cruisers HMAS *Australia* and HMAS *Shropshire* supported by four destroyers blasted the enemy while the Air Force pin-pointed targets for them. The Japanese had made the mistake of advancing along the coast. The enemy forces weakened by malnutrition and malaria were routed when strong American Infantry reinforcements arrived. This was a decisive action after which the threat to Aitape evaporated.

Following instructions on 14 August from NORCOM, 340RS was transferred from administrative and operational control of No. 114 MFCU, Los Negros to that of No. 111 MFCU at Tadji. F/Lt Colley's request to return the station to Aitape Point was refused by the Americans. During September while F/Lt Hubbard was in Madang, F/Lt Colley was acting radar officer for No 111 MFCU. He handed over control of 340RS to F/O C C Zahara on 23 October 1944.

The station was erected and proven operationally on Tadji beach and then, with approval given, returned to Aitape Point to again be operational on 23 December 1944. On this occasion the camp was set up on the beach to the west of the Point. With the Japanese menace gone the station settled down to routine operation under reasonably pleasant circumstances for 12 months before disbandment.

On 22 April 1944 a two pronged assault was made on Hollandia, one at Humboldt Bay and the other at Tanahmerah Bay some 30 miles farther west. The airfield objectives were midway between the landings and about 10 miles inland near the large Lake Sentani. The terrain was jungle clad, rain was incessant and vehicular tracks were soon churned into deep muddy strips.

Company D of the 583rd SAW Battalion was assigned to the Hollandia mission. An Assault Echelon and the Reporting Platoons landed after the troops at Tanahmerah Bay. Although the 23rd Reporting Platoon was caught up with its equipment during the landing the 21st Reporting Platoon was in operation 45 minutes later on the beach head.

Soon after landing at Humboldt Bay on the same day the l9th and 20th Reporting Platoons were in operation. However communication was not established with the plotting board as the Assault Echelon and 22nd Platoon did not land at Tanahmerah Bay until next day. It was intended to set up the Sub-Sector inland near the aerodromes but transport to there was impossible from Tanahmerah Bay. Advice was given that it was more likely the selected site could be reached from Humboldt Bay.

By the second day of the landing four Reporting Platoons were operating and the remaining two were endeavouring to reach a pre-selected site on Cape Tanahmerah. Various elements of Company D used frequency modulated transceivers for commun-ication. Transmissions were extremely disrupted during these operations because of jamming of the radio channels. This was evidently of Japanese origin.

The Plotting Platoon obtained barge transport to Humboldt Bay on 28 April only to find that even bulldozers were bogged down on the road towards the airstrips. The Sub-Sector was set up temporarily at a site overlooking Humboldt Bay.

On 5 May the road was cleared, the Sub-Sector set up in its final position and readied for operation. The Assault Echelon at Humboldt Bay then withdrew its small plotting board.

While there was no dangerous opposition from the enemy the members of Company D had a frustrating time coping with continual movement over muddy terrain in hot wet conditions and with no established camp. Hammocks between jungle trees were used at night. Work was carried on as long as the daylight persisted and food for four weeks alternated between K and C emergency rations.

Long Range Radars at Hollandia.

Company B of the 583rd SAW Battalion had the use at Hollandia of three radars from the 579th. The long range radars were an Australian LW/AW and an SCR270. Ground-to-air interception was provided by an SCR527. With the SCR602s still operating there were nine radars providing cover at Hollandia. Although enemy air activity was light the odd lone bandit used the mountains to avoid detection.

Radar Under Fire at Wadke.

The mission at Wadke Island had all the disadvantages experienced at Hollandia plus constant sniper fire and enemy counter attacks. It was an all American mission and again the American SCR602s went in with the assault troops. Company A of the 583rd SAW Battalion departed Finschhafen on 9 May. Some of the platoons flew to Aitape and boarded LSTs there while others moved to Hollandia direct by LST. The Commander's orders when leaving Finschhafen were vague and the forward planning for staging incomplete. There was considerable confusion at congested Hollandia.

Once aboard the assault craft the mission progressed in an orderly fashion. D-Day was an American Infantry landing on the mainland of New Guinea opposite Wadke Island 17 May 1944. The air warning contingent was comprised of the 1st Fighter Control Squadron, three Ground Observer teams and the 1st and 5th Reporting Platoons. Next day the 5th Platoon went into operation but the 1st Platoon spent several days clearing faults.

On 18 May the 3rd, 4th and Plotting Platoons landed under fire on Wadke Island after the infantry at 1300 hours. The small assault plotting board was ready at 1600 hours but enemy sniper fire hindered operation. The 4th Platoon operated until night fall. Everyone entered foxholes for the night. Enemy fire was too intense for operation to be sustained the next day. Three members of the Company were wounded, one mortally.

That night Japanese soldiers infiltrated the positions of the 4th Platoon but there were no casualties. When a sniper opened up next morning he was soon silenced by the Platoon's .5 calibre machine gun. During the first few days at least three Japanese were killed in action with the 4th Platoon.

On 19 May the 2nd and 6th Platoons landed on two nearby islands unoccupied by the enemy. Two days later the Sub-Sector became operational on Insomania Island separated from Wadke Island by about 500 yds.

Meanwhile on the mainland the 1st Platoon began operating on the east bank of the Tor River. It maintained operations for a week withstanding infiltrations and mortar fire by the

enemy before retiring to the rear. Most of the American troops had pushed forward and the 5th Platoon remained operating on the beach.

When the enemy infiltrated their area the 5th Platoon personnel held fire for fear of shooting one another. The enemy found the radar site and riddled the plotting tent with bullets before withdrawing. The only damage was to the interrogator equipment. There were no further attacks and few air raids occurred. Long range air warning was provided by an LW/AW set up in an LCT proving the practicability of an idea discarded by the Australians at Lae.

Efforts of the personnel at Wadke were in fact recognised and to quote from official US Records:

> The company commander with the platoon commanders were unanimous in praising the discipline and courage demon-strated by enlisted personnel of the Company during the early phases of the Wadke operation. Troops conducted themselves in such a manner that casualties were held to a minimum, equipment was practically unscathed and operation was maintained with a minimum time off the air due to enemy fire.

Biak

The landing at Biak on 27 May 1944 was among the most dangerous experienced by the radar platoons. The southern coastal strip captured extended from Bosnek westward to Mokmer airstrip. This was overlooked by a coral cliff less than a mile from the sea. Japanese occupied the high land beyond the cliffs and as it turned out later the caves in the cliffs themselves. There they had secreted a small artillery piece.

Assault troops were followed by the 7th Platoon with radar equipment part way towards Mokmer airstrip and began setting up their LW/AW aerial near the Plotting Platoon's position. During the early hours of 28 May Japanese troops sallied forth and infiltrated the radar positions. Both sides held fire not wanting to disclose their whereabouts. The remainder of the night was a dramatic 'cat and mouse' affair in which both sides suffered bayonet casualties. The Japanese withdrew before daylight leaving a number dead while one American died of wounds. After withdrawing the 7th Platoon was relocated offshore on Owi Island while the 8th Platoon went to Woendi Island.

The 9th Platoon with its SCR602 also set up along the narrow coastal strip where its life was made uncomfortable by the artillery piece hidden in the cave in the cliff. By 6 July a Fighter Sector was set up in three C47 aircraft parked near Mokmer airstrip. Dubbed 'The Flying Circus' it received plots from one SCR270, one SCR527 and five SCR602s, two of which, as already noted, were on offshore islands. Two RAAF LW/AWs were sent to Biak with the intention of replacing the American units but this did not eventuate as the need petered out.

A Tacit Goodbye

As each American SAW Platoon completed its mission at Hollandia, Wadke and Biak it was withdrawn from service - a tacit goodbye to the RAAF.

Substantial and comfortable camps were set up; sawmills established to produce timber for the camps and new packing cases for the equipment. After reconditioning all equipment an intensive training program was commenced enhanced by a valuable interchange of strategies between platoons camped nearby. Work was tempered by recreational activities and the men enjoyed food luxuries missed during the difficult preceding months spent with the assault troops.

The purpose of this refurbishing, mainly occurring at Hollandia, was to prepare for the invasion of the Philippines sometimes described as General MacArthur's 'return.'

That invasion is outside our self-imposed terms of reference so we will continue with RAAF movements towards Borneo in the later chapters.

349RS at Hansa Bay.

Deployment of 349RS to Hansa Bay on 4 January 1945 seems to have been an afterthought. By that time Japanese aircraft along the northern New Guinea coast line had disappeared. Many had been shot down and at places like Hollandia hundreds had been destroyed on the ground. Radar stations had been installed at Aitape, Hollandia and Wadke Island more than six months earlier and even then very few enemy aircraft were plotted. The purpose for deploying this station could only have been to give navigational aid to our own aircraft in adverse weather conditions and in the event of instrument failure. There was no radar operational in the Madang/Kranket Island area.

F/O L Bell OBE was sent by the CO of No. 3 RIMU at Kranket Island to help with the installation of this radar. He gave this report on the mission.

> I got Dick Cribbin to fly me up to Hansa Bay in his Walrus. He was the same chap who flew me out from Bat Island when I had scrub typhus. The Australian Army at Hansa Bay did not know where the radar unit was camped. There were Japanese wandering around everywhere and the Army had patrols working along the coast. It was teeming rain and all the rivers were in flood. When I asked a Lieutenant if I could accompany the patrol south next morning he asked my name and then said, "You're not Lincoln's brother are you ?" On finding that I was he added, "Half this outfit were assisted by Lincoln Bell when they got out of Rabaul. He ran them down to Talasea where they got a ship back to Australia. Come and see the Major.
>
> The Major said: 'We'll get you down the coast tomorrow morning. I'll supply a jeep and driver and get you down to the river and across on the flying fox. When you get to the next river there is another patrol and they'll help you.' I found the station after a day and a half travel holed up from the incessant rain near a swamp. First thing was to shift the camp out of the mud to a sandy beach. Abandoned Japanese vehicles in working order were standing idle everywhere. Petrol was available by draining it from tanks. So a Japanese truck with a hoist was soon in working order. Fortunately I had previously known the ANGAU officer there, Bill McGregor. He had been a plantation owner near Kavieng before the war. He put twenty native labourers in my charge.

First of all many steps had to be cut in the steep hillside up to the radar site as had been done at Cape Ward Hunt for 315RS. After much hard labour the radar was installed and operated normally. Four guards had to be on duty at all times because of the presence of Japanese.

These enemy troops cut off from supplies, abandoned and without hope were desperate for food. Many starved in the jungle where the nauseating smell of death pronounced a parlous state of affairs. The natives assisted the demise of many and collected a great harvest of arms, ammunition and equipment. Retribution for aggression was taking a terrible toll on the Japanese as happened in the jungles of New Guinea - an abysmal expression of man's inhumanity to man.

Native labourers erected an orderly room, good mess and cook house, officer's hut and men's quarters before Les Bell returned them to the ANGAU compound. Bell was then faced with the arduous journey back to the tropical resort enjoyed by those who found permanent residence at No. 3 RIMU, Kranket Island.

This was another case of an isolated station bordering on being neglected as reported by P/O K A W Blair who took over the unit on 20 April 1945:

> Twice weekly an old Walrus would drop a 'sitrep' [a situation report] giving a list of villages where the enemy had moved in. Some of them [villages] would have numbers (100 or 150) indicating the number of soldiers moved in for survival, expanding village gardens. At first 15,000 was the estimated Japanese population - a division. After some time the estimates fell to 10,000. After the war some 27,000 came in to surrender, having been back in the mountains..... It was thought that some of the enemy might try to reach Rabaul.... I think I kept the village of Sakula, about a mile away on the western side, supplied with trade tobacco, a box of which had been brought from Madang. More importantly there was a daily visit from two 10 year old boys, named Epar and Ah-wee-al, who were given a ration of tinned beef. They were reminded often that they were to slip out of the back of the village and get word to us if any Japanese appeared on the coastal track.
> This was our own 'early warning' - we hoped.
> Inward mail was dropped by the Walrus on occasions when it came to Wewak but there was no mail out save by supply ship on its three monthly visit. On one occasion a Dakota, flying at 50/70 feet shot a bundle of mail out via a shute near the pilot only to see it cut to pieces by the propeller - the boys were very upset over the incident....
> In the six months I was there, we did not have any emergency evacuations but the Walrus was available if needed and Hansa Bay had smooth water.

CHAPTER 18

Morotai to Borneo

January to August 1945

The Capture of Morotai

Morotai, lying just north of latitude 2°N and longitude 128°E, offered an ideal platform from which to attack the Japanese northward to the Philippines, westward to Borneo and southward to the islands of the Dutch East Indies. Japanese forces, who were cut off and seriously short of supplies, could offer only token resistance to the Allied assault on the island. On 15 September 1944 an armada of heavily laden landing craft surged ashore as aircraft carriers provided a protective umbrella. As had now become customary at landings the fighters were controlled from a ship. While the US Infantry were securing the required area an RAAF Aerodrome Construction Squadron was already engaged preparing landing strips for aircraft.

Then during the consolidation phase the US 36th Fighter Control Squadron and radars commenced operations ashore as the ship housing the fighter control centre was required elsewhere. Following the now established pattern of operation the Allies took the area they required - the southern part of the island in this case - leaving the Japanese garrison to languish on the remainder.

From Morotai Australian ground forces supported by the RAAF were to begin the occupation of Borneo and the Japanese held Dutch colonies to the south. Allied air, ground and amphibious forces were to support where demands arose. Three of the originally proposed OBOE Operations were carried out before the atomic bomb spelt the end of the war. For these operations it was agreed that the Australian First Tactical Air Force (Ist TAF RAAF) be under direct control of the RAAF rather than that of the American Thirteenth Air Force.

Dr Peter Stanley, of The Australian War Memorial, has said that the Borneo campaign was tragically unnecessary since, at the time, it was recognised that capture of Borneo would not have shortened the war against Japan by a minute. It only resulted in expenditure and the death of 681 Australian Army personnel.

General MacArthur had seemingly played a double game by telling Washington that Australia wanted to capture Borneo and telling Australia that Washington wanted the campaign. The interpretation, in hindsight, is that MacArthur did NOT want any significant presence of the three experienced Australian Army Divisions in the liberation of The Philippines.

