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WWII Aviation Archaeology in Victoria, Australia

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FLINDERS UNIVERSITY

DEPARTMENT OF ARCHAEOLOGY

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Maritime archaeology has been taught at undergraduate level in the Department of Archaeology at Flinders University since 1996 and the first Bachelor of Arts Honours thesis in maritime archaeology was completed in 1997. The introduction of the Bachelor of Archaeology in 1997 saw undergraduate students specializing in maritime archaeology for the first time and the first Bachelor of Archaeology Honours thesis appeared in 1999. Then in 2002, a new Graduate Program in Maritime Archaeology was introduced resulting in the first Master of Maritime Archaeology thesis in 2003.

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Biography

Julie Ford started studying at James Cook University in 1995, but transferred to Flinders University in 1997 to undertake a Bachelor of Archaeology, majoring in Maritime Archaeology. She completed her Honours Degree in 2000 with a thesis entitled 'Jetty Construction in South Australia and the involvement of the State Government'. In 2001, Julie undertook a contract position at Heritage Victoria. In 2002, Julie continued her studies with a Masters Degree in Maritime Archaeology, completing a thesis in 2004 on 'World War Two Aircraft in Victorian Waters'. Julie also completed her SCUBA diving training to the level of Dive Master in 2005. In addition to her university studies Julie has been involved in archaeological drawing on both terrestrial and maritime sites and has taught these skills to undergraduate students and post-graduate. Julie is now The IS Administration Assistant at Yalumba Wine Company.

Preface

Abstract

This study is of 75 aircraft wrecks located in Victorian waters from World War II. Victoria during World War II was a major training centre for aircraft personnel, and aircraft construction. Bases were setup around Port Phillip Bay, Sale and Bairnsdale to accommodate the large number of training units that was required throughout War. While it is understood that some training accidents would follow the establishment of these facilities, the number of accidents related to training personnel and the Royal Australian Air Force has never been truly known.

Of the 75 sites nine area located in Port Phillip Bay, 51 on the East Coast of Victoria heading towards the New South Wales border and two on the West Coast heading towards the South Australian border. While the wreck sites were not able to be physically located during the course of this study the large number of sites associated in this study is bigger than initially thought that it was going to incorporate.

The results of this research have been to evaluate the archaeological potential of locating and surveying planes in Victoria. The archaeological significance of these sites is that they demonstrate the growth of the aviation industry, and the Royal Australian Air force in Victoria during World War II. The understanding and recognition of these sites as cultural resources is a necessity to ensure there survival. It is hoped that this thesis will shed some light onto a topic which has only briefly touched upon, and that this research will be the starting point of further work on their location and characteristics.

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1

Introduction

As is the nature of war in the air, there is no known grave. (Ilbery 1999: ii)

During the centenary year of Orville and Wilbur Wrights' first powered flight, it seems appropriate to undertake research into aviation archaeology. It seems fitting to look at a time where necessity brought about enormous developments in aviation design and construction. The advances in aviation technology in the 20th century can be recognised as nearly as essential as shipping and navigation was to the development of the industrial and pre-industrial world (Cooper 1994: 136).

Humankind has been fascinated by flight since before written history and has strived to fly nearly more than anything else. Tales are told of men trying to fly like birds by fixing artificial wings to them. Leonard da Vinci's flapping-wing (ornithopter) was another attempt to enable flight (Mondey 2000: 9). Written records of attempts to fly go back to the 14th century AD when tethered man-carrying kites used in China were witnessed by Marco Polo (Mondey 2000: 9). Travel in hot-air balloons was first achieved by Etienne and Joseph Montgolfier in France on 25 April, 1783 (Mondey 2000: 10). The first engine-powered, heavier-than-air flight was made by Orville and Wilbur Wright in 1903. The first flight in Australia was on 17 March 1910 (*Advertiser* 1 March, 2003: 7).

In the past century, there have been considerable advances in aircraft design. The invention of the airplane allowed people to travel long distances more easily and frequently. Trips that took months by boat now only took hours. But it was only the elite who could afford the price of a ticket and it was not until World War Two (WWII) that air flight became more affordable for the general population (Mondey 2000: 27).

The fascination with flight has not diminished either with the fact that people can now fly, as evidenced by the popularity of the National Air and Space Museum in America (Melzter 1981). The National Air and Space Museum has such a large pull on people that it outdraws the remainder of the Smithsonian complexes combined (Melzter 1981: 113). The appeal of flight is well-defined by the museum stating:

> Since the Wright brothers' first flight, air and space technologies have been central in creating the modern world. Aviation and spaceflight have transformed our lives - our conceptions of time and distance, our daily routines and popular culture, and the conduct of exploration, business, and war (National Air and Space Museum 2003).

Melzter (1981) explains the appeal and draw that the museum creates when he said:

> The Museum works so well because it presents the new both in time (the future) and in space (the frontier); it shows where we come from (the past), where we are (the present) and most important, where we can expect to go (Meltzer 1981: 113).

The development of aviation as a major element in the world's everyday life has enabled the continued expansion and development of transportation, communication and exploration, thus contributing to the global markets and geopolitics of today (Cooper 1994: 136). This can be seen in the development and progress in aviation construction between 1903 and WWII (Mondey 2000).

The development of an aviation industry in Australia just prior to WWII brought about a new era of Australian initiative and ingenuity when people were able to succeed and make do with what was available. For the second time in a generation, aircraft were used in a world war, and they became the final decisive weapon in the conflict (Gibbs-Smith 1985). These machines demanded a higher degree of human endurance than was ever called for before in a war. Endurance, bravery and heroism were required of anyone who set foot in one of these planes during a period of major development in aeronautics.

Australia and Victoria During World War II

At the outbreak of war in 1939, Australia's ties to the United Kingdom were great and when the 'mother country' declared war, the whole of the Commonwealth was at war. Three weeks after the onset of war Prime Minister Robert Menzies, advised Australia:

> In our hours of greatest difficulty … the mother country [might be] asking more insistently for help in the air than for help on land or the sea (Stephens 2001: 60).

In a country that had less than a hundred aircraft, most of which were obsolete, and nowhere near the number of personnel that this type of war would require, this was an impressive statement (Hill 1998: 2). Australia's aviation industry was only just taking off with the Commonwealth Aircraft Corporation (CAC) still in its infancy. How was Australia going to participate in a war nearly half a world away that was going to be dependent on mastery of the air?

A shortfall of pilots, observers, wireless operators and gunners ensured that at the start of the war, the mastery of the sky was one-sided (Stephens 2001). The establishment of the Empire Air Training Scheme (EATS) by Australia, Canada, New Zealand and the United Kingdom ensured that this would not be the case for long (Ilbery 1999). The establishment of schools across six states brought about a training schedule that would take in approximately 1 000 new trainees every four weeks (McCarthy 1988: 21). The Royal Australian Air Force (RAAF) was responsible for supplying approximately 9 per cent of all aircrew used by the Royal Air Force (RAF) in Europe and the Mediterranean (Stephens 2001: 73). During this enterprise 740 planes were lost in training accidents in Australia, involving flying schools, while even more were lost outside either on reconnaissance, test flights or inter-base flights (Stephens 2001). A further 3284 aircraft were lost in the south west Pacific (Stephens 2001: 71).

Australia's involvement in WWII is well-known, but this is generally restricted to overseas operations. The significance of Victoria during WWII in the construction of aircraft and training of personnel has been stated in many texts (Gibbs-Smith 1985; McCarthy 1988; Stephens 1992; Ross 1994; Hill 1998; Ilbery 1999; Stephens 2001).

Thousands of aircrews were trained around Victoria and the rest of the country, this resulted in training school mishaps that have up until now been neither documented nor researched. While research has been undertaken on WWII sites across the world, Normandy, Battle of Britain, the

Blitz (see Chapter 2), and in Australia, Darwin, Broome, and *HMAS Sydney* (see Chapter 3). This has been because of their historical significance due to a particular event, place or outcome (Gould 1983a; Rodgers et al. 1998; Schmidt 2003). Up until now sites that have been focused upon are due to particular incidences like Pearl Harbour or Battle of Britain, not individual sites like those associated with this thesis.

Battlefield Archaeology

The study of battlefield archaeology investigates a specific event in the past that is a persisting memory into the present (Carman 1999). The archaeological investigation of battlefields is to examine a defined space where organized groups of armed people undertook regulated violence upon each other (Carman 2002: 9).

Until WWI, sites of conflict were either on land or in the sea. Large wars were fought using men and the environment around them for protection. Earthworks during the American Civil War and WWI were used as passageways and defensive barriers (Lees 2001). Sea battles, like the Spanish Armada of 1588 were planned in order for the Spanish to invade England but resulted in 67 ships of the Spanish fleet, out of 130 wrecked along the English and Scottish coastlines (Bruce & Cogar 1998: 346-347).

The Industrial Revolution increased not only the capacity of industrial nations to produce equipment but also changed the way in which war was fought. The manufacturing of mass-produced weapons allowed not only armies, but also the general populace to be equipped. Conflict took on a whole new approach with the chance to equip more personnel than ever before, as a side would not be restricted by arms but by personnel.

The first major examination of archaeological remains left behind from armed conflict, was conducted by Scott et al. (1989) and Fox (1993). This survey of the Battle of Little Big Horn and the conflict that ensued, between Lieutenant-Colonel George A. Custer and his cavalry regiments and the Sioux and Cheyenne Native American tribes, was a pioneering study. The determination of troop movements and Native American positions through the analysis of historical and archaeological data, class and density variation was the first of its kind (Fox & Scott 1992).

Freeman states, “What Fox demonstrated was the potential quality of the information which might be extracted from the investigation of such sites as well as their susceptibility to theoretical modeling” (Freeman 2001: 2). The work of Fox has been classed as the “mother” of recent battlefield projects (Freeman 2001: 2). It has allowed a progressive approach to understand what battlefield archaeology is and what the information that can be gained from studying battlefields by looking at the archaeological material left behind.

A more developed approach to battlefield archaeology which encapsulates the ideologies of Fox’s work is that of the Bloody Meadows Project and the interpretation of battlefields as places (Carman 1999, 2001, 2002). The purpose of the Bloody Meadows Project is to “establish a meaning for the historicity of the place in the present…an understanding of the nature of war in the past: and for preservation and public interpretation in the present” (Carman 2001: 277).

Gould’s work on the Spanish Armada and the Battle of Britain saw that wreck sites offered a unique opportunity to observe the material by-products of human conflict (Gould 1983: 105). The necessity of reuse of material left behind by invading armies during times of conflict requires the reuse of parts that would not normally be scavenged. The scavenging of wrecks relied heavily upon those that were easily accessible, leaving submerged sites that were less attractive (Gould 1983: 139). Gould’s conjecture was that sites with a higher archaeological content would be in deeper water and these shallower sites would be damaged (Gould 1983:

139). Gould's work on aviation wreck sites is one of the first attempts at looking at whole sites, not those of a single wreck.

Another WWII site that has been well-documented over the years is that of Pearl Harbour. The investigation into the remains of *USS Arizona* is the most significant of these investigations. There is great reverence for this site by the American public. An estimated 1.5 million visitors annually visit the memorial that spans the mid-section of the sunken vessel (Adams 1996). Over 90 per cent of the exterior hull has been surveyed, as well as the marine growth and the corrosion potentials to determine the rate of deterioration (Adams 1996: 57). Additional surveys implementing side-scan sonar and magnetometers have been undertaken throughout the harbour to determine the location of Japanese aircraft and midget submarines (Delgado 1999: 307). Access to *USS Arizona* and its interpretative display allows visitors to gain a better understanding of how it would have been on that fateful day as well as how the site has changed.

Archaeology of the Event

The study of aviation archaeology is a new discipline, but in some aspects it is similar to shipwreck archaeology. The informative potential of each site in regards to construction, modifications and personalization by aircrew is an untouched resource. Each plane is able to shed light on the operational and maintenance regime and to provide information about the cause of the crash itself (the event). Aviation sites are one-off events. A cause or reason has led to the site being located in water. Sites of a single event can be seen on land and under water, such as Port Royal in Jamaica and Pompeii in Italy.

Port Royal and Pompeii were both destroyed in a single event. Port Royal as a town was only occupied for thirty-seven years before two-thirds of the town slid and sank into Kingston Harbour (Delgado 1997: 316). Archaeologists are obtaining significant information from entire buildings, as they represent a unique terrestrial component that generally does not remain intact. These findings are complemented by historical records of the township (Hamilton & Woodard 1984). Pompeii, on the other hand, was buried by a volcanic explosion of Mount Vesuvius in 79 AD. This city underwent its first archaeological excavation in 1748 when it was rediscovered during the construction of a canal (Romer 1988). The ash stopped the town in a single event, encasing buildings and people in ash (Bahn 2001: 23).

Similarly, aircraft sites are those of an event. This study examines their introduction into the archaeological record during WWII. In a way, their wrecking event was similar to that of the atomic bomb, as the event leading to an aircraft's eventual end is directly related to its use and objective. Aircraft are equipped with what was required for its flight and intent. Information that can be obtained from an aircraft site and its last flight are directly related to this event.

Researching site locations for ditched aircraft can be undertaken in three different ways: looking for a particular plane such as A4-10, researching a type of plane such as Lockheed Hudson Bomber or conducting an analysis of a region. Since the same amount of time and effort is spent sifting through records for one type as for almost all planes, a regional analysis of ditched aircraft is the preferred approach, but this has rarely been undertaken.

Aims

The aims of this study are to examine the technological and social preparations of war in Victoria during WWII. While this study is not going to incorporate any fieldwork as it is theoretically based, there are five aims that this study considers. They include:

- to analyze the preparations of WWII of training crew and training facilities

- to identify through historical research, WWII planes that are located off the Victorian coastline
- to identify plane types by statistics of accidents and training incidents
- to show the correlation between bases and sites by asking whether there is an increased number of sites as a result of the location
- to refine areas for search to pinpoint sites, by plotting search areas of potential high yield sites

The reasoning behind this study being theoretical is two-fold. Firstly since the depths off the Victorian coastline are between 60-300 metres, it is impracticable to reach them with the equipment and funding available for this study. Secondly, it is difficult to locate sites because of the vast areas involved in the research. Areas, such as Bass Strait, contain large numbers of submerged sites that have not been located. These include both shipwrecks and aircraft. Due to the nature of planes, the materials used in their construction and their size, sites are not favourable for easy detection or long-term survival.

People who classify themselves as 'aviation archaeologists' are not always as concerned with the research potential and significance of the sites as they are with the monetary return available to them (Hoffman 2001). This is similar to 'maritime archaeology'. The monetary potential of shipwrecks and their cargoes are such an enticement to people that sites are raided and later sold off at auction or to private buyers.

The idea of studying battlefield archaeology as a defined space and specific event (Carman 1999, 2000) has an alternative approach. Gould's idea of studying the archaeology of war is to examine social, economic and technological preparations for war, rather than studying the particular events (Gould 1990: 160). This idea can be used to understand the build-up of arms before war begins. Gould believes the 'arms race' that countries go through to increase personnel, equipment and resources in the lead up to war and can tell more about a nation than the material remains left after the event (Gould 1990).

Study Outline

Chapter 2 outlines modern/contemporary archaeology, in particular WWII archaeology. It also describes similarities between maritime and aviation archaeology in regards to their direction and progress into conventional mainstream archaeology. Chapter 2 also illustrates the difference between aviation archaeology and aviation salvage. Aviation archaeology began with collectors and scavengers feeding the need to own rare WWII planes. It has advanced to a disciplined approach of recording wreck sites to gain construction and flight details as well as wrecking sequences of the plane. This chapter reviews the definition of aviation archaeology and its progress. It also shows how the study of aviation wrecks has progressed and how it is becoming a disciplined approach in archaeology.

Chapter 3 describes the theory and methodology of this thesis. The distribution of sites and the survival of aluminium in salt water environments are major factors to be considered. It shows not only an understanding of the survival rate of aluminium, but also how this material reacts in aqueous environments by trying to evaluate those using similar methods to Muckelroy's (1978). This chapter also examines previous studies in Australia by Jung (1996, 2001) and McCarthy (1997). Finally, Chapter 3 places this study in a broader context, showing how this study can contribute to the future development of aviation archaeology in Australia.

Chapter 4 presents the data in consideration and shows how the sites are related. It identifies different types of planes, site locations, and reasons for becoming submerged as well as suggests a correlation between sites. This chapter also examines the proximity of bases and sites, suggesting areas with the best potential for further research.

The associations between different sites are discussed in detail in Chapter 5. This chapter gives the results of the historical analysis, suggesting refined search areas that can be used in locating and identifying sites. The significance of these sites based on the *Heritage Act 1995* is assessed, in this way this assessment could assist in management and future archaeological studies.

Chapter 6 presents the results of the study, revealing the correlation between historical and archaeological data. Victoria's aviation heritage and the large number of wreck sites located in and around the state are addressed. Suggestions for further work, including possible locales, identifications and site formation processes, are proposed. Finally, this study addresses the management of Australia's aviation sites, allowing for a better understanding on this resource and its protection

2

Literature Review

> Given the vast amount of documentary source material available, from contemporary blueprints, servicing manuals, photographs, film and even sound recordings, it might be expected that early 20th century military aircraft represent an extremely well defined and understood phenomenon. As with many other aspects of archaeological or historical study, closer analysis suggests otherwise. (Holyoak 2001: 259)

How can modern sites be considered as historical or archaeological assets? (Gould & Schiffer 1981; Schiffer 1981; Gould 1983b; Dobinson et al. 1997; Tarlow & West 1999; Hardesty & Little 2000; Buchli & Lucas 2001; Haecker 2001; Löndahl et al. 2001; Lees 2001; Oliver 2001; Pollard 2001; Moore et al. 2002; Schofield et al. 2002). If they are considered assets, what more can be learned from recently documented events, such as WWII (Delgado 1991; Spenneman 1992; Diebold 1993; Cooper 1994; Dudley 1995; Whipple 1995; Wills 1996; Holland & Mann 1996; Jung 1996; William et al. 1997; Drew 1998; McCarthy 1998; Rodgers et al. 1998; Neyland & Grant 1999; Smith 1999a, 1999b, 1999c; Green 2000; Lake & Schofield 2000; Anderton 2001; Carman 2001; Jung 2001; Legendre 2001; Lake 2002; Schofield et al. 2002, Holyoak 2002; Spenneman 2002a, 2002b).

Oliver (2001) uses the definition from the *European Convention for the Protection of the Archaeological Heritage* 1992 to state the boundaries of archaeological exploration. This definition is:

> to protect the archaeological heritage as a source of the European collective memory and as an instrument for historical and scientific study. To this end shall be considered to be elements of the archaeological heritage all remains and objects and any other traces of mankind from past epochs …the preservation and study of which help to retrace the history of mankind and its relation with the natural environment…The archaeological heritage shall include structures, constructions, groups of buildings, developed sites, moveable objects, monuments of other kinds as well as their context, whether situated on land or under water (European Convention for the Protection of the Archaeological Heritage 1992: 2).

Using this definition, as long as the object imparts information on the "history of mankind and its relation with the natural environment," then it can be considered as part of the archaeological record (European Convention for the Protection of the Archaeological Heritage 1992: 2). Tarlow and West (1999) see archaeology "as the study of the physical remains of the past…nineteenth-century workhouse … the Bronze Age burial mound; the country house as well as the stone axe" (Tarlow & West 1999: 1). Schofield et al. state that "too often are we relegated to a role of only being able to illuminate prehistory or history so distant that no living persons exist to tell about

it" (Schofield et al. 2002: 9). These researchers have broken out of the mould of archaeology as excluding contemporary sites and undertaken work to illuminate recent history.

