

## President's Log

*"Patience is a key element of success."*

*Bill Gates*

Over a number of years I have been restoring a 50 year old Austin Healey Sprite, originally purchased by my wife Pattie. Particularly challenging was waiting many months to get the body painted, parts plated and painted, seats reupholstered etc. Pattie and our neighbour Terry Sheppard, provided endless assistance and Terry got into all the awkward places I couldn't. We finally completed finishing the myriad of items, tuning and polishing last Christmas. We are delighted with the result and enjoy driving in this sporty red number.

Likewise the progress on the restoration of former No 87 (PR) Squadron Mossie A52-600 continues to be slow, which is to be expected with the detailed nature of the tasks and limited volunteer resources. However, we can certainly see where all volunteers have been, with the small successes along the way such as the completion of the second undercarriage, tail wheel, elevator assembly, and pilot seat repairs. We all look forward to the immense pleasure and sense of satisfaction in seeing the completion of A52-600. We just need to be patient.

Less evident are the continual updates taking

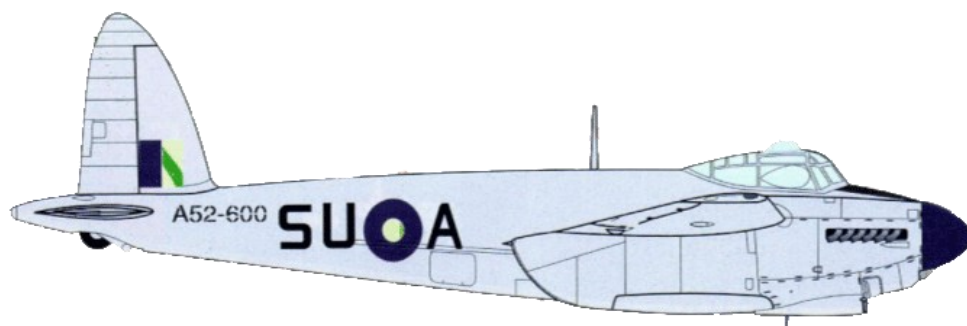


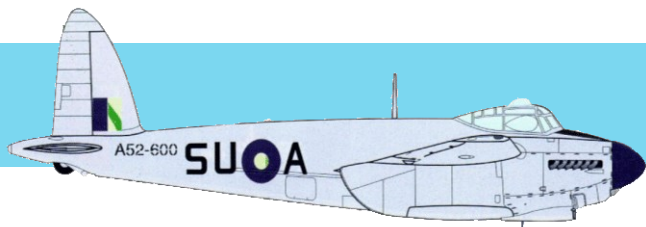
place with respect to drawings and computer database. Bob Stevens has added further photographs, manuals and drawings which will improve tracking down data and drawings required for all parts and assemblies. Drawings have been sourced to add to our existing set or replace the un-readable. For example, ailerons drawings were sourced from Historical Aircraft Restoration Society (HARS) which now houses the de Havilland Australia drawings. In addition, many Mk16 fuselage related drawings have been accessed through the de Havilland Museum in the UK. Both groups have their drawings catalogued and volunteers on hand to assist with requests. On behalf of all of us at Point Cook, many thanks to George Lawrence (HARS), Bob Glasby and Gerry Mears (de Havilland Museum UK) for your great help over the months.

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In spite of the continuing fall in our numbers, due in part to an aging membership, our active members remain an essential part of the RAAF Museum's restorations program. This brings me to alert you to the AGM later in the year. As there will be changes to the committee this year, we would welcome some new faces. Please think about nominating for the committee to help us progress the restoration of A52-600.

This Bulletin includes the next instalment of "A Short History of Aerial Photography" by Peter Lewis and also a paper recently presented by archaeologist Fiona Shanahan, "Meaningful remembrance at Coomalie airbase". Both provide significant insight into issues which are of great interest to us all.

Terry Burke, President  
Mosquito Aircraft Association of Australia Inc

*Pattie in her 50 year old Austin Healey Sprite*



*Terry in the driver's seat.*



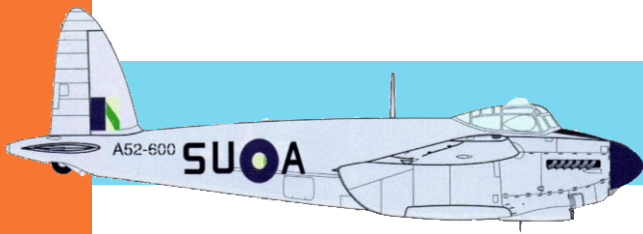
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# Coomalie NEWS

Richard Luxton has now owned the former RAAF Base Coomalie Creek for more than 40 years.

Some of the highlights at Coomalie from recent months:

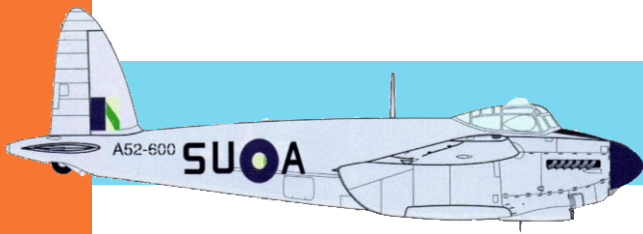
A February fly-in looks and sounded like a great weekend, with Nick Bellfield in his Harvard, Tim and Fiona Shanahan in Tim's Drifter and a couple of others joining in the fun. I like the wet season colours, very different to the dry season browns. The new street art in Austin Lane, Darwin looks good too. Thanks for the update and photos Richard.

Terry Burke



- 1 Elevated view of north end of strip showing aircraft silhouettes painted on the aircraft parking area and airstrip no 17.
- 2 Looking south down strip. Taken by Fiona aboard Tim's Drifter Ultralight aircraft.
- 3 Tim, Fiona and Drifter
- 4 New Street Art in Austin Lane, Darwin





# More Coomalie NEWS

Via Ian Madden, No31 Squadron Beaufighter Association, March 2019 Newsletter.

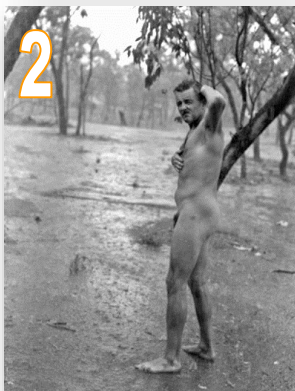
Richard Luxton would like it known that the last Japanese bombing on Australian soil was at Coomalie at 5am on the morning on the 12th of November 1943. He also wanted to say that he let off a firecracker to remember the event. (Apparently the bombing had about the same impact as the Firecracker!!)

This year, in remembrance of the 77th anniversary of the bombing of Darwin, Richard was invited to give the address for the Remembrance service at the Adelaide River Cemetery which was held recently. To quote a friend of his, "What a great recognition of a territory identity who certainly does his bit to preserve the history of WW2."

Richard says he loves it when relatives of original squadron members call in. Sometimes they haven't been before and are really amazed and moved at the experience. Did you know? - Richard lights a flare over the airfield at the time of their funeral whenever an original Sqn member passes on. He says, "This is to guide them on their way". Did you know? - Richard allows family to scatter the ashes of original Sqn members over the airfield?

Richard has reminded me to remind you. if you have never been to Coomalie and you would like to go, then 2020 is going to be the 75th anniversary of the end of the war in the Pacific, and he is going to celebrate. If there is any way you can make it to Coomalie, then you should try at least for this particular year. I personally perform the tours there along with Richard, and we think it's going to be a big one. 15th August is the day. If you want to contact me, I can tell you all you need to know about getting there and what it's going to be like.