No 110 MFCU at Morotai.

This unit sailed from Darwin for Biak aboard the SS *Mexico* on 18 January 1945 steaming through Torres Strait, then east of Papua New Guinea, and westward through the Bismarck Sea. Thence it led a convoy under escort to arrive at Morotai on 30 January.

Personnel of RAAF radar stations 161, 162, 302, 310, 343, 351 and 352 camped with No. 110 MFCU waiting for the arrival of their technical equipment. When the gear arrived unloading and sorting was a nightmare as it had yet again been loaded haphazardly.

The first weeks on Morotai were notable for the lack of transport, rain and muddy roads, which were almost impassable, and the excellent and abundant American rations. The

operations room personnel of the Fighter Control Unit commenced transitional training with the Americans while the RAAF unit was being established. Boggy roads were re-surfaced with crushed coral and the camp 'duckboarded' throughout.

One RAAF Controller was stationed with the American GCI radar on the peninsula.

On 1 April No 110 MFCU took over from the American Fighter Control Squadron. The American radar RS416 closed down on 3 April and RS551 ceased operation on 5 April.

352RS was loaded on a barge on 2 April and arrived at Kokoya Island on the next day. Radio communication was established with No. 110 MFCU on 4 April and the LW/AW was on the air at 0600 hours on 5 April. It was the first Australian radar to be operational in the northern hemisphere. American radar RS531 operating nearby closed down on that day.

Because the station was somewhat isolated nine extra guards from Ist TAF RAAF were attached. Some excitement was generated on 27 April when three Sumatran soldiers fleeing from the Halmaheras landed near the radar and were detained. Again on 10 July the guards raised an alarm at 0150 hours. Barges without navigation lights were approaching flashing a light at intervals. All hands manned the defences. When the barges were about 400 yds off shore warning shots were fired. They immediately veered off and disappeared. Next day the captain of a PT boat investigating the incident said that it had been expected that fleeing Japanese barges would pass the island during the night.

310RS was operational on 6 April; 343RS on 21 April and 302RS on 21 May.

352RS detected an enemy target at 0345 hours on 23 June at 90 miles. The enemy aircraft dropped eight 100 lb bombs without damage to personnel or equipment. 310RS tracked one enemy aircraft the same morning at 0337 hours at a range of 28 miles where its echo disappeared among PEs. The enemy appeared to drop three bundles of WINDOW which was readily identified on the screen and did not affect operation.

161RS radar was on air on 1 April 1945 and next day F/Lt Dorhman and F/O O'Connor, controllers, arrived from No 110 MFCU. Immediately VHF ground to air communications were established. At the same time S/Ldr John Allan of Ist TAF RAAF visited. On 9 April 161RS was calibrated by members of No. 4 RIMU led by S/Ldr Greenham. The station took over from the American GCI on 15 April and went on stand-by with 15 minutes readiness expectancy. Early warning and GCI coverage of the island was then complete.

Refurbishing of No 114 MFCU.

On 23 January 1945 No 114 MFCU ceased operations at Momote and handed over responsibilities to the US Fighter Director Post. The fourth and final echelon of the Sector flew via Port Moresby to Brisbane completing the move to Strathpine, Queensland, by 29 January. There No. 111 MFCU was reformed and joined by 167, 168, 308, 309, 312, 354 and 355RSs.

Loading operations commenced on 1 April 1945 aboard the Liberty Ship *Morgan Robertson* at Bretts Wharf on the Brisbane River. The ship proceeded to Biak and concluded the journey to Morotai in convoy arriving on 19 April.

OBOE ONE Operation at Tarakan.

The Assault Echelon was to be ready for embarkation a week after reaching Morotai. This called for a speedy unloading and sorting of equipment. No time was available to function operationally at Morotai. The plan laid down for the reorganisation of an Assault Echelon

from an MFCU was completed. Personnel were assigned and the basic needs to operate effectively after the landing selected from the Unit's dump area. All gear was loaded aboard the USS *Titania* and the 16 officers and 194 ranks went aboard LCI 699 on 26 April. Personnel were mainly comprised of the MFCU detachment, 167, 308, 354 and 355RSs.

LCI 699 arrived at the landing point at Tarakan at 0100 on 1 May but the Beachmaster refused permission for it to run ashore. Those ashore returned to the LCI for the night. It remained off shore and it was not until 1700 hours the next day that the personnel landed. The Ops room was set up in a village house that had very little of its roof left. The GCI radar was set up close by.

Personnel disembarked from LST 699 at 1900 hours on 2 May and had to wait for equipment to be unloaded from USS *Titania*. 354RS began moving to its site at Lingkas by 0700 hours on 4 May and the radar was operational at 1600 hours on 5 May.

The Operations Control Room was completed on 4 May, receiving information from 354RS and 167RS, the nearby GCI, on 5 May. Meanwhile 168, 309 and 312RSs had arrived with the second echelon. An ASV beacon was installed and assigned to the care of 354RS. By May 22 all radars and Fighter Control equipment had arrived at Tarakan.

On 6 May Sgt R G King took the advance party of 355RS to Sadau Island from where an AIF artillery unit were busy shelling the Japanese across the water on Tarakan. Meanwhile rations and fuel were loaded onto LCT 1331. An extra eight guards transferred from 308RS to 355RS. As some 355RS test equipment could not be found, replacements were loaned by 308RS. During 8 May the LCT battled difficult currents to reach the south landing place on Sadau Island.

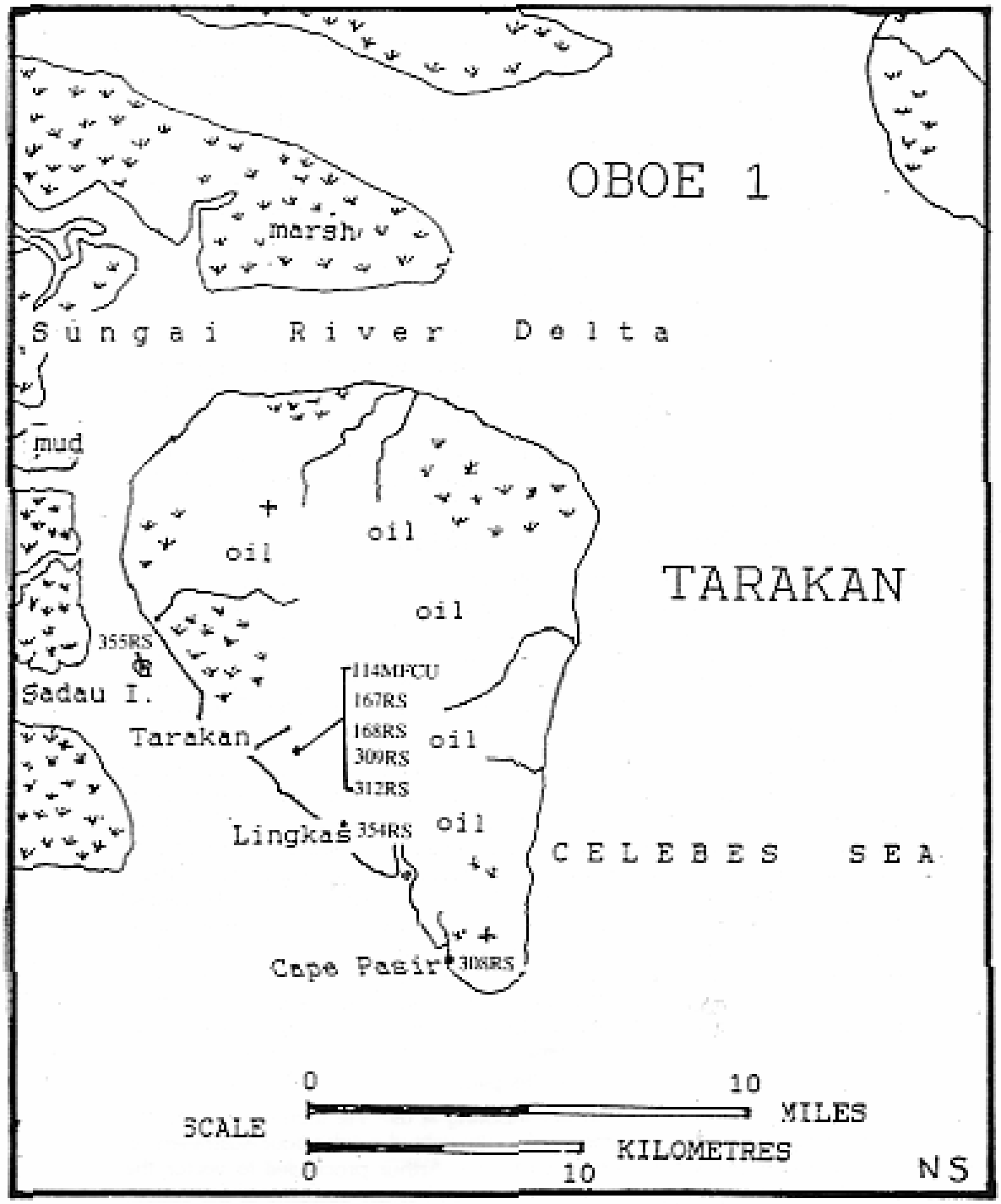
The AIF 7th Field Regiment garrison helped transport technical gear to the highest point on the island using a bull-dozer. 355RS was fully operational at 0830 hours on 10 May 1945, contact having already been made with No. 114 MFCU. F/Lt Russell-Bennett and his men had practised assiduously in the speedy erection of this LW/AW along the Riverstone Road near Richmond Air Base and again near Dapto, NSW before leaving Australia.

Buildings had been left intact by the Japanese who had operated a sea plane base there, so ample accommodation was readily available for the radar personnel. The spacious mess was located just above the water line. Radar controlled ack-ack and searchlights were installed just east of the radar to which they were attached for rationing.

A revised maintenance schedule was made out for 167, 168, 308, 354, and 355RSs. Finally the units were allocated the following sweeps.

GCI radars 167 and 168	a full 360^{o}
308RS at Cape Pasir	to sweep from 315^{o} to 185^{o}.
354RS at Lingkas	to sweep from 090^{o} to 270^{o}.
355RS at Sadau Island	to sweep from 180^{o} to 360^{o}.

309RS and 312RS were set up on stand-by and for training purposes.


OBOE 1
marsh
Sungai River Delta
mud
oil
oil
oil
TARAKAN
355RS
Sadau I.
114MFCU
167RS
168RS
309RS
312RS
Tarakan
oil
Lingkas
354RS
oil
CELEBES SEA
Cape Pasir
308RS
0
10
MILES
SCALE
KILOMETRES
0
10
NS

Tarakan Map

The two GCI stations were also set up and the following statement is taken from No. 114 MFCU's Unit History sheets:

> Height finding hopeless with 167 Radar due mainly to its unsatisfactory site. This is not important as 168 Radar is used for GCI and 167 for good tracking and estimation of numbers.

Enemy Air Raid Activity at Tarakan.

The early warning radars operated efficiently recording ranges up to 170 miles. 354RS picked up a raid by 3-4 JAKES at 125 miles from base at 2130 hours on 21 May. Six bombs were dropped without causing any damage. Searchlights and ack-ack engaged the enemy and claimed one aircraft damaged. Radars 167, 354 and 355 recognised WINDOW dropped by the enemy. A similar raid was detected at 90 miles from base two days later. The outcome was similar.

Fighter Controller Arthur Pettitt remembers an unusual action at Tarakan. Several weeks were to pass before the strip was ready to receive aircraft. In the meantime American pilots in Black Widow night fighters flew down from Mindanao each evening to patrol the island. On a particular occasion an enemy flight was detected approaching just as the regular Black Widow was due to arrive. Arthur was listening to the American in radio contact with his base on a frequency different to that used at Tarakan. He was waiting for the American to call in on the Tarakan ground-air frequency so that he could vector the Black Widow into position for interception. The proximity of the enemy aircraft forced a RED alert to be called and every Bofors battery fired the mandatory air raid alert of three rounds. Evidently the Black Widow was over the Tarakan strip by that time and across the airways came the strident voice of the American navigator to his pilot, "Shit ! Those ----- bastards are shooting at us." He then switched to the Tarakan fighter control frequency and spoke unkind words about Australians in general and RAAF Controllers in particular. Arthur proceeded to vector the night fighter into position but does not remember the outcome of the action.

On May 29 at 1704 hours a lone HELEN flew over the base evidently on reconnaissance. Ack-ack engaged it without any result. Later at 2314 hours 3 JAKES were detected 80 miles from base by 355RS. An attempted interception by the Controller at 167RS utilising one P61 failed. At 0342 hours on 9 June 354RS detected a 'bogey' at grid reference ZN4545, out 95 miles from base. Three bombs were dropped without damage. Next day at 0247 hours the same radar detected a lone aircraft at grid reference ZH5901, 65 miles from base. No bombs were dropped but two parachute flares were dropped near the northern end of the strip.

Following this there was little enemy air activity in the area.

After June 1945, without enemy aircraft to engage, the reporting system resolved into a routine of assistance to Allied aircraft, weather reports, practice interceptions and care and maintenance. Every effort appears to have been made to maintain a spirit of enthusiasm among the personnel.

This was the state of affairs when S/Ldr J Paine handed over No. 114 MFCU to F/Lt H G Cumes who had the difficult task of maintaining morale after the Japanese capitulation.

Problems Encountered at Tarakan.

Poorly organised transport of equipment caused the most disruption of schedules. The inability to have a unit's equipment kept together on one transport led to much confusion at the landing. The RAAF and the US forces never learnt that the radar stations which travelled with and handled their own loading and unloading of equipment arrived at their destinations speedily and intact. This point was also stated forcibly by an American report regarding movement of a medical team and equipment in the Solomon Islands campaign.

Enemy infiltration of the Australian lines at night caused some damage and was a constant threat. Muddy tracks caused by continuous heavy rain and enemy mines and booby traps were hindrances. The enemy threatened 308RS at Cape Pasir and that station was warned to be prepared for a swift withdrawal if the need arose. The USS *Colorado* stood off shore on 6 May and shelled the enemy positions beyond the radar station. After that the Japanese ceased to threaten the position.

Assistance to Allied Aircraft.