What is the importance of studying modern warfare and the technology involved when it is well documented? One point about modern warfare is that equipment is mass-produced to enable soldiers to be equipped in exactly the same way. How can mass-produced artefacts be classed as unique and worthwhile for an archaeological investigation? What can be learned that is not already known? How can they be archaeologically significant when it is one of either hundreds or thousands produced? These are some of the questions that this study addresses.

At the end of WWII it was estimated that one thousand Australian airmen were missing (Eames 1999: 1), but does this estimate take into account aircrew lost during the training around Australia? The sites associated within this research are linked not to combat but to training aircrew. These aircrew never made it to combat but paid the ultimate price of fighting during WWII.

World War II saw the involvement of aircraft far more than in WWI. Previous to WWII, a battlefield could be largely described within a "fixed spatial and temporal area" (Anderton 2001: 265). It was the first global war with both static and mobile defenses staged across nearly all continents. Thus, this war involved more space than WWI, with a large portion of activities over water. It became a war with fewer infantrymen, but, at the same time, it covered a broader area with new technology. Planes flew over and bombed targets. It was a faceless war with the pilots seeing only targets and not people.

Archaeology of the Contemporary Past and Modern Warfare

At what point do sites of the contemporary past become archaeological sites? Is it possible to undertake archaeological investigations in an area that is still within living memory? The archaeological study of the contemporary past is not a new topic (Gould & Schiffer 1981; Rathje 1981; Delgado 1991; Tarlow & West 1999; Olivier 2001; Schofield 2001). Research on studying modern warfare and the sites associated with it has also been undertaken (Dobinson et al. 1997; Spenneman et al. 1997; Rodgers et al.1998; Legendre 2001; Holyoak, 2002).

The understandings of studying the contemporary past by Tarlow and West (1999), Oliver (2001) and the *European Convention for the Protection of the Archaeological Heritage* (1992) was presented in the introduction of this chapter. As long as information can be gained from the study of contemporary pasts, this field has a hope of succeeding, but that can be said of any archaeological field.

The study of "familiar past" or "modern-world" archaeology is considered more than historical archaeology or post-medieval archaeology (Orser 1999: 280). The study of modern sites, especially those involved in military action, should be considered in more of a global context than other historical sites. While historical sites located on land are generally contained within the country that they are associated, shipwrecks and sites associated with war, especially those of WWII, are often located outside the jurisdiction of the home country.

The study of modern military sites can provide important information on design, construction, usage and condition at the time of wrecking. Submarines and aircraft came out of WWII as the most highly advanced technologies of the day. While submarines were designed to ply the depths of the oceans, planes were not. Thus, their wreck sites were out of their depth, figuratively as well as physically.

To undertake research into WWII sites is to undertake an investigation that some consider as not being worthy of an archaeological investigation. What can be gained from investigating sites and

events that people still remember? At what point does the investigation of the contemporary past start to get mixed with the present? A large number of countries state that a site can be classified as archaeological when it is 50 years old. Australia, the United Kingdom, Canada, Indonesia, Kuwait, Malta and the Netherlands, to name a few, are examples of such classification systems (Strati 1995: 179-180).

Warfare has long been interlinked with archaeology, with "the study of arms, armour and fortifications … research has focused on the art of war … rather than the evidence of its experience" (Freeman 2001: 2). Only in recent years has archaeology of modern warfare been considered significant enough to obtain its own standing as a truly important subject (Jung 1996; Dobinson et al.. 1997; Rodgers et al.. 1998; Schofield 2001; Legendre 2001; Anderton 2001; Jung 2001; Holyoak 2001 & 2002).

Until recently, the importance of modern warfare has rarely gone beyond the boundaries of amateur enthusiasts or local history writings, fleetingly in print and even more rarely at conferences (Dobinson et al. 1997: 288). Articles on shipwrecks, planes and other sites that are published in dive magazines provide little or no archaeological information about the site (Bailey 1989, 1991). General site descriptions and information into the crash event are usually the only information that these articles describe (Bailey 1989, 1991; Lewis 1992; Amsler et al. 1995).

A major development during WWII that has gained a great deal of interest is that of the atomic bomb tests undertaken at Bikini and Kwajalein atolls. The first atomic bomb was detonated at Alamagordo, New Mexico, on 16 July 1945 (Delgado et al. 1991: 11). The end of WWII was brought about through the dropping of atomic bombs on the Japanese cities of Hiroshima and Nagasaki, respectively. The first large-scale test of the atomic bomb, however, did not commence until 1 July 1946, when tests were undertaken on Bikini and Kwajalein atolls (Delgado et al. 1991: 18).

The aim of detonating the atomic bombs at the atolls was to determine the impact that an underwater explosion would cause to a deployed fleet (Carrell 1991; Delgado et al. 1991). Not only were navy vessels used as test subjects, but all equipment, including tanks, guns, trucks, planes, fuel, water and live animals, were included in the tests (Carrell 1991: 273). It was estimated that each blast yielded 23 kilotons, or 23 000 tons, of TNT (Delgado et al. 1991: 18). Twenty-one vessels were sunk during the course of the tests, some of which were not sunk as a result of the explosions, but later by personnel because of their high radiological readings (Carrell 1991: 273).

The sites in the Bikini and Kwajalein atolls have now become popular with visitors and divers, due to their accessibility and close proximity to land. They are currently being archaeologically assessed, providing information on their interpretation, protection and conservation.

Theoretical Background: Aviation Archaeology Versus Aviation Salvage

The study of aircraft crash sites as a discipline in archaeology was first considered in the late 1970s (Robertson 1977; Darby 1979). Although this view considered these sites as archaeological, they have suffered the ravages of amateur archaeological excavations that only considered the aircraft for restoration, sale or both. These amateurs did not record positions, orientation of the sites or artefacts. Although these details may seem irrelevant to amateur archaeologists, they can yield important information. An investigation of instrument panels, for example, can tell how an aircraft was trimmed prior to ditching or crashing (Wills 1996).

All over the world aviation wreck sites have been subjected to aviation archaeological investigations, but not all have succeeded. An attempt to fly a Boeing B-29 off a Greenland icecap, where it crashed in 1947, met with catastrophic results when the aircraft caught alight. It was abandoned and later destroyed by the same people who tried to recover it (Hoffman 2001).

The desire to own WWII warplanes did not become widely established until the 1980s (Wills 1996). At the end of the war, they were classed as obsolete, and those that were not destroyed were sold cheaply. Planes flown as fighters during the war were relegated to crop-dusting and other such menial jobs. Nearly thirty-five years after the war, this mentality changed. Entire planes and individual components were targeted by collectors to restore planes in private collections around the world. Since then, no aviation site has been safe.

With the development in technologies, sites that were not previously accessible have been reached, such as from under 200ft of ice in Greenland (Hayes 1994). The recovery of planes from such isolated places is becoming more commonplace. By deconstructing planes into smaller parts on site, salvagers can recover them easily. The recovery of parts to restore wrecked and damaged planes is also causing problems. No locations are plotted by these "plane scavengers" and the result is that one reconstructed plane can be made from a dozen other planes of the same type (Dudley 1995; Capelotti 1996; Hoffman 2001).

Origin of Aviation Archaeology

The evolution of aviation archaeology into a sub discipline of archaeology has taken a similar course as maritime archaeology. Both had amateur beginnings of investigating sites for useable components. From minutes, days, weeks and months after the incident these sites have been salvaged (Capelotti 1996; Dept. of Navy 2000).

Until recently, people have not been interested in the archaeological potential of aviation sites. Interest has been in the repatriation and identification of human remains and in the high demand for artefacts from such sites. The search for aviation wreck sites began in a more disciplined form after WWII when the air force began to search for missing aircrew; however, they were more interested in looking for missing aircrew and burying them than investigating the sites (Holland & Mann 1996; Eames 1999; Moore et al.. 2002).

To study an aircraft crash site is to study more than material remains. The lack of material remains also needs to be taken into consideration. Of course, the underlying question of all crash sites is: what it is doing there? Some of these queries are easy to answer, depending upon the location and the time that the plane went down.

The study of aircraft crash sites requires intensive historical documentation. Information pertained in accident reports, repair cards and discussions with those on active duty can allow a better understanding of what to expect from a site, such different types of repairs unique to that particular plane (Wills 1996: 78-80).

The focus on individual sites is starting to give way to a more highly developed approach by comparing several sites usually at a regional scale (Jung 1996, 2001; Holyoak 2002). Sites like Pearl Harbour and the Battle of Britain (Gould 1983a; Schmidt 2003) are well-documented events, but they are also within a set time frame. Each site can be defined within its own context, but by exploring an entire region, a more holistic approach is taken. Each region can be explored in a single context as well, revealing a chronological sequence of events that led to the planes ending crashing in a particular location.

Aviation Archaeology

The origins of aviation archaeology have a great deal of influence on how the discipline has evolved. While salvagers are generally only concerned with locating and retrieving planes and their parts, aviation archaeology contributes to the aviation industry as a whole. Aviation archaeologists are interested in construction, maintenance and other mechanical attributes, which contribute to knowledge of aviation at its broadest level.

To investigate a plane is to consider its history. What was it doing there? Where did it come from? What was its association with the country in which it resides? Of the thousands of planes that came down during WWII, a large portion went down, not in the country of origin, but in allied or enemy territory, either on land or sea. The actual number of downed aircraft during WWII has never been fully established, but in England alone it is estimated that from 1939 to 1945 over ten thousand allied and enemy aircraft were downed (English Heritage 2002: 5).

Until recently, there was no accepted definition of aviation archaeology. The idea that aviation archaeology was "wreck salvage" that used a legitimate name is now becoming a thing of the past. A developed definition of what aviation archaeology is has been produced by Dirk Spenneman (2002b):

> The field addresses both the archaeology of single airplane wrecks and the …support structures of aviation, such as airfields and related structures (air operations centres, flight controls etc). Research issues focus on the archaeological site formation process of aircraft wrecks and patterns and the study of modern mass transportation systems, and their social and political impacts; as well as on the interpretative uses of such sites for education and recreational purposes. Often the aircraft wrecks have little in common with the country they rest in, belong to the heritage of other cultures, and brought into the local orbit only by happenstance (Spenneman 2002b: 2).

Capelotti extends this definition by stating that the "development of aeronautical technology in this century has created as enormous and largely unexplored base of aviation cultural resources" (Capelotti 2003: 1). He defines aviation archaeology as "aeronautical archaeology," incorporating air and space technology that not only enables humankind to fly lighter than air, but also permits humans to travel off this planet, to the moon and beyond.

People have always been interested in Aircraft crash sites. During both world wars, souvenirs as well as salvaged parts were collected from downed and allied enemy aircraft. Since the 1960s aircraft crash sites have been targeted by amateur excavators as the collection boon of "warbirds" started to climb. The desire for more rare planes meant that the need to source aircraft from crash sites for either whole planes or components started to become greater.

Since 1986, 1400 licenses have been issued to amateur archaeologists to disturb crashed military aircraft sites in England. These sites were protected by the *Protection of Military Remains Act 1986* (Holyoak 2001: 263). In this Act there is no stipulation for the protection of rare archaeological sites, or for the adequate recording of sites (Holyoak 2001: 263). Of the 1400 licenses issued, less than ten (0.6%) of the sites had been listed in the English Heritage's Excavation Index before 1999. By August 2000, this figure rose to 122 (8.7%) (Holyoak 2001: 263). As can be seen, the archaeological potential of these sites has only recently been realized, and it is unfortunate that this occurred after many sites sustained damage by amateur excavation. These sites are being used as an avenue for the commercial resource for the market on aviation artefacts.

The archaeological investigation of WWII aircraft is generally split into two categories: a survey of aircrew remains and a study of the crash site. While positive identification of remains identifies the aircraft, it does not necessarily clarify the status of the aircrew, especially when the aircraft is located in enemy territory (Moore et al. 2002: 1). The archaeological investigation of

aircraft crash sites has the potential of providing otherwise undocumented information on the construction, modification and uniqueness of each plane (Whipple 1995: 12).

The number of aircraft involved in WWII is enormous. There were over 300 different types of aircraft (Chant 2001). Not all aircraft were designed for the same purpose and conditions. Because of this, there was a great variation in the types of aircraft available. While the first planes built and utilized for military purposes had a general purpose, with the advancement in technology there was an opportunity for more specialized aircraft. A wide range of specific aircraft types included fighters, bombers (dive, medium, light attack, heavy, tactical), communication, transport, amphibian and observation. While not all of these aircraft types were used in Australia during WWII, a significant number were present.

Another source of information that crash sites contain, apart from the inanimate material of the plane itself, is the human remains attributed to the site. The United States (US) Army Central Identification Laboratory in Hawaii (CILHI) has been recovering fallen war dead to inter on American soil for over 150 years (Hoshower-Leppo 2001: 80). This organization has located, identified and returned fallen soldiers around the world. Before examining a site, the historical background of the plane and all other relevant information, including identification material for the plane and flight crew, is investigated.

The analysis of aircraft crash sites, by CILHI, involves the combined talents of aviation archaeologist, forensic anthropologists, botanists, chemists and photographers (Holland & Mann 1996). Because of the size and speed of impact, associated components can become spread over a very large area, making it nearly impossible to record all associated artefacts (Hoshower-Leppo 2002: 83). Compounding this issue, World War II sites have been involved with over 50 years of taphonomic disturbances, both human and environmental, which dramatically alter site characteristics (Hoshower-Leppo 2002: 82).

This investigation of aviation sites is one of the first in-depth approaches in this field. While it is mainly concerned with the recovery of people missing in action, it also explores why the plane came down, what has happened to the personnel, and what has happened to the site since its formation. CILHI uses standard archaeological procedures, but at the same time it treats each site as a crime scene. Because the recovery of human remains is a forensic issue, this involves a proper chain-of-custody (Holland & Mann 1996: 20). Its investigations into each site involve not only physical evidence but also oral history (Holland & Mann 1996 and Hoshower-Leppo 2002).

The methodological approach of CILHI into aviation crash sites can be implemented by other organizations. The years of experience that CILHI has gained through surveying aviation sites and the positive results of this research proves that the surveys are meaningful and worthwhile.

Conclusion

Aviation archaeology is a new field that is progressively growing. Figuratively speaking, it is finding its wings. While legislation, knowledge and protection are now part of shipwreck archaeology, aviation archaeology is suffering a similar stigma to that maritime archaeology during its earliest years. It requires the same recognition that maritime archaeology now evokes. The aviation industry burgeoned in a few short years during the course of WWII in a way no other type of transport had before. By the mid-nineteenth century it was available to the general public, enabling the world to become better connected.

While aviation and aeronautical development has reached the sky and beyond, the discipline of aviation archaeology has been restrained by a lack of a developed definition. A detailed description of aviation archaeology has taken some time to develop. For the discipline to grow

and become a legitimate archaeological field, a detailed approach is necessitated. Some queries that require exploration are: what types characterizes this archaeological resource, how does this resource help in explaining local history, cultural identity, and the broader involvement of the world's aviation advancements during the last world war.

Until recently, aviation research has been directed towards two different areas: the study and search for individual sites and the recovery for pilots. An in-depth research into a regional analysis of aviation crash sites has not yet been undertaken. While research has been undertaken in Broome and Darwin (Jung 1996; Western Australian Maritime Museum 2002), these are only associated with a single event or significant events rather than regional comparative studies.

3

Theory and Methods

> When my brother and I built the first man-carrying machine, we thought that we were introducing into the world an invention which would make further wars practically impossible. (Wright 1917:227)

Victoria's aviation heritage is relatively unknown. What is the link between Victoria and the air war component of WWII? Is this link still visible in the archaeological record? As stated in the previous chapter, this study is a theoretical undertaking. The distribution of aviation wreck sites underwater is similar to shipwrecks in that the sites are sometimes more difficult to locate. Even with historical information, it is difficult to find aviation sites because they are smaller than shipwrecks and therefore harder to locate. To search for these small sites in such a large area is fruitless without a starting point. This study obtained information solely through historical research. This chapter outlines possible site formation processes associated with aviation sites. It also shows possible site locations and discusses the validity of this research in a broader context.

Aviation sites in Victoria are not well-documented. Those that are documented were likely recorded as afterthoughts as a result of searching for missing aircrew. Researching and locating sites through historical research seems similar to that of other historical archaeological fields. The difference with aviation sites, however, is that they are relatively recent. Is there any new information that can be learnt from these sites? Additionally, there is no known predictive modeling of aviation crash sites or site characteristics. Considering this, without undertaking archaeological fieldwork, how can the significance of these aviation sites be determined?

After the war, WWII planes were considered obsolete. Many were sold or salvaged for parts to reduce storage needs. While this did not occur so much within the Australian fleet of planes, the US reduced its number of planes by destroying them under Lend-Lease Agreements (*Australasian Legal Information Institute* 2003).

Theory

At the commencement of this research, the total number of aircraft sites relating to WWII in Victorian waters was unknown. This research revealed 75 sites (see Chapter 4); however, this number could be higher. This study only includes sites that are only located in water, but the number could be significantly higher if land sites were included. Unfortunately, these sites are usually recovered or salvaged soon after the incident.

During WWII, aircraft in Victoria did not engage in combat, but their presence was a major contributor in developing Australia's aircraft fleet and in training aircrew. A large number of non-combat aviation crash sites are now located in Victoria. The aircraft industry in Victoria

during WWII has been well-documented in the past (Harlin & Jenkins 1973; Oughton 1973; Gibbs-Smith 1985; McCarthy 1988; Ross 1994; Hill 1998; Stephens 1992, 2001, Wilson 2001) along with the training of aircrew (see section 3.7) (McCarthy 1988; Ilbery 1999; Stephens 2001 & Fleet Air Arm Archive 2003). Predictive theory could be utilized to augment these studies.

Predictive modeling on the distribution of aviation sites has yet to be undertaken. The usefulness of this theory has been demonstrated on settlement sites (Warren 1990; Savage 1990; Wheatley & Gillings 2000). While predictive modeling has seen a great advancement since the introduction of Geographic Information Systems (GIS), this theory has only allowed terrestrial archaeologists to predict the location of sites using geographical and environmental data. Prediction of sites in underwater environments is more difficult. There are no known patterns for the ditching of aircraft in water, except for that their abandonment usually follows flight paths. Additionally, the search for these small aviation sites in such large areas requires intense preliminary research to reduce the survey area and to increase the success rate of locating them.

In addition to predicting site locations, this study addresses which sites likely contain significant archaeological information for future research. This idea was first documented for shipwreck sites by Muckelroy (1978) in his flow diagram of the evolution of a shipwreck site. While ships were made to work on water, most aircraft were not. Therefore, the characteristics and preservation of sites are difficult to determine. The survival of aluminium sheeting, timber, artificial coverings and other materials in water is not only related to environmental factors but also to the way planes were ditched.

Muckelroy's (1978) study in determining environment's effects on wreck sites and finding any correlation between archaeological remains and environmental attributes was one of the first theoretical approaches to the survival of shipwreck remains. In his research he determined that the nature of the seabed deposit was the main determining factor for the survival of archaeological remains (Muckelroy 1978: 162). Muckelroy associated 11 different attributes to the survival and depositional characteristics of wreck sites (Muckelroy 1978: 162). The location of the site determines which factors will influence it. Muckelroy, however, only associated these characteristics with physical attributes, and he did not take into consideration biological and chemical factors that affect the disintegration of wreck sites. Since planes were never designed to be submerged in water environments, the survival of aviation sites will be determined by similar characteristics.