Ian Madden 0414 991494



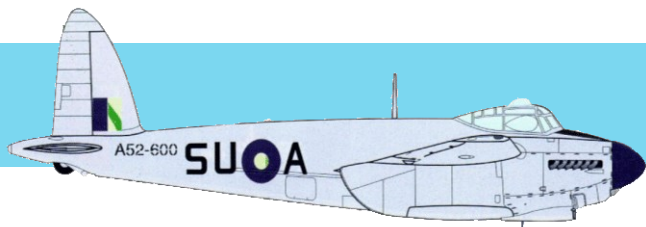
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WINGS November 15, 1945
1

## THE WET

By Sgt Terry Cassidy

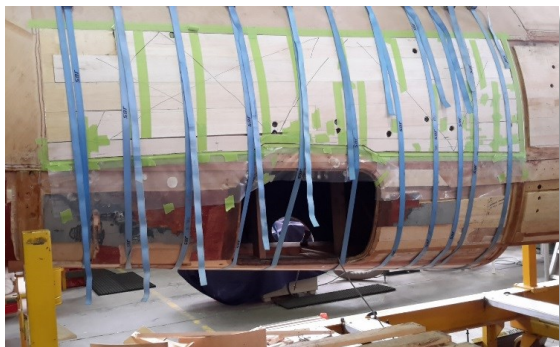
<p>In Yankee issue underpants I sit upon my bed And listen to the drizzle of the raindrops overhead.</p> <p>The water-trench around the tent is just a muddy drain As I gaze upon the vista of the dreary bloody rain.</p> <p>The deluge shrinks the guy- ropes, the tent-pegs all pull out;</p> <p>The upright leans like Pisa and the canvas flaps about, And just to lend it emphasis, in case I wanted proof, I'm regularly pattern-bombed by droplets off the roof.</p>	<p>My dirty clothes are clammy damp, my boots are never dry;</p> <p>I hear the drone but seldom see the aircraft in the sky Because the place is blanketed, by night as well as day, With never-ending canopy of dull, depressing grey.</p> <p>Your sinful soul gets sodden and the moss grows on your mind;</p> <p>You get all misanthropic to- wards the rest of human- kind;</p> <p>You swear about the present and you brood upon the past, And count the weeks and days until you're safely home at last,</p>
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- 1 Poem penned by Sgt Terry Cassidy in 1945 captures the thoughts of young blokes camped in war time Darwin area enduring the wet. (Courtesy Ron Vassie collection.)
- 2 Showering in the wet.  
(S. Gore collection State Library Western Australia).
- 3 Flooded tent.  
(S. Gore collection State Library Western Australia).



## Restoration News - A52 600

Work has continued de-skinning the outer layers of timber ply, spruce and balsa to remove the old failed glue on the Mossie fuselage upper surface by the Wednesday team. New outer ply has been successfully re-installed to the fuselage on the lower outer sections of the starboard side forward of the new tail segment and around the rear access hatch towards bulkhead #4. Temporary Internal stiffening has been installed so that the fuselage strength can cope with the strapping.



Similarly, repairs are continuing reconstructing the missing 1/3 lower end of the trailing antenna, which had been cut off to allow access to a hard point to support the fuselage. For details refer previous reports.

Restoration of the pilot's seat is continuing. Kyle, Terry, Ron



Gretton, John McCrystal, Bob Tomlin and museum staff are progressing the work. The seat components have been repaired, painted and re-assembled by riveting and bolting. Some missing components and safety webbing is required to complete the seat.



Drawings and parts for the Navigators seat are being sourced. It is yet to be confirmed that the upper section of the seat is missing.

The missing bolts from the main undercarriage have been manufactured from an order by David Jones the Technical Curator. These have been installed by Peter and Eddie where required in the undercarriages. They are cataloguing the restoration of both main undercarriage assembly's components. The chaps also found the tail wheel hub and the axle to fit the tyre to the tail wheel assembly. Looks good, well done lads!

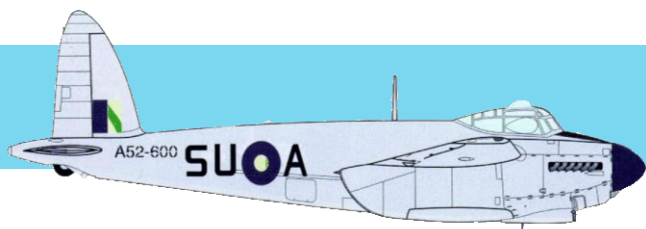


Cataloguing of all the fuel tanks in the bomb bay area and wings has been completed by Pat, David and Ron Gretton. Pat and David have been searching for associated components for cataloguing and restoration. It has been confirmed that the Bomb-bay rear Long Range Fuel tank is missing.



(Continued on page 6)





Work continues on the 'in-house' restoration of the tail wheel mud guard and it's support structure by Ron Gretton.



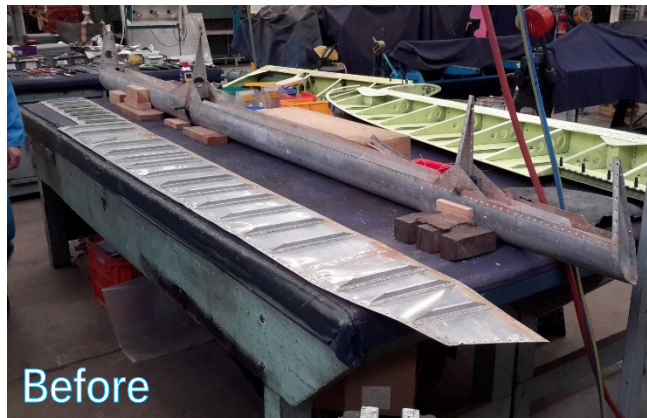
Great progress has been achieved with the restoration of the tail elevators and trim tabs by Ron Gretton, John McCrystal Bob Tomlin and Warwick Smalley. Warwick spray painted the components in the new museum spray booth.



Restored Elevator Trim Tab.



Work has started on the restoration of the wing Ailerons by Ron Gretton, John McCrystal and other volunteers. The aileron trim tabs appear to be missing, so a decision will have to be made as to try and find a pair or build new ones from scratch.



Before

The man and his handy work - good job, John McCrystal.



After

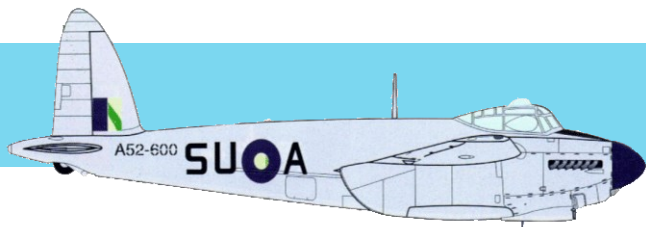
The team has been asked to help the Wednesday wood worker volunteers to provide cross section profiles to help with the repair of the port side of the fuselage between bulkheads #3 and #4. See picture below showing where a 600 long x 400 deep piece of fuselage has broken away.



The latest challenge for the MAAA team is to investigate what components we have of the wing flaps and control mechanisms and discuss restoration options.

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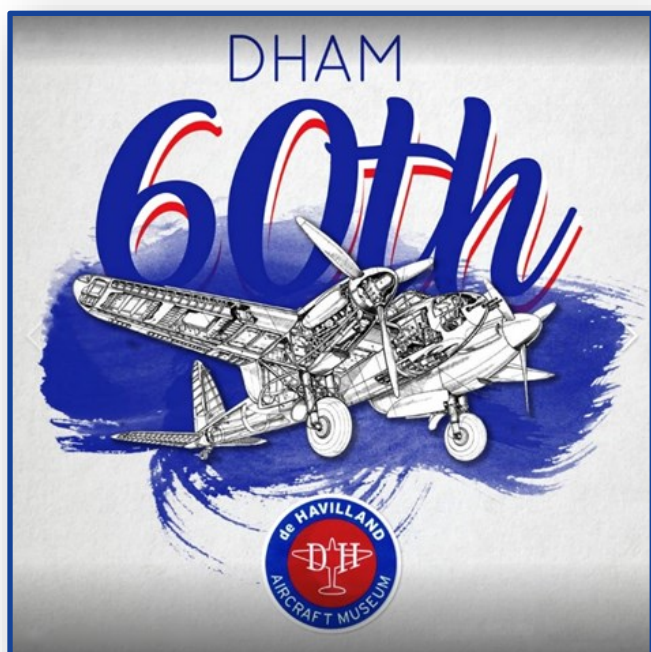
Work continues on cataloguing of the contents of the Mosquito storage racking by David and the MAAA team and clean up and reconfiguring by Bob of our major computer parts data inventory. "Safe Working", and thanks for your continued effort.

**Ron Gillis - Restoration Coordinator**



Warwick Smalley working in the spray booth.

# de Havilland Aircraft Museum



The de Havilland Aircraft Museum, UK, celebrates its 60th anniversary this year.

It became the first aviation museum in Britain when it opened to the public in 1959.

The museum is dedicated to the preservation and display of de Havilland Aircraft as well as the story of the de Havilland Aircraft Company and its significant role in the history of aircraft development in 20th century Britain.

The de Havilland company created world beating aeronautical innovations including many iconic aircraft such as the de Havilland Mosquito – "The Wooden Wonder", the Comet – the world's first jet

Images from

<https://www.dehavillandmuseum.co.uk/>

airliner, the Tiger Moth – the "backbone" of the RAF's training aircraft in WWII and the Airspeed Horsa Glider – used extensively by our airborne troops in 1944 during D-Day, Arnhem and the Rhine crossing.

The de Havilland Aircraft Museum is mostly staffed by volunteers who perform a wide range of tasks according to their skills.



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*DHAM 60th Anniversary*

# DHAM 21<sup>st</sup> Century Project

Together with funding received from several Trusts and donations from many supporters, the “de Havilland Aircraft Museum in the 21st Century Project” is now being built. It is a significant investment in Hertfordshire’s aviation heritage and Community facilities.