The ASV beacon, giving an effective range of 70 miles. was moved from the site of 354RS to the vicinity of 168RS. Also a VHF/DF installation was maintained with great success. On at least three occasions 'Snafu' aircraft were 'homed' to base from as far as 120 miles. As an experiment a VHF aerial was mounted on the top of the highest oil derrick on Tarakan Hill. This resulted in communication with a P38 to a distance of 170 miles.

On 12 July S/Ldr Barclay of 452 Squadron 'ditched' 35 miles NNW of Tarakan. Air cover was directed to the spot and the rescue affected by an RAN launch. On 14 July aircraft from 75 Squadron were successfully 'homed' from a point 90 miles south. On 27 July a P40 of 78 Squadron required emergency homing but the VHF D/F was unable to pick up his transmissions. The pilot was directed by the Controller to activate his emergency IFF. On the basis of resultant radar plots the pilot was directed to base. These events are indicative of round-the-clock service to Allied aircraft by the air warning organisation at Tarakan.

Efforts were maintained in an endeavour to increase the operational efficiency of the reporting system. The temporary radar maintenance party visited all radar stations with HQ test gear and adjusted all equipment to peak efficiency. Permanent stations were calibrated and the GCI stations arranged practice interceptions to hone the skills of the radar crews and Spitfire pilots defending the base. Attention was given to communication systems and telling procedures examined so that messages were passed with speed and accuracy. To quote once again from No 114 MFCU's Unit History Sheet for July 1945:

> An exercise has been carried out simulating an assault echelon as far as Signals is concerned. Each shift was sent to a predetermined point and set up communications. The exercises were on a competitive basis, and the enthusiasm and energy displayed by the shifts was a revelation. This shows that the men are ready and willing to work and do a good job if given the opportunity and encouragement. The results of the exercise were more than satisfactory and created tremendous interest.
>
> F/Lt H G Cumes
> T/Commanding 114 Fighter Control Unit.

OBOE SIX Operation.

The rapid withdrawal of support by the Japanese to their troops in the Borneo area caused a major reorganisation of the six projected OBOE operations. After ONE there was an immediate advance to OBOE SIX and TWO followed within a few days.

Fighter control and air warning for this operation was delegated to No. 111 MFCU. On 17 September 1944 a signal from NORCOM ordered the Fighter Sector to depart Tadji aboard TSS *Katoomba* for the mainland and to re-equip at Mildura, VIC.

During the first two months of 1945 there was a movement of 316, 323, 324 and 342RSs from the Merauke area in Dutch New Guinea back to the mainland. These units were re-equipped at Castlereagh, west of Sydney, NSW, by new crews who were billeted at Richmond Air Base. A welcome improvement to these stations was the provision of the newly designed spacious framework produced for the Mk II LW/AW tower. By the end of February these stations had entrained at Penrith and proceeded to Archerfield Air Base on the western outskirts of Brisbane, Qld. LW/GCI station 163RS moved from Melbourne to Sandgate, near Brisbane to await overseas deployment. It was joined by LW/GCI 166RS towards the end of February after preparations at Castlereagh.

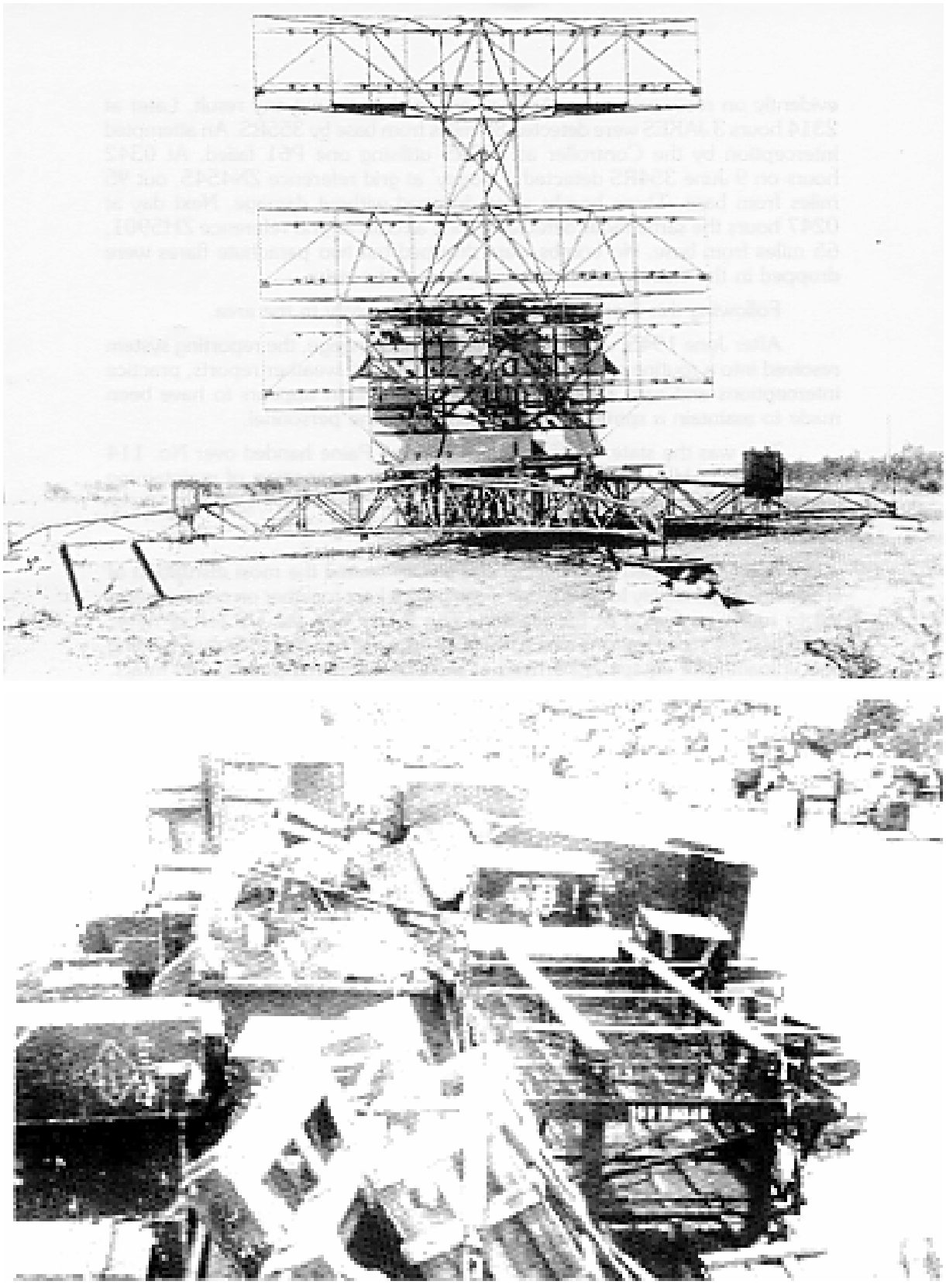
No 111 MFCU with its radar units embarked on the Liberty Ship USS *Simon Bamberger* on the afternoon of 2 May 1945. On arrival at embarkation point the personnel found lead-acid batteries still sitting on the otherwise cleared wharf. It was reported that they were too much of a hazard for the ‘wharfies’ to carry aboard.

Other Ranks were accommodated in the ship’s holds, each accessed by a single vertical steel ladder. Each man had a 6ft X 3ft sheet of three ply wood on which to sleep and arrange his personal equipment. Lack of ventilation and the occasional seasick person produced a nauseous atmosphere depleted in oxygen. Port holes were non existent. Most of the personnel regarded their quarters as a death trap and spent as much time as possible on deck.

Meals were served twice a day at 0900 and 1600 hours. Each of the 700 men aboard had contributed £1 before embarkation for the purchase of extra rations. The apples and oranges were much appreciated.

During the day gambling groups were active wherever space could be found. Even tarpaulin awnings were erected to keep the sun off clients. Each evening a number of skilled entertainers among the troops gave a much appreciated concert after which the blackout was enforced. The escorting destroyer reported enemy submarine presence on several occasions during the voyage. The journey was via the north of New Guinea visiting Hollandia and Biak and reaching Morotai on 16 May 1945.

At Morotai preparations were made for the assault on North West Borneo. No. 111 MFCU had its associated radar stations erected and checked all equipment before repacking for going ashore soon after the 9th Australian Division assault troops landed. The assault echelon including 342RS embarked on LST 1025 and LST 993 on 30 May. The follow-up convoy consisted of ten LSTs, eight LCIs, five Liberty Ships and four escort vessels. 316RS was aboard the ammunition ship LST 590. The personnel unloaded the ammunition while waiting for the radar site to be cleared of Japanese.



LW/GCI Mk II
Top: The unit fully assembled and operational.
Below: The station packed up in transit cases and crates, ready to move.

Z day for OBOE 6 was 10 June 1945. The assault echelon of No 111 MFCU including 342RS and 166RS landed six hours after the 9th Division Infantry. The operations room and all support facilities were completed in four hours. Contact was made with US Headquarters ship, USS *Rocky Mount* which was controlling fighter aircraft until advised to hand over to No. 111 MFCU.

F/Lt Bruce Aldrich had 342RS operating on level ground close to sea level near Victoria township on Labuan in record time the same day. Coverage from this station proved to be most satisfactory.

A landing barge deposited 323RS on Muara Island and one of the radar operators, Keith Flynn, reports that the station was operational in three and a quarter hours. However radar coverage was not as complete as desired and F/Lt Campbell was given permission to resite the station on Brunei Bluff on the southern entrance to Brunei Bay near Brooketown.

From the above it can be seen that as late as June 1945 radio communications was still a problem. Advances in the equipment end at No. 111 MFCU end, the amount of signals equipment supplied is somewhat of surprise. The numbers and types of transmitters and receivers were 21 AR7s, 20 AT21s, two AT14s for HF coverage and six AR17s plus four US aircraft type SCR522/TR5043 transmitter-receivers used for the VHF band. HF band equipment, using the AT21/AR7 combination, covered the reporting of radar plots, administrative traffic, communication with adjoining Fighter Sectors and US Fighter Sectors. One link was provided for 323RS, 324RS, 325RS, 163RS, ship-to-shore for Fighter control, No. 114 MFCU at Tarakan, No. 110 MFCU at Morotai, Balikpapan (a sector of No. 110 MFCU), air-sea rescue, Tactical Bomber Command (on a US frequency) and one to all US Fighter Sectors in the Philippines.

Initially American SCR522/TR5043 equipment was used for the four VHF ground-to-air circuits normally used for aircraft control work. Later the Australian AT17/AR17 combination became the link when it proved to be more suitable.

Whilst the AT21/AR7 combination may have been effective at ‘base’ (MFCU) for handling radar plots, there were serious shortfalls at the ‘sharp end’, namely the radar stations supplying the basic information. But equipment supplied to radar stations was still the same AT5/AR8 combination as had been in use in 1942!

There was a deal of confusion when 166RS, an LW/GCI Mk II with F/Lt W Mann in charge, landed at Labuan and two of the trucks became separated from the rest of the unit which spent a restless night wondering about the fate of the men in the trucks. They turned up next morning having spent some time behind the Japanese lines - no casualties, only a few bullet holes in a milk can which was supposed to hold drinking water. For a period there was constant danger from routed Japanese groups wandering about the hinterland. 166RS was first erected and operational at a temporary site by 12 June and after the Japanese forces were dislodged it moved to the permanent site chosen where it began operating on 26 June.

The other LW/GCI, 163RS with F/Lt F Surman as CO, and 325RS, under F/O A E Irvine, landed at Labuan on 12 June and set up camp. On 24 June the crews took their gear aboard LST 137 and departed next day for Lutong in British Sarawak arriving on 26 June. The GCI began reporting to No. 111 MFCU by radio on the last day of the month. The early warning station 325RS set up on a suitable site and reported from Miri.

While 166RS had some confusion when landing at Labuan, 324RS, the only Mk V to become operational also encountered difficulties when in transit at Morotai. Their gear was put ‘under safe hand’ alongside the airstrip and checked daily. Consternation arose when one morning they found that the gear was missing. By some quirk of the system the gear had been inadvertently sent to somewhere in the Philippines. On arrival at Labuan the 324RS personnel found their equipment had been transhipped back to Labuan and was stacked in the open alongside the airstrip.

No details of the performance of the Mk V as compared with the Mk IA are available but it must have been a significant improvement as the unit was told that they were to set up the Mk V on a landing barge to take part in another invasion but the war ended instead.

LST 590 carried the back-up munitions supply for the invasion force. It was deeply laden and the cause for some concern as it ploughed more deeply than other craft in the convoy through recently mined waters. An attempt to reach the beach at high tide on 12 June failed by some 25 yards. Personnel of 316RS were aboard this LST and stayed at the landing as an unloading party. Large trucks were pushed aboard through several feet of water by bulldozers and dragged ashore with their loads. The work went on all day and through the night with short breaks for meals and twice during RED alerts.