Ward's (1998) investigation of the *Pandora* shipwreck site progressed from Muckelroy's (1978) model of wreck disintegration to include a more in-depth study of physical attributes as well as biological and chemical attributes (Ward et al. 1998). This study was undertaken by using knowledge of local oceanographic and sedimentary conditions. While this approach is related to the *Pandora* wreck site in particular, the same factors could hypothetically be used for other submerged sites. The four different stages in Ward's study outline the "hypothetical qualitative model for its breakdown" (Ward et al.1998: 112).

Knowledge of how *Pandora* was wrecked and how the site appears today seems to be a significant element that was used in Ward's (1998) model. In this study, detailed information on how a plane crashed or how the site looks today is unknown. By understanding Ward's conceptual approach, this study proposes a hypothetical understanding of how aviation sites survive and which would be more likely to be preserved. By combining Muckelroy's ideas on wreck disintegration, Ward's hypothetical model and site attributes, this study generates a better understanding of how these sites would survive in different environments.

The corrosion rate of aluminium in salt water can only be estimated, due to the makeup of aluminium and the nature of the protective covering over the metal. A number of different

aluminium treatments were available in the years leading up to and during WWII. These treatments included anodisation, heat treatment, alodine, paints and coatings. Each country of origin had a preference for treating aluminium based on the manufacturer, year build and type of materials available (Johnson 2001). The purity, thickness, temperature, and galvanic effects of aluminium as well as the outcome of what would and would not survive is almost guesswork (Johnson 2001). Conserving aluminium that has been submerged in salt water is dependent upon its chemical make-up (MacLeod 1983).

The unknown effects of salt water on aluminium aircraft and the condition of sites in question compounds issues associated with wrecking. If it is assumed that a pilot eased a plane into the water using the safest approach, then the site is likely relatively intact. Ditching procedures for aircraft in water were indicated in operating manuals for all aircraft and were a training requirement for all pilots. These procedures ensured their survival as well as the best survival rate for the aircraft, even if it the wrecked plane was to be used for spare parts (Point Cook RAAF Archives 2003).

Studies in Australia

In Australia, only a limited number of investigations have been undertaken in aviation archaeology (Jung 1996, 2001; McCarthy 1997; Smith 2002; and Souter 2003). Smith's work is a brief report on the significance, types and possible numbers of aircraft sites in New South Wales (NSW) (Smith 2002). Smith's study is similar to this research, as it was not intended to locate sites, but it aimed to state the significance of aviation sites in NSW and the protection they have attained under state heritage legislation.

Jung's research to identify seven Catalina Flying Boats wreck sites in Darwin Harbour was one of the first in-depth investigations to take place in Australian aviation archaeology. He attempted to determine the identity and exact location of aircraft (Jung 2001). These sites have national and international significance, as the sites consist of Australian and allied aircraft (WAMM 2002). Site location, diagnostic features and layout enabled site identification. Jung discovered that site layout is an important aspect in identifying aviation wreck sites (Jung 2001: 163). Through historical and archaeological evidence, he reconstructed of wrecking sequences. The difference in site integrity was determined to be related to how they, either by fire, bombing or depth charge. In this way, the physical layout of the site only revealed part of the site formation processes. The importance of this historical information gave credence to the archaeological work that was undertaken on these sites.

Work undertaken by the Western Australian Maritime Museum (WAMM) in Broome was a result of looters pilfering aviation sites. Fifteen aircraft, nine of which were Royal Netherlands Navy aircraft, were wrecked with the loss of hundreds of lives during WWII. The planes remain the property of the Netherlands Government (WAMM 13/86/2). Further research is being undertaken by Jung to positively identify the aircraft as well as to determine their location and preservation state. The Flying Boats of Roebuck Bay, Broome, became the first aircraft crash sites to be entered in the Register of Heritage Places of Western Australia. The sites were classed as being significant under six different categories: going to war, remembering the fallen, remembering disasters, world wars and other wars, refugees and tourism (WAMM 2002: 3).

At the end of the war, the US sold $27000000 worth of surplus stock to Australia (Table 1). Equipment not included in this sale was disposed of through the Lend-Lease Agreement. An example of this is that of the Catalina's off Rottnest Island which were destroyed at the end of the war after seeing service with the Royal Australian Air Force. These sites are unique in that they were deliberately sunk in fully operational condition (McCarthy 1997). The military used

them for target practice, and, even though they were deliberately sunk, their exact location is undetermined (McCarthy 1997: 6).

Table 1. Equipment bought under Lend/ Lease Agreement (Australasian Legal Information Institute 2003: 6)

Type	Number	Spare parts	Propeller	Engines
C-47	109	382 (engines)	127	164
		48 (airframes)		
PBY Catalina	11	272 (engines)	136	68
		21 (airframe)		
PB2B Catalina	41 (29) from Canada			

Site Formation Processes

Both McCarthy (1997) and Jung (2000) describe the site formation processes of Rottnest Island and Darwin Harbour, respectively. McCarthy's work classifies sites by utilizing operational functions of planes and comparative intactness of sites in relation to salvage efforts. He assesses general site characteristics to identify sites with a higher probability of survival (McCarthy 1997: 12 & 13) (Table 2).

Table 2. Aircraft classification (From McCarthy 1997: 12-13)

Category	Group A wrecks	Group B wrecks	Group C wrecks
	Aircraft that have sunk while in fully operational and active service.	Aircraft that have been abandoned/ scuttled.	Aircraft that have been stripped similar to abandoned shipwreck hulks.
Category 1	Aircraft that have been sunk in fully operational and active circumstances, which now lie intact.	Scuttled with all fixtures and fittings but not containing all paraphernalia of active aircraft such as machine guns and other loose material.	Information gleaned from sites is often limited to structural detail of fittings and fixtures deemed unsuitable for salvage and/ or reuse.
Category 2	Aircraft that have been sunk in fully operational and active circumstances. Has become susceptible to wind and/ or wave action.	Deliberate abandoned/ scuttled in flying condition but does not contain any paraphernalia of active service. Has become susceptible to wind and/ or wave action	Information gleaned from sites is often limited to structural detail of fittings and fixtures deemed unsuitable for salvage and/ or reuse but that has become susceptible to wind and/ or wave action.
Category 3	Former category 1 & 2 but have been subject to human interference by professional or recreational salvage. Categorised according to the extent of interference and degree of salvage.	Former category 1 & 2 but have been subject to human interference by professional or recreational salvage. Categorised according to the extent of interference and degree of salvage.	Information gleaned from sites is often limited to structural detail of fittings and fixtures deemed unsuitable for salvage and/ or reuse. Have been subjected human interference by professional or recreational salvage. Categorised according to the extent of interference and degree of salvage.

Broome's aviation heritage was rediscovered when WAMM located and identified the aviation sites in Roebuck Bay through side-scan sonar (WAMM 2002). Due to high tides characteristic to this region, concentration was directed to identification of sites in deeper water. Building off of WAMM's research, Jung's located aviation sites in deep water as well as those in shallower water. The location of the sites through side-scan sonar along with historical and oral history is being employed in the positive identification of the sites. The combination of data from the

archaeological and historical record and oral history has allowed a fuller understanding of the sites in Broome. This research illustrates not only the history of the plane, but also the people whom they ferried.

The significance aviation archaeology has only begun to be realized. Whilst a site can tell a great deal about the individuality of an aircraft and the people who flew it, a broader understanding of the aviation resource is necessitated. Regional studies, like those in Broome and Darwin, are only now being undertaken. Similarly, Australia's involvement in WWII is just beginning to be analysed, and this research aims to gather more information about this.

Research Methods

Most historical research for this study was compiled at Point Cook RAAF Base; however, research also occurred at the Australian War Memorial. At Point Cook, accident reports were accessed on microfiche. The microfiche was organized according to aircraft type, such as A4 and A9. These reports contained details of both Australian and allied aircraft accidents that occurred in Australia and overseas. A systematic approach was utilized to assess this large amount of information. Once site location was determined, each plane was classified as Victorian based or non-Victorian based. A few cards contained only a limited amount of information, varying between type of aircraft and date and location of the crash. Research at the Australian War Memorial proved to infeasible for this study as the records at the War Memorial are not catalogued and it would have been outside the scope of this study. While information contained on the accident report cards was not uniform, there was enough information to determine if the aircraft was Victorian or non-Victorian. Information that was extracted from the accident reports included the location, date, plane type, personnel, unit attached, flight details, and Australian or overseas plane.

A few websites dedicated to aircraft history were utilized in this investigation (www.adf-serials.com and http://home.st.net.au/). These websites do not give complete information about each plane. Some sites contain more information than others, as the site relies on the public to supply information. Data from the general public is usually linked to the relatives of airplane crash victims who conduct personal research on the incident (A29-71). Other people involved are interested in local history, relating information of aviation sites in their local area (A20-404).

An in-depth, chronological-examination of RAAF losses from 1921 to 1999 was undertaken by Dean Norman (Norman 2003). This study was available on the Internet, but it has recently been taken off. While this resource was supposed to contain information about aircrew deaths, it contained contradictory information to material examined at Point Cook RAAF Base. These reports, however, were more concerned with personalized aspects of wrecking rather than plane and flight details. These contradictions exemplify the problems associated with the historical records and the nature of aircraft flights and accidents, especially during wartime. Thus, the exact number of missing aircraft may never be known.

Research Material

For this research, information assessed was not limited to location alone. While most records only gave a brief account on where the plane went down, a few gave flight transects rather than specific locations. These resources also described what equipment might have been carried on the plane. This information related to the function of the flight.

To look at the sites as objects with no reference to people would unhumanize the wrecking process. It is estimated that over 1000 Australian aircrew remained unaccounted for at the end of the war (Eames 1999). This number does not seem to include aircrew that went missing during

training flights. An estimated 740 accidents occurred during training in Australia, accounting for over 1000 aircrew (Stephens 2001: 71).

Empire Air Training Scheme

At the outbreak of war in 1939, the United Kingdom (UK) realized that it could not supply enough personnel for the upcoming air conflict, let alone the area to support such an endeavour that this would require. To overcome this shortfall, the UK sought assistance from its dominions, including Canada, South Africa, Australia and New Zealand (Stephens 2001).

A war of this magnitude required a large force of trained personnel. While the UK itself did not have the capabilities to train the required personnel, the nation along with assistance from its dominions could raise a force of 30000 per year (McCarthy 1988). It was expected that with a force this large in a war of this magnitude over 30 per cent of its aircrew per year would be wasted, of which 60 per cent would be killed or missing (McCarthy 1988). The agreement struck between the Dominions and the UK brought into action an international training scheme, the Empire Air Training Scheme (EATS), which had never before been attempted.

Within six months of Britain declaring war, 68000 men including, 11500 airmen volunteered for the air force (Stephens 2001: 68). A large majority of volunteers wanted to be pilots; however strict medical examinations determined who would be trained as pilots and who would fill the other positions, such as gunners, navigators and wireless operators.

Bases

The Australian government established training schools in Queensland, New South Wales, Victoria, South Australia, and to a lesser extent in Western Australia (Figure 1). The majority of these schools were established in Victoria and New South Wales because of the proximity of suitable facilities required by the RAAF and air bases. Additionally, nearly two-thirds of all EATS trainees came from Victoria and New South Wales.

The location of bases in Victoria during WWII is one consideration that needs to be addressed in this study. To accommodate the large number of people who were going to be needed for pilot and other training programs, an increased number of bases was necessitated.

The establishment of aviation schools across Victoria involved a wide variety of training facilities needed for four different types of training: pilots, navigators, wireless operators and air gunners. The establishment of bases in Port Phillip Bay and along the east coast was due to the need for these different types of training facilities.

The types of aircraft employed at bases are reflected in the accidents that occurred in these areas. While Elementary Training Schools (ETS) and Service Flying Schools (SFS) were located in Port Phillip Bay, the more advanced training was undertaken along the cast coast. The Operational Training Unit (OTU), Bombing and Air Gunnery School (BAGS) were also located along the east coast. The General Reconnaissance Schools (GRS) were established both in Port Phillip Bay and along the east coast (Table 3).

The proximity of bases in Port Phillip Bay and along the east coast suggests that the majority of aircraft wrecks would be near these locations. Can the training at these bases and the use of specific aircraft be seen in the archaeological record and, if so, how can this information lead to our better understanding of WWII aviation in Victoria?

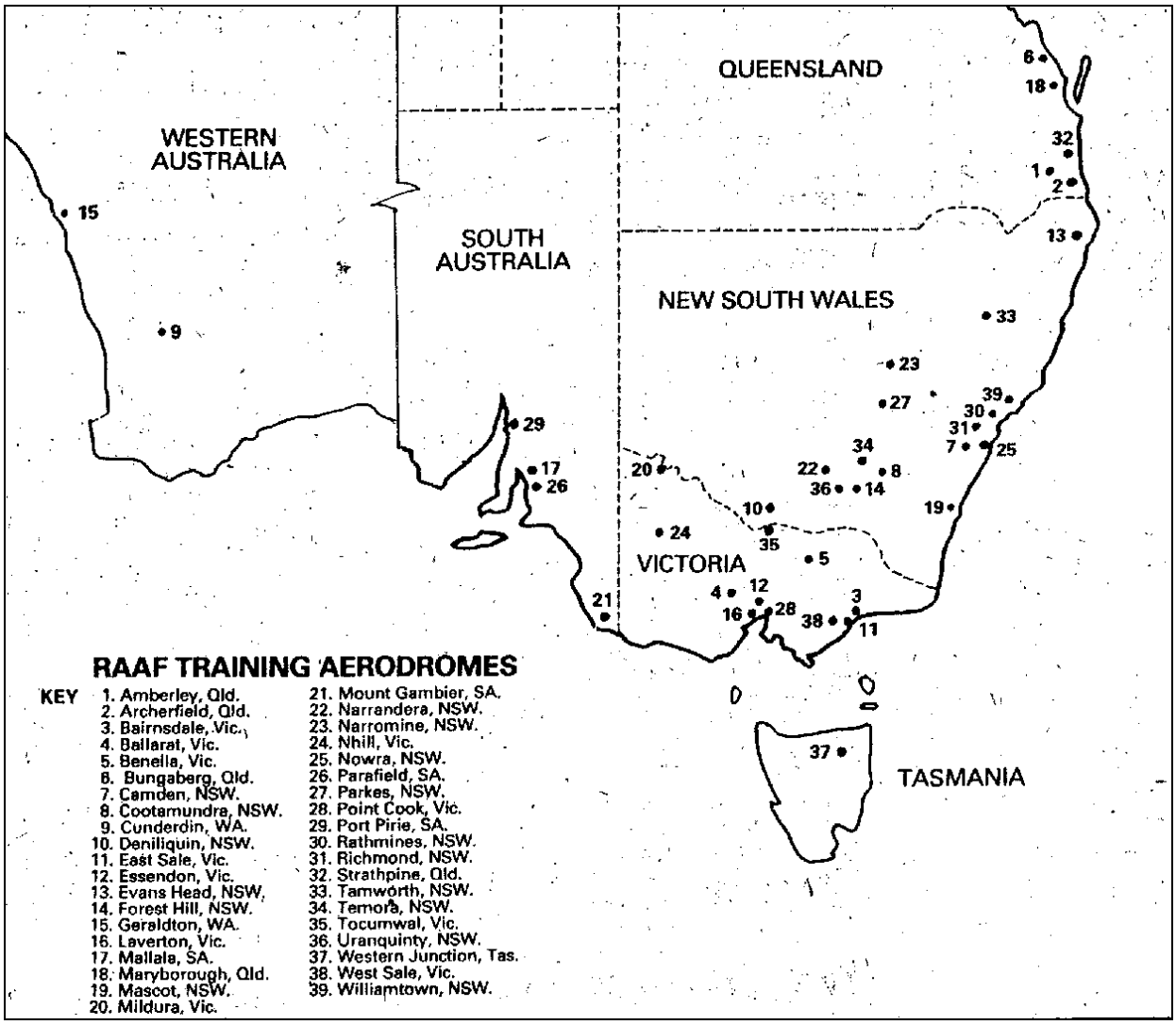

Figure 1. Training Bases during WWII (From Sturtivant 2003)

Conclusion

This research is the first of its kind in Australia. Previous studies have located sites; however, a better understanding of their locations and information on their site characteristics was required (Jung 1996 & 2001). While McCarthy (1997) attempted to identify the Rottnest Island aviation sites, this work only demonstrated how difficult even well-documented sites can be to locate.

By better understanding reasons behind aviation wreck sites, either through training or general missions, their location could be predicted. While exact locations of sites is not addressed in this research, flight details, origin and destination of the plane will be discussed, hopefully leading an enhanced understanding of where these sites may be located.

An analysis of accident report cards and the archaeological record can show some indication of the increasing aviation force in Victoria during WWII. This study, therefore addresses: what types of planes are left in the archaeological record and what is the possibility of locating these sites? It is a goal of this research to fill in the gaps of the historical record as well as to garner information that can complement the archaeological record.

Table 3. Units, Bases and Aircraft in Victoria during WWII (From Sturtivant 2003)

Title	Bases	Aircraft types
No.2 Air Navigation School	Nhill	Anson
No.1 Bombing Gunnery School	East Sale	Battle; Wirraway; Beaufort VI, VIII
No.3 Bombing Gunnery School	West Sale	Battle; Demon
Beam Approach Landing School	Point Cook	Oxford
Central Flying School	Point Cook; East Sale	Cadet; Oxford
No.3 Elementary Flying School	Essendon	Tiger Moth; Rapide
No.11 Elementary Flying School	Benella	Tiger Moth
No.1 Flying Training School	Point Cook	Magister; Wirraway CA-1; Wackett
No.2 Flying Training School	Melbourne	Tiger Moth
General Reconnaissance School	Point Cook; Laverton; Bairnsdale	Anson; DH.60
No.1 Operational Training Unit	Nhill; West Sale; Bairnsdale; East Sale	Beaufort V, VIII; Hudson IV; Oxford
No. 2 Operational Training Unit	Mildura	Spitfire Vc; Oxford; Anson; Wirraway CA-1, CA-5, CA-7, CA-8, CA-9; Boomerang I; Kittyhawk P-40E, P-40K; P15K Mustang
Paratroop Training Unit	Laverton; Tocumwal	
Signals School	Point Cook	DC-2; DH.86; Anson
No.1 Service Flying Training School	Point Cook	Oxford; DC-2; Demon
No.1 Wireless Air Gunners School	Ballarat	Tiger Moth; DC-2; Wackett CA-6; Dragon; Anson

4

Results

> We should be able to assume that no commander deliberately sets out to crash his aircraft …except for Japanese suicide pilots … or any situation when an aircraft is experiencing mechanical trouble … But even these exceptions support the rule: all aircraft are going somewhere. That they might wreck is a failure to reach a geographic objective. (Capelotti 1996: 146)

This chapter presents aviation accidents in Victoria during WWII. An estimated 75 sites, 13 different aircraft types and one unknown (see Appendix A and B) were identified during the course of this research. Aircraft types were further divided into subcategories: B25 Mitchell, Bristol Beaufort, Lockheed Hudson and Wirraway. The difference between one subcategory and another was generally due to small changes in the aircraft, like fixed or retractable landing gear, weapons or engines. This study, however, only addressed the 13 major categories of aircraft. The locations of these sites were estimations derived from available historical documentation.

The locations of aviation sites were divided into three major areas: Port Phillip Bay, East Coast and West Coast. East Coast wrecks were predominantly located between Wilsons Promontory and Mallacoota, while West Coast wrecks were located near the coast of Anglesea. This segmentation of sites into three regions allowed for better analysis of data, particularly in the case of proximity of sites to bases in Port Phillip Bay and the East Coast.