The Project enables the building of a large new hangar at the museum, providing an all-undercover experience for visitors to see a range of historic aircraft designed by the de Havilland Aircraft Company at its Hatfield factory. The New Hangar also provides a range of syndicate rooms on a mezzanine floor which will offer the local community a venue for meetings, conferences, parties, learning and other social events.

[Donations](#) are still needed to complete the project and will help continue work in preserving the de Havilland Heritage.



Artist impression of the new hangar at the Museum. de Havilland Aircraft Museum  
<https://www.dehavillandmuseum.co.uk>





## Mission Completed Tributes

### Flt Sgt Joseph Ward DFM RAF

Recently Joseph Ward passed away at his home in Melbourne. His early life and RAF service in the UK included flying de Havilland PR Mosquitos, PR English Electric Canberras and eventually flying helicopters.

From an English farming family background, Joseph joined the RAF during WW2 at the minimum age; starting in the UK, Joseph was sent to the US Navy's advanced training facilities. He eventually qualified as pilot in command of twin engine PBY (Catalina) air-craft. Returning to the RAF in England expecting a posting to an operational squadron, instead found himself on Civvy Street as the War in Europe drew to a close. After four years of little job satisfaction, he walked into the RAF Recruiting Office in London. Shortly after, he was back in uniform.

As the Cold War became increasingly tense, he was posted to a conversion course on PR Mosquitoes which were still a front line aircraft in the late 1940s. Some interesting times followed, flying both from England and advanced bases in Germany, with missions "close to" the USSR borders. From Mossies, Joseph converted to PR Canberras.

Joseph extended his time with the RAF, eventually converting to helicopters as he rightly predicted that rotary pilots would soon be in demand in civilian life. Another of his "interesting" escapades involved a mission into a small jungle clearing in Malaya during that country's Emergency. The photo at right shows what can only be described as a very dangerous looking young man indeed!

Leaving the RAF, he joined Bristow Helicopters, the largest civilian operator of rotary wing aircraft in the UK and one of the largest in the world at that time. After many years in Africa, he left to join the fledgling Ansett Helicopter Services in Western Australia. His adventures in helicopters over remote areas of the north west were legendary.

Joseph spent many years in retirement in WA; where he and his wife travelled extensively in a camper van, locating and recording hundreds of native orchids. One of the new types identified will eventually have his name attached to its official description. Joseph Ward retained a keen interest in aircraft and the broader world until the end.



More recently Joe moved to Melbourne to be near his family which enabled our association members to enjoy Joe's company and learn more about his life story.

*Fine winds, fair weather, God speed Joseph.*

Terry Burke





# New Zealand MOSSIES



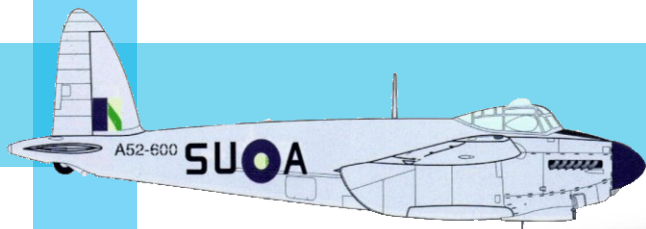
Mosquito, FB VI PZ474, resplendent in camouflage upper surfaces, D-Day invasion stripes, red propeller spinners and rockets under wing. (Classic Aircraft Photography)

A newly restored Mosquito, FB VI PZ474, recently flew in NZ and is now in the US at the Lewis Air Legends Museum, San Antonio, Texas. This Mossie is the third example of a flying "Wooden Wonder", built in NZ. The Mosquito Aircraft Restoration Ltd team under the watchful eye of Glyn Powell, constructed the wooden fuselage using jigs and tooling which he has developed over 30 years. The Avspec Ltd team led by Warren Denholm, re-furbished, re-manufactured, assembled and made airworthy the Mossie, ably support by many talented NZ & US sub-contractors and pilots.

The Mossie was originally constructed at Hatfield in 1945 and used for RAF training before moving on to New Zealand in 1948, where it was delivered to 75 Squadron as NZ2384. In the early 1950s, the aircraft was acquired by new owners before being transferred to the United States. There, the Mosquito was given civil registration and it was believed that the Mossie was used by the CIA for intelligence gathering in South America. In 1970, PZ474 was abandoned and began a period of decline. It was rescued in 2014, when it was acquired by Lewis Air Legends.

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# New Zealand MOSSIES

Mark No.: FB.V1  
Serial No.: PZ474, also NZ2384, ZK-BCV  
and N9909F

Owner: James Merizan

Location: Yorba Linda, California, USA



By 1970, PZ474 was in a very poor state and the fuselage had been cut behind the wing. Jim Merizan is considering the use of plastics to restore the fuselage.



Glyn Powell

PZ474 in final stages of restoration at Avspec prior to test flying.

Warren Denholm (back row 4<sup>th</sup> from left), owner of Avspecs Ltd and his talented team. Second on the right is Glyn Powell, owner of Mosquito Aircraft Restoration Ltd. First on the right is Mike Tunnicliffe, Glyn's assistant, in front of PZ474.

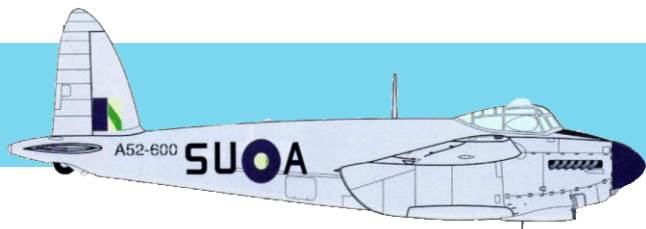


The original Merlin engines were overhauled in the US and re-fitted.



Photos courtesy of AVSPECS and Gary Bridger.





*This article was originally published in Signals, the journal of the Australian National Maritime Museum, Issue 124 .September—November 2018.*

*Reproduced with permission.*

# Meaningful remembrance at Coomalie Airbase

## DEFINING WHAT IS 'IMPORTANT' IN REGARD TO HERITAGE

*For whose benefit and remembrance do heritage professionals manage and preserve World War II aviation sites? Archaeologist **Fiona Shanahan** provides some answers from her work at Coomalie Airbase in the Northern Territory.*



The last operational flight of World War II from Australia's mainland returning to Coomalie after peace had been declared, 1945. Image courtesy MAAA.

It is the role of heritage professionals to engage with sites and the people for whom those sites have meaning. We do this through legislation, site visits, interacting with the participants of the site and implementing flexible management plans. At World War II aviation sites, we should aim to provide a management plan with protections that ensure that those engaging with the site are able to experience meaningful remembrance. To achieve this, we must explore how and why we define sites as important, establish what protection we can provide and, most importantly, identify the site's stakeholders.

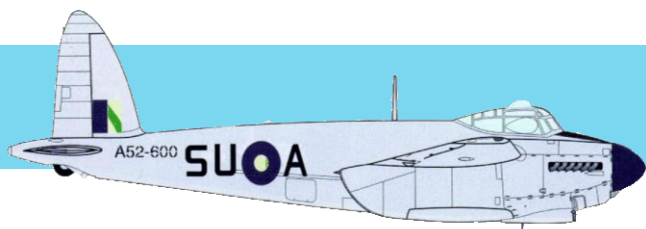
In 2015, 70th anniversary commemorations were being planned for Coomalie, a World War II airbase in the Northern Territory. I was discussing them with someone without a heritage background when they asked the hard-hitting questions:

- How do heritage professionals decide if a site is important?
- At what point do you stop researching the site?
- How do you know that you have spoken to all of the right people in regards to the site?

These questions led me to change my research topic at Coomalie. I went from studying the living history evident at the site, to studying meaningful remembrance – the way that sites are used in the active remembrance of a place or time, or by people associated with that site.

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Coomalie is located approximately 83 kilometres south of Darwin. It was constructed in November 1942 as a satellite airbase to Batchelor, some 14 kilometres south-east, in response to the Japanese bombing of Darwin in February that year.

At its peak, Coomalie was home to 2,000 military personnel. These units mainly consisted of photoreconnaissance units (87 Squadron, No 1 Photoreconnaissance), bomber units (31 Squadron), secret wireless units (No 2 Wireless Unit) and travelling units as the war progressed (34 Squadron).

Coomalie holds an important place in Australia's World War II history due to four major events that occurred there. Firstly, Coomalie was the last location to be bombed on Australia's mainland during World War II, on 12 November 1943 (the 64th Darwin raid). Secondly, No 1 Photoreconnaissance was born there, on an active airbase during wartime, which is rare for the Royal Australian Air Force (RAAF). Thirdly, the investigation of a crash there in August 1945 (in which pilot Frederik Gillespie was killed and navigator Frank Haynes seriously injured)<sup>1</sup> led to the establishment of protocols to be undertaken by



Richard Luxton, the current landowner of Coomalie airbase, 2015. Image courtesy Jordan Gannaway

pilots and navigators prior to take-off, which are still used by the RAAF today. Finally, Coomalie was the site at which the last operational flight from Australia's mainland took off during wartime and returned during peace.