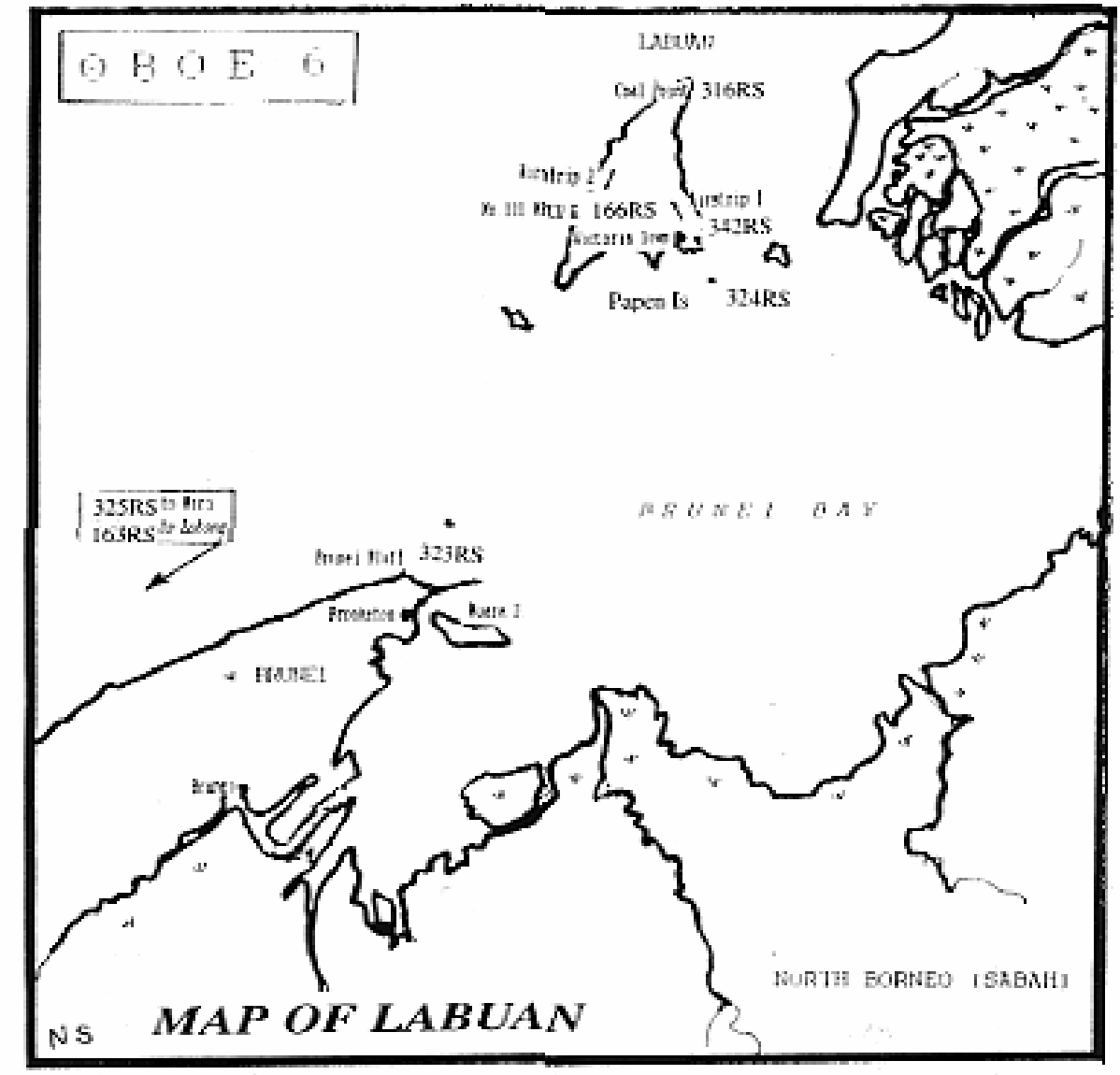
Finally when the enemy were cleared from Coal Point on Labuan, 316RS was erected there becoming operational on 23 July. The air warning operations for OBOE SIX went according to plan. Shipping and unloading problems were few. The terrain was far less inhospitable than that experienced at Tarakan and Balikpapan.

It should be noted that 316RS was the last operational RAAF radar station to be erected during WWII.

Enemy Air Activity at Labuan and Brunei.

The first RED alert was sounded by USS *Rocky Mount* on 12 June. A patrolling Black Widow, P61, intercepted and shot down a NICK-type aircraft which was seen to fall in the vicinity of Brunei. At 2053 hours on 14 June an enemy aircraft tracked in from 25 miles dropped two bombs on Ramsay Point with no damage. At 2240 hours the same night another ‘bogey’ flew over the beach head. Radar controlled searchlights and guns were alerted. The Japanese aircraft was illuminated immediately and destroyed by land-based and ships’ guns.

No 111 MFCU took over warning facilities and fighter direction for OBOE SIX on 15 June 1945. On 20 June warning radars reported a hostile track on bearing 215 degrees, range 55 miles and moving east. At 1823 two Spitfires already airborne were vectored to intercept. A Dinah was sighted at 1841 hours and shot down in flames. On 23 June an enemy aircraft was detected 70 miles from base travelling east at 16000 ft on a bearing of 230 degrees. Two



Labuan Map

Spitfires were scrambled to intercept. When vectored into position no sighting was made because of the 10/10 cloud in the area. The Spitfires were ordered to ‘pancake’ (land) while the bogey was tracked out on 210 degrees. On 3 July at 0441 hours a single enemy aircraft, without warning, dropped two bombs and strafed Miri. Casualty sustained - one dog. Enemy air activity ‘fizzled out’ at that point. 325RS and 316RS were not operational in time to report hostile aircraft. The only Japanese aircraft they were destined to track was the surrender aircraft that flew from Borneo under escort to Labuan where the Japanese Commander of the Borneo forces signed surrender documents.

During October 1945 all outlying radars were called in to No 111 MFCU. During November all equipment was issued ‘off’ to No 4 RIMU. On 16 November F/Lt Surman, assumed command of the small remaining contingent. They boarded the Royal Navy LSI, HMS *Glengyle* on 23 November bound for Brisbane arriving there on 3 December 1945.

As a link with past events, the 24-hour clock from the operations room of No. 111 MFCU at Labuan may be seen still ticking away the time at the museum in Murwillumbah, NSW.

OBOE TWO Operation at Balikpapan

It was not known that Japanese aircraft were few and far between in Borneo before the stations were despatched, so the role of radar in the overall campaign was predominantly supportive in nature.

The assault convoy for Balikpapan included No. 110 MFCU detachment and 302RS, 343RS and 162RS aboard LST 703. The echelon departed Morotai on 18 June 1945 and arrived Balikpapan 1 July.

The Fighter Sector Detachment was functioning at 0900 hours on 4 April, a day ahead of schedule, and 343RS was operational the same day. On 5 July 162RS was operational followed by 302RS on the next day and 35lRS a day later.

CHAPTER 19

Radar Countermeasures - Section 22

Early in the Pacific conflict the Japanese did not appear to make much use of radar. However, the Allies knew that the position would change and were fortunate in that counter-measures had been developed to a high level in the European theatre because the Germans were more technically advanced than the Japanese.

In consequence it was decided to establish a combined services section to locate enemy radar stations so that they could be either jammed when necessary or destroyed. Responses by Allied radar stations to 'jamming' was also of concern so some intentional local jamming was to be addressed.

The use of 'ferret' aircraft were being used in Europe to locate German radar installations and thought was given to introducing a similar procedure in the Pacific. Suitable search receivers had been developed for Europe so saving time before any plan was implemented.

Early Steps in Radar Countermeasures

Dick Graf, the former Sergeant Radio Operator in General Kenny's personal B17, was recently interviewed and it is possible that this plane was the first ferret flight in the Pacific. The timing is placed at July/August 1942, fixed by the fact that it was just prior to a period when Dick was temporarily grounded for a minor medical condition - a cold.

A search receiver was fitted into the aircraft and the associated aerial was mounted near the tail. The level of secrecy was even higher than normal radar operations as the aerial was covered with a canvas cover which was only removed by a crew member just prior to take-off when the aircraft had taxied to the end of the strip. The operator of the search receiver was covered with a black curtain so that the aircrew could not see what he was doing!

Unfortunately the outcome of this mission is not known.

S/Ldr David Swan OBE was interviewed in December 1988 and he was able to supply some background material. Lt Hallett, RN, working out of Port Moresby was in the forefront of countermeasures in 1942. Searching frequencies from about 30 Mc/s to 300 Mc/s) he had a mixed team who flew in the planes operating the receivers during bombing missions. The team included two RAAF Wireless Air Gunners, Frank Cooper and Keith Bevan and an operator from the Royal New Zealand Navy, Leading Seaman Page.

The three Australian services thought that they should become involved in ascertaining the extent of Japanese radar and agreed to set up a combined services venture towards the end of 1942. The first three representatives were Lt Mace,RAN, an officer named Finucane from the Army and David Swan, RAAF. Their first task was to learn about countermeasures.

Early in 1943 Lt Hallett was in a jeep accident in Port Moresby resulting in David Swan being sent north to take over. When he arrived there were six RAAF personnel who were on the strength of No 41 Wing but flying with the US 43rd Bomb Group in B17s and the 90th in B24s. No records have been found relating to these missions but an indication of their activities may be gleaned from the citation associated with the award of OBE to S/Ldr Swan which reads:

> Squadron Leader Swan has been instrumental in the development of radar [countermeasures]. His singular devotion to duty, his excellent technical

> knowledge and his outstanding ability and effectively direct units in the field have made possible present radar and radio counter measures. Operations planned and directed by him have been directly responsible for saving our aircraft and lives of Allied airmen. In involving and testing new tactics and techniques Squadron Leader Swan has voluntarily engaged in numerous single aircraft flights without fighter escort deep into enemy territory. On one occasion while testing new equipment in a radar reconnaissance flight over strongly defended airfields he operated the search equipment under great difficulties when his aircraft was actively engaged with the enemy. Despite long periods of tropical duty and attacks of malaria Squadron Leader Swan has always been an inspiration to all members of the Allied Forces with whom he had come in contact.

Section 22

Lt Mace, hopefully with the approval of his superiors, had approached the headquarters of the US 7th Fleet in Brisbane successfully requesting that they take over radar countermeasures in the SWPA. They agreed and he was put in Room 22 which was the origin of the name of Section 22 which thereafter denoted countermeasures.

General MacArthur heard about Section 22 and decided to take it over with Lt Mace in charge. The section was moved to the AMP Building but the name of Section 22 was maintained. Soon afterwards there was a contretemps between Swan and Mace. Whether or not the wordy battle was the reason for Mace being sent to England to be an observer of countermeasure activity in relation to the Second Front is not known but he did send back a wealth of information to Section 22.

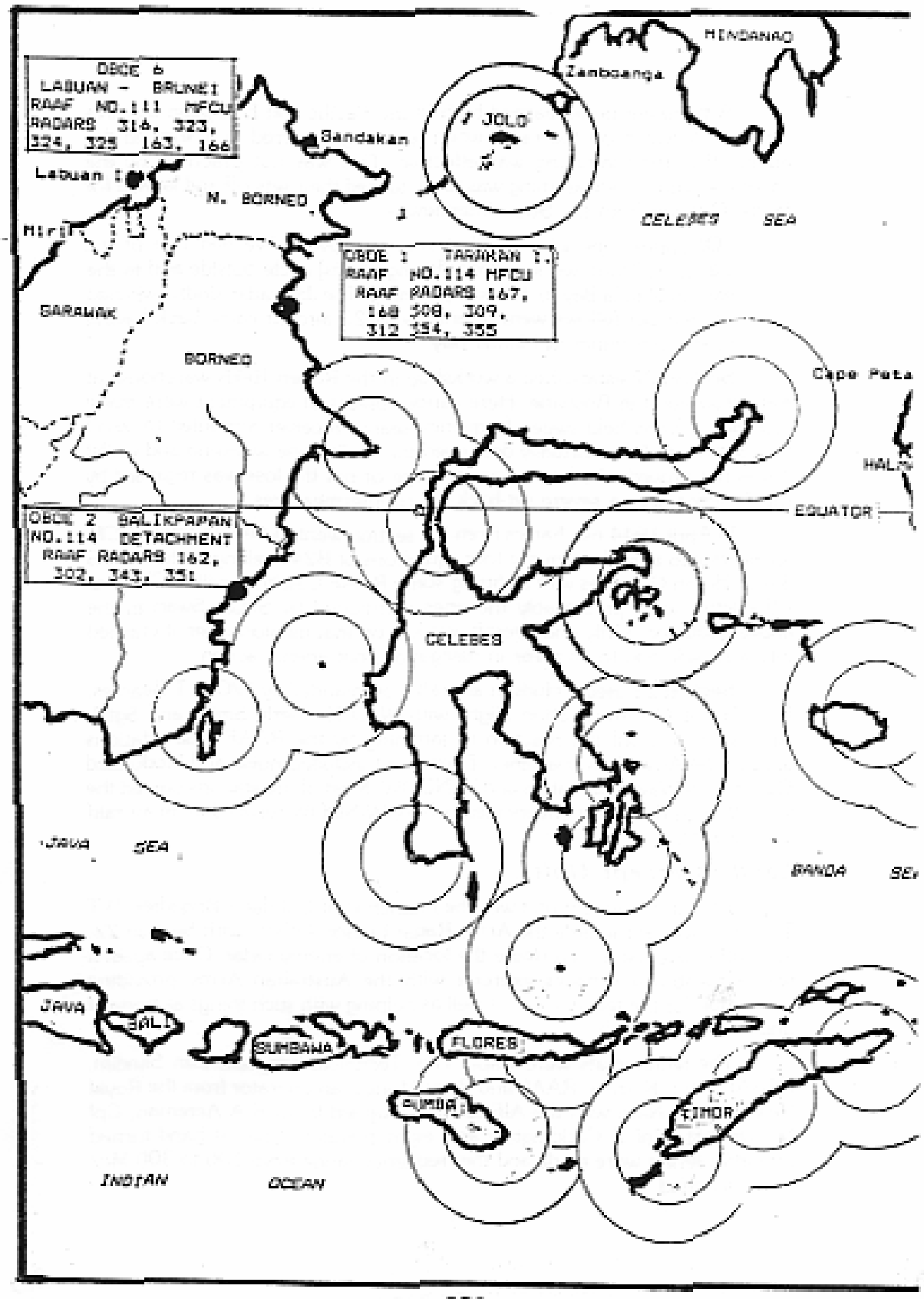
With the US Army in charge, a more formal structure of Section 22 was introduced with an American Colonel from the US Signals Corps as Director, and four Associate Directors. S/Ldr Swan became Associate Director for Operations with the other two being S/Ldr Bell for administration and a civilian named Norman Chauntor for the examination of enemy materials and information. Employed by the Americans, Chauntor, an Englishman, had been an oil physicist working in the Balikpapan region and therefore had valued local knowledge.