The identification of plane types was a major area of interest for this research. What types of aircraft were used and for what purpose? Identifying a particular use of an aircraft was difficult because some aircraft were used for multiple activities. Thus, there was a mixed understanding as to how these aircraft were being utilized.

This chapter also examines statistics on planes types that went down in Victorian waters. Utilizing historical research, this study presents locations where site are probably located as well as reasons why they went down. After examining accident report cards, the location of bases in relation to that of aviation wreck sites was determined to be significant, particularly in the case of East Coast sites. This correlation between sites and bases is addressed further to ascertain whether or not it was coincidental.

At what point are sites considered salvageable? Does aircraft type, site location or other factors influence the viability of salvaging sites? Post-depositional recovery is addressed in this chapter. Some accident report cards gave evidence that aviation sites may have been salvaged. Sometimes salvagers only take parts rather than entire planes, leaving evidence that is still archaeologically significant. This study explores if the location of sites was an important factor in salvaging activities.

Aircraft

Aircraft analyzed in Victoria were involved in a variety of activities: training, fighting, reconnaissance and bombing. The different types of aircraft were indicative of those utilized by the RAAF during WWII in Victoria (Figure 2).

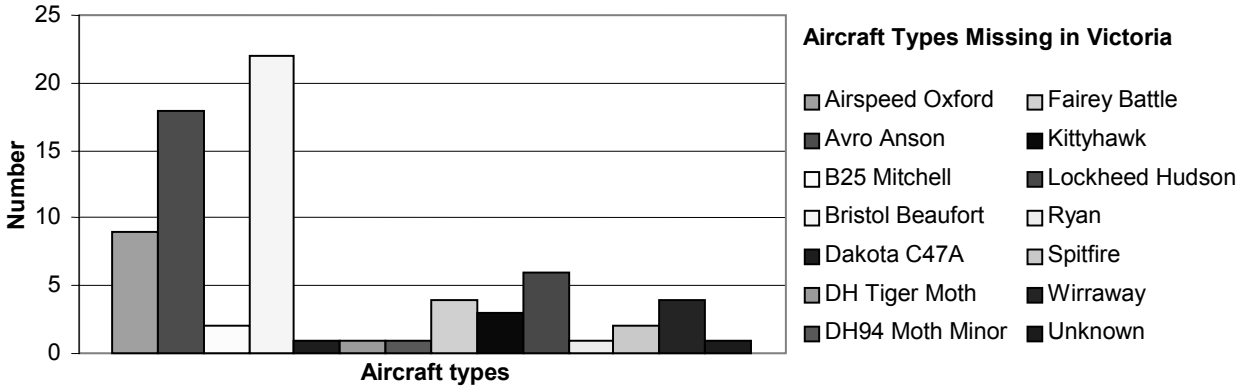

Figure 2. Aircraft types missing in Victoria

This study categorized the 13 known aircraft types into subcategories based on design and purpose to better understand their usage. Some aircraft were utilized for multiple purposes such as training, bombing, reconnaissance and fighting; however, this study only analyzed their principal purpose, rather than their original design capabilities or multiple usages.

Bombers and trainers were the most recurrent type of aircraft, consisting of nine out of 13 types (Figure 3). Trainer aircraft were generally two-seater planes, like Moth Minor, Airspeed Oxford, Avro Anson, Kittyhawk and Tiger Moth, while bombers consisted of Bristol Beaufort, Lockheed Hudson, Fairey Battle and B25 Mitchell. Since Victoria was used as the training ground for the air force, the large number of training aircraft identified in this study is understandable

The number of training-related accidents was not indicative of the number of sites identified in this research, as they account for only 25 out of 75 sites (33%) (Figure 4). Interestingly, the number of training-related accidents on the East Coast, 22 out of 51 sites (42%), was greater than those near Port Phillip Bay, which were three out of 19 sites (16%).

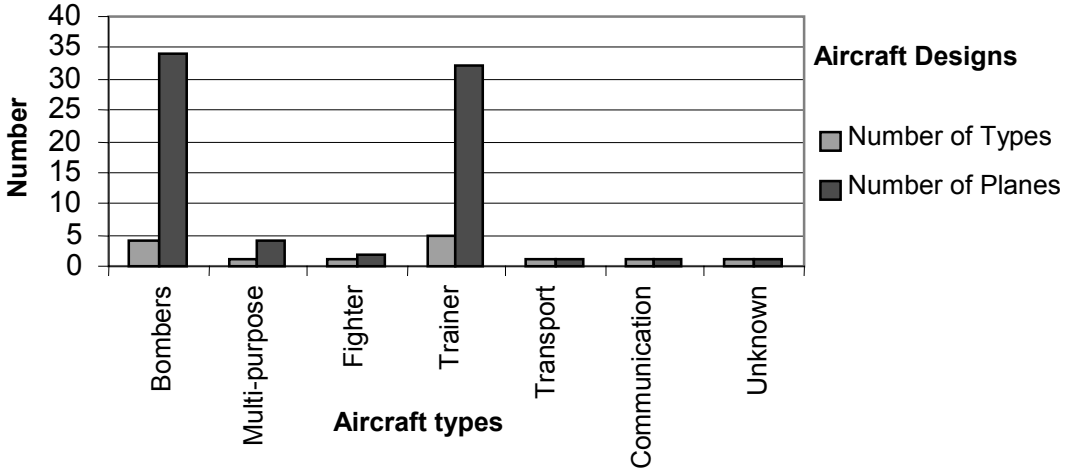

Figure 3. Aircraft designs

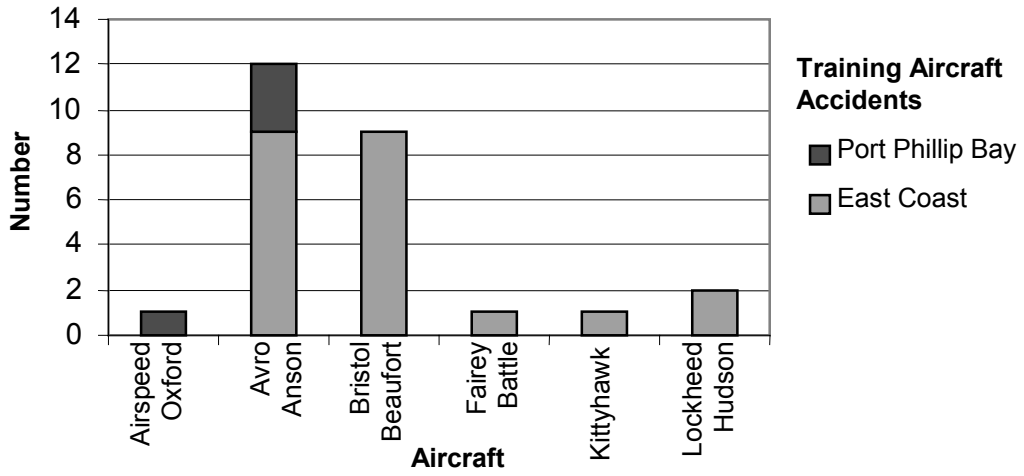

Figure 4. Aircraft training accidents

The higher number of training accidents on the East Coast compared to Port Phillip Bay appears to relate to the different types of aircraft and training undertaken in each region. While Port Phillip Bay was generally associated with Elementary Flying Schools (EFS) and General Reconnaissance Schools (GRS), the East Coast bases supported advanced training facilities. A higher number of accidents were recorded at advanced training facilities due to riskier exercises in advanced levels of training (Stephens 2001: 71). Out of the training aircraft accidents, four were bombers: Avro Anson, Bristol Beaufort, Fairey Battle and Lockheed Hudson. The Kittyhawk, which was originally designed as a fighter, was utilized in the RAAF as a trainer, while the Airspeed Oxford was an advanced trainer. The Avro Anson, on the other hand, was employed as a basic trainer and bomber. As can be seen, Victorian aircraft had a multitude of purposes.

Sites

Seventy-five sites were identified during the course of this research (see Appendix A). These sites span across Victoria waters, from Anglesea (West Coast), to Port Phillip Bay and to Mallacoota (East Coast). All identified sites were associated with water environments: dams, creeks, rivers and the ocean. It appears that some shallow water sites may have been salvaged. The severity of salvaging activities is undetermined; however, it is assumed that some remains may still be present.

Because of the presence of training bases located near Port Phillip Bay and along the East Coast, it seems that there would be a higher proportion of aircraft crashes in these areas as opposed to the West Coast, where there was no such facilities. This study identified a higher concentration of sites near the construction and training facilities. Only two aircraft, on the other hand, were located near the West Coast, and neither one was related to training activities.

In a few instances, site locations could not be located through historical documents. In this case, details of the final flight plan were examined to determine its approximate site location. If flight plans were also unobtainable, then the sites were classified as unknown. Although information on a few sites was rudimentary, there were only three sites that were classed as unknown (A9-41, A9-96 and A9-260).

Port Phillip Bay

The seabed of Port Phillip Bay has changed since WWII, partly as a result of channel dredging through the mouth of the bay connecting Melbourne and Williamstown. In Port Phillip Bay 19 sites were located. Eleven of these sites were concentrated between Altona and Werribee, with the largest concentration around Point Cook RAAF Base. Eight of these sites were within four kilometers of the base. Another three sites were located at Fisherman's Bend (Williamstown) and other isolated places around bay (Figure 5).

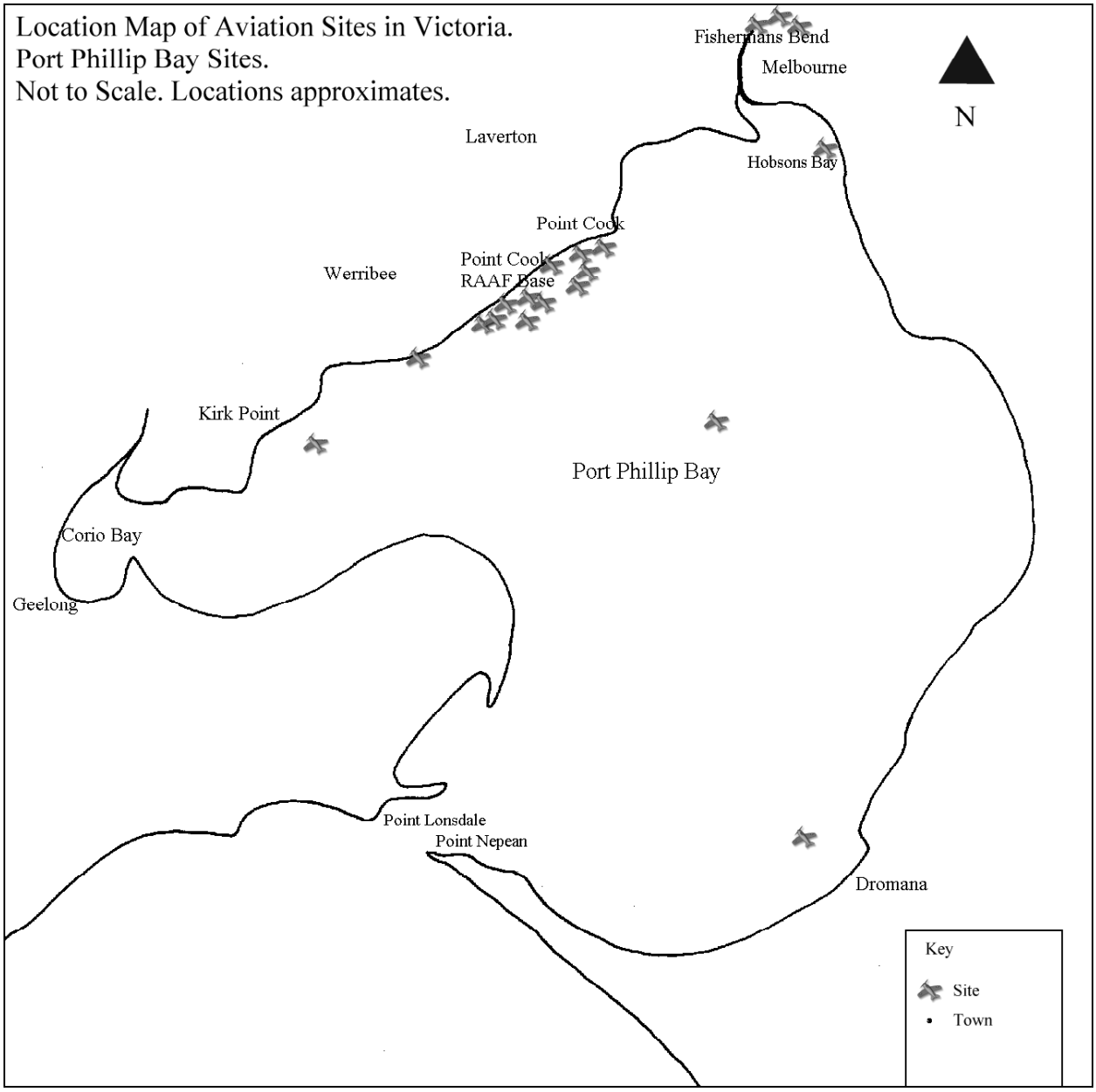

Figure 5. Port Phillip Bay site locations (approximates)

Site information

Aviation sites in Port Phillip Bay consisted of nine known aircraft types and one unknown type (see Figure 6). These aircraft were typical of RAAF training aircraft, including two bombers (Lockheed Hudson and Beaufort), a fighter (Spitfire) and one multipurpose (Wirraway). This

variety of aircraft in the bay is indicative of the types of planes that flew around Port Phillip Bay during WWII.

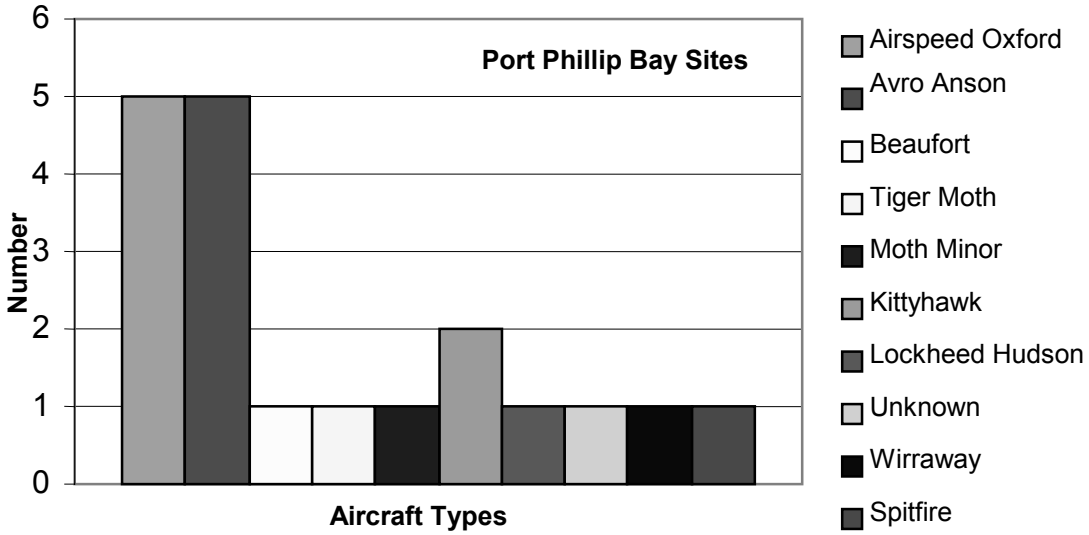

Figure 6. Aircraft types in Port Phillip Bay

Seventeen out of 19 sites were located within a few kilometers from the Port Phillip Bay shoreline. Sites located around the perimeter of the bay lie at a depth of approximately 18metres. The locations of two aircraft, A20-718 (Wirraway) and A58-75 (BS187 Spitfire), were not identified; however, historical evidence indicates that they did wreck in the Bay.

Out of 19 sites located in Port Phillip Bay, 12 crashed near the western side of the bay, while only two wrecked near the eastern side (Figure 7). It is highly likely that salvaging occurred on three of the sites because they were located in relatively shallow depths and they were in close proximity to construction facilites. Two of these possible salvage sites were Kittyhawks, which were small fighters used by the US Air Force. No other information was available on these two particular aircraft. The other possibly salvaged site was an Australian Lockheed Hudson (A16-77). The Lockheed Hudson was a large bomber, and because it crashed in shallow water, it was likely classed as a hazard. Little is known about these sites, particularly the US plane crash. Green states, "Pre-1961 aircraft wrecks on non-Air Force property are considered abandoned by the Air Force … due to a Pentagon fire at the time which destroyed the relevant known records" (Green 2000: 26). The only documentation found was located in Point Cook RAAF Records and related to aircraft type and location (see Appendix A).

Site information

The sites located off the coast of Anglesea lie in depths between 32 to 72 meters. It was estimated that the location of the RAAF plane A47-24 was 144.19S 38.05E (Point Cook RAAF Base Archives). This estimate is debatable as the records on this plane were missing and the it was made by personnel at Point Cook RAAF Base Archives who were familiar with the missing historical documentation.

Little is known about the B25 Mitchell Bombers. The US B52 went missing after it took off from an US aircraft carrier off the coast of Victoria. No additional information is known about the Australian B52.

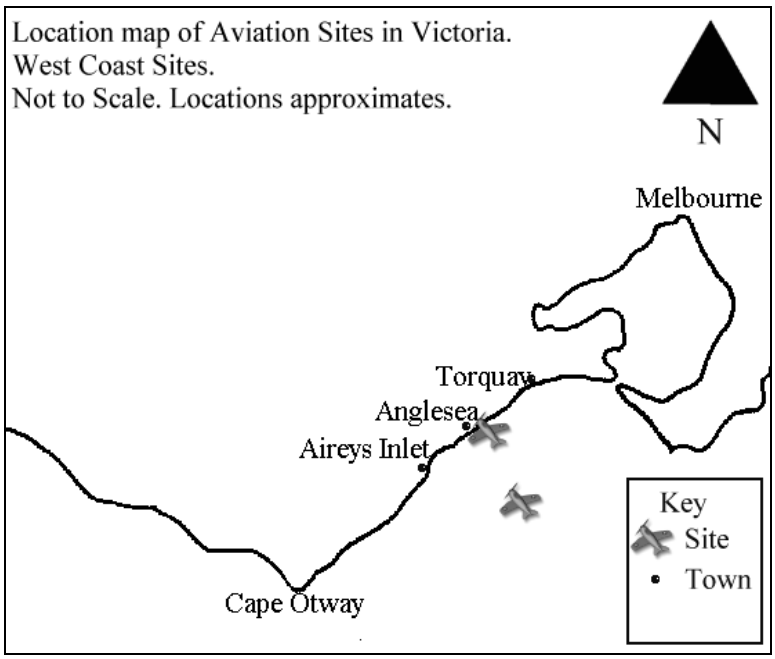

Figure 7. West Coast Site locations (approximates)

East Coast

East Coast sites, 51 in total represent the largest concentration of sites in this study (Figure 8). These sites were concentrated between Woodside and Bairnsdale, but a few sites were also located between the Victorian coastline, King Island, Flinders Island and Tasmania. Out of 51 sites located in this area, 15 wrecked in inland waterways. While there is a high probability that these sites were recovered or salvaged, it is possible that remains are still present. Those sites that were recovered, as indicated in the historical record, were not incorporated into this research.