After the war Coomalie was abandoned by the military and in 1977 was purchased as farming land by Richard Luxton. Richard has remained the

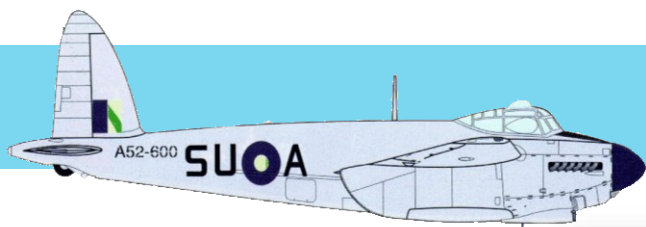
owner to the present day, and has always approached the site and its wartime objects with the aim of maintaining a living history. This has seen Coomalie remain mostly intact and allows a wide variety of people to visit and interact with the site in a meaningful manner.

Due to this rich wartime history and the current condition, it has been argued that the site is important. But how do heritage professionals define 'importance' in regard to the heritage in Australia's Northern Territory? To answer that question, I reviewed government heritage websites and heritage reports and was surprised to find that despite using the words 'important', 'significant' and 'valuable' to justify listing or not listing sites on the heritage register, it was never explicitly stated how those words are defined. Rather, four broad categories – aesthetic, historical, scientific and social – are listed in the 2017 Heritage Council report to establish this meaning.

As of May 2018, 302 sites had been declared for listing and protection in the Northern Territory, of which 47 sites were World War II related. Since the establishment of the Northern Territory Heritage Register in 1991, 60 per cent of World War II sites and objects nominated for heritage listing and protection have been approved. Coomalie is one of them. It was nominated for heritage listing in 2007, when heritage-nominated sites were assessed against 16 criteria (in 2008 this was altered to eight criteria as an Australian standard for all states and territories). These criteria are assessed in the process of producing a heritage report of the site.



Coomalie Airstrip, 2015. Image courtesy Jordan Gannaway



Richard R Searle (Lyn Hutton's father) and his wartime friend Jack McAuley standing on their tent site. Image courtesy Lyn Hutton

*(Continued from page 13)*

The heritage assessment report for Coomalie was produced in 2007 and unfortunately is an example of the need to change how desktop assessments are completed. The front-page image of the report is that of a World War II airbase in Western Australia, not Coomalie.

The criteria section of the report stated that Coomalie did not meet the first eight criteria, as it was not nominated for its natural attributes. The remaining eight criteria were addressed in two to three sentences, which were not substantial enough to determine whether the site was eligible for heritage listing. Furthermore, Richard Luxton was not made aware that his property had been nominated for heritage listing until after the report had been written, and therefore Richard's resources and knowledge of the airbase were not utilised. Due to the lack of a site visit, the report could not detail the state of the airbase in 2007. The way this assessment was conducted is one that should be discouraged. Rather, it is advised that all heritage assessments be conducted in a way that engages with site owners and involves at least one site visit. Once aware of the nomination, Richard approached the Heritage Council and in 2011 the Coomalie airstrip and 50 metres either side of it were declared for heritage listing and protection.



A group of Coomalie veterans' descendants prior to a dinner held on the site of the officers' mess at Coomalie in 2015. Image courtesy Jordan Gannaway

Knowing that the main camp and work sites are approximately one kilometre from the airstrip, as a heritage professional I wonder if this is enough protection for Coomalie.

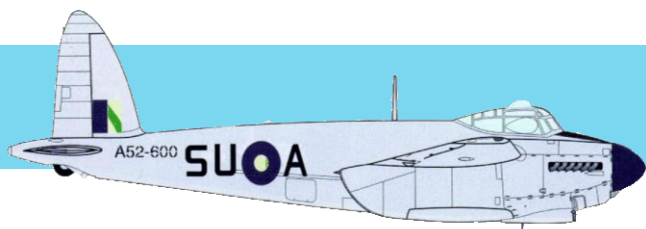
However, the only way to establish if such protection is suitable is to understand who the active participants or consumers of the airbase are. The use of the term 'consumer' is appropriate for this assessment, as a consumer is 'someone who uses a place, service or item for personal use' and that is exactly what people who visit past conflict sites seek to do. So who are the consumers of Coomalie?

Arguably the most important consumer group are Coomalie veterans. Veterans have been revisiting Coomalie over a number of decades for varying reasons. Some return to remember lost friends, to show their families and/or friends where they served, to remember their time there or to reunite with old wartime friends. Due to the varying reasons for remembrance, this occurs in differing ways.

At the 70th anniversary commemoration, Lyn Hutton told me that her father and his wartime best friend met at Coomalie a few years earlier. This was the first time they had seen each other since the war and they were able to look at photos of their time there and revisit the sites (such as their tent site).

Other veterans have been able to fly down the Coomalie airstrip due to the active recreational pilots in the area. Richard Luxton has found that families have begun sending the ashes of past





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Coomalie veterans to Coomalie with the request they be scattered on the airstrip. Additionally, every time a Coomalie veteran dies, Richard lets off a flare on the Coomalie airstrip on the day of their funeral. An example of this was the flare set off for Air Vice Marshall J C 'Sam' Jordan in July of this year when his funeral was held. Due to the role the Coomalie airstrip plays in allowing Coomalie veterans to gain meaningful remembrance, its heritage listing, protection and management are vital.

With the Coomalie veterans aging and passing away, the number of their partners and descendants visiting Coomalie is steadily rising. Veterans' widows visit mainly to gain an understanding of why the site meant so much to their husbands, or to finally see where their wartime letters had been coming from. Since my involvement with Coomalie in January 2013, I have met more than 20 descendants of Coomalie veterans. Descendants visit for similar reasons to those of Coomalie veterans' partners: they want some context.

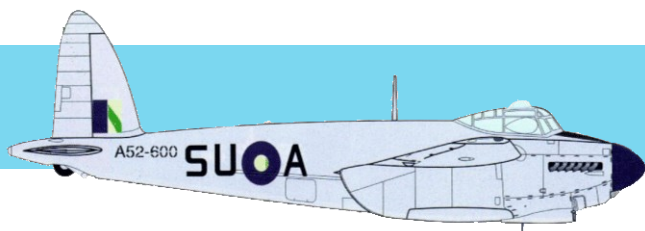
Doug Nicholas is one such example. He contacted me in 2016 hoping that Coomalie might still be accessible and parts of it might remain. He had heard stories and seen photos that his father had taken and he wanted to be able to place them in context. His father's role was to fit cameras for flight operations. Doug recalls his father talking about Gillespie's crash and the melted camera from the aircraft. When visiting Coomalie in 2017 Doug held that same melted camera, and stood where his father had stood before on the original 1942 sealed Coomalie airstrip.

Current members of the 31 and 87 Royal Australian Air Force Squadrons have recently begun actively engaging with Coomalie. In 2016 five current members of 87 Squadron attended the 70th anniversary commemorations. While being shown the site of 87 Squadron, one member remarked that in his current role, if he had served during World War II he would have most likely been posted there. After the memorial service held on the site of Gillespie's crash I asked them what they thought of it. They said that despite attending numerous services as part of their duty, this was different because it was the actual site where one of their own had died. In June of this year I met another 87 Squadron member at Coomalie and he



Re-enacting the last operational flight from Australia's mainland at the 60th anniversary of the end of World War II, 2005.

Image courtesy MAAA



(Continued from page 15)

stated that the visit far exceeded his expectations and he hoped to learn more of Coomalie's history on his return from service overseas.

For at least the last three decades, Royal Australian Air Force cadets have been camping and training at Coomalie. Richard Luxton notes that after graduating, those that progress into the Royal Australian Air Force often return to Coomalie to reflect on their camping and training experiences at an actual World War II airbase. The ability for children and teenagers to be able to actively engage with World War II history has proven invaluable for their education, as they are more likely to remember the site visit than what they read about in books.

It is not only defence personnel that engage with Coomalie; a number of local community groups and individuals regularly visit. The local recreational flying club is actively engaged with Coomalie. The pilots are known to willingly offer veterans and descendants free flights from the airstrip around the site. This offers the opportunity for the passengers to share their knowledge of the site as well as for the pilots to illustrate where certain building foundations, taxi ways and other World War II objects and structures remain today. The active involvement of these pilots allows Richard Luxton to manage the site in a flexible manner. The pilots are likely to identify any changes and damage to the site much sooner than Richard would be able to, due to the sheer size of the site.