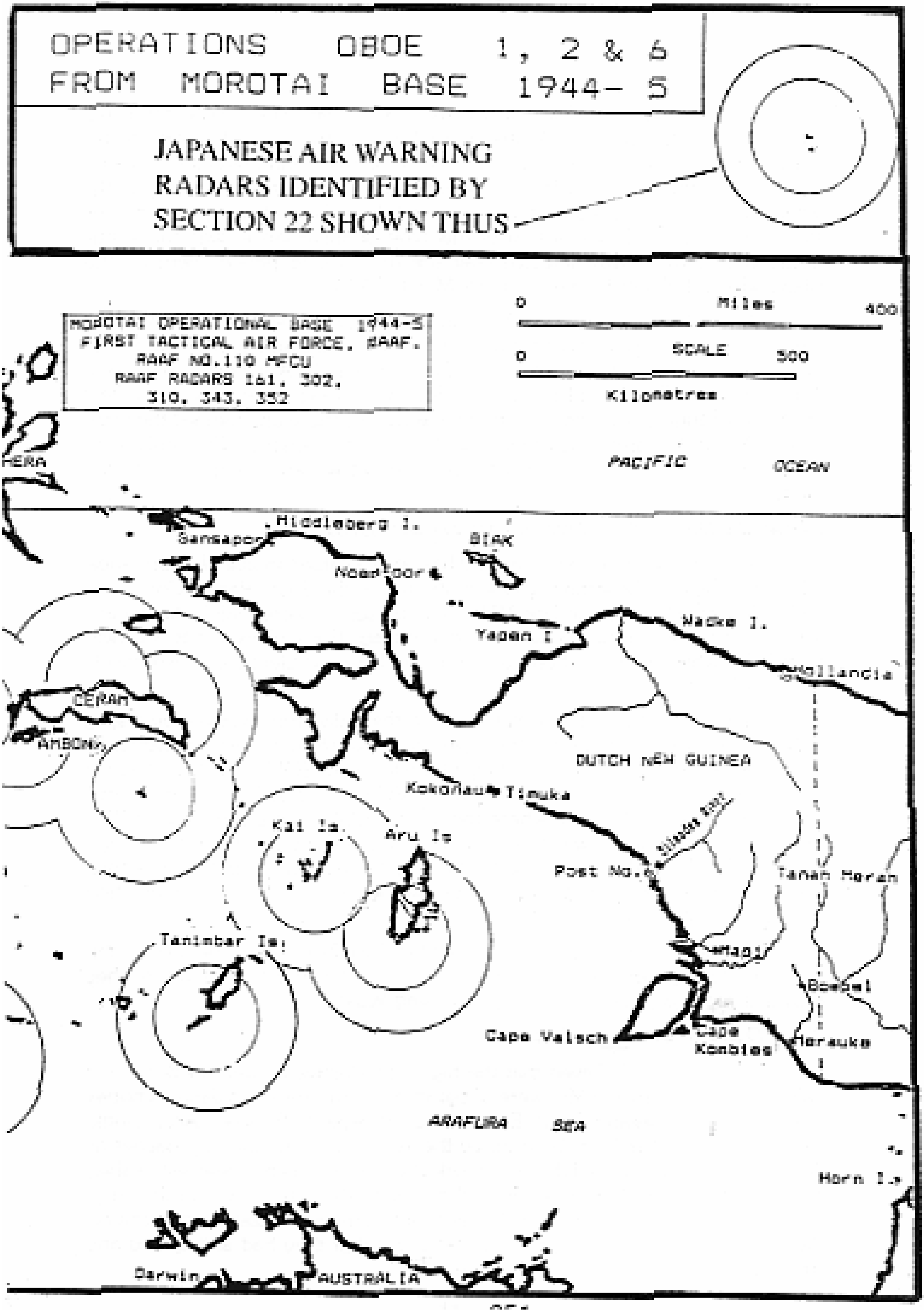
Section 22 operated wherever General MacArthur's head-quarters moved, Hollandia late in 1944 followed by Manila in a few weeks. In Manila the office was a bowling alley which also served as their quarters at night by simply erecting camp stretchers.

A pertinent point learned both in the Pacific and European theatres was not to switch off the radar when jamming occurred as it showed the enemy that their jamming was effective. This was not practised by the Japanese who, when jamming was used, turned their sets off and looked for faults. Quoting from the Swan interview :

> Of course operationally that was just lovely. We had one of the Catalinas [from two squadrons laying mines] circle outside and to the west of Manila Bay to do some jamming. The Jap radar kindly switched off and our fellows went in and those 23 aircraft came back having sown their mines in Manila Bay.

Section 22 established a workshop in the Robert Reid warehouse in Brisbane. Here various pieces of equipment were made including a hand held sweep frequency search receiver


OBOE 6
LABUAN - BRUNEI
RAAF NO.111 HFCU
RADARS 314, 323,
324, 325 163, 166
OBOE 1 TARAKAN I.
RAAF NO.114 HFCU
RAAF RADARS 167,
168 308, 309,
312 354, 355
OBOE 2 BALIKPAPAN
NO.114 DETACHMENT
RAAF RADARS 162,
302, 343, 351
MINDANAO
Zamboanga
JOLO
Sandakan
Labuan I.
N. BORNEO
Miri
CELEBES SEA
SARAWAK
BORNEO
Cape Puta
EQUATOR
CELEBES
JAVA SEA
BANDA SE
JAVA
BALI
SUMBAWA
FLORES
SUMBA
TIMOR
INDIAN OCEAN


OPERATIONS OBOE 1, 2 & 6
FROM MOROTAI BASE 1944-5
JAPANESE AIR WARNING
RADARS IDENTIFIED BY
SECTION 22 SHOWN THUS
MOROTAI OPERATIONAL BASE 1944-5
FIRST TACTICAL AIR FORCE, RAAF.
RAAF NO.110 MFCU
RAAF RADARS 161, 302,
310, 343, 352
0
Miles
400
0
SCALE
500
Kilometres
PACIFIC
OCEAN
Middleburg I.
Sansapor
BIAK
Yapen I
Wadke I.
CERAM
AMBON
DUTCH NEW GUINEA
Kokonau
Timuka
Kai Is
Aru Is
Post No.6
Tanah Merah
Tanimbar Is.
Cape Valsch
Merauke
ARAFURA
SEA
Horn I.
Darwin
AUSTRALIA

attributed to W/O Leo Stratford. A fire virtually destroyed the facility one weekend and whilst it was not proved whether it was sabotage or not the loss was regarded by the Americans as a severe set-back for countermeasures.

In April 1944 mechanics from the section went to Darwin fitting RCM receivers into aircraft from the four squadrons of B24s belonging to the US 370th Bomb Group as well as fitting some RAAF Catalinas with RCM gear - the latter were presumably the ones mentioned by S/Ldr Swan in the above quotation. Only one aircraft was lost on that mission when it crashed into a hillside due to an error in navigation, not enemy action.

Section 22 used a Hudson aircraft, commanded by F/O G T Beames, from No. 4 Communication Flight with W/O Kennerly Smith and Sgt L Kinross to test out the reaction to jamming by the RAAF radar stations around the Australian coastline. Equipment included noise and Modulated Continuous Wave generators and WINDOW. Most of the stations passed the test although there was one incident where WINDOW resulted in an air raid alert at Perth.

Land Intercept Units.

The land intercept unit was the brainchild of Cpt (later Brigadier) D T Tier, who was at the time the Army Radar Liaison Officer with Section 22, as another avenue to determine the location of enemy radar. Once again it was a combined services exercise with the Australian Army providing protection for the technocrats as well as helping with such things as portage and running the unit.

The technocrats were Capt. Tier, Technical Sergeant Ben Sandlin, USAAF, Sgt L Kinross, RAAF and Peter Money, an operator from the Royal New Zealand Navy with the AIF escort group led by Lt K A Acreman, Cpl MacDonald, Cpl E Coddington and eight privates. Special hand-turned rotatable aerials were made and the frequency range from 100 to 300 Mc/s was scanned.

The unit was airlifted with its electronic surveillance gear to Saidor, PNG, where it was equipped with Australian uniforms in the form of jungle greens, American hammocks, two months supply of rations, hand grenades et cetera. Despite difficulties such as frightful weather on the barge trip, landing at the wrong beach on Long Island, delays in establishing the unit being encountered the operation, which was a trial of this type of surveillance, was successful. Some enemy radar was detected over the month long period spent on the island which they left by barge on 24 March 1944.

Deemed to be a success with valuable lessons being learned and improved aerials, land intercept units continued into the Borneo Campaign but no RAAF personnel were involved after Long Island - mainly Australian Army and Americans. On Tawi Tawi Island, in the Sulu Archipelago, Capt Tier ‘captured’ the Sanga Sanga airstrip because there was no one there and radioed the news to the Americans and asked them not to bomb the airstrip. The reply went something like ‘we don’t know who you are but we are going to bomb the airstrip.’

New Zealand Contribution to Section 22

Dr R S Unwin from New Zealand has been a valued source of information relating to Section 22 setting up one of its units at the South Pacific Command (SOCPAC) Headquarters in late 1942. The personnel were mainly Americans with the exception of two New Zealand

scientists, E R Collins and R S Unwin from RDL, who were given honorary ranks of Major and Lieutenant respectively in the NZ Army.

January to March 1944 was spent in the Solomons followed by a spell in New Caledonia which was frustrating as it was away from the action. Eventually in September they both managed to get transferred to SOUWESPAC, attached to Section 22 which was with the 13th USAAF based at Noemfoor. Shortly after they moved to Morotai where the 13th USAAF had a squadron of B24 'snoopers' whose task it was to seek out Japanese shipping at night on single missions. The USAAF were persuaded to equip these aircraft with D/F antennae and search receivers so that the aircraft could perform a dual function and find enemy radar stations.

In addition to the above activities the two New Zealanders operated search receivers during night bombing missions aimed at major targets where they provided radar jamming and deception using WINDOW.

The Dutch East Indies.

The Japanese believed that the highly productive oil wells in Borneo at Balikpapan, Tarakan and Miri were of paramount importance to Japan's hopes of sustaining its 'Greater South East Asia Co-Prosperity Sphere'. Accordingly there was a strong military build up by the Japanese along the approaches to Borneo. It was soon proved that a network of enemy radars had been established throughout the island approaches to these oil fields as is shown on the large map on pages 170 and 171, which was obtained from the Australian Archives, Canberra, - supporting the previous statement that they had anticipated any attack would come from the Darwin area.

As 1944 was drawing to a close Australian and American forces had pushed forward to the western extremity of New Guinea. Bases had been established at such places as Biak, Noemfoor, Sansapor, Middleberg and Morotai. Aircraft based at these centres harassed the Japanese.

During the outward journey to the target and again on the return trip any radar signals intercepted were DFed and the results recorded. As there was no jamming on these occasions the enemy was not aware that the radar was being monitored. Having ascertained the approximate position of the enemy installation a special RCM mission was flown by a 'ferret' aircraft - Americans used B24s and B25s while the RAAF used Beauforts. High level photographs and low level oblique shots of the suspected sites were taken and sightings noted. Systematically the Japanese radar stations were pinpointed on the map and their characteristics tabulated.

Once an enemy radar's position was known it was always in danger of being an alternative target for Allied aircraft unable to find their primary targets.

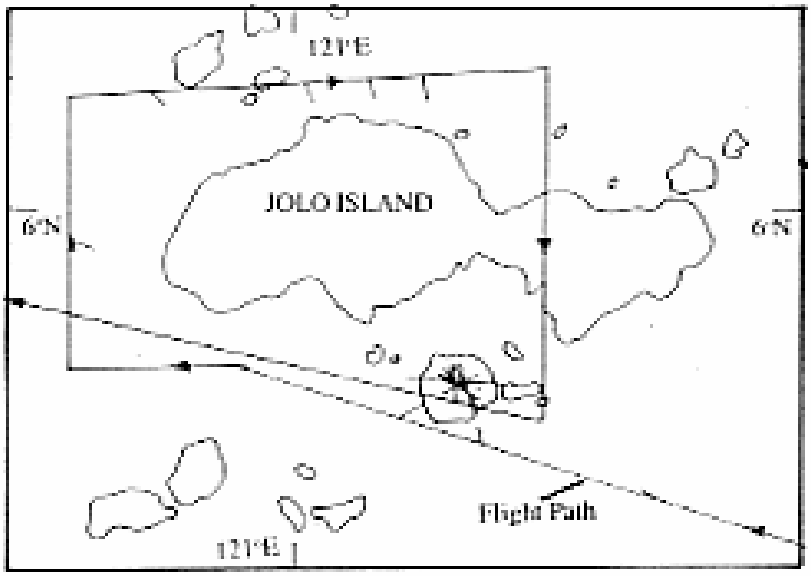
When it was decided that one or several enemy radars should be 'off air' during a major Allied operation, bombing and strafing from a single aircraft was carried out. B24s and B25s were not sufficiently manoeuvrable around headlands during low level attacks so RAAF Beaufighters were often called in for this purpose. Key stations were taken out by intensive bombing. The following example of the Section 22 activity have been obtained from the USAF Historical Research Centre at Maxwell, Alabama, USA. The report relates to Field Unit 13 of Section 22. RCM mission #25 was carried out by the 868th Bomb Squadron 13th USAAF. The pilot of the search aircraft was Lt Barry, navigator was Lt Kullerstrand and the RCM observer Tech/Sgt Plant. The aircraft took off from Noemfoor at 1215 hours on 10

November 1944 and landed at Morotai at 1520 hours. It departed Morotai at 2010 hours flying westward to search for a convoy in the Sulu sea west of Palawan Island returning to Noemfoor by 1000 hours on 11 November. The report was written by Lt R S Unwin and the numbers at the beginning of each detected radar summarise the station's characteristics eg, 151/250/9 where 151 was the operating frequency in megacycles, 250 was the pulse repetition frequency and 9 the pulse width in microseconds.

(1) 151/250/9
This signal was heard strongly for one minute only at 1305 hours approaching the Ajoe Islands on the way to Morotai. The single D/F taken lies towards these islands but it is possible that this signal was an image of that from an Allied radar. No radar has so far been suspected to be in the area of the Ajoe Islands and RCM equipped planes have been flying over them for a considerable time.

(2) 161/350/7
This signal was heard for about an hour round midnight on the outward trip and again between 0446 and 0508 hours on the return. Twelve D/F's were taken which lie in the vicinity of Jolo Island and there is little doubt that the signal came from the same radar as has been D/F'd onto the island. It is interesting to note that on two occasions the radar showed a double pulse, indicating that the modulator was operating unsatisfactorily.