Site information

Due to the large area of Bass Strait (973 440 000 km^2), identification of crashed aircraft was difficult, particularly because much of the information was incomplete. A large concentration of sites was identified along the Victorian coastline between Bairnsdale and Woodside. Although this area consists of only two kilometers of shoreline, the surrounding waters span 4 000 square kilometers. Compounding the logistics of searching such a large area, some of these waters are restricted due to gas and oil fields. The oil field boundaries begin approximately 25 kilometers north east of Seaspray and span over 50 kilometers to Lakes Entrance. By omitting this restricted area, the proposed search area would be reduced by nearly half.

The East Coast contained the largest number of aviation sites identified in this research. Larger aircraft like the Bristol Beaufort and Avro Anson's were predominantly located in this area (Figure 9). This appears to be related to the types of bases and squadrons on the East Coast compared to those in Port Phillip Bay.

As a whole, East Coast aviation sites were unique in that out of the 51 sites associated with this area, 15 were located in inland waterways. It appears that the location of sites in inland waterways was related to the location of bases. East Coast bases were predominantly located inland, and a large proportion of aviation sites were found near Sale and Bairnsdale. Sites located in inland waterways have a higher probability of being located, recovered and/or salvaged than those in the ocean because they attract much interest.

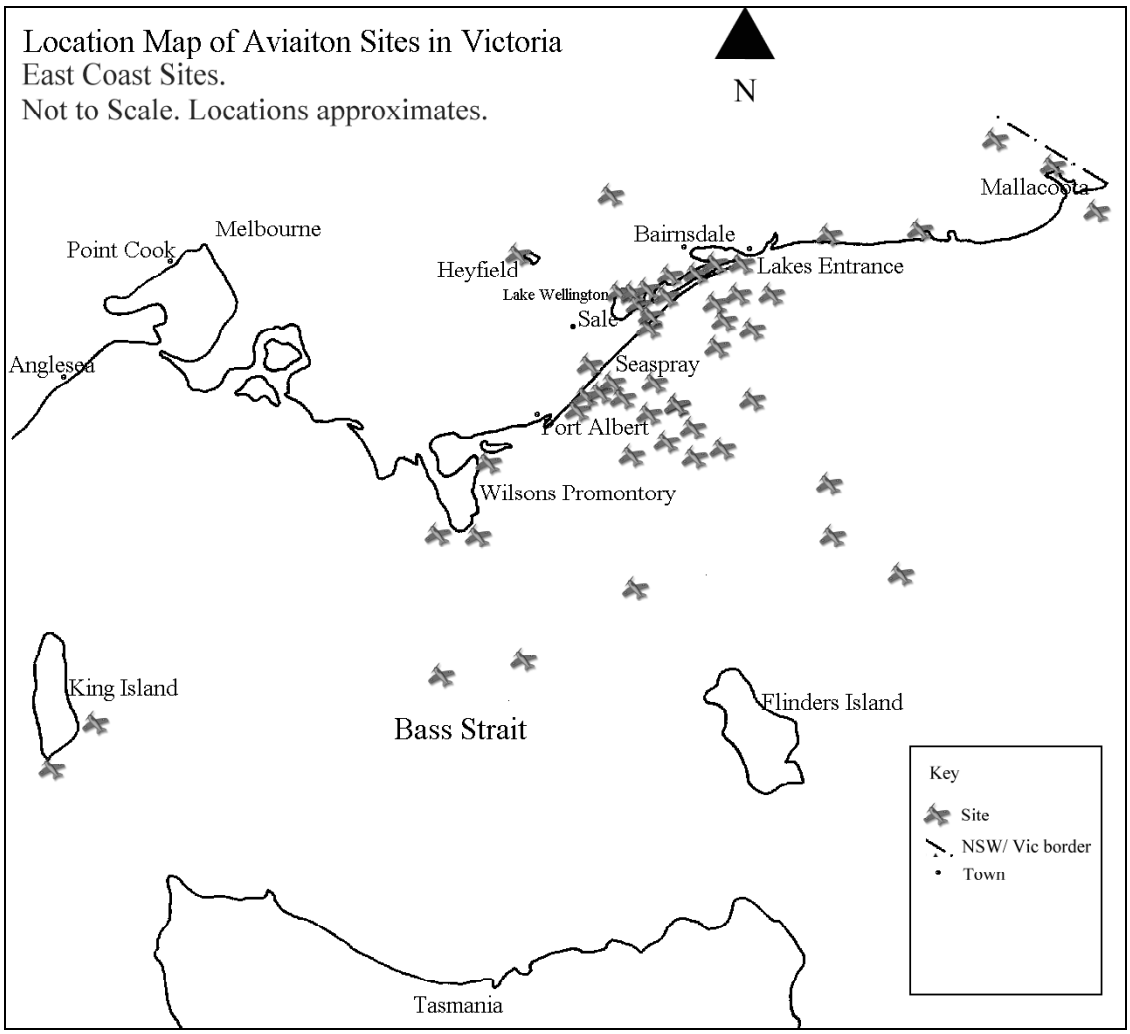

Figure 8. East Coast Site locations (approximates)

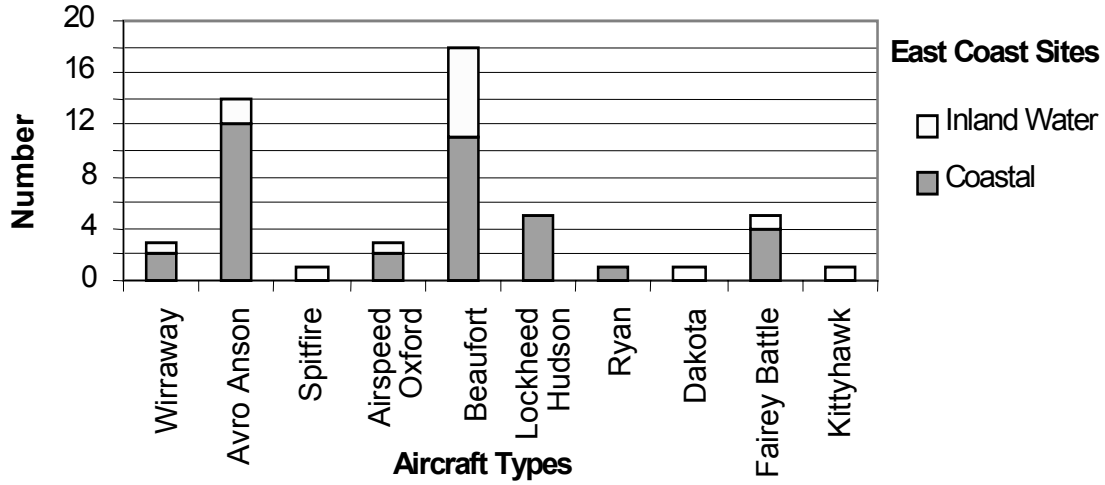

Figure 9. East Coast sites and aircraft types

Out of the 15 planes that wrecked in inland waterways, two, A29-71 (Kittyhawk) and A20-404 (Wirraway), were recently identified. A29-71 was a Kittyhawk that crashed into Lake Reeve on 16 January 1945. The pilot, F/O W R Binning, was killed, but his body was recovered from the crash site (http://home.st.net.au/~dunn/vic75.htm). While no archaeological work has been undertaken, the site was documented with photography by Rick Hanning in 1992. The photographs show a high level of deterioration as well as indicated that salvage activities had taken place. They also show that the plane exhibits little structural integrity (Figures 10 and 11). Usually smaller components, such as the steering yoke, the propeller and console instruments were the first objects salvaged from an aviation site, and this seems to have been the case for A29-71 (http://home.st.net.au/~dunn/vic75.htm). Additional remains may be submerged; however, due to the low visibility of the water, an archaeological survey would be difficult.

Figure 10. A29-71, Lake Reeve, 1992 (Photo by Rick Hanning 2003a)

Figure 11. A29-71, Lake Reeve, 1992 (Photo by Rick Hanning 2003b)

A20-404 was photographed in 1982 during a period of low water, but it has since become submerged again (Figure 12). This plane was performing aerobatics over Lake Glenmaggie when it crashed on 14 March 1942. The body of the pilot was recovered from the site the next day (http://home.st.net.au/~dunn/ozcrashes/vic86.htm). Salvagers removed one of the wheels and

undercarriage legs, which are now displayed on display at the dam wall (http://home.st.net.au/~dunn/ozcrashes/vic86.htm).

Figure 12. A20-404 (Photo by Trevor Vondrasek 2003c)

Site A20-404 (Wirraway) contains less archaeological evidence than A29-71 (Kittyhawk). The photograph (Figure 0-1) indicates that only a small section of the framing remains on the site. It has been subjected to post-depositional recovery by the Australian Restoration Group (Moorabbin Air Museum), who recovered the port wing in 1980 (http://home.st.net.au/~dunn/ozcrashes/vic86.htm). This museum has since closed, and the location of the wing as well as the rest of its collection remains unknown.

The size difference between the A20-404 and A29-71 was similar. The Kittyhawk measured 10.16 meters in length, had a wing span of 11.37 meters and was 3.23 meters in height, while the Wirraway measured 8.84 meters in length, had a 13.11 meter wing span and was 3.66 meters in height. There was, however, a significant difference in weight, with the Kittyhawk weighing 2812kg and the Wirraway 1805kg. This weight difference probably reflected the difference in construction materials.

Unknown

Three out of 75 site locations were undetermined. These included A9-41, A9-96 and A9-260 (Beaufort). Accident report cards relating to these three wrecks were not located at Point Cook RAAF Base.

Salvaged Sites

Nineteen of the East Coast aviation sites were likely salvaged immediately after wrecking. Eight of these sites were in Port Phillip Bay, while the remainder was near the East Coast (Figure 13). The proportion of salvaging activities appeared to relate to the way the aircraft went down. Archaeological material probably represents items not highly desired, as hard to come by items were likely the first removed. Accessibility and proximity to facilities was probably also a determining factor in this activity.

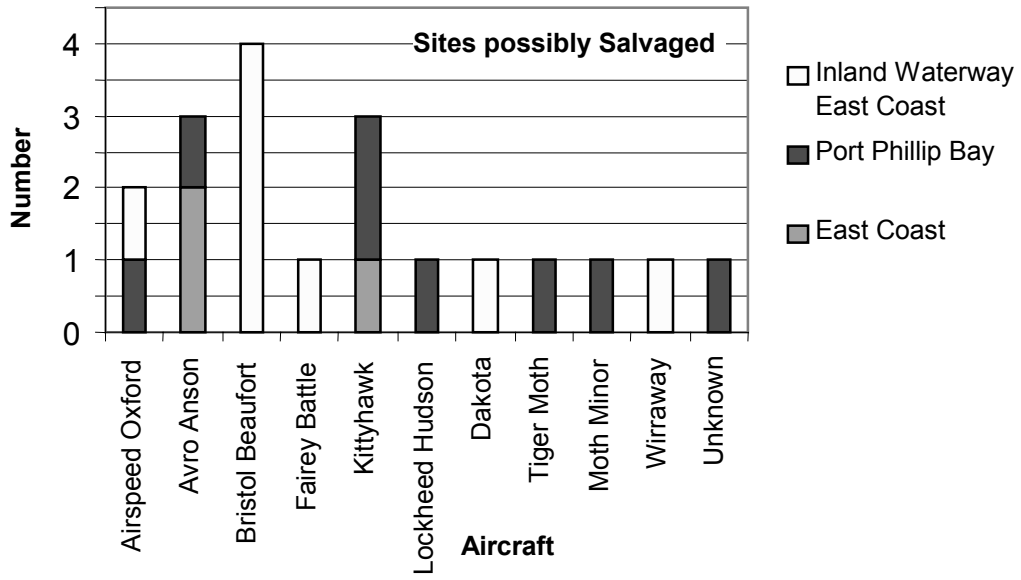

Figure 13. Sites possibly salvaged, aircraft types and locations

The proximity of sites to shore, particularly in the case of the inland waterways, and their accessibility made the prospect of both survival and salvage plausible. Sites associated with Port Phillip Bay were similar to those of inland waterways. On the basis of historical evidence, there was a higher probability of salvaging sites within close proximity to the shoreline and at shallower depths. Sites in deeper water or great distances from shore or facilities were likely deemed inaccessible.

Correlation Between Sites and Bases

It appears that there was a correlation between aviation sites and bases. It was uncertain from the historical record whether a particular plane was directly linked to the base closest to its wrecksite, as pilots in distress probably headed for the closest base. The proximity between aviation sites in Port Phillip Bay to Point Cook, however suggests that there was a correlation. Out of the 19 sites in the bay, 11 were concentrated between Altona and Williamstown. Nine of these were within four kilometers of Point Cook. Eight East Coast sites, on the other hand, were located within 15 kilometers of Sale and were in close proximity to the shoreline.

Refined Search Area

Because this study examined such a large area, it focused on only two specific regions: Point Cook in Port Phillip Bay and Woodside and Bairnsdale on the East Coast. These two regions were chosen because they contain a high concentration of aviation wrecksites with a high probability of being located. Eight out of 11 sites were found around Point Cook RAAF Base laying within four kilometers of the jetty. This area has a potential for containing salvaged sites and discarded material from Point Cook. The other three were located between Werribee and Altona.

The second area of research was composed of two, 50-kilometer wide search areas along Ninety Mile beach: Bairnsdale-Sale and Sale-Port Albert. Unlike Port Phillip Bay, this area was defined as a long and extended strip along the coast. Although the search area was defined as 50 kilometers wide, sites within this area were estimated to be within two kilometers of shore. Four sites were located in the Seaspray region, two along Ninety Mile beach, seven near Bairnsdale,

two near Lakes Entrance, two by Sale and one close to Paynesville. The sites adjacent to Seaspray have the highest potential of being located, as they are located near the shore.

Search Techniques

Aircraft in shallow water have successfully been located in Australia using side scan sonar (WAMM 2002; Jung 2001). Attempts to locate sites in deeper water, however, have had limited results (McCarthy 1997).

World War II aircraft design consisted of very little metal. Original aircraft designs were mainly plywood and material, making them difficult to detect with a magnetometer. Green (1990) states that a 10 kilogram cannon ball can be detected with a magnetometer at three meters and that a 2-ton cannon can be recognized at 27 meters (Green 1990: 45). An aircraft engine weighed more than 10 kilograms but generally less than two tons. Therefore, aircraft sites would probably have to be located above 27 meters of water to be detected with a magnetometer. Depending upon the type of aircraft and the amount of metal in its design, targeted depths would vary.

Side scan sonar has achieved success in locating Australian aircraft wrecks in Roebuck Bay, Broome, Western Australia (WAMM 2002). Side scan sonar produces the topography of the seabed in a negative image, providing an advantage in looking at sites with profiles. The advantage of using side scan sonar is that it undertakes simultaneous surveys on either side of the scanning device, called a tow-fish. The depth of the seabed in relation to the depth of the tow-fish dictates the width of the survey. Assessment of the data includes size and distances of target features (Dean et al. 2000: 144). The refined search areas at Point Cook and along the East Coast using side scan sonar would enable wide search areas, reducing field time and logistics.

Conclusion

This chapter defined the number, types and possible locations of sites associated with WWII wreck sites in Victoria. These 75 sites included 13 known aircraft types with six design purposes. The use of Victoria as a training platform for flight personnel can be seen in the record, as out of 75 sites, 25 (35%) were training related.

Areas of importance include Port Phillip Bay and the East Coast, accounting for 70 out of the 75 sites. The proximity of eight sites in Port Phillip Bay to Point Cook RAAF Base have the highest potential of being located, as they were wrecked in close proximity to shore and lay in shallower depths than those encountered along the East Coast. Obstacles relating to the East Coast were identified as deeper water and large search areas. Sites in shallower water have a higher potential of being discovered, but they were likely susceptible to salvaging activities, as seen in the case of A20-404 and A29-71.

The two sites that have been located and identified prior to this research include A20-404 and A29-71. These sites appear to have been heavily hit by salvagers, leaving little material on either site. Important pieces of information were carted away from the sites without archaeological documentation. Surveys should be undertaken on them to document any remain features as well as to determine site extent. Since these sites lay in fresh water, their preservation characteristics are likely to be different to those located in saline environments.

5

Discussion

This chapter analyses the archaeological potential of Aviation sites in Victoria. The potential of aviation archaeology in Victoria is great. Considering that Victorian aircraft were never involved in combat, they are probably more intact than those that were shot down. Because of this, the patterns of distribution and the attributes associated with these sites are unique.

Determining the archaeological potential of aviation sites in Victoria is essential to devising a method of studying these sites. This enables researchers to gain the most amount of information and to refine specific areas of search, enabling more positive results. Moreover, these sites have the potential of offering information relating to the build up of Victoria's and Australia's aviation industry during WWII.

Aircraft

This study identified two regions of aviation sites in Victoria: Port Phillip Bay and the East Coast. As indicated in the previous chapter, the bases in these regions had a direct relationship to the number and types of sites, as they were either the place of origin, destination or both. Aircraft types utilized in these bases are represented in the archaeological record today. Port Phillip Bay contained a wider variety of types than that of the East Coast. Eleven varieties of aircraft were utilized in units around Port Phillip Bay, but this study identified only four (Oxford, Anson, Wirraway and Tiger Moth) of the 11 in the archaeological record (Table 4). Another four aircraft types (Beaufort, Hudson, Spitfire and Kittyhawk) not associated with these units were also represented in the Bay.

East Coast and inland units seem to be slightly better represented in the archaeological record, as eight out of the 18 (44%) aircraft utilized in these areas have been identified. Although there is some overlap of aircraft types between East Coast and inland units, these sites were in close proximity of each other and, as such, were treated the same.

Overall, planes associated with base units in Victoria did not seem to be well represented in the archaeological record. In addition to the known varieties that were utilized, three varieties not connected to units, Ryan Trainer, Dakota C-47A and Moth Minor, were represented. Out of the 21 types of aircraft associated with units in Victoria, only nine (42%) were represented in the archaeological record. These inconsistencies between the archaeological and historical record requires further investigation to determine the service records, the home bases of aircraft and the circumstances prior to crashing (Figure 14).

Table 4. Units located in Victoria during WWII

Point Cook Area	East Coast Area	Inland Area
Oxford [1]	Oxford [2]	Oxford [2]
Anson [1]	Anson [2]	Anson [2]
Wirraway [1]	Wirraway [2]	Wirraway [2]
Cadet	Cadet	
DH.60	DH.60	
Wackett		Wackett
Tiger Moth [1]		Tiger Moth
DC-2		DC-2
Rapide		
DH.86		
Magister		
	Beaufort [1,2]	
	Hudson [1,2]	
	Battle [2]	
	Demon	
		CA-6
		Dragon
		Spitfire [1,2]
		Boomerang
		Kittyhawk [1,2]
		Mustang

[1] Port Phillip Bay wrecks, [2] East Coast (including inland wrecks)

Figure 14. Aircraft types missing in Victoria

Bombers and trainers were the most prevalent types of aircraft identified in this study. Bombers and trainers accounted for nine of the 14 aircraft types, representing 66 (88%) aircraft sites in Victoria. The other five types, including one unknown, account for only nine (12%) of the sites (Figure 15).

Bases

Aviation sites in Victoria were directly related to the location of bases, as the highest concentration of wreck sites in each region occurred in close proximity of bases. The number and types of units at each base was different, with the largest variation and number of units found in the Port Phillip Bay area.

The largest number of Flying Training Schools was located around Port Phillip Bay, with 11 different schools compared to six in both of East Coast and inland Units. Even though the largest number of training units was located around Port Phillip Bay, only four of the 26 (15%) sites were related to training accidents (Table 5).