Maintaining a living history for active participants at Coomalie is the ideal that Richard Luxton has maintained for over 40 years. This goal has allowed for the implementation of a flexible management plan which is supported by the current heritage listing of the Coomalie airstrip.

The management plan can be adjusted to each of the different consumer groups currently engaged



Doug Nicholas at Coomalie, 2017. Image courtesy Doug Nicholas

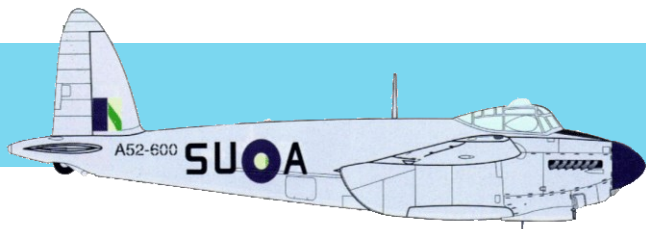
with the site as well as any new groups and individuals that seek the ability to achieve meaningful remembrance in the future.

In summary, providing meaningful remembrance at World War II aviation sites is possible, as evidenced by Coomalie. It does, however, take time and a flexible approach, and requires the heritage professionals involved to actively engage with the site themselves.

Fiona Shanahan is a consulting archaeologist in Australia, specialising in aviation and conflict archaeology. She has published papers in regard to Coomalie and its living history as well as creating the first definition for 'aviation archaeology'. This is an edited version of a paper she presented at the Archaeology of War conference at the Australian National Maritime Museum on 23 June 2018.

Fiona Shanahan, (2018) Meaningful Remembrance at Coomalie Airbase, *Signals quarterly*, Number 124, September-October-November 2018, Pages 33-36





# A Short History of Aerial Photography - Part Two

By Peter W Lewis, BSc, MAusIMM, MAAA

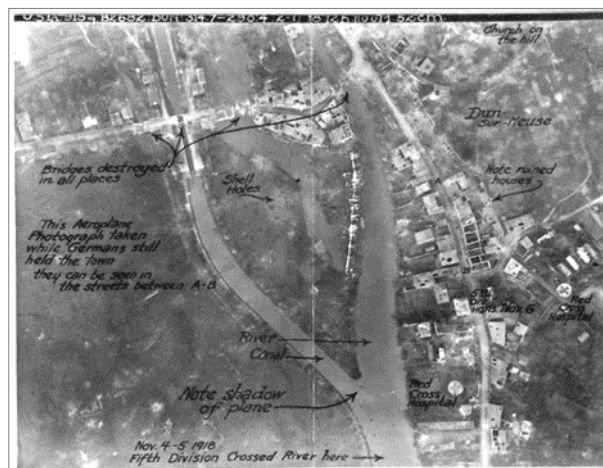
*Dedicated to all the gallant photographic reconnaissance flyers of World War One and World War Two.  
We will remember them.*

## The Interwar Years 1919 to 1939

By the end of “The Great War” or “the war to end all wars” as the survivors began to call it, aerial photography was established as a legitimate technology of warfare, but would there be applications in the peace which somewhat unexpectedly broke out in November 1918? The answer is a resounding yes, but as usual in the history of human technological advancement it required individuals with vision, experience, courage, daring and finely honed risk taking skills to realise the advances. This chapter will focus on seven such individuals although in fairness there were thousands of contributors. All shared common traits: born into the last years of the 19<sup>th</sup> Century; tested as young men in various ways by their experiences in World War One; all went on to make great contributions in the years ahead. Some acquired great wealth; some served and led worthy lives; some thrived and had great lives; while others disappeared into obscurity. This is the story of how the new technology of aerial photography began to be used for peaceful purposes.

*(Please note there is a glossary of terms used and some very brief notes on the technology of aerial photography at the end.)*

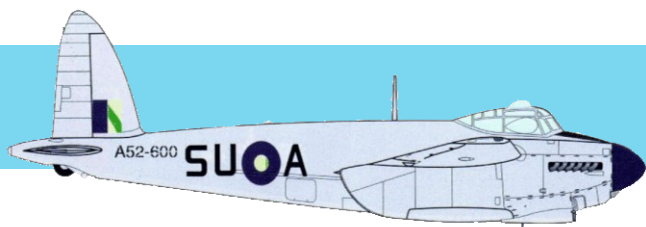
Aerial Photographic Analysis by Doughboy Cartographer, Willard B. Prince. Maps of the First World War: An Illustrated Essay and List of Select Maps in The Library of Congress, Second Edition by Ryan Moore.



### Introduction

After hostilities ended 22 year old Lawrence Wackett, newly promoted to Major was placed in command of Number 7 (Training) Squadron AFC in England early in 1919. This command lasted only two months as 7 Sqn. was soon disbanded as post war demobilisation gained pace. Wackett, who had been awarded the Distinguished Flying Cross for his gallant flight on 25<sup>th</sup> September and an aerial ammunition drop over the Hindenburg Line battle a few days later, was soon shipped back to Australia where he chose to remain in the AFC as one of the small core of officers charged with developing a peacetime Australian air force. Wackett became Squadron Leader after the formation of the Royal Australian Air Force in March 1921 and by 1924 had designed and built his first aircraft. The “Warbler” was a parasol wing monoplane powered by a two cylinder, 25hp engine of his own design. Wackett eventually left the RAAF and went on to develop many aircraft in a remarkable career, but he no longer featured in the story of aerial photography.

*(Continued on page 18)*



As the combatant nations began to adjust their requirements for peace through 1919 and beyond one fact becomes obvious: all air forces largely lost interest in aerial photography as a branch of their air activities as other post war priorities prevailed. Many of the really significant developments after WWI were privately funded and developed for commercial purposes. However, the RAF did retain a photography school and this brings us to the first of our seven post war figures.

### Frederick Charles Victor Laws

FCV Laws was born in Norfolk, UK (1887 – 1975), later became Group Captain, RAF,



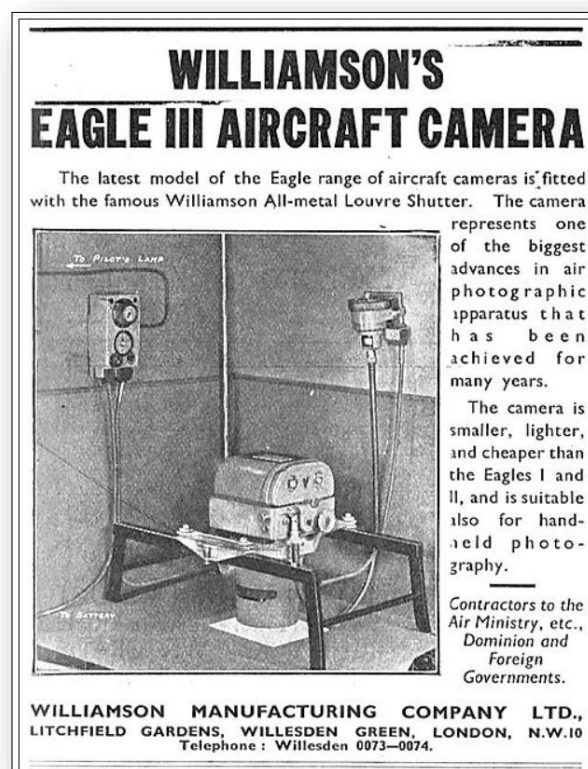
Group Captain Laws. Air Photography in war, 'Flight' Aug 27, 1942

awarded with CB and CBE, and was known to all who served under his guidance as “Daddy” Laws, as he was widely regarded as the “Father of RAF Aerial Photography”. Victor Laws was an early proponent of aerial reconnaissance, attracting attention as early as the Battle of

Neuve Chapelle in March 1915. In a daring series of photographic flights over the German lines, Laws so impressed the British commanders with the results (after leaning over the side of an aircraft and taking pictures with a hand held camera) that he was soon withdrawn from the frontline and despatched to Farnborough to start the RFC School of Photography, to meet the demand for trained photographers. Later in 1915, Laws became the first commanding officer of the School with the rank of Second Lieutenant!

By war's end Laws was described as “the most

experienced aerial photographic advisor in England and probably the world” and awarded OBE for his service. Victor Laws stayed on in the RAF and served twice more as CO of the RAF School of Photography in 1924 for six years and again briefly in 1933 but retired from the RAF after becoming disillusioned with the lack of official interest in his field. Laws had led the development of the F24 camera, capable of taking roll film, from 1925 onwards, which was eventually manufactured by the Williamson Manufacturing Company in London becoming the standard camera in use by British forces in World War II.