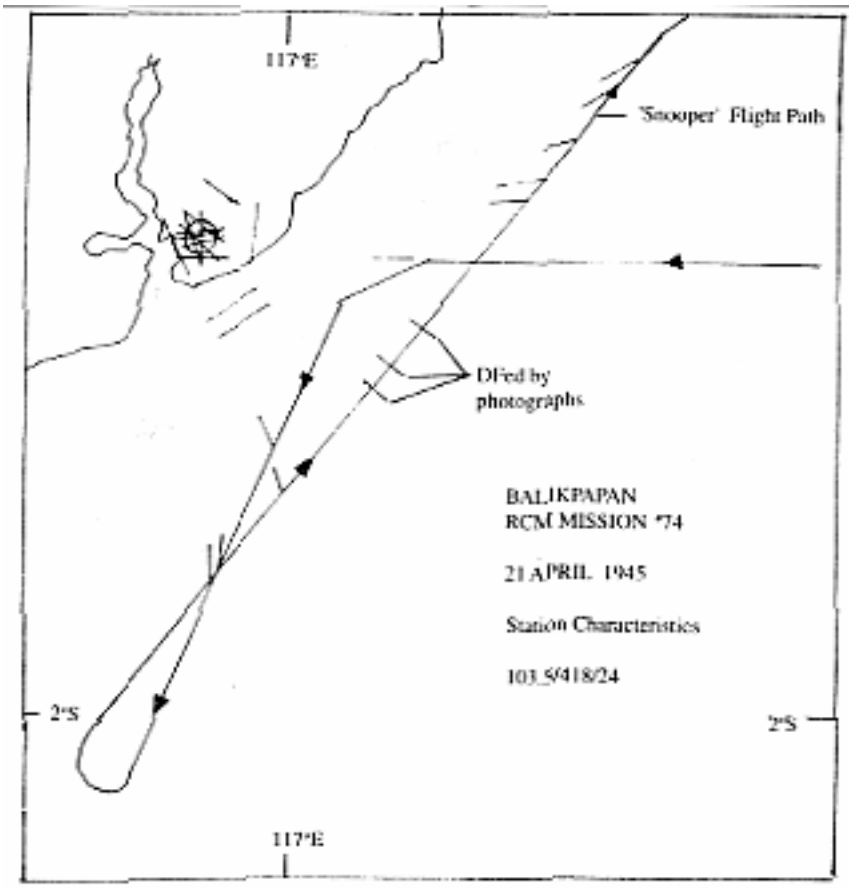
(3) 151/500/14
This signal was heard between 0823 and 0859 hours on the morning of the 11th when flying east of Morotai (returning to Noemfoor). The DF's lie towards, and intersect on and north west of Cape Gam Tjaka on Halmahera. On the previous morning a Japanese Mk 1 Model 3 radar on this Cape was attacked and hit with two 500 lb. bombs and reported destroyed. It is possible that this signal came from the Cape Petak radar, although the frequency is high for that station, the alternative explanation being that the station destroyed was a dummy or stand-by.



Subsequently special attention to the radar suspected to be on Jolo Island proved the site to be on smaller Pata Island south of Jolo. The map below shows the plane's flight path and how this was done by DFing.

The other example of an RCM mission on the next page shows similar information gathered to locate a radar station at Balikpapan.

Over a six month's period, to the end of April 1945, the 868th Bomb Squadron of 13th USAAF flew 63 RCM missions. Added to this were the Allied Navy and RAAF activities in this field. Unrelenting attention created a disruptive climate for Japanese radar defences unlike anything suffered by Allied air warning defences in the Pacific conflict. Some selected reports of RCM Missions follow.



RCM Search Mission 46 - 16 January 1945 - Borneo.
197-199/750-800/9-13.
This signal was heard with moderate strength between 0527 and 0615 hours on the outward trip and again from 0849 to 0930 hours on the return. Although the characteristics during each period were slightly different, it is assumed that the two signals emanated from the same radar. A number of DF's were taken which lie scattered around Boenjoe Island and Tarakan Island. There is little doubt that the signal emanated from the Tarakan Island radar DF'd on our Mission 44. The station was sweeping during the whole time the signal was under observation.

This Mark 1 Model 2 Japanese radar was found to be situated on Cape Pasir on the west coast of Tarakan. It was destroyed during the Allied assault on the island.

Cape Mangkalihat Radar. (01.01N - 118.59E)
This radar was visually observed and photographed on 15, 16 and 17 January by an aircraft of the Navy squadron VPB-130. On the last date the installation was attacked by bombing and strafing, the only visible damage being the setting on fire

of one of the buildings on the ground. A rocket, bombing and strafing attack was made on 19 January by two aircraft of the same squadron. One rocket exploded at the base of the tower, all bombs exploded within 60 ft of the tower and 6000 rounds of ammunition were expended in strafing, the bulk of it being directed at the camouflaged hut suspected to house the equipment on top of the tower. The radar is regarded as being at least temporarily put out of action. The tower is almost certainly the one that used to carry the marine light known to have been situated at Cape Mangkalihat because no sign of any lighthouse installation was seen in the vicinity.

As a footnote to the Borneo Campaign Lt Unwin, probably because he had been part of the snooper flights which had located Japanese radar in East Borneo, was chosen to take part in the Balikpapan landings with the Australians. He was assigned to a Commando unit commanded by Lt Max Rose with the assignment of gathering information on all radar installations which could be found.

Dr Unwin's comments follow:

In the event it was no big deal, one radar had been completely destroyed by a direct hit from a bomb, another in a trailer had been thoroughly done over by a flame thrower and the third had been destroyed by the Japanese, not very efficiently and we were able to pick up some relatively undamaged units and also found in a dugout some circuit diagrams but no manual....
The Mark I Model I radar operated at 3m and was mounted in a hand rotated hut with a broadside antenna mounted on its side. For some reason that I was never able to fathom these radars were always operated in pairs, the two units being separated by up to several hundred metres. This was convenient for us, as when we heard one and roughly located it we could tell the photo interpreters to look for a pair, they were fairly easy to spot and were normally located fairly close to major towns of which Balikpapan was one. They were the Japanese Navy's major land-based air warning set. The Type II radar operated at 200MHz and was trailer mounted, again with a broadside antenna fixed to the side of a cabin which was rotated by hand. They could clearly be brought into operation fairly quickly once they were ashore but would have had less range than the Model I.
The one at Balikpapan had probably just remained as a back-up to the Model I pair after they had been installed. The Mark I Model III was the simplest imaginable with an antenna consisting of three or four pairs of dipoles stacked vertically, on a light frame, the frequency was 150MHz. The radar broke down into units that could be hand carried, including the power supply, and possibly the hut which was very small. These radars were set up on remote headlands and islands all over the place, and must have given pretty good service because they seemed to operate pretty consistently and with their geographical spread must have provided good early warning. The antenna was fed via coaxial cable allowing it to be rotated by hand over a limited azimuth. It seems from a Japanese article that it was capable of picking up IFF signals and I am sure that they must have made good use of this capability.

Flights 200 and 201

At the end of the war the RAAF were equipping two flights of aircraft to carry out their own countermeasure activities. This was the result of a study tour in Europe by S/Ldrs W Nash and A Thomas which recommended a greater involvement and training program for the RAAF but the flights were not needed.

[The inference in the above paragraph is that these flights only took part in RCM activities. Such was not the case, as they were given other special, and sometimes clandestine, missions.]

380th Heavy Bombardment Group, US Fifth Air Force

The text of the book was virtually on its way to the printer when the following was received. Fortunately it could be placed on the last page where it fitted - almost as a post script. Its arrival confirms the opinion that there is much more information out there ‘in the wide blue yonder’ still to be found.

P/O A (Bert) J Pattison was a RAAF navigator/wireless operator who was seconded to Section 22 to be trained to use the new sophisticated jamming equipment for which the Americans had no one able to operate it. Nine RAAF senior NCOs were selected and trained over a period of five or six weeks by Section 22 personnel at Kangaroo Point near Brisbane.

Basically these men tuned in to Japanese long range radar recording data as to bearing, frequency and PRF as they were detected on the way to their targets. Operating frequencies were scanned and ‘butterfly’ condensers were used to find the null points to determine the PRF of the radar. When the PRF changed from a low number to a higher one it was likely that they were then probably within range of the ack-ack radar control area, so a ‘jammer’ was switched on to blanket the Japanese oscilloscopes to protect the flight.

The 380th Heavy Bombardment Group which consisted of four squadrons of Liberators, the 528th, 529th, 530th and 531st, commenced operations from Darwin in June 1944 moving to Mindoro in early February 1945. P/O Pattison flew 27 missions from Darwin and five from Mindoro with targets ranging from Tanimbar Island to Lingayen and Manila in the Philippines, Formosa (Taiwan) and Okinawa.

Other squadrons were also involved in similar activities but this story emphasises the excellent cooperation which existed between the US Fifth Air Force and the RAAF during WWII.

AFTERWORD

The completion of this book has been a challenge on several counts. To begin we felt that the history of air warning radar has been largely neglected by military historians - whether this was because of the lack of official records or the 'veil of secrecy' imposed after the war is not clear. Then to fill in gaps, consultation with those veterans who were there was an absolute necessity. Also it was an urgent matter since the veterans of WWII have all reached the age when they are 'slipping off the edge'.

Every endeavour has been made to give an unbiased view, exposing what has been perceived as shortcomings with the aim of portraying the conditions as they then existed, recalling the 'not so pleasant' along with the pleasant. Where possible each incident has been cross-checked with official files, personal diaries et cetera to ensure that the material is as accurate as can possibly be fifty years after the events.

The book is intended to provide the interested reader with a reasonably comprehensive overview with the hope that others will compile the history of individual stations. Some valued work has already been achieved by Morrie Fenton and Hal Porter*, as well asDon Brown, Tony Craig*, Ted Dellit*, Don Everitt, Allan Ferguson*, Keith Flynn*, Tim Jones*, Ian McKellar, Eric Unthank, and Ian Sexton, from New Zealand, but still more has yet to be done.

No claim can be made that all ground-based radar stations in the mainland Australia have been covered in any detail - this would have required at least another volume.

To assist future researchers in this subject readers are asked to forward any additional information to:

Radar Returns
39 Crisp Street
Hampton, Vic 3188.

Ed Simmonds
Norm Smith

* November 2007 - now deceased

ABBREVIATIONS and GLOSSARY

AC1 ..... Aircraftsman Class 1

A/Cdre ..... Air Commodore

ACO ..... Advance Chain Overseas- HF Band

ACW ..... Aircraftswoman

ADHQ ..... Air Defence Headquarters

ADMIR I ..... Admiralty Islands

AI ..... Aircraft Interception - airborne radar on night fighters

AMES ..... Air Ministry Experimental Station

ANGAU ..... Australia New Guinea Administration Unit

AOC ..... Air Officer Commanding

Array ..... A number of dipoles, fed in phase, to produce a radio beam

ASV ..... Air to Surface Vessel - airborne radar

ASV Beacon ..... Navigational aid for aircraft. A transponder in a fixed position on ground, activated by ASV, gives the aircraft its range and azimuth from the beacon.

"A" Trace ..... Horizontal sweep/trace on CRT or indicator giving range only.

AW ..... Air Warning - Australian ground radar

Azimuth ..... Horizontal bearing measured clockwise in degrees from true north

Bay ..... A vertical stack of dipoles

BOR ..... Borneo

CA ..... Coastal Artillery

CD ..... Coastal Defence - Army operated

CD/CHL ..... Dual function - CD and CHL

CH ..... Chain Home - HF Band- UK

CHL ..... Chain Home Low Flying - VHF Band

CIC ..... Combat Information Centre

Clutter ..... Random echoes, mainly sea returns, similar in appearance to receiver noise- but coarser

COL ..... Chain Overseas Low Flying- VHF Band

Col ..... Colonel

Cpt ..... Captain

CRT ..... Cathode Ray Tube

CSIR ..... Council for Scientific and Industrial Research

CSIRO ..... Commonwealth Scientific and Industrial Research Organisation- post war

DEI ..... Dutch East Indies

D/F ..... Direction Finding- see goniometer

Dipole ..... A piece of wire or tubing cut to (an electrical) length of approximately half a wavelength

DNG ..... Dutch New Guinea

Doover ..... Australian expression (slang or secretive ?) for an operative radar set

Dukw.....Amphibious vehicle

ETA.....Expected Time of Arrival

FEAF.....(US) Far Eastern Air Force

FCU.....Fighter Control Unit

F/Lt.....Flight Lieutenant

Floodlighting.....HF Band Transmission where the beam covers a sector of 120^{o} rather than a narrow VHF beam

F/O .....Flying Officer

Frequency.....The number of oscillations per second or cycles per second (c/s)

FS .....Fighter Sector

G/Cpt.....Group Captain

GCI.....Ground Controlled Interception

GL .....Gun Laying

Goniometer .....Instrument used for obtaining bearings when D/Fing radio signals or in 'floodlit' radar

Grass .....Fine small echoes on the trace resulting from random electrical noise in the receiver

Ground Pulse.....The echo resulting from direct radiation from the transmitter arriving at the receiver

HF .....High Frequencies (3-30 Mc/s)

HF/DF .....High Frequency Direction Finding

IFF.....Identification Friend or Foe. A transponder fitted to either an aircraft or ship

Indicator.....CRT or display unit

Interrogator .....Separate Tx and Rx to activate IFF and transfer signal to the main trace on CRT

kc/s .....Kilocyles per second

kW.....Kilowatts

KVA.....KiloVolt Amps- measure of alternator output

LAC.....Leading Aircraftsman

LCI .....Landing Craft Infantry

LCM.....Landing Craft Mechanised

LCT .....Landing Craft Tank

LRAW.....Long Range Air Warning- NZ designed and made

LSD.....Landing Ship Dukws (and amphibious tanks)

LST .....Landing Ship Tank

Lt.....Lieutenant

Lt Col .....Lieutenant Colonel

LW .....Light Warning RAF - AMES Type 6

LW/AW.....Light Weight Air Warning - Australian

LW/LFC.....Light Weight Low Flying Cover - Australian

LW/GCI ..... Light Weight Ground Controlled Interception - Australian

MAG ..... Marine Air Group

Maj ..... Major

MAWD ..... Modified Air Warning Device - modified SCR268

Mc/s ..... Megacycles/second

MFCU ..... Mobile Fighter Control Unit

MoD ..... (UK) Ministry of Defence

MRU ..... Mobile Radio (radar) Station - HF Band, truck mounted

Mustering ..... RAAF trade classification or designation

MW ..... Megawatt

NB ..... New Britain

NSW ..... New South Wales

NSWGR ..... New South Wales Government Railways

NT ..... Northern Territory

OBU ..... Operational Base Unit

PE ..... Permanent Echo. A response from a fixed object within the operational range of a radar set