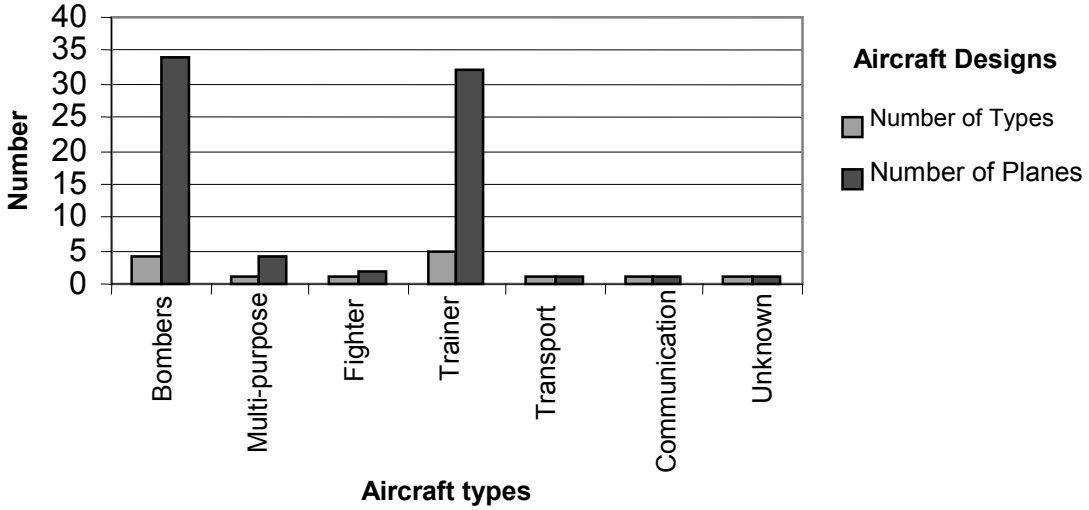

Figure 15. Aircraft designs used in Victoria

Table 5. Base and units used in Victoria during WWII (Sturtivant 2003)

Title	Bases
Air Navigation School	Nhill [3]
Bombing Gunnery School	East Sale [2]
	West Sale [2]
Beam Approach landing School	Point Cook [1]
Central Flying School	Point Cook [1]
	East Sale [2]
Elementary Flying School	Essendon [1]
	Benella [3]
Service Flying Training School	Point Cook [1]
Flying Training School	Point Cook [1]
	Melbourne [1]
General Reconnaissance School	Point Cook [1]
	Laverton [1]
	Bairnsdale [2]
Operational Training Unit	Nhill [3]
	West Sale [2]
	Bairnsdale [2]
	East Sale [2]
	Mildura [3]
Paratroop Training Unit	Laverton [1]
	Tocumwal [3]
Signals School	Point Cook [1]
Wireless Air Gunners School	Ballarat [3]

1 Port Phillip Bay Units, 2 East Coast Units, 3 Inland Units

Out of the 11 units near Port Phillip Bay, eight were located at either Laverton or Point Cook. These sites were located within a couple of kilometers to each other. Not all of these sites were classed as training accidents, but it is possible that this may be the case.

It is undetermined whether there was a correlation between the cause of the accident and their location. Site characteristics and site formation processes were partly determined by the wrecking process; however, not enough work has been undertaken on aviation sites to gain an understanding of these processes.

Defined Search Areas

The two major defined search areas were located in Port Phillip Bay and the East Coast. Out of the 75 sites revealed in this thesis, the largest concentration was located on the East Coast, representing 51 sites. In Port Phillip Bay, 19 sites were identified through the historical records. These two defined search areas include 11 of the 13 types of aircraft known to have wrecked in Victoria. The other two types of planes, Mitchell B-25 and one unknown, complete the 13 aircraft types in Victoria.

Port Phillip Bay

The sites in Port Phillip Bay have a higher possibility of being located than any other area. The close proximity of sites to shore and in concentrated areas between Altona, Werribee and Point Cook increases the chance of locating these sites. Due to their relatively shallow depths and proximity to land, they offer the greatest accessibility for divers than any other sites. Additionally, the close proximity of these sites to shore and in relation to each other presents and ideal opportunity for further study incorporating side-scan sonar. It is estimated that sites in this area are within 1kilometre of shore. This means that although the search area between Altona and Werribee is 400 square kilometers, a confined search near Point Cook RAAF Base shore could identify a number of site locations.

Searching for these sites by using side scan sonar appears to be the best approach. A search area adjacent to the shore between Altona and Werribee and extending out to one kilometer off shore has a high potential for discovering aviation sites. It is difficult to determine the height and depth to place the sonar, as each sonar design has different working specifications. With this in mind, it is difficult to determine how much time it would take to survey this area.

East Coast

The East coast had the highest number of wrecks than any other area. Only six training units were linked to this area, but these involved more complex training relating to Bombing Gunnery School (BGS) and Operational Training Units (OTU). The two types of aircraft that were most linked to this area include Avro Anson (14) and Beaufort (18). Both of these types were utilized in the training of personnel, but only nine of each type were linked with training accidents.

A concentration of sites between Woodside and Bairnsdale accounted for 16 (31%) of the 51 sites, but this did not take into consideration the 15 sites that were classed as being in inland Waterways. If inland waterways sites were added to this figure, 25 (49%) of the sites would be associated to this area.

The historical records indicated that these sites wrecked within two kilometers of the shoreline in approximately 40-50 meters of water. The proposed search area for these sites was large, and, in some sections, restricted. These restricted areas relate to gas and oil exploration and were located between Sale and Bairnsdale.

Aircraft leaving bases near Bairnsdale and Sale were associated with a number of flights to Tasmania. These sites are likely located in depths from 61-600 meters, but some have the possibility of being up to 4500 meters deep. Although these deeper wrecks may never be located, they are interesting. Survival of aircraft at 4500 meters of water is not well known. The sinking of an aircraft through deep water could cause significant site distribution patterns to occur. The existence of these sites is dependent upon how they crashed and the distance between the surface of the water to the ocean floor.

Site Classification and Evaluation

The evaluation and classification of aviation wrecks sites is a field that has not seen a lot of attention. The evaluation of aircraft wreck sites has been touched upon in Australia by two researchers Jung (2001) and McCarthy (1997). McCarthy's classification of aviation sites described their archaeological significance based on condition and circumstances of the wrecking process (McCarthy 1997). While this work was undertaken with Flying Boats, the same classification could potentially be used for non-amphibian aircraft. Jung's work on Catalina wrecks in Darwin Harbour proved that site formation processes are key factors in understanding the spatial distribution of sites (Jung 2000: 166).

This research utilized McCarthy's classification system. It found that Victorian Aircraft were representative of Group A and of a combination of Category 1, 2 and 3 (Table 6). This classificatory system only considered the operational use of aircraft and site integrity. It did not refer to site formation processes. Deep water sites were generally associated with Category 1. The determining factors in this classification included how they came to rest on the ocean floor and how this is represented in the archaeological record today. Sites in shallower waters were classified as either Category 2 or 3. As seen with sites A20-404 (Wirraway) and A29-71 (Kittyhawk), they are located in inland waters and have been heavily salvaged over the years, leaving little discernable structure, particularly in the case of A20-404 (Wirraway).

Table 6. Aircraft classification (McCarthy 1997: 12)

Category	Group A wrecks
	Aircraft that have sunk while in fully operational and active service.
Category 1	Aircraft that have been sunk in fully operational and active circumstances, which now lie intact.
Category 2	Aircraft that have been sunk in fully operational and active circumstances. Has become susceptible to wind and/ or wave action.
Category 3	Former category 1 & 2 but have been subject to human interference by professional or recreational salvage. Categorised according to the extent of interference and degree of salvage.

Diebold (1993) conducted the first study into evaluating aircraft as a historical resource on a national level. His investigation was based on three criteria:

- Significance of aircraft type
- Rarity of the aircraft type
- Airworthy status

Diebold based aircraft integrity on standards associated with the National Register Bulletin. He examined designs, materials, and associations along with four minor categories: locations, settings, workmanship, and feeling (Diebold 1993: 5). While these categories were worthwhile, their shortfalls lie in that this classification only looked at airworthy planes and that the basic test of integrity probably would not be representative of aircraft as wreck sites (Table 7).

Diebold's work formed the basis for a preliminary report on the establishment of evaluating aviation sites. The *National Register Bulletin: Guidelines for Evaluating Historic Aviation Properties* (Milbrook et al. 1998). In this publication, a "structure" referred to a relatively intact site, while a "site" lacked the structural integrity of a structure (Milbrook et al. 1998: 20).

It has been previously shown that the condition of the sites in this research were indeterminate and that it was difficult to place these sites within the constructs of Diebold's (1993) and Milbrook's (1998) evaluation. This was mainly because their evaluations were directed towards airworthy aircraft only.

Table 7. Standards for aircraft evaluation (Milbrook et al. 1998: 20-25)

Integrity	Description
Location	Place where historic property constructed or event occurred.
Setting	Physical environment of a historic property. How and where the property is situated and its relationship to its surroundings.
Materials	Physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration.
Design	Combination of elements that create the form, plan, space, structure, and style.
Workmanship	Physical evidence of distinguished workmanship, distinctive aircraft markings, field modifications.
Feeling	Expression of aesthetic or historic sense of a particular period of time.
Association	Direct link between an important historic event or person and a historic property.

Cultural Resources

Australian military equipment that was not "abandoned" has been classified as the remains of the Commonwealth (Department of Defence 2002: 3). Unfortunately, wrecked aircraft are not included under these guidelines if:

> Equipment such as an aircraft crashed or went missing somewhere in Australia and the owner had made numerous attempts to find it without success, then the aircraft would not have been abandoned. (Department of Defence 2002: 4)

Even though there is no specific heritage legislation to protect aviation wrecks sites, State and Commonwealth legislation regulates survey, excavation and/ or removal of artifacts from these resources. In Victoria, aviation sites are protected under the *Heritage Act 1995* as an archaeological site if they are over 50 years old. Under the *Heritage Act*, "cultural heritage significance" means any material culture has aesthetic, archaeological, architectural, cultural, historical, scientific or social significance (*Heritage Act 1995*: 2). The *Heritage Act 1995* describes a "place" as including buildings, gardens, trees, archaeological sites, shipwrecks, precincts, and land, while an "object" includes building contents, archaeological artifacts and relics associated with particular places (*Heritage Act 1995*: Section 3). Under these descriptions all associated objects within a registered archaeological site are protected and are the property of the Crown (*Heritage Act 1995*: Section 125).

This definition is a broad example of the protection of heritage significant sites in Victoria. Unfortunately it does not address the significance of aviation sites. While historic shipwrecks have been formally classified and protected under state (*Heritage Act 1995*) and Commonwealth legislation (*Historic Shipwrecks Act 1976*), aircraft have not.

The UNESCO Convention on underwater cultural heritage occurred because there were inadequacies in the protection of underwater sites (*Law of the Sea*, 1982: article 303 & 149). The convention recognized the importance of underwater cultural heritage and the need to protect such sites. Importance is embedded in a site because it represents the history of people, nations and their relations with each other (*Convention on the Protection of the Underwater Cultural Heritage*, 2001: 2).

UNESCO defines underwater cultural heritage as:

> Underwater cultural heritage means all trace of human existence having a cultural, historical or archaeological character which have been partially or totally underwater, periodically or continuously, for at least 100 such years. (*Convention on the Protection of the Underwater Cultural Heritage*, 2001: 3)

The UNESCO *Convention on the Protection of Underwater Cultural Heritage, 2001*, was the first step towards universal protection of submerged sites throughout the world. The necessity to

protect, not just a national history, but the history of humanity brought about this convention. It was the culmination of a progressive movement towards the protection of underwater cultural heritage sites.

While this convention does not protect aviation sites because they are less than 100 years of age, the idea behind underwater cultural protection and the need to protect more than just shipwrecks is finally being realized.

On Victoria's Heritage Register, 16 aircraft or associated material have been included as historically significant sites (http://www.doi.vic.gov.au/doi/hvolr.nsf). Not all of these sites relate to this research, as this study only examines WWII sites. Other aircraft more than 50 years old have been included on the register. The inclusion of these aircraft means that they are legally protected under the *Heritage Act 1995*.

These sites have a strong historical, social and cultural connection with Victoria and Australia as sites of development and training of aircrew during WWII. Their archaeological and scientific significance relates to how these sites were constructed and how this is represented in the archaeological record today.

Conclusion

This chapter presented the evaluation and classification of Victorian aviation sites. It also accounted for several differences between the archaeological and the historical record. The variety of aircraft types examined in this research embodies the history of Victoria's involvement in the build-up of WWII aviation industry as well as the training of aircrew for the war overseas.

This study proposed several refined surveys areas in Port Phillip Bay and along the East Coast, and, if undertaken, these surveys could be the first non-amphibian sites in Australia to be evaluated. Potentially, the data obtained from these sites could be utilized to assess a number of different questions including: Was there any difference between Australian built aircraft to foreign built aircraft? If so, was there any difference between training and general use of aircraft of the same type?

Little work has been undertaken on aircraft wreck sites, and, because of this, there is a weak understanding on the classification of aviation sites, particularly sites that are not Flying Boats like those in Broome and Darwin. The location and identification of sites near Point Cook base would be a valuable step in this direction. Side scan sonar, which has proven successful in other circumstances, could be useful in locating aviation sites in Victoria.

Aviation sites in Victoria are eligible for protection under the *Heritage Act 1995* if they are at least 50 years old. At this time, there are no specific characteristics used to evaluate archaeologically or historically significant sites. A more in depth approach to aviation archaeology as a discipline as well as defined guidelines in the identification and protection of these sites is necessitated. Additionally, a more appropriate definition of underwater cultural heritage that includes more than shipwrecks needs to be addressed. This definition should include all forms of underwater cultural heritage, including those relating to aviation sites. The UNESCO *Convention on the Protection of Underwater Cultural Heritage, 2001* is the first step towards a broader protection of this underwater cultural heritage.

6

Conclusions

This predictive analysis of Victoria's WWII aviation heritage through an archaeological perspective is the first of its kind. The aim of this study was to identify WWII aircraft wrecks in Victoria as well as recognize the possibility of future work on such sites. This research examined only those WWII aviation sites associated with Victorian waters. Land based sites were not included because they were generally recovered after the incident. If land based sites were included, the number of aviation sites would be much higher.

Victoria's Aviation Heritage

This study identified 75 WWII aircraft that wrecked in Victorian waters. What is different about these sites is that the wrecking process was not related to combat. These sites were either related to training incidents or to general reconnaissance missions, and, because of this, they are unique.

The significance of Victorian aviation sites is that they were related to training aircraft, a type of aircraft that has not received much attention in aviation archaeology. Other aircraft were also represented in Victoria. Out of the 14 types of aircraft identified in Victorian waters, only six were related to training activities, accounting for 25 (33%) out of the 75 sites.

This research found that there was a correlation between bases and aircraft wreck sites (Chapter 4). In Port Phillip Bay, 11 (57%) out of the 19 sites were located near Point Cook Base. The close proximity of these sites to shore gives them a high possibility of being discovered than any other region.

Future Survey Work

The potential of future studies on these sites is high. The two defined search areas, Point Cook in Port Phillip Bay and between Woodside and Bairnsdale on the East Coast, account for 28 (38 %) out of 75 sites. Even though there are more sites on the East Coast, its large search area compared to Port Phillip Bay makes it the second choice in future work.

Sites along the coast of Point Cook could present the best opportunity for a future archaeological survey to locate aviation wrecks in Victorian waters. These sites could provide answers to a number of different questions including: How did Australian built aircraft compare to foreign aircraft? Were there differences between training and operational aircraft of the same type? What characterizes non-combatant site? Is there a preservation difference between freshwater aviation sites and saltwater sites?

A survey of the area around Point Cook Base utilizing both side scan sonar and a magnetometer would enable an advance understanding of this resource. To date, the only work using side scan sonar in Australia has been on amphibian aircraft (McCarthy 1997; WAMM 2002). These results proved that the details of aircraft wrecks can be attained with side scan sonar, but the differences between amphibian and non-amphibian sites is unknown. This raises the question as to what differences will be seen in smaller aircraft and will this type of survey be useful in detecting single-seat aircraft?

The two sites located in freshwater, A29-71 and A20-404, should be archaeologically surveyed to determine their research potential as well as extent. While it is understood that these sites have had some level of salvage, the degree of salvage remains undetermined.

Aviation Protection

Sites in Victoria are protected under the *Heritage Act 1995*. This act prevents the illegal disturbance or removal of relics from unregistered archaeological sites. This act states,

> **127. Offence to damage or disturb unregistered relics and unregistered archaeological sites**
> (1) A person must not knowingly or negligently deface or damage or otherwise interfere with an archaeological relic or carry out an act likely to endanger an archaeological relic except in accordance with a consent issued under section 129. (Heritage Act 1995: Section 127)

While aircraft wreck sites on land or in water are not classed as war graves by the Australian government (Williams, G. 2003, pers. comm. Feb), they are protected under state legislation. The Australian Air Force will only investigate an aircraft wreck site if serial numbers are provided for the plane or remains observed (Williams, G. 2003, pers. comm. Feb). They will also investigate sites that could contain human remains. During the last five years, three recoveries have resulted in the burial of seven airmen. One of these occurred in Lae War Cemetery, Papua New Guinea, while the others were buried at the Bita Paka War Cemetery near Rabaul, New Britain, Papua New Guinea (Williams, G. 2003, pers. comm. Feb).

This study addressed what this resource can contribute to the historical and archaeological record. Research into aviation site characteristics would complement the growing base of knowledge of Australian aviation resources. The positive identification of aviation sites would further support research on individual sites and would allow the public to become aware of Australia's submerged aviation resource.