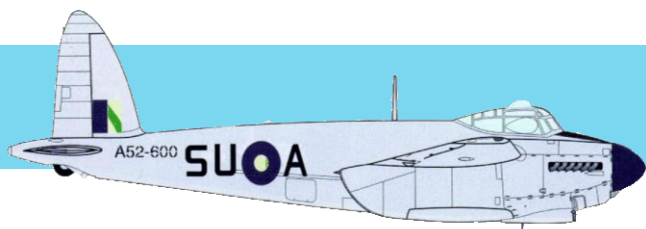


The Aviation Ancestry Database website of British Aviation Industry advertisements dating from 1909-1980.  
<http://www.aviationancestry.co.uk>

Laws had served his country and craft loyally but later in 1933 he relocated to Western Australia to lead an expedition of aerial photographic survey of the eastern goldfields

(Continued on page 19)





on a commercial contract for the Western Mining Corporation, using two DH84 Dragon aircraft and Williamson cameras including the Eagle III and one Eagle IV, derivatives of the F24 and at the time the state of the art vertical cameras for aerial survey and mapping. Laws successfully assembled a team of pilots (3), photographers (8) transport drivers (2) radio operators (5) aircraft engineers (4) and geologists (3) and relocated the operation to Kalgoorlie and set about producing the aerial surveys. Significant difficulties had to be overcome to achieve useful results owing to the rather flat and featureless landscapes. An innovative method of using trucks and radio communication to the aircraft for positioning of the flight lines was employed for this purpose. The survey continued to 1935 and whilst not producing much of success in identifying potential gold deposits was a significant step forward in progressing aerial photography in Australia. FCV Laws eventually returned to the UK with the threat of another war approaching.

Two of Laws' team, Charles Snook (pilot) and Stuart Gore (photographer) went on to serve in the RAAF in World War II. Photographer Stuart Gore served with No 1 Photographic Reconnaissance Unit at Coomalie Creek, NT from 1943 to 1944. 1 PRU became No. 87 Squadron in September 1944.

Laws returned to the service in 1939 when RAF command found that they had few capabilities in aerial photography and it was belatedly realised this would be of crucial importance in the next war. Group Captain Laws again served with distinction as Deputy Director, Photography at the Air Ministry. Laws deserved a knighthood for his achievements (in my opinion). Perhaps he had told too many RAF



*'Mrs. W.S. Robinson, wife of the Company's founder, christening the two de Havilland Dragon aeroplanes, "Gay Prospector" and "Golden West" in October 1933 prior to them being used to survey tens of thousands of square miles of the eastern goldfields.'*

*The Australian newspaper, 8 April 1935.*

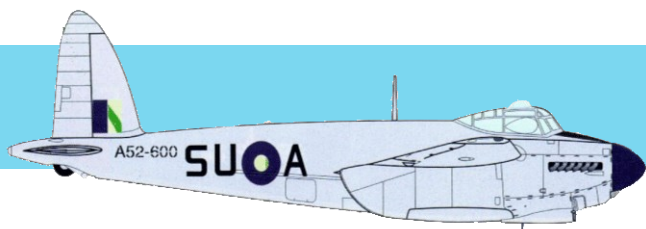
"bigwigs" truths that they couldn't see for themselves in 1933! The motto of the RAF School of Photography: "Luce Scribimus" "We write with light".



*Western Mining Corp. truck, one of two used, to deploy radio direction finding equipment to enable bearings to be determined from survey aircraft, transmitted to base station, plotted on chart and then flight-line transmitted to the aircraft. It was the first time a radio navigation system had been used for aerial survey work.*

*S Gore collection, WA State Library*

*(Continued on page 20)*



## Francis Lewis Wills

FL Wills, born in Wandsworth, London (1893-1980) is the second significant figure in this story. In the interwar years Wills and his associates built the first company finding commercial applications of aerial photography in the UK, eventually employing 600 staff. He was also eventually known to all as “Daddy” Wills (it must be a British thing). In 1940 all of the expert staff and specialist equipment of the company were absorbed by the British Government to fill the gap in expertise in this field, becoming the nucleus of the Central Interpretation Unit at RAF Medmenham. FL Lewis meanwhile went to the School of Photography, Farnborough as Chief Technical Officer in 1941. But, we have jumped too far ahead in the FL Wills story.

Francis Wills studied architecture after leaving school but as with all the youth of his generation the outbreak of war with Germany intervened. Wills joined the Royal Navy rising through the ranks, listed as a Petty Officer in 1916 and transferred to the Royal Naval Air Service. In May 1917 Wills was an Observation Officer training at Hendon and later that year



Francis Wills (in front seat), Jerry Shaw and Claude Friese-Greene posing in AIRCO Ltd.'s De Havilland DH.9B, K-109, 11 July 1919.  
[rcanmw.gov.uk](http://rcanmw.gov.uk)

as Observation Officer, Sub Lieutenant based at RNAS Great Yarmouth. There was a huge build up in RNAS patrolling in the North Sea to counter the German U-boat threat and by late 1917 they were flying the “Large American” Curtiss H12 flying boats, with a crew of four, on North Sea patrols from Great Yarmouth and other east coast bases. Flying as far as the German North Sea ports of Emden, Cuxhaven and Wilhelmshaven, this would have been tough work for the crews in open cockpits over open water and on long duration flights. Wills survived the war having gained an appreciation of the capabilities of aerial observation and photography and had lots of time on those long patrols to think about what he wanted to do after the war. He was demobilized early in 1919 with a clear vision ahead.

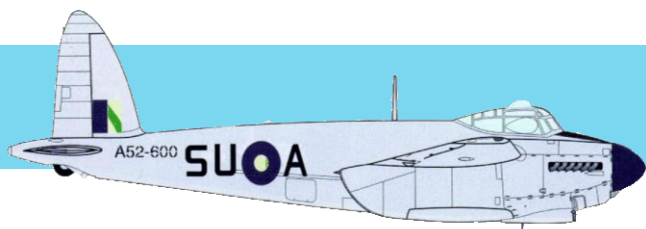


Commercial aerial photography by biplane was pioneered by Aerofilms from 1919. Pictured is a de Havilland DH50 1923 aircraft in Aerofilms livery. Aerofilms Collection

Later in life Francis Wills wrote “I thought of the idea and went to a friend and put it to him. Soon after we started Aerofilms and Surveys Ltd. When I left there was a staff of 600”. That friend was Claude Grahame-White who put up the capital to fund Wills idea. Aerofilms was established in May 1919 and was the first private

*(Continued on page 21)*





company formed in the UK to find commercial applications for aerial photography. Initially based and flying from Stag Lane Aerodrome, Edgware, London, with a rented Air Co DH9 aircraft, it was a risky business as they had to create a market from nothing for their pictures. There must have been quite a large amount of daredevil derring-do behaviour from this group of young men who were conditioned to risk taking in war and now in this new and exciting venture. Wills and Grahame-White were clearly on good terms with other significant figures in early aviation such as Alan Cobham (who piloted aircraft for Aerofilms) and Geoffrey De Havilland (who developed many of his early designs at the Stag Lane workshops).

Money was tight, they soon relocated to Hendon



Southwark Boating Lake; Francis Wills with pilot Gordon Olley made a forced landing following engine failure; February 1920. [rcahmw.gov.uk](http://rcahmw.gov.uk)

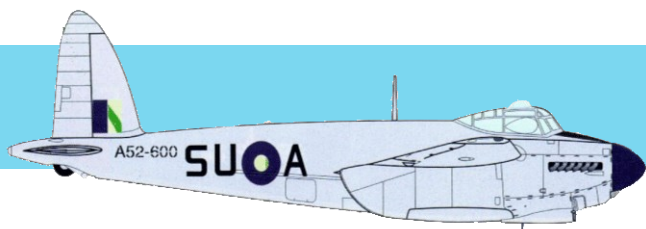
operating from Grahame-White's own apartment in the London Country Club adjacent to the flying ground and developing glass plate negatives in a bathroom converted to a darkroom! Aerofilms came to the attention of the law on occasions, having crash landed twice in 1920 attempting to get low level pictures for their clients (Wills himself was the photographer. He was summonsed to court for low flying but escaped conviction). They were also warned off on occasion by Special Branch for approaching too close to sensitive sites.

Nevertheless their photography became popular especially with local councils and various industries and the business began to thrive and expand specialising in oblique aerial photography, flying anywhere in Britain for clients. Aerofilms Ltd was purchased by Aircraft Operating Company Ltd in 1925, with FL Wills retained as managing director. By 1928 they had new offices and workshops at Hendon and production of oblique photography increased dramatically. They also produced vertical photography, mosaics and early photogrammetry. By the early 1930s tens of thousands of glass plate images were being produced by the highly skilled technical staff, pilots and photographers. Eventually as mentioned earlier the entire staff answered the call in 1939 to transfer all their skills and equipment to the RAF. Wills continued in aerial photography after World War II, eventually retiring and passing away in 1980. A worthy and at times exciting life largely forgotten by the broader populace until a few years ago when the Aerofilms' stash of glass plate negatives was rediscovered with many reprinted and published in "Aerofilms, A History of Britain From Above" a book by James Crawford, Katy Whitaker and Allan Williams, 2014. A priceless collection of images of towns and sites around Britain captured from the air in a moment in time.