PNG ..... Papua New Guinea

PPI ..... Plan Position Indicator

PRF ..... Pulse Repetition, or Recurrence, Frequency

Qld ..... Queensland

Radar ..... American terminology for and successor to RDF. The technique using pulsed radio signals to determine the range and bearing of aircraft, ships et cetera

RAAF ..... Royal Australian Air Force

RAF ..... Royal Air Force

RAN ..... Royal Australian Navy

RCAF ..... Royal Canadian Air Force

RCM ..... Radio (radar) Countermeasures

RDF ..... Radio Direction Finding used by the RAF and RAAF until the term radar was adopted

RDL ..... Radio Development Laboratory - New Zealand

RIMU ..... Radio (Radar) Installation & Maintenance Unit

RN ..... Royal Navy

RNZAF ..... Royal New Zealand Air Force

RP ..... Radiophysics Division of CSIR and CSIRO

RPL ..... Radiophysics Laboratory

R/T ..... Radio Telephony- clear speech

RWG/GCI ..... Canadian version of English GCI- SCR588B

Rx ..... Receiver

SA ..... South Australia

SAW..... Signals Air Warning- US

ShD ..... Shore Defence - Army operated

SLC ..... Searchlight Control - Army operated

S/Ldr ..... Squadron Leader

Tas..... Tasmania

Transponder ..... Radio receiving device which amplifies a signal from an interrogator or ASV and then transmits a coded message from an in-built transmitter

TR Switch ..... Transmit-Receive Switch or duplexer which electronically connects the Tx to the array when transmitting and the Rx to the array when receiving, protecting the receiver from the transmitted pulse

TRU..... Transportable Radar Unit - HF Band similar to MRU, electronics housed in tents

Tx ..... Transmitter

USAAF ..... United States Army Air Force

VHF..... Very High Frequencies (30-300 Mc/s)

Vic..... Victoria

WA..... Western Australia

WAAAF..... Womens' Auxiliary Australian Air Force

Wavelength ..... The distance, in metres, between adjacent crests or troughs of a continuous wave

W/Cdr..... Wing Commander

W/O..... Warrant Officer

W/T ..... Wireless Telegraphy or Morse code

Yagi Aerial..... Consists of a parasitic reflector behind driven element (dipole) and some parasitic directors in front of the dipole to reduce the beam width and increase performance

X-Ray Plot ..... Radar trace of unidentified aircraft possibly enemy

APPENDIX I

Radar Equipment Summary

The following is a brief summary of the characteristics of the main types of Air Warning equipment used in the region. The information has been mainly taken from the 1944 RAAF Manual *The Principles of Ground Radar.* Actual ranges depended on the height of the site eg, the distance to the horizon is proportional to the square root of the height above sea level.

TYPE CHL or COL.....Made in: UK
Chain Home Low Flying or Chain Overseas Low Flying
Type of Array.....Broadside - 4 stack, 4 or 5 bay
Frequency Mc/ 200
Pulse Recurrence Frequency 300-400
Pulse Width, Microseconds 3
Pulse Power, kW.....120 with VT58s, 150 with VT98s
Display .....A type and PPI
Maximum Normal Range, miles 150 with VT58s, 180 with VT98s
Remarks : Fixed station. In Australian and NZ stations the AW transportable tower was used with the CHL array.

TYPE TRU and MRU ..... Made in: UK
Transportable or Mobile Radio (Radar) Unit
Type of Array.....Tx 3 stack main array, 2 stack gap filler on 105 foot tower.
Rx 2 sets of cross dipoles on 105 foot tower.
Frequency Mc/s.....42.5
Pulse Recurrence Frequency 25 or 50
Pulse Width, Microseconds 8 or 16
Pulse Power, kW.....180-220
Display .....8 inch A Type
Maximum Normal Range, miles two range settings 75 or 150
Remarks : Floodlight system, azimuth determined by a goniometer. Height finding. Used in Malaya, one in Australia and one in New Zealand. MRU units had Tx and Rx mounted in trucks.

TYPE ACO.....Made in: UK
Advanced Chain Overseas
Type of Array.....Tx 3 stack main array, 2 stack gap filler on 132 foot tower.
Rx 2 sets of cross dipoles on 132 foot tower.
Frequency Mc/s.....42.5
Pulse Recurrence Frequency.....12.5, 25 or 50
Pulse Width, Microseconds 8 or 16
Pulse Power, kW.....180-220
Display .....11 inch A Type
Maximum Normal Range, miles..160
Remarks : Floodlight system. Fixed station, azimuth determined by a goniometer also used for height finding. Used in Malaya and nine stations in Australia.

TYPE GCI - Mobile.....Made in: UK
Ground Controlled Interception - Truck mounted

Type of Array.....Broadside Array, upper 2 stacks, 4 bays lower 2 stacks, 4 bays at mean height of 10 feet. Switched to be in phase or anti-phase.
Frequency Mc/s.....209
Pulse Recurrence Frequency.....400
Pulse Width, Microseconds 3
Pulse Power, kW.....120-150
Display.....Range/height tube A Type and PPI.
Maximum Normal Range, miles..80
Remarks : Truck mounted, used in Mainland Australia, New Guinea by RAAF and the Solomons by the RNZAF.

TYPE SCR268.....Made in: USA
Type of Array.....Stacked dipole arrays, one Tx and two for Rx - one for azimuth and one for elevation.
Frequency Mc/s.....204-206
Pulse Recurrence Frequency.....4096
Pulse Width, Microseconds 9
Pulse Power, kW.....50-80
Display.....A Type
Maximum Normal Range, miles..25
Remarks : Searchlight control and anti-aircraft gunnery. Oscillator had 16 100TS Eimac valves in a ring circuit - a brute to tune.

TYPE SCR 270.....Made in: USA
Type of Array.....Broadside
Frequency Mc/s.....103-110
Pulse Recurrence Frequency.....344 or 621
Pulse Width, Microseconds 10-30
Pulse Power, kW.....100
Display.....A Type
Maximum Normal Range, miles..150
Remarks : classified as mobile - weighed about 84000 lbs !

TYPE SCR 271.....Made in: USA
Type of Array.....Broadside
Frequency Mc/s.....103-110
Pulse Recurrence Frequency.....621
Pulse Width, Microseconds 10-30
Pulse Power, kW.....100
Display.....A Type
Maximum Normal Range, miles..150
Remarks : fixed station with long establishment time. Like the SCR270, oscillator had two watercooled Westinghouse WL530 valves.

TYPE SCR 516.....Made in: USA
Modified SCR 268
Type of Array.....Same as SCR 268
Frequency Mc/s.....215
Pulse Recurrence Frequency.....1366

Pulse Width, Microseconds 9
Pulse Power, kW.....50-80
Display.....A Type and PPI
Maximum Normal Range, miles..70
Remarks : Used for air warning and GCI - not searchlight control.

TYPE SCR 527.....Made in: USA
Type of Array.....Broadside Tx and Rx
Frequency Mc/s.....209
Pulse Recurrence Frequency.....350-1000
Pulse Width, Microseconds 4
Pulse Power, kW.....100
Display.....A Type and PPI
Maximum Normal Range, miles..60
Remarks : Similar to the UK Mobile GCI

TYPE SCR 588.....Made in: Canada
Canadian RWG/GCI
Type of Array.....Broadside Array, upper 2 stacks, 4 bays lower 2 stacks, 4 bays at mean height of 10 feet. Switched to be in phase or anti-phase.
Frequency Mc/s.....209
Pulse Recurrence Frequency.....1000
Pulse Width, Microseconds 4
Pulse Power, kW.....100
Display.....A Type Range/height tube and PPI
Maximum Normal Range, miles..60
Remarks : Fixed station used by RAAF and USAF

TYPE SCR 602 T6.....Made in: Canada
North American version of UK AMES Type 6
Type of Array.....Upper, 2 bays of Yagis, Lower, 2 bays of Yagis switched to be fed in phase or anti-phase
Frequency Mc/s.....176 or 212
Pulse Recurrence Frequency.....400
Pulse Width, Microseconds 2
Pulse Power, kW.....100
Display.....A Type and PPI
Maximum Normal Range, miles..60
Remarks : Primary use in assaults as warning for the infantry.

TYPE LRAW.....Made in: New Zealand
Long Range Air Warning
Type of Array.....Assault array, 4 Yagis similar to SCR602 Alternate array broadside.
Frequency Mc/s.....97
Pulse Recurrence Frequency.....?
Pulse Width, Microseconds .....?
Pulse Power, kW.....150-200
Display.....PPI tube and A type display

Maximum Normal Range, miles..Yagi 125 miles on a group, Alternate 180 miles on a group.
Remarks : Six used by USAF at Guadalcanal.

TYPE AW ..... Made in: Australia
Air Warning
Type of Array.....Broadside; 3 stack, 6 stack
Frequency Mc/s.....200
Pulse Recurrence Frequency.....50
Pulse Width, Microseconds 20
Pulse Power, kW.....10-15
Display .....5 inch A Type
Maximum Normal Range, miles..80
Remarks : Time base in indicator unit was a bridge circuit. Unit could suffer large voltage and frequency swings and still maintain calibration.

TYPE LW/AW Mk I &IA ..... Made in: Australia
Light Weight Air Warning
Type of Array.....Broadside, 4 bay, 4 stack
Frequency Mc/s.....200
Pulse Recurrence Frequency.....50
Pulse Width, Microseconds 20
Pulse Power, kW.....10-15
Display .....5 inch A Type
Maximum Normal Range, miles..100
Remarks : Air Transportable, used extensively by RAAF and USAF. Mk IA was tropicalised. See last page of this Appendix for overall weight.

TYPE LW/AW Mk II ..... Made in: Australia
Light Weight Air Warning
Type of Array.....Broadside, 4 bay, 4 stack
Frequency Mc/s.....200
Pulse Recurrence Frequency.....50
Pulse Width, Microseconds 20
Pulse Power, kW.....40-50
Display .....5 inch A Type
Maximum Normal Range, miles..130
Remarks : as for the Mk IA but with new transmitter. Four 100TH Eimac valves in a ring circuit.

TYPE LW/GCI MkI .....Made in: Australia
Light Weight Ground Controlled Interception
Type of Array.....Broadside - two 4 bay, 2 stack arrays at mean heights of 13 and 21.5 feet.
Frequency Mc/s.....207
Pulse Recurrence Frequency.....400
Pulse Width, Microseconds 10
Pulse Power, kW.....100
Display .....Range/height tube A Type plus PPI
Maximum Normal Range, miles..95

Remarks : Used SCR 602 T6 electronics

TYPE LW/GCI Mk II ..... Made in: Australia

Type of Array.....Broadside - three 4 bay, 2 stack arrays at mean heights of 8, 12.5 and 21 feet.
Frequency Mc/s.....207
Pulse Recurrence Frequency.....400
Pulse Width, Microseconds 10
Pulse Power, kW.....100
Display .....as for LW/GCI Mk I
Maximum Normal Range, miles..100+
Remarks : used SCR 602 T6 electronics.

TYPE MAWD ..... Made in: USA

Modified Air Warning Device - Modified SCR268
Type of Array.....Stacked dipole arrays, one Tx and two for Rx - one for azimuth and one for elevation.
Frequency Mc/s.....204-206
Pulse Recurrence Frequency.....1366
Pulse Width, Microseconds 5-9
Pulse Power, kW.....50-80
Display .....Two A Type tubes
Maximum Normal Range, miles..100
Remarks : RPL modified some SCR268s for air warning for use on mainland Australia in early 1942

Approximate Weights of Elements in an LW/AW Mk IA Radar

Array, mast and hut (uncrated)	5700 lbs
Power supplies (uncrated)	3100
Transmitter (crated)	1200
Receiver (crated)	1000
Spares and test equipment	1000
BL4 Interrogator and array	600
W/T equipment including batteries and battery charger	1200
Jeep	2200
Armament, blocks and tackle, axes, tools, tents et cetera	800
Personnel, 200 lbs per man, including personal gear.	
20 men plus guards	4000
Barracks equipment - non-technical	23000
..... Total	47000 lbs

Plus food at 5.62 lbs per man per day
Plus fuel at 220 lbs per day.

One DC3 aircraft could carry enough food for 45 men and fuel for a period of 11 days.

APPENDIX II

RAAF Station Numbering

The numbering system appears to have grouped the stations by their function with three exceptions. Nos 50, 53 and 61 were LW/AWs even though their numbers were in the first group. No explanation has been found for Nos 50 or 53 but 307RS was re-numbered to 61RS as it was intended that the LW/AW equipment would be replaced by a Mk V COL.

Station Numbers .....Function

7 - 49, 51, 52 & 54 - 59.....Fixed stations, either on the mainland or islands & close to the mainland, Australian AW or English Mk V COL.

101 - 109 .....MAWD (Modified Air Warning Device).

.....Modified SCR268 Gun Laying sets.

131 - 168 .....Mobile GCI (Ground Control Interception). Three types were in this grouping viz : 131-155 English Mk V and Canadian RWG/GCI. Over 160 Australian LW/GCI Mk 1 and Mk 2.

207 - 228 .....Fixed stations, wholly on the mainland using English ACO equipment.

251 - 257 .....LW/LFC (Light Weight/Low Flying Cover). Only two sets 'almost' in operation at the end of the war - 10 cm set with Australian designed and constructed aerials & huts with English 500 KW Type 277 equipment.

50, 53 & 61, 301 - 355 .....Australian air transportable equipment using LW/AW Mk 1, Mk 1A, Mk 2 and Mk 5.

ESTABLISHMENT OF STATIONS

The following table, based on information which is still available, shows the expansion of the RAAF network during WWII view of the paucity of official records and the errors found therein it should possibly be labelled E & OE.