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Appendix A:
Submerged Aviation Sites in Victorian Waters Sorted by Aircraft

Airspeed Oxford

Record No: 1
Aircraft: AF841
Date: 21-Jan-1942
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Port Phillip Bay, 400 Yards SE Pt. Cook.
Reason: Crashed into sea
Information: Possibly Salvaged
Trainer:
EATS:
Comments: Aircraft dove into water. Crew Pilot LAC Sampson, K.H. (killed). No.1 SFTS (ITS) Pt. Cook
Longitude and Latitude Min: 144° 45' 6" 37° 55' 2"
Longitude and Latitude Max: 144° 48' 0" 37° 56' 4"

Record No: 51
Aircraft: AS356
Date: 29-Mar-44
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: 2 miles Seaward SW of Point Cook.
Reason: Crashed into sea
Information:
Trainer:
EATS:
Comments: Aircraft dived into sea during night flight exercise.
Longitude and Latitude Min: 144° 45' 0" 37° 54' 6"
Longitude and Latitude Max: 144° 50' 0" 38° 0' 0"

Record No: 38
Aircraft: AS357
Date: 11-Apr-42
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: 1 mile SE of Point Cook pier.
Reason: Crashed into sea
Information:
Trainer:
EATS:
Comments: Completely submerged and broken up.
Longitude and Latitude Min: 144° 44' 4" 37° 56' 1"
Longitude and Latitude Max: 144° 42' 0" 37° 57' 6"

Record No: 72
Aircraft: BF887
Date: 11-May-42
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Pt. Cook, 2 miles SW in Bay
Reason: Crashed
Information:
Trainer:
EATS:
Comments:
Longitude and Latitude Min: 144° 34' 0" 37° 59' 0"
Longitude and Latitude Max: 144° 34' 0" 37° 59' 0"

Record No: 45
Aircraft: BG119
Date: 19-Sep-43
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: North shore of Victoria Lagoon, between Lake Victoria and Lake Wellington.
Reason: Unknown
Information: Possibly salvaged
Trainer:
EATS:
Comments:
Longitude and Latitude Min:147° 22' 8" 38° 4' 8"
Longitude and Latitude Max: 147° 22' 8" 38° 4' 8"

Record No: 29
Aircraft: BM711
Date: 12-May-1943
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia

Location: Seaspray within 5 miles
Reason: Crashed into sea
Information:
Trainer:
EATS:
Comments:
Longitude and Latitude Min: 147° 12' 6" 38° 0' 0"
Longitude and Latitude Max: 148° 0' 0" 38° 18' 0"

Record No:87
Aircraft: X6687
Date: 11-May-42
Service: RAAF
Confirmed: No
Origin: Victoria, Australia
Location: Port Phillip Bay, Point Cook.
Reason: Crashed into sea
Information:
Trainer:
EATS:
Comments:
Longitude and Latitude Min: 144° 47' 0" 37° 57' 0"
Longitude and Latitude Max: 144° 50' 0" 38° 0' 0"

Record No: 4
Aircraft: XF687
Date: 11-May-1942
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Port Phillip Bay, 2 miles SW of Point Cook.
Reason: Crashed into sea
Information:
Trainer:
EATS:
Comments:
Longitude and Latitude Min: 144° 34' 0" 37° 59' 0"
Longitude and Latitude Max: 144° 34' 0" 37° 59' 0"

Record No: 12
Aircraft: XN711
Date: 28-Feb-1943
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: 5 miles SW Seaspray.
Reason: Crashed into sea
Information :
Trainer:
EATS:
Comments:
Longitude and Latitude Min: 147° 8' 4" 38° 18' 0"
Longitude and Latitude Max: 147° 17' 4" 38° 31' 2"

Avro Anson

Record No: 22
Aircraft: A4-11 (K6222)
Date: 2-May-1939
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Port Phillip Bay , Hobsons Bay near Elwood.
Reason: Crashed due to fog
Information:
Trainer: yes
EATS:
Comments: Delivered from RAAF 1/37.Training flight. Crew pilot Davies R., Cpl Peake G., AC1 Quinn J.
Longitude and Latitude Min: 144° 55' 0" 37° 52' 0"
Longitude and Latitude Max: 144° 59' 0" 37° 55' 0"

Record No: 19
Aircraft: AW660
Date: Unknown
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Near 90 Mile Beach
Reason: Struck water and sank
Information :
Trainer:
EATS: Mk 1
Comments: Partial wreckage recovered
Longitude and Latitude Min: 147° 45' 0" 37° 56' 0"
Longitude and Latitude Max: 147° 45' 0" 37° 56' 0"

Record No: 78
Aircraft: AX225
Date: 25-Feb-45
Service: RAAF
Confirmed: No
Origin: Victoria, Australia
Location: Bairnsdale
Reason: Crashed into sea
Information:
Trainer: T1 trainer
EATS:
Comments:
Longitude and Latitude Min: 147° 52' 0" 37° 55' 0"
Longitude and Latitude Max: 148° 20' 0" 38° 30' 0"

Record No: 28
Aircraft: AX425
Date: 11-May-1943
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Lakes Entrance
Reason: Missing
Information:
Trainer: Trainer
EATS: Mk 1
Comments:
Longitude and Latitude Min: 147° 57' 0" 37° 52' 2"
Longitude and Latitude Max: 148° 3' 0" 38° 0' 0"

Record No: 79
Aircraft: DG213
Date: 24-Feb-45
Service: RAAF

Confirmed: No
Origin: Victoria, Australia
Location: Bairnsdale.
Reason: Crashed
Information:
Trainer:
EATS:
Comments:
Longitude and Latitude Min: 147° 20' 0" 37° 40' 0"
Longitude and Latitude Max: 148° 20' 0" 38° 30' 0"

Record No: 42
Aircraft: DJ290
Date: 22-Jul-43
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Bass Strait.
Reason: Missing
Information:
Trainer: T1 trainer
EATS:
Comments:
Longitude and Latitude Min: 144° 36' 0" 37° 30' 0"
Longitude and Latitude Max: 150° 0' 0" 39° 6' 0"

Record No: 80
Aircraft: K8713
Date: 13-Mar-41
Service: RAAF
Confirmed: No
Origin: Victoria, Australia
Location: Werribee.
Reason: Crashed
Information: Possibly Salvaged
Trainer:
EATS:
Comments:
Longitude and Latitude Min: 144° 40' 0" 37° 52' 0"
Longitude and Latitude Max: 144° 50' 0" 38° 0' 0"

Record No: 60
Aircraft: LT159
Date: 8-May-45
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Tamboon Inlet east of Cann River
Reason: Forced landing
Information:
Trainer: T1 trainer
EATS: Mk 1
Comments: 67th Squadron
Longitude and Latitude Min: 149° 5' 0" 37° 43' 0"
Longitude and Latitude Max: 149° 9' 0" 37° 47' 0"

Record No: 55
Aircraft: LT296
Date: 19-Nov-44
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Near Mallacoota
Reason: Forced landing
Information:
Trainer: T1 trainer
EATS: Mk 1
Comments: 67th Squadron
Longitude and Latitude Min: 150° 25' 0"37° 50' 0"
Longitude and Latitude Max: 150° 25' 0" 37° 50' 0"

Record No: 63
Aircraft: LT792
Date: 1-Jul-45
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: 18 miles SW of Seaspray.
Reason: Propeller struck water
Information:
Trainer: T1 trainer
EATS: Mk 1
Comments:
Longitude and Latitude Min: 147° 0' 0" 38° 30' 0"
Longitude and Latitude Max: 147° 10' 0" 38° 40' 0"

Record No: 16
Aircraft: N1336
Date: 27-Apr-1943
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Lake King, 2 miles from Paynesville.
Reason: Crashed
Information :
Trainer: T1 trainer
EATS:
Comments: GRS
Longitude and Latitude Min: 147° 43' 2" 37° 51' 6"
Longitude and Latitude Max: 147° 48' 0" 37° 54' 0"

Record No: 81
Aircraft: N4920
Date: 24 Feb 1945
Service: RAAF
Confirmed: No
Origin: Victoria, Australia
Location: Bairnsdale
Reason: Crashed
Information:
Trainer:
EATS:
Comments:
Longitude and Latitude Min: 147° 52' 0" 37° 55' 0"
Longitude and Latitude Max: 148° 20' 0" 38° 30' 0"

Record No: 54
Aircraft: W1580
Date: 30 May 1944
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia

Location: Bass Strait, 18 miles from Lakes Entrance.
Reason: Missing
Information:
Trainer: T1 trainer
EATS: Mk 1
Comments:
Longitude and Latitude Min: 147° 54' 0" 37° 52' 2"
Longitude and Latitude Max: 148° 18' 6" 38° 7' 8"

Record No: 61
Aircraft: W1991
Date: 18 June 1945
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Forced landed on southern tip of Snake Island in 2 feet of water.
Reason: Forced landing
Information: Possibly Salvaged
Trainer: T1 trainer
EATS: Mk 1
Comments: Crewmen rescued. Sergeant Duggan R.W. (pilot), Flight Lieutenant Hadley C., Flight Lieutenant Jobson N.A., P/Off Messer C.H.
Longitude and Latitude Min: 146° 32' 0" 37° 46' 0"
Longitude and Latitude Max: 146° 36' 0" 37° 50' 0"

Record No: 46
Aircraft: W2039
Date: 4 Oct 1943
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Crashed into ocean 1/2 mile down stream from Gipsy point and 19 miles NW of Mallacoota
Reason: Poor technique
Information:
Trainer:
EATS: Mk 1
Comments: 67th squadron. Aircraft stalled on right hand speed turn at low altitude, dove into water at steep angle and burst into flames. Flight Sargent Howship B.E., Pilot Officer Murphy K.P (NavB), Flight Sargent Dufty B.F., Lac Ball H.E.W. (clerk - passenger).
Longitude and Latitude Min: 149° 40' 0" 37° 27' 6"
Longitude and Latitude Max: 149° 40' 0" 37° 29' 0"

Record No: 62
Aircraft: W2261
Date: 21 June 1945
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Forced landing into ocean near Laverton.
Reason: Forced landing
Information:
Trainer: T1 trainer
EATS: Mk 1
Comments: 67th squadron. 2 rescued. Crew Pilot Officer Packer A.E (seriously injured), Flight Sergeant Cooper G.C. (missing), Sergeant Dufty B.F. (slightly injured).
Longitude and Latitude Min: 144° 48' 0" 37° 54' 0"
Longitude and Latitude Max: 144° 52' 0" 37° 57' 0"

Record No: 3
Aircraft: W2369
Date: 11 March 1942
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Port Phillip Bay, Corio Bay 1 mile South of Kirk Point
Reason: Crashed into ocean
Information:
Trainer: Training
EATS: Mk 1
Comments: Aircraft overdue on training flight Sale-Laverton via Yanakie, Barwon Heads. Crew Flight Lieutenant J.L.Webb, Flight Officer K.C.Peters, W/O R.J. Barker, AC1 H.G. Lincoln.
Longitude and Latitude Min: 144° 23' 0" 38° 5' 0"
Longitude and Latitude Max: 146° 46' 32" 38° 5' 0"

Record No: 82
Aircraft: W2557
Date: 24 February 1945
Service: RAAF
Confirmed: No
Origin: Victoria, Australia
Location: Bairnsdale
Reason: Crashed
Information:
Trainer:
EATS:
Comments:
Longitude and Latitude Min: 147° 52' 0" 37° 55' 0"
Longitude and Latitude Max: 148° 20' 0" 38° 30' 0"

B-25 Mitchell

Record No: 21
Date: Unknown
Service: USAAF
Confirmed: Yes
Origin: United States
Location: Aireys Inlet
Reason: Missing
Information:
Trainer:
EATS:
Comments:
Longitude and Latitude Min: 144° 5' 0" 38° 50' 0"
Longitude and Latitude Max: 144° 5' 0" 38° 50' 0"

B-25D Mitchell

Record No: 56
Aircraft: A47-24
Date: 11 December 1944
Service: RAAF

Confirmed: Yes
Origin: Victoria, Australia
Location: Crashed into ocean 6 miles east of Anglesea and 20 miles south of Point Phillips Head.
Reason: Missing
Information:
Trainer:
EATS:
Comments:
Longitude and Latitude Min: 144° 19' 0" 38° 50' 0"
Longitude and Latitude Max: 144° 19' 0" 38° 50' 0"

Beaufort V

Record No: 13
Aircraft: A9-16
Date: 9 March 1943
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Bairnsdale
Reason: Crashed into ocean
Information: Seaward operations
Trainer:
EATS:
Comments: Crashed into ocean 90 degrees off Port Albert 15 miles 245 degrees 53 miles off Bairnsdale. Crew: Pilot Officer Greenwood H.W.M., Sergeant Crosbie W.J., Sergeant Gough W.E.M., Sergeant Shepard J.H.
Longitude and Latitude Min: 146° 58' 8" 38° 30' 0"
Longitude and Latitude Max: 147° 30' 0" 38° 40' 0"

Record No: 6
Aircraft: A9-28
Date: 12 September 1942
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Between Bairnsdale and Flinders Island
Reason: Missing
Information: Reconnaissance flight
Trainer:
EATS:
Comments: OTU. Left on reconnnasance patrol, no combat, no contact was made with aircraft after departure. No trace of wreckage found. Crew: Sergeant Barton A.B. (pilot), Sergeant Cuthill R.A. (observer), Healy P.J., Sergeant Pugh K.. RAAF number T9567
Longitude and Latitude Min: 147° 40' 0" 37° 45' 0"
Longitude and Latitude Max: 148° 0' 0" 39° 40' 0"

Record No: 67
Aircraft: A9-41
Date: 9 March 1943
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Unknown.
Reason: Wingtip struck water
Information: Possibly Salvaged
Trainer:
EATS:
Comments: Wing tip struck water, force landing in shallow waters. Crew: Sergeant Gear G.
Longitude and Latitude Min:
Longitude and Latitude Max:

Record No: 7
Aircraft: A9-49
Date: 2 Oct 1942
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Between Bairnsdale and Cape Portland Tasmania.
Reason: Missing
Information: Reconnaissance flight
Trainer:
EATS:
Comments: 1OTU Reconnaissance patrol. Crew: Sergeant Crombie. P.K. (pilot), Sergeant Cribb. P (observer), Morrow B.W., and Carl A.J.
Longitude and Latitude Min: 147° 40' 0" 37° 45' 0"
Longitude and Latitude Max: 148° 0' 0" 39° 40' 0"

Beaufort VI

Record No: 70
Aircraft: A9-64
Date: Unknown
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Dromana
Reason: Crashed
Information:
Trainer:
EATS:
Comments: 100th Squadron.
Longitude and Latitude Min: 144° 55' 0" 38° 16' 0"
Longitude and Latitude Max: 144° 59' 0" 38° 19' 0"

Record No: 10
Aircraft: A9-67
Date: 11 January 1943
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Near Victorian Coastline in Bass Strait
Reason: Missing
Information: Seaward operationss
Trainer:
EATS:
Comments: Crew: Flight Officer Patterson, R.S., Sergeant Simpson A.R., Sergeant McKay N.N., Sergeant Lang N.J.
Longitude and Latitude Min: 144° 0' 0" 38° 30' 0"
Longitude and Latitude Max: 148° 30' 0" 40° 41' 0"

Record No: 11

Aircraft: A9-70
Date: 7 February 1943
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Near Bairnsdale
Reason: Missing
Information: Seaward operations training
Trainer:
EATS:
Comments: Crew: Sergeant Davey M.B., Sergeant Goldsmid P.E., Sergeant McDonald R.N., Sergeant Keith C.J.W.
Longitude and Latitude Min: 147° 30' 0" 37° 54' 0"
Longitude and Latitude Max: 148° 0' 0" 38° 30' 0"

Beaufort VII

Record No: 30
Aircraft: A9-126
Date: 2 Jul 1943
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Between Moruya and Mallacoota
Reason: Missing
Information:
Trainer:
EATS:
Comments: 5 OUT. Crew: Flight Sergeant Simpson M.K. (pilot), Pilot Officer Carey S.E., Flight Sergeant Cameron W.B., flight Sergeant Hellewell L.H., Sergeant Davie D.J., LAC and Young C.W.J.
Longitude and Latitude Min: 150° 0' 0" 36° 37' 0"
Longitude and Latitude Max: 150° 0' 0" 36° 37' 0"

Record No: 83
Aircraft: A9-143
Date: 30 July 1945
Service: RAAF
Confirmed: No
Origin: Victoria, Australia
Location: 4 miles from Paynesville on Waddy Island. Victoria.
Reason: Crashed into ocean
Information: Possibly Salvaged
Trainer:
EATS:
Comments: Crew: Flight Officer Castle M.M., flight Officer Hammond R.M., Slight Sergeant Lloyd S.T.
Longitude and Latitude Min: 147° 55' 0" 37° 55' 0"
Longitude and Latitude Max: 148° 0' 0" 38° 0' 0"

Record No: 69
Aircraft: A9-96
Date: 11 January 44
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Unknown.
Reason: Struck water and sank
Information:
Trainer:
EATS:
Comments: Aircraft struck water during low formation practice, lost speed, crashed and sank.
Longitude and Latitude Min:
Longitude and Latitude Max:

Beaufort VIII

Record No: 66
Aircraft: A9-260
Date: 4-May-43
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Unknown
Reason: Engine failure
Information:
Trainer:
EATS:
Comments: Port engine failed at 50 feet, crashed into ocean. Crew Swaffield A.A
Longitude and Latitude Min:
Longitude and Latitude Max:

Record No: 47
Aircraft: A9-301
Date: 9 October 1943
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: near channel of Lakes Entrance by the Kalimna Hotel.
Reason: Submerged on sand bank
Information: Possibly Salvaged
Trainer:
EATS:
Comments: Submerged on sand bank.
Longitude and Latitude Min: 147° 57' 6" 37° 52' 0"
Longitude and Latitude Max: 147° 58' 56" 37° 53' 0"

Record No: 44
Aircraft: A9-303
Date: 13 September 1943
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: In swamp 3 miles SE of Sale runway
Reason: Unknown
Information: Possibly salvaged
Trainer:
EATS:
Comments:
Longitude and Latitude Min: 147° 7' 0" 38° 9' 0"
Longitude and Latitude Max: 147° 7' 0" 38° 9' 0"

Record No: 15
Aircraft: A9-304
Date: 26 April 1943
Service: RAAF

Confirmed: Yes
Origin: Victoria, Australia
Location: King Island.
Reason: Crashed into ocean
Information: Training exercise
Trainer: Training
EATS:
Comments: Training mishap. Formation with A9-164 slipped and disappeared into ocean.
Longitude and Latitude Min: 144° 12' 0" 39° 50' 0"
Longitude and Latitude Max: 144° 12' 0" 39° 50' 0"

Record No: 64
Aircraft: A9-311
Date: 23 August 1945
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Seaward from Sale.
Reason: Missing
Information:
Trainer:
EATS:
Comments: Non-operational flight seaward.
Longitude and Latitude Min: 147° 10' 0" 38° 10' 0"
Longitude and Latitude Max: 147° 40' 0" 38° 40' 0"

Record No: 41
Aircraft: A9-352
Date: 11 July 1943
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: 1.5 miles east of Currie Airfield, King Island
Reason: Crashed into sea
Information:
Trainer:
EATS:
Comments:
Longitude and Latitude Min: 143° 54' 0" 39° 56' 0"
Longitude and Latitude Max: 143° 54' 0" 39° 56' 0"

Record No: 43
Aircraft: A9-353
Date: 26 August 1943
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: 3 miles east of Sale near Lake Wellington.
Reason: Crashed into lake
Information: Training exercise
Trainer:
EATS:
Comments: Dive bombing exercise on mobile splash target. Dive commenced at 2500 feet and aircraft struck water 200 yards over target. 4 crew killed
Longitude and Latitude Min: 147° 19' 0" 38° 6' 0"
Longitude and Latitude Max: 147° 19' 0" 38° 6' 0"

Record No: 76
Aircraft: A9-409
Date: 7 October 1943
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Crashed into 60 feet of water in the Tasman Sea near Ninety Mile Beach near Woodside.
Reason: Crashed into sea
Information: Training exercise
Trainer:
EATS:
Comments: 1OTU. Dead-reckoning navigation exercise. 4 crew killed: Sergeant Smith L.W., Flight Sergeant Rodgers W.J., Sergeant Sexton G.G., Sergeant Butler R.F.
Longitude and Latitude Min: 147° 0' 0" 38° 30' 0"
Longitude and Latitude Max: 147° 30' 0" 39° 0' 0"

Record No: 52
Aircraft: A9-417
Date: 29 March 44
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Lakes entrance area.
Reason: Missing
Information:
Trainer:
EATS:
Comments 1 OTU. Crew SqnLdr MacPherson, FlgOff Tanner, Woff McGuiness, FlghtSgt Feigert.
Longitude Min Latitude Min 147° 50' 0" 37° 57' 0"
Longitude Max Latitude Max 147° 50' 0" 37° 57' 0"

Record No: 57
Aircraft: A9-426
Date: 13 January 1945
Service: RAAF
Confirmed: No
Origin: Victoria, Australia
Location: Lake Caringle (Lake Garingle RAAF files)
Reason: Unknown
Information:
Trainer:
EATS:
Comments: 1OTU. Departed East Sale on a night flight. Crew: Flight Sergeant Blackie I.D., Flight Sergeant Simon D.J., Flight Sergeant McUthane M., Sergeant Sullivan R.E.
Longitude and Latitude Min: 148° 28' 0" 37° 45' 0"
Longitude and Latitude Max: 148° 31' 0" 37° 48' 0"

Record No: 50
Aircraft: A9-542
Date: 18 March 1944
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: In Lake Victoria, near Storm Point.