Francis Lewis Wills in later life c.1958, at Aerofilms Ltd. Wills co-founded the company with Claude Grahame-White, having been - so the story goes, inspired in his WW1 role as a Royal Naval Air Service observer. He became known for his leading role in aerial photography and photogrammetry. [britainfromabove.org.uk](http://britainfromabove.org.uk)

(Continued on page 22)



## Claude Grahame-White

We must include some comments on the life of Claude Grahame-White. Claud White, or Claude Grahame-White as he fashioned himself as a young man, was born at Burlesdon, Hampshire UK (1879-1959) into a middle class family. As with many young men growing up at the turn of the 20<sup>th</sup> Century he was fascinated by developments in all things mechanical and the bright future this new century presaged. Having learned the mechanics of motor vehicles in some early business ventures Graham-White travelled to South Africa and acquired the taste for a "larger" life. Early success came to him after he went to France in 1909, learning to fly a Bleriot monoplane. He soon acquired a Henry Farman III aircraft in which he participated in sponsored events winning substantial money in both Britain and the US for his pioneering flying exploits. By the outbreak of war in 1914, Grahame-White was a household name and had substantial property and business interests at Hendon aerodrome. Grahame-White volunteered for a temporary commission in the Royal Naval Air Service in 1914 and soon gained further fame by making a daring night flight over London attempting to attack a Zeppelin. In 1915 he participated in an unsuccessful RNAS air raid on Cuxhaven and was forced by engine failure to ditch in the North Sea, lucky to survive.

He resigned his commission to concentrate on aircraft production at his Hendon factory, building models of Government and other manufacturers' designs. Meanwhile the Hendon aerodrome had been "requisitioned" by the Admiralty and used from 1916 as a training centre.



Claude Grahame-White, 1910, at Boston Aero Meet, U.S.A.  
NATIONAL AIR AND SPACE MUSEUM

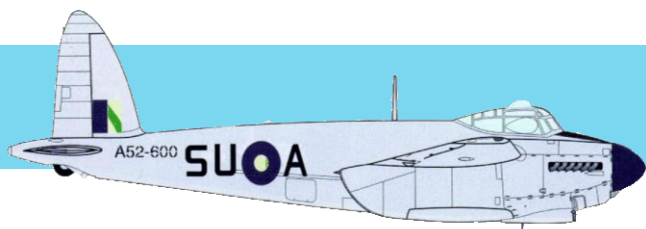
Building aircraft was not a profitable venture for Grahame-White, mainly owing to his ambitious borrowing to fund an expected expansion in 1917 and 1918. This didn't eventuate owing to shortages of materials and cutbacks in production of certain types, as newer more advanced aircraft were naturally favoured by the RAF. Close to bankruptcy he switched to furniture and vehicle manufacture including restoring war surplus vehicles and he had re-established himself by the time Francis Wills suggested his business idea. Grahame-White staked 3,000 pounds to the venture and joined the management but legal battles with the British government over the ownership of the Hendon aerodrome largely occupied his time



Period photo c.1918, of the inside of Claude Grahame-White factory Avro 504 assembly shop. RAF Museum Hendon.

(Continued on page 23)





and energy post war. The RAF eventually purchased Hendon in 1925 and, with Aerofilms sold, Grahame-White left flying to follow other business interests which eventually made him a fortune. He died in Nice, France in 1959. His participation in this story, while brief, cannot be ignored.

### Frederick Sidney Cotton

Sidney Cotton, inventor, aviator and photographic pioneer definitely has a place in this story although I suspect that later in his career some of the British establishment, both civil and RAF may have viewed with distain the activities of the unconventional, even maverick at times, Australian. Frederick Sidney Cotton OBE was born on a cattle station near Proserpine, Queensland (1894 – 1969) and was educated both in Australia and for two years as a teenager in the UK having moved back there temporarily with his English father and family for a period. Soon back in Australia he worked as a jackeroo until the outbreak of war when, with his father's help, he took himself back to the UK and enlisted in the RNAS, being appointed temporary Flight Sub Lieutenant in November 1915 and qualifying quite rapidly as a pilot. Moving quickly onto operations he was soon flying channel patrols in BE2c aircraft from Dover and later in France, after promotion to Flight Lieutenant, flying bombing raids over Germany. In the winter of 1916/17 while on long distance night bombing flights he solved the problem of keeping warm by developing a fully lined one piece flying suit which became known as the Sidcot and which was still in wide usage in both civil and military flying until well after World War II. He flew a wide variety of aircraft types and missions whilst on active service but was temporarily

grounded for medical reasons in 1917 and returned to England. His entry in the Australian Dictionary of Biography states that in 1917 he “conflicted with his seniors and resigned his commission”.

In the interwar years Cotton had a colourful career moving around, seeking flying jobs of various sorts, Tasmania, Canada, UK, France, Greenland, US, anywhere where flying work of all sorts could be found. His exploits through these years have filled books but our interest in Sidney Cotton and his exploits in aerial photography doesn't start again until 1939. His activities then can't really be separated from his subsequent World War II service so we will revisit him in Part III of this story.

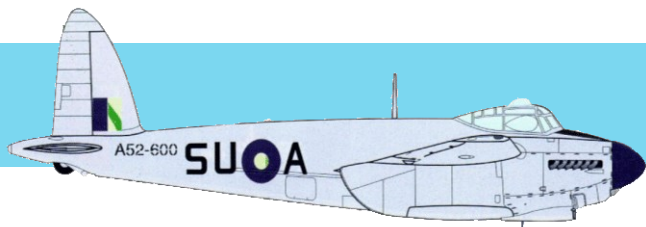


*Frederick Sidney Cotton OBE, 1941, Sussex, UK. Wikipedia*

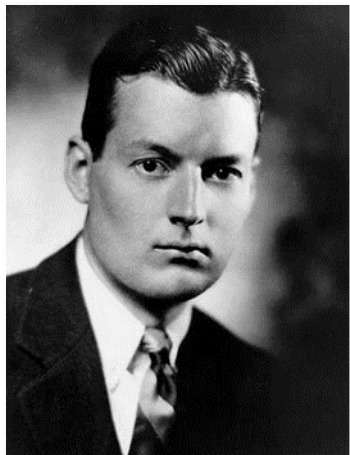


*British flyers wearing Sidcot suits. Illustrated Service Diaries of H. G. H. Roberts.*

*(Continued on page 24)*



## Sherman Mills Fairchild



*Sherman Mills Fairchild,  
inventor & manufacturer.  
[prabook.com](http://prabook.com)*

Sherman Fairchild was born at Oneonta, New York State, (1896-1971) into a wealthy family and, an only child, had a privileged childhood. He never made it to the battle fields of France in World War One but his contribution to the development of aerial photography was enormous. His early life

was notable for his drive, enthusiasm for new ideas and intellectual curiosity, combined with the wealth to buy and tinker with the latest early 20<sup>th</sup> Century gadgets and “toys”. Whilst at Harvard University in 1915 he invented a mechanism to synchronise the flash of a bulb with the opening of the camera shutter! Who does that at eighteen years of age?



*Informal portrait of Sherman Mills Fairchild,  
c.1915, holding a Graflex camera in his left  
hand.*

NATIONAL AIR AND SPACE MUSEUM.

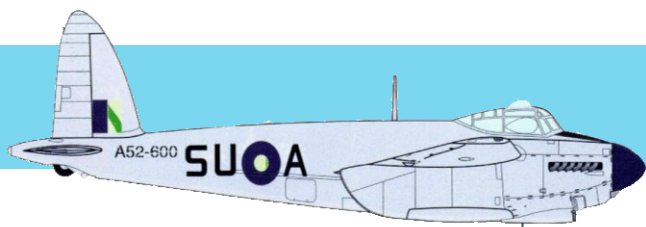
The US entered WWI in 1917 and Sherman Fairchild along with hundreds of thousands of others volunteered to join up but he was rejected by the military for health reasons as he had previously had tuberculosis. As a young man of means but unable to join up he turned his substantial intellect to finding other ways to make a meaningful difference to the war effort. What he invented changed photography forever and would have made a stunning contribution to military aerial photography in WWI but was not picked up until after the war had ended. His brilliant invention was to put the shutter inside the lens of a camera. For aerial photography this was a major advancement as it simultaneously solved several problems. Aircraft at the time were lightweight, prone to vibration from engine and propeller, very susceptible to air turbulence and cameras had slow shutter



*Photographer with camera suspended for oblique  
photos in a Fairchild F-1 Monoplane, Alaska,  
1937. Bird's-eye Views: Aerial Photographs of the  
Arnold Arboretum by Sheila Connor*

*(Continued on page 25)*





speeds, all of which had an impact on picture quality. Moving the shutter inside the lens brought a step change in image quality. Shutter speeds could now keep pace with the movement of the aircraft over the ground, a major improvement particularly for vertical photography. Fairchild rather naively had offered his lens to the US military but his idea was met with indifference. He decided he would only deal with military and other clients on a strictly commercial basis in future and this resulted in his establishment in 1920 of the Fairchild Camera and Instrument Company and his invention would become widely used. All this by the time he had reached 24 years of age!