	1942		1943		1944		1945		
TYPE	**J-J**	**J-D**	**J-J**	**J-D**	**J-J**	**J-D**	**J-J**	**J-D**	**TOTAL**
AW or COL	10	14	14	4					42
MAWD	8								8
GCI		3	4	2	5				14
ACO		1	2	6					9
LW/AW		7	22	12	8	3	3	1	56
LW/GCI						4	4	1	9
LW/LFC								2	2
Milne Bay Specials		2							2
No Established	18	27	42	24	13	7	7	4	142
No Disbanded		8	1	1	3	1	4		-
No Operational	18	37	78	101	114	118	124	124	-

APPENDIX III

Location of Operational Radar Stations

	Shepherd's Hill, NSW
	Port Kembla, NSW
	Parkes, NSW
7	Wedge Island, SA
10	Cape Jervis, SA
13	Cape Otway, Vic
14	Wilson's Promontory, Vic
15	Metung, Vic
16	Gabo Island, Vic
17	Burrewarra Pt, Moruya, NSW
18	Saddleback Mt, Kiama, NSW
19	Bombi Point, NSW
20	Tomaree, Nelson Bay, NSW
23	Lytton, QLD
24	Caloundra, QLD
25	Sandy Cape, QLD
	Re-formed as No 167
26	Cape Cleveland, QLD
27	Dunk Island, QLD
28	Fitzroy Island, QLD
29	King Spur, Pt Moresby, PNG
31	Dripstone Caves, NT
	Pt Charles, NT
	Fenton, NT
	Renumbered to No 310
32	Rottnest Island, WA
33	Cape Naturaliste, WA
35	Stony Ridge, Albany, WA
36	Hammond Island, QLD
	Horn Island, QLD
37	Gurney, Milne Bay, PNG
38	Cape Fourcroy, Bathurst Is.NT
39	Port Keats, NT
40	Merauke, DNG
42	Bowen, QLD
	Renumbered to No 55
43	Portland Roads, QLD
44	Cooktown, QLD
	Renumbered to No 56
45	Stanley Island, QLD
46	Cape Don, NT
47	Gin Gin, WA - US SCR270
	Kalamunda, WA - US SCR270
	Geraldton, WA
48	Jurien Bay, WA
49	Point Lookout, Qld
50	Dobodura, PNG
	Tsili Tsili, PNG
	Amami, PNG
	Tadji, PNG
51	Point Danger, Qld
52	Mutee Head, Qld
53	Mount Surprise, Qld
54	Collaroy, NSW
	Renumbered from 101
55	Bowen, Qld
	Renumbered from 42
56	Cooktown, Qld
	Renumbered from 44
57	Castle Hill, T'ville Qld
	Renumbered from 104
	Mt Spec, Paluma, Qld
59	Lee Point, NT
60	Cape Van Diemen (Melville Is), NT
61	Peron Is, NT
	Renumbered from 307
101	North Head, Sydney, NSW
	Collaroy, NSW
	Renumbered to 54
102	Point Danger (Coolangatta), Qld
103	Stradbroke Is, Qld
104	Kissing Pt, T'ville Qld
	Renumbered to 57
105	Point Charles, NT
107	Quamby,Cloncurry, Qld
109	Mt Woods, NT
	Nightcliff, NT
131	Kyeemagh, NSW
	Ash Island, NSW
	2 OTU, Mildura, Vic
132	Knuckeys Lagoon, NT
134	Maroubra, NSW
	Beverley Hills, NSW
135	Pinkenba, Qld

136 Bunnerong Park, NSW
Alligator River, Qld
138 Waigani, Port Moresby, PNG
Dobodura, PNG
144 Cannington, WA
150 Adelaide River, NT
151 Merauke, DNG
152 Tadji, PNG
153 Finschhafen, PNG
154 Truscott, WA
155 Ash Island, NSW
Exmouth Gulf, WA
161 Adelaide River, NT
Truscott, WA
Potshot, WA
Morotai, DEI
162 Knuckeys Lagoon, NT
Balikpapan, BOR
163 Essendon, Vic
Labuan Is, BOR
Lutong, BOR
164 Bankstown, NSW
Bargo, NSW
165 Quaker's Hill, NSW
166 Labuan Is, BOR
167 Tarakan, BOR
Re-formed from No 25
168 Tarakan, BOR
169 Marsden Park, NSW
170 Marsden Park, NSW
207 Lilli Pilli, NSW
208 Mine Camp, Swansea, NSW
209 Benowa, Qld
210 Toorbul Point, Qld
211 Home Hill, Qld
220 Tolga (Bones Knob), Qld
224 Old Southport Rd, Darwin, NT
227 Yanchep, WA
228 Rockingham, WA
251 Collaroy, NSW
257 Casuarina, Darwin, NT
301 *Kanokopi, Milne Bay, PNG
Saidor, PNG
302 *East Cape, Milne Bay, PNG
Old Southport Rd, Darwin, NT
Balikpapan, BOR
303 Forduma, Tufi, PNG
Boirama Is, Milne Bay, PNG
Meimeiara Is, Milne Bay, PNG
304 Cape Pierson,(Normanby Is.), PNG
Gurney Strip,(Milne Bay), PNG
Hood Point, PNG
Port Moresby, PNG
305 Mwononoia,(Goodenough Island), PNG
Bomata Pt, Kiriwina, PNG
306 Bulolo, PNG
307 Peron Island, NT
Renumbered to No 61
308 Millingimbi, NT
Cape Pasir, Tarakan, BOR
309 North Goulburn Is, NT
Tarakan, BOR
310 Exmouth Gulf, WA
Morotai, DEI
Renumbered from No 31
311 Archer Bay, Qld
Nissan (Green) Is, SOL
312 Wessel Is, NT
Tarakan, BOR
313 Mornington Is, Qld
Green Island, SOL
314 Onslow, WA
315 Cape Ward Hunt, PNG
Middleburg Is, DNG
316 Kombies, PNG
Coal Pt, Labuan Is, BOR
317 Old Drysdale Mission, WA
Sir Graham Moore Is, WA
Batchelor, NT
318 Batchelor, NT
Cape Don, NT
Cape Van Diemen (Melville Is), NT
319 Fenton, NT
Drysdale, WA
Truscott, WA
320 Mitchell River, Qld
Puruata Torokina, SOL
321 Adelaide River, NT
Cape Arnhem (Yirrkala Mission), NT
322 Digoel River (Tanah Merah), DNG
323 Boepel, Merauke R, DNG
Mapi Post, DNG
Muara Is, BOR

	Brunei Bluff, (Brooketown), BOR
324	Paradise, Noonkanbah, WA
	Cockatoo Is, WA
	Papen Is, BOR
325	Corruna Downs, WA
	Miri, BOR
326	Cape Leveque, WA
327	Reddell's Beach, Broome, WA
328	Red Hill, Wallal Downs, WA
329	Warriearran, WA
330	Koitaki, near Pt Moresby,PNG
331	Tami Island, Finschhafen,PNG
332	Lae, PNG
	Malahang, Lae, PNG
	Sio, PNG
333	Goodenough Is, PNG
334	Gusap, Ramu River, PNG
	Cape Gloucester, NB
335	Pilelo Is, Arawe Islands, NB
	Emirau Is, Bismarck ARCH
336	Glibu, Trobriand Is, PNG
	Safon, Tufi, PNG
	Oro Bay, PNG
337	Kiriwina, PNG
	Los Negros, ADM I
338	Long Island, East Coast, PNG
	Matafuma Point, Long Is, PNG
339	Yule Island, PNG
340	Bat Is, ADM I
	Aitape Point, PNG
	Tadji Beach, PNG
	Aitape Point, PNG
341	Mulgrave Is, QLD
342	Post 6, Eilanden R, DNG
	Victoria, Labuan, BOR
343	Sattler, NT
	Balikpapan, BOR
344	West Montelivet Is, WA
345	Bipi Is, ADM I
	Harengan Is, ADM I
346	Salami, ADM I
	Bundralis, ADM I
347	Mockerang Point, ADM I
348	Tumleo Is, PNG
	Tadji, PNG
	Hollandia, DNG
349	Hansa Bay, PNG
351	Darwin, NT
352	Sattler, NT
	Kokoya, Halmahera I, DEI
354	Tarakan, BOR
355	Sadau Is, BOR

* These stations operated with ASV equipment and a Yagi aerial located at the entrance to Milne Bay in 1942 to report on any Japanese ships entering the bay.

It is to be noted that 108RS was formed and moved to Julia Creek, Qld and 350RS was at Finschhafen, PNG, for 15 months and neither unit became operational.

Abbreviations

ADM I -	Admiralty Islands	PNG-	Papua New Guinea
BOR -	Borneo	SOL	Solomon Islands
DEI -	Dutch East Indies	Qld -	Queensland
DNG -	Dutch New Guinea	SA -	South Australia
NB -	New Britain	Tas -	Tasmania
NSW -	New South Wales	Vic -	Victoria
NT -	Northern Territory	WA -	Western Australia

UNNUMBERED STATIONS

Shepherd's Hill The first radar station (a CD/CHL) installed by the RAAF commenced operations on 10 January 1942 - two months before 31RS at Dripstone Caves. The gear was later moved to Bombi where it became 19RS.

Port Kembla An Army AW station, installed by the RAAF and RPL becoming operative around 10-15 February 1942. Therefore it was the second RAAF station. S/Ldr John Allan was there for a short time as was S/Ldr Don Kennedy and crew before they set up Kiama.

Parkes No record has been found so far that this station actually operated. It was a GCI.

RADAR STATION SITES SELECTED BUT NOT USED

This list has been taken from file 1846/4/201 located in Melbourne Archives.

1*	Flinders Island, Tas
2	King Island, Tas
3	St Marys, Tas
4	Low Rocky Point, Tas
5	Temma, Tas
6	Hobart, Tas
8*	Elliston, SA
9*	Whyalla, SA
11*	Robe, SA
12	Cape Nelson, VIC
21	Smoky Cape, NSW
22*	Yamba, NSW
30	Rabaul, PNG
34	Chudulup, WA
41	Sydney, NSW
42	Merinda, Qld
133	Melbourne, Vic
137	Horn Island, Qld
139	Abau, PNG
140	Rabaul, PNG
141*	Wingfield, SA
142	Birdum, NT
143	Daly Waters, NT
145 to 149	Not Found
201	Hobart, TAS
202*	Victor Harbor, SA
203*	Cowell, SA
204	Drysdale, Vic
205	Bairnsdale, Vic
206	Dapto, NSW
212	Bambaroo, Qld
213	Charters Towers, Qld
214	Hughenden, Qld
215	Cloncurry, Qld
216	Cloncurry, Qld
217	Burketown, Qld
218	Burketown, Qld
219	Burketown, Qld
220	Cairns, Qld
221	Horn Island, Qld
222	Port Moresby PNG
223	Rabaul, PNG
225	Birdum, NT
226	Daly Waters, NT
229	Torbay (Albany), WA

* Civil works completed but no equipment installed.

LOCATION OF ASSOCIATED RAAF UNITS

FIGHTER SECTORS[1]

1	Bankstown, NSW
2	New Lambton, NSW
3	Townsville, QLD
4	Port Moresby, PNG
5	Darwin, NT
6	Mt Lawley, WA
7	Preston, VIC
8	Brisbane, QLD
9	Cairns, QLD
	Milne Bay, PNG
	Goodenough Island, PNG
	Dobodura, PNG
	Madang, PNG
10	Darwin, NT
	Sattler, NT
	Darwin, NT
	Morotai, DEI
11	Yanrey, WA
	Giralia, WA
	Potshot, WA
	Lae, PNG
	Nadzab, PNG
	Cape Gloucester, PNG
	Tadji, PNG
	Morotai, DEI
	Labuan, BOR
12	Horn Island, QLD
	Townsville, QLD
	Torokina, NB
13	Garbutt, QLD
	Merauke, DNG
14	Camden, NSW
	Goodenough Island, PNG
	Kiriwina, PNG
	Los Negros, ADM I
	Tarakan, BOR

RADIO INSTALLATION AND MAINTENANCE UNITS

1	Croydon, NSW[2]
2	Townsville, QLD
3	Milne Bay, PNG
	Kranket Is, Madang,PNG
4	Nadzab, PNG
	Noemfoor, DNG
	Morotai, DEI
	Labuan, BOR
5	58 Mile, NT
6	Morotai, DEI

RADAR WINGS

41	Port Moresby, PNG
42	Townsville, QLD with detachments at Horn Is, QLD and Port Moresby, PNG
44	Adelaide River, NT

RADIO SCHOOL[3]

1	Richmond, NSW
	Maryborough, QLD

1. All Fighter Sectors were reclassified to Fighter Control Units on 7-3-1944 and subsequently renumbered by adding 100 to the original number, eg 7FS became 107FCU.
2. Renamed to RDIU (Radar Development and Installation Unit)
3. Renamed to RDF School and Radar School

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This work would not have been possible without the continued support and encouragement received from many authorities and people including the Committee of the NSW Radar Air Defence Branch of the Air Force Association, serving members of the RAAF, veterans of several services and civilians who were also involved.

Credit should be given to James Stewart, who as a young officer at No. 114 MRCU at Amberley, QLD, in the late 1970s, was probably one of the first people who became interested in collecting material relating to the history of RAAF radar in WWII. Norm Smith met James on a visit to Amberley which may have resulted in Norm, with Frank Coghlan, subsequently writing the *Secret Action of 305*. Then Norm Smith and Ed Simmonds, who trained together at Melbourne Technical College in 1942, met after a gap of some 45 years. The infection then spread to Ed and there was a change in direction as every effort was made to contact as many veterans as possible because of a conviction that a history could not be written based only on official records.

The list is long and the authors apologise if any authority, organisation or person has been inadvertently omitted.

Main Sources of Information

Australian National Archives, Canberra and Melbourne.

Australian War Memorial Collection.

CSIRO, Radiophysics Division Library.

RAF Museum, Hendon UK.

RAAF Historical Section, Dept. of Air.

USAF Historical Centre, Maxwell Base, Alabama, USA.

Serving Members of the RAAF

A/Cdre D Bowden AM, A/Cdre B Treloar AM, G/Cpt K Clarke AM, G/Cpt G R Lee AM, W/Cdr M Rowland, W/Cdr P Smith, S/Ldr M Pryor and F/Lt L Horne.

Veterans and Civilians Who Have Contributed to the Overall History of Radar.

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