Reason: Struck water and sank
Information:
Trainer:
EATS:
Comments: Floated for 5mins before sinking.
Longitude and Latitude Min: 147° 43' 0" 37° 57' 0"
Longitude and Latitude Max: 147° 43' 0" 37° 57' 0"

Beaufort XI

Record No: 53
Aircraft: A9-137
Date: 12 May 1944
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Channel between Victoria Lagoon and Lake Wellington.
Reason: Unknown
Information: Possibly Salvaged
Trainer:
EATS:
Comments: Possibly salvaged for spare parts.
Longitude and Latitude Min: 147° 22' 8" 38° 0' 0"
Longitude and Latitude Max: 147° 28' 8" 38° 4' 8"

Dakota C-47A

Record No: 20
Aircraft: A65-50
Date: Unknown
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Wreckage located Swift Creek.
Reason: Unknown
Information: Possibly Salvaged
Trainer:
EATS:
Comments:
Longitude and Latitude Min: 147° 30' 0" 37° 0' 0"
Longitude and Latitude Max: 147° 30' 0" 37° 0' 0"

DH Tiger Moth

Record No: 2
Aircraft: A17-74
Date: 28 January 1942
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Port Phillip Bay, Mouth of Werribee River.
Reason: Crashed into sea
Information: Possibly Salvaged
Trainer:
EATS:
Comments:
Longitude and Latitude Min: 144° 41' 0" 37° 58' 0"
Longitude and Latitude Max: 144° 44' 0" 38° 0' 0"

DH-94 Moth Minor

Record No: 23
Aircraft: A21-11
Date: 8 July 1940
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Near Point Cook
Reason: Forced landing
Information: Possibly salvaged
Trainer:
EATS:
Comments:
Longitude and Latitude Min: 144° 45' 0" 37° 54' 6"
Longitude and Latitude Max: 144° 50' 0" 38° 0' 0"

Fairey Battle

Record No: 88
Aircraft: K9362
Date: 5 June 1943
Servvice: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Seaspray
Reason: Crashed
Information:
Trainer:
EATS:
Comments: 3BAGS. Crew: Sergeant Stevens R.P., LAC Epps C.T., LAC Fisher D.C.
Longitude and Latitude Min: 147° 5' 0" 38° 20' 0"
Longitude and Latitude Max: 147° 30' 0" 38° 50' 0"

Record No: 85
Aircraft: L5789
Date: 27 December 1943
Service: RAAF
Confirmed: No
Origin: Victoria, Australia
Location: Seaspray
Reason: Crashed
Information:
Trainer:
EATS:
Comments:
Longitude and Latitude Min: 147° 5' 0" 38° 20' 0"
Longitude and Latitude Max: 147° 30' 0" 38° 50' 0"

Record No: 86
Aircraft: V1219
Date: 17 August 1944
Service: RAAF
Confirmed: No
Origin: Victoria, Australia
Location: Near Seaspray.
Reason: Crashed
Information:
Trainer:
EATS:

Comments:
Longitude and Latitude Min: 147° 5' 0" 38° 20' 0"
Longitude and Latitude Max: 147° 30' 0" 38° 50' 0"

Record No: 14
Aircraft: V1250
Date: 21 March 1943
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: In Lake Reeve, 1 mile SW of Letts Beach Air Range.
Reason: Forced landing
Information: Possibly salvaged
Trainer:
EATS:
Comments:
Longitude and Latitude Min: 147° 21' 0" 38° 6' 0"
Longitude and Latitude Max: 147° 30' 0" 38° 12' 0"

Kittyhawk

Record No: 34
Date: 1942
Service: USAAF
Confirmed: No
Origin: United States of America
Location: Fishermans Bend
Reason: Unknown
Information: Possibly salvaged
Trainer:
EATS:
Comments:
Longitude and Latitude Min: 144° 54' 0" 37° 50' 0"
Longitude and Latitude Max: 144° 55' 2" 37° 50' 4"

Record No: 33
Date: 1942
Service: USAAF
Confirmed: No
Origin: United States of American
Location: Fishermans Bend
Reason: Unknown
Information: Possibly salvaged
Trainer:
EATS:
Comments:
Longitude and Latitude Min: 144° 54' 0" 37° 50' 0"
Longitude and Latitude Max: 144° 55' 2" 37° 50' 4"

Record No: 74
Aircraft: A29-71
Date: 16 January 1945
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Lake Reeve, 8 miles from Seaspray.
Reason: Crashed
Information:
Trainer:
EATS:
Comments: 1OTU. Crew: Flight Officer Binning W.J
Longitude and Latitude Min: 147° 17' 0" 38° 17' 0"
Longitude and Latitude Max: 147° 17' 0" 38° 17' 0"

Lockheed Hudson 1

Record No: 31
Aircraft: A16-12
Date: 6 July 1943
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Seaward from Sale
Reason: Unknown
Information:
Trainer:
EATS:
Comments:
Longitude and Latitude Min: 147° 30' 0" 38° 0' 0"
Longitude and Latitude Max: 148° 0' 0" 38° 18' 0"

Record No: 32
Aircraft: A16-32
Date: 6 July1943
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Between East Sale and Flinders Island and Hogan Group
Reason: Missing
Information: Training exercise
Trainer:
EATS:
Comments: Operational Training Exercise and navigational exercise. Crew: Pilot Officer Bowman J.J., Pilot Officer Malone A.J., Pilot Officer Guymer R.A., Pilot Officer McDonald A.F., Pilot Officer Buchanan J.A.
Longitude and Latitude Min: 147° 30' 0" 38° 0' 0"
Longitude and Latitude Max: 148° 1' 2" 38° 52' 2"

Record No: 84
Aircraft: A16-38
Date: 27 October 1942
Service: RAAF
Confirmed: No
Origin: Victoria, Australia
Location: Bairnsdale.
Reason: Wing detached
Information:
Trainer:
EATS:
Comments: Wing detached during gentle dive.
Longitude and Latitude Min: 147° 52' 0" 37° 55' 0"
Longitude and Latitude Max: 148° 20' 0" 38° 30' 0"

Record No: 8
Aircraft: A16-8
Date: 11 October 1942
Service: RAAF
Confirmed: Yes

Origin: Victoria, Australia
Location: Bairnsdale, Flinders Island
Reason: Missing
Information: Reconnaissance flight
Trainer:
EATS:
Comments: Operational exercise. Crew: Pilot Officer Deacon E.R. (pilot), Sergeant Manning A.F., Sergeant Andrews C.H., Sergeant Anderson W.
Longitude and Latitude Min: 147° 40' 0" 37° 45' 0"
Longitude and Latitude Max: 148° 0' 0" 39° 40' 0"

Lockheed Hudson II

Record No: 71
Aircraft: A16-77
Date: October 1943
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Fishermans Bend.
Reason: Crashed
Information: Salvaged
Trainer:
EATS:
Comments:
Longitude and Latitude Min: 144° 55' 0" 37° 49' 0"
Longitude and Latitude Max: 144° 54' 2" 37° 50' 5"

Lockheed Hudson IV

Record No: 59
Aircraft: A16-113
Date: 4 May 1945
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Paynesville seaward, crashed into sea during night flying.
Reason: Missing
Information: Training exercise
Trainer: Trainer
EATS:
Comments: 1OTU. Crashed into ocean during non-operational height seaward training exercise. Crew: Flight Officer Cullen A.S., Officer Maughan M.J., Officer Hammersley A.H., Flight Sergeant Smith R.C., Sergeant Walker F.W.
Longitude and Latitude Min: 147° 57' 0" 37° 55' 0"
Longitude and Latitude Max: 148° 10' 0" 38° 10' 0"

Ryan

Record No: 49
Aircraft: A50-16
Date: 4 December 1943
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: 100 yards seaward, 1 mile off Seaspray.
Reason: Forced landing
Information:
Trainer:
EATS:
Comments:
Longitude and Latitude Min: 147° 12' 0" 38° 22' 0"
Longitude and Latitude Max: 147° 12' 6" 38° 22' 2"

Spitfire

Record No: 65
Aircraft: EF588
Date: 16 August 1943
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Lake Victoria.
Reason: Crashed into lake
Information:
Trainer:
EATS:
Comments:
Longitude and Latitude Min: 147° 40' 0" 37° 50' 0"
Longitude and Latitude Max: 147° 20' 0" 37° 40' 0"

Spitfire FVC

Record No: 5
Aircraft: A58-75 (BS187)
Date: 1 December 1942
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Port Phillip Bay.
Reason: Missing
Information:
Trainer:
EATS:
Comments: Delivered by the RAF 1/40.
Longitude and Latitude Min: 144° 34' 0" 37° 59' 0"
Longitude and Latitude Max: 147° 30' 0" 37° 59' 0"

Unknown

Record No: 26
Aircraft: Unknown
Date: 31 October 1941
Service: RAAF
Confirmed: No
Origin: Victoria, Australia
Location: 1/2 mile south Point Cook Aerodrome in ocean.
Reason: Unknown
Information: Possibly salvaged
Trainer:
EATS:
Comments:
Longitude and Latitude Min: 144° 44' 4" 37° 55' 8"
Longitude and Latitude Max: 144° 48' 0" 37° 57' 6"

Wirraway CA-16

Record No: 18
Aircraft: A20-718
Date: Unknown
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Port Phillip Bay
Reason: Missing
Information:
Trainer:
EATS:
Comments: Ditched into Port Phillip Bay
Longitude and Latitude Min: 144° 48' 0" 38° 3' 0"
Longitude and Latitude Max: 144° 48' 0" 38° 3' 0"

Wirraway CA-7

Record No: 24
Aircraft: A20-180
Date: 2 October 1941
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Wilsons Promontory.
Reason: Unknown
Information:
Trainer:
EATS:
Comments:
Longitude and Latitude Min: 145° 52' 2" 38° 46' 2"
Longitude and Latitude Max: 146° 34' 2" 39° 9' 0"

Record No: 25
Aircraft: A20-189
Date: 6 October 1941
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Swimashore Bay, Wilsons Promontory.
Reason: Crashed into sea
Information:
Trainer:
EATS:
Comments: There is no 'Swimashore bay' at Wilsons Promontory. National parks and Air Force have no idea what bay it refers to.
Longitude and Latitude Min: 145° 52' 2" 38° 46' 2"
Longitude and Latitude Max: 146° 34' 2" 39° 9' 0"

Wirraway CA-8

Record No: 37
Aircraft: A20-404
Date: 14 march 1942
Service: RAAF
Confirmed: Yes
Origin: Victoria, Australia
Location: Lake Glenmaggie, 5kms North of Heyfield.
Reason: Unknown
Information: Salvaged
Trainer:
EATS:
Comments: Parts of this plane have been removed and are now on dam wall and other locations.
Longitude and Latitude Min: 146° 46' 32" 37° 54' 59"
Longitude and Latitude Max: 146° 46' 32" 37° 54' 59

Appendix B:
Aircraft Descriptions

Airspeed Oxford

Designer and model: United Kingdom
Description: Three-seat advanced trainer
Construction: Wooden structure, plywood covered.
Length: 26.3m
Span: 17.76m
Height: 11.23m
Weight empty: 5,380Ib
Weight max: 7,600Ib
Max speed: 188m/h
Service ceiling: 6,500m
Range:
RoC: 320m/min
Engine: 2x370hp Armstrong Siddley cheetah X
Fuel qty:
Crew: 3
Armament:

Avro Anson

Designer: United Kingdom
Description: General Reconnaissance Bomber, multi engined trainer
Construction: Tubular steel, timber and plywood covering,
Bakelite and plywood wings.
Length: 12.88m
Span: 17.22m
Height:3.99m
Weight empty:2,500kg
Weight max: 3,608kg
Max speed: 302km/h
Service ceiling: 5,944m
Range:1,315km
RoC:
Engine: 2x355hp Armstrong Siddley Cheetah IX Radials.
Fuel qty:
Crew:
Armament: 2x.303 machine guns, one fixed in nose & one in
Dorsal turret. Bomb load 360Ib

B-25 Mitchell

Designer: North American Aviation (USA)
Description: Four/ five seater medium bomber
Construction: Metal
Length: 16.12m
Span: 20.60m
Height: 4.82m
Weight empty: 9208kg
Weight max: Max take-off 18,960kg
Max speed: 457km/h
Service ceiling: 6460m
Range: 2454km with 1452kg bomb load
RoC: 4570m in 16min30sec
Engine: Two 1,700hp Wright R-2600-13 Double Cyclone 18-cylinder two row radial engines.
Fuel qty:
Crew: 4-5
Armament: Twin 0.5in trainable forward-firing machine guns in the nose position, two 0.5in trainable machine guns in the dorsal turret, and two 0.5in trainable machine guns in the ventral turret, plus an internal and external bomb and torpedo load of 1361kg

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Beaufort

Designer: United Kingdom
Description: Torpedo bomber.
Construction: All metal stressed-skin construction.
Length: 26.09m
Span: 44.4m
Height: 16.7m
Weight empty: 13,000Ib
Weight max: 21,500Ib
Max speed: 232m/h at sea level, 267m/h at 5,300m
Service ceiling: 5,300m
Range: 1,060/1,600m
RoC:
Engine: 2x12,00hp Pratt & Whitney twin-row Wasps.
Fuel qty:
Crew: 4
Armament: 2,000Ib bomb load or 2,000Ib torpedo, .303, later .5 guns in turret, nose or wing.

Dakota

Designer: United States of America C-47
Description: two/three-seat transport with accommodation for 28 troops, or 14 litters plus three attendants or 10,000Ib (4536kg) of freight.
Construction: All metal stressed-skin construction.
Length: 64.6ft (19.63m)
Span: 95ft (28.90m)
Height: 16.11ft (5.20m)
Weight empty: 16,865lb
Weight max: 31,000lb
Max speed: 230mph
Service ceiling: 24,000ft (7315m)
Range: 1,510m
RoC: 10,000ft (3050m in 9min 36sec
Engine: two 1200hp (895kW) Pratt & Whitney R-1830-92 14-cylinder two-row radial engine.
Fuel qty:
Crew: 2-3 + 28 troops
Armament: none

DH-94 Moth Minor

Designer: United Kingdom
Description: Two seat Elementary Trainer
Construction:
Length: 7.44m
Span: 11.15m
Height: 1.93m
Weight empty: 446kg
Weight max: 703kg
Max speed: 190km/h
Service ceiling: 5,029m
Range:
RoC:
Engine: 1x90hp DH Gipsy Minor 4-cylinder in line air-cooled.
Fuel qty:
Crew: 2
Armament: None

Fairey Battle

Designer: United Kingdom
Description: Light bomber
Construction: All metal stressed-skin construction.
Length: 21.78m
Span: 18m
Height: 20.24m
Weight empty: 6,647Ib
Weight max: 10,792Ib
Max speed: 241m/h at 4,333m
Service ceiling: 7,833m
Range: 1.050m
RoC: 1,250m/min
Engine: 1x1,030hp Rolls Royce Merlin I, II, III, or V
Fuel qty:
Crew: 3
Armament: 1 browning gun forward and 1 Vickers K gun aft.
Bomb load 1,000Ib

Kittyhawk

Designer: United States America
Description: Single-seat fighter and fighter-bomber.
Construction:
Length: 10.16m
Span: 11.37m
Height: 3.23m
Weight empty: 2812kg
Weight max: 5171kg
Max speed: 552km/h
Service ceiling: 9450m (31,000ft)
Range: 1207km
RoC: 765m
Engine: 1x1200hpAllison V-1710-81 12-cylinder Vee engine
Fuel qty:
Crew: 1
Armament: 6x.5in fixed forward-firing machine guns in the leading edges of the wing, plus an external bomb load of 680kg.

Lockheed Hudson

Designer: United States America
Description: General Reconnaissance Bomber
Construction: All metal stressed-skin construction.
Length: 24.82m
Span: 36.90m
Height: 30.33m
Weight empty: 12,000Ib
Weight max: 17,000Ib
Max speed:
Service ceiling: 7,333m
Range: 6hours
RoC: 400m/min
Engine: 2x1,050hp Pratt & Whitney Wasps, or 2x1,100hp Wright Cylinders.
Fuel qty:
Crew: 5
Armament: 2x.303 fixed forward guns, 2x.303 guns in dorsal turret, 1x.303 gun in ventral position. Provision for 2x.303 guns in beam positions. Bomb load, 750Ib.

Spitfire

Designer: United Kingdom
Description: Single seat fighter and fighter-bomber
Construction: All aluminium monocoque fuselage and wings.
Length: 10.14m
Span: 11.23m
Height: 3.86m
Weight empty:
Weight max: 4990kg
Max speed: 721km/h
Service ceiling: 13,565m
Range:1368km

RoC: 870 f/min
Engine: 1 2050 hp Rolls-Royce Griffon 65 12-cylinder Vee engine.
Fuel qty:
Crew: 1
Armament: 2x20mm forward-firing cannon and 2x.5in fixed forward-firing machine guns in the leading edges of the wing, plus an external bomb and rocket load of 227kg

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DH Tiger Moth

Designer: United Kingdom/Australia
Description: Two-seat elementary fighter
Construction: Tubular steel and timber, plywood and fabric covering.
Length: (23ft11in)
Span: (29ft4in)
Height: (8ft9.5in)
Weight empty: 1,115lb
Weight max: 1,650lb
Max speed: 109mph
Service ceiling: 14,000ft
Range: 300miles or 3hrs
RoC: 635ft/min
Engine: 1x De Havilland Gipsy Major
Fuel qty:
Crew: 2
Armament: None

Wirraway

Designer: North American Aviation NA33.
Description: 2-seat multi-purpose low-winged monoplane with retractable main undercarriage and constant speed propeller.
Construction: All metal semi-monocoque wing, fuselage fabric covered steel frame.
Length: 8.84m
Span: 13.11m
Height: 3.66m
Weight empty: 1805kg
Weight max: 2992kg
Max speed: 180kts
Service ceiling: 23,000ft
Range: 740nm
RoC: 1950 f/min
Engine: Pratt & Whitney R1340 of 600hp
Fuel qty: 418ltr
Crew: 2
Armament: 2x.303 Browning mg firing forward, 1x.303 Vickers mg rear 227 Kg

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Vultee Vengence

Designer: United States America
Description: Two-seat general purpose dive bomber
Construction: All metal stressed-skin construction
Length: (40ft)
Span: (48ft)
Height: (15ft4in)
Weight empty: 10,300lb
Weight max: 16,400lb
Max speed: 279miles at 13,500ft
Service ceiling: 22,300ft
Range: 2,300miles
RoC:
Engine: 1x 1,700hp Wright Double Row Cyclone radial air-cooled.
Fuel qty:
Crew: 2
Armament: 4x 0.5in (or 0.303) MGs on wings, 2x 0.5in(or 0.303) MGs on rear cockpit, bomb load 2,000lb.

Ryan

Designer: United States America
Description: Two-seat trainer, communication
Construction: Metal, wood and fabric construction.
Length: (21ft6in)
Span: (29ft11in)
Height: (6ft11in)
Weight empty: 1,100lb
Weight max: 1,600lb
Max speed: 128mph
Service ceiling: 15,000ft
Range: 350miles
RoC: 650ft/min
Engine: 1x 125hp Menasco C4 Pirate 6-cylinder, in-line air-cooled engine
Fuel qty:
Crew: 2
Armament: None