After the war ended the US Army also lost interest in aerial photography so Fairchild determined that the future would be in commercial applications and he set about creating the Fairchild Aerial Surveys Company. Using a war surplus Fokker DVII biplane and with his own camera design, he began in 1921 taking a series of 100 air photos to produce a mosaic map of the island of Manhattan which he then sold to any interested parties. Aerial survey by photography was an instant success considered faster, cheaper and more accurate than ground survey and US cities began placing orders. Fairchild had created the standard and was leading the charge.

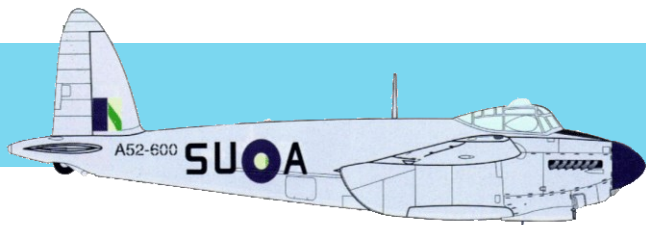
He quickly judged that the biplanes available at that time were inadequate for air photography and accurate aerial mapping so in 1925 he formed Fairchild Airplane Manufacturing Co. (later Fairchild Aviation Corporation) and produced his own design, a high wing monoplane with an enclosed heated

cabin – the Fairchild FC-1. This was an advanced aircraft for the time, capable of wheel, float or ski landing. The famous Hollywood silent movie actress Gloria Swanson christened the first model. Charles Lindbergh on his return from France used an FC-2 (the production model) on his triumphant tour around the nation after his Atlantic Ocean flight in 1927. One was used for the first PanAm airmail delivery flight from Key West Florida to Havana Cuba and Admiral Byrd took one on his 1928 Antarctic expedition. Fairchild Aviation became the largest supplier at the time of cabin monoplanes and Fairchild cameras dominated aerial photography. Fairchild aircraft were eventually used everywhere in North America for civil, military, cargo, passenger, mail and photo work and his photo survey business was extensive. Sherman Fairchild deserves a place in this story and naturally he became known as the US father of aerial photography.



*The Fairchild FC-1 and its derivatives were a family of light, single-engine, high-wing utility monoplanes produced in the US, in 1920 -1930s. The aircraft was originally designed to provide a camera platform for Sherman Fairchild's aerial photography and survey business. Wikipedia.*

*(Continued on page 26)*



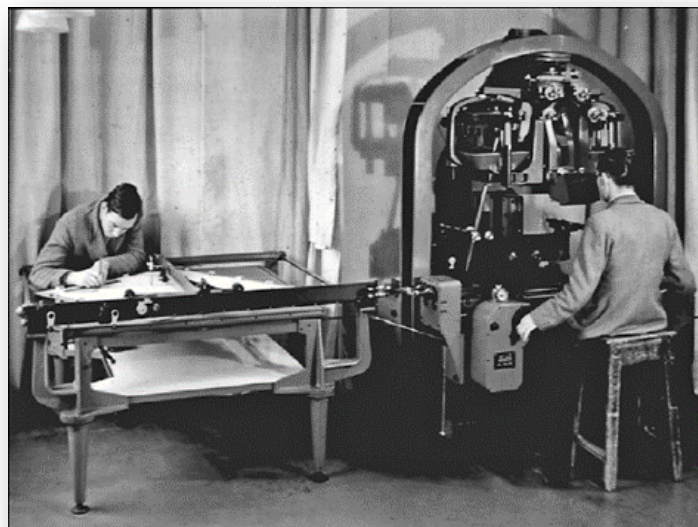
## Wing Commander Percival Russell Burchall OBE



Mr Burchall 1939.  
Heritage Aerofilms  
Collection

A short note on the life of PR Burchall, born at Ashton-Under-Lyne, Lancashire, UK (1888-1950). He wasn't a pilot and he wasn't trained as a photographer, his skills were in supply and management, one of those hundreds of thousands

who beavered away at everything they did and in the end made a difference, but were largely forgotten. Burchall served in France with the RFC as a supply officer but was invalided due to illness back to the UK in 1917. On his recovery he was posted to No.1 School of Photography, Farnborough becoming CO of the School before the end of the war. He stayed on in the RAF, was awarded the OBE for his service and retired in 1924, but maintained his interest in photography and related equipment. Work wasn't easy (he worked as a "freelance" photographer, probably as a street photographer) but maintained interests in photographic technology working both in and out of various photographic companies, publishing articles on aerial photography and looking at developments in Europe in photogrammetric equipment. He eventually joined Aerofilms in 1934 working alongside Francis Wills as manager of photographic aerial survey and technological developments in vertical photography and photogrammetry. He was responsible for selecting and purchasing the Swiss made A5 Autograph Photogrammetric Plotter from the Wild Heerbrug Company in 1938, which eventually became invaluable for aerial plotting during WWII. Burchall re-joined



*The First Universal Photogrammetric instrument of Wild, was a workhorse instrument during WW2 years. Virtual Archive of Wild Heerbrug Photogrammetry.*

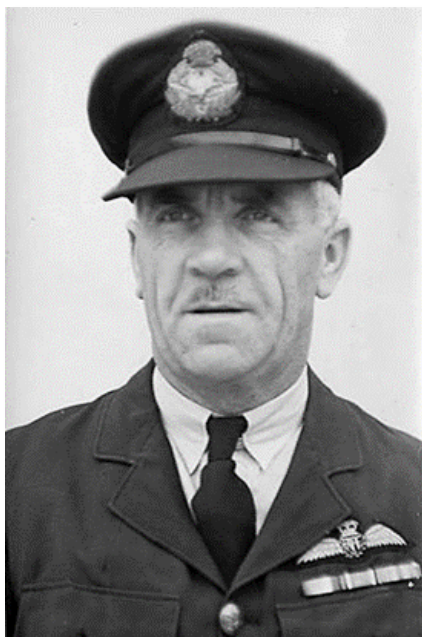
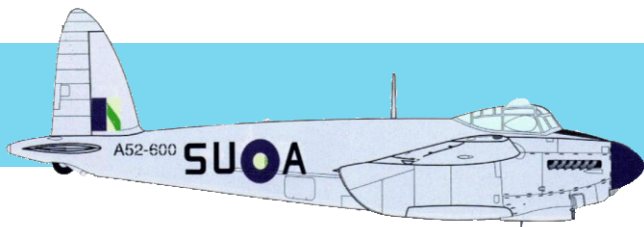
the RAF during the war, with the rank of Wing Commander, in various roles, including at the School of Photography at Farnborough. He died in 1950. His was a quiet life of dedication to the field that in effect had chosen him by circumstance. Post WWII he dedicated himself to establishing a photogrammetric society but didn't live long enough to see it happen.

## Charles Daniel Pratt

Charles Pratt was born in Wellington, New Zealand (1891-1968) and as a young man had joined the Territorial Army. In 1914 he quickly joined the army as a private, soon arrived in Egypt and landed on Gallipoli where he was wounded and removed to Lemnos hospital, according to his Cenotaph record at the Auckland Museum. He then served in Sinai and Palestine in the NZ Engineers and as a

*(Continued on page 27)*





Charles Pratt  
Victorian State Library.

despatch rider. In 1917 he volunteered to join the Flying Corps and qualified as a pilot, in fact he appeared to be a natural pilot being assigned as an instructor. He was promoted to 2<sup>nd</sup> Lieutenant in February 1918 and held that rank until discharge after serving overseas for four years.

He wanted to start an aerial business on return to NZ and for this had purchased four surplus aircraft, two DH6, a Sopwith Pup and an Avro504K and shipped them crated in the cargo of the transport ship "Cooee". The vessel got as far as Melbourne and could not continue, held up by a strike. In frustration Charles persuaded the Captain to offload one of his crates and he assembled a DH6 right on the wharf and then to the excitement of all present flew the aircraft straight off Victoria Dock, landing from that flight at Pt. Melbourne aerodrome. He made enquiries and decided that Melbourne and Victoria might be a good place to start his commercial aerial activities.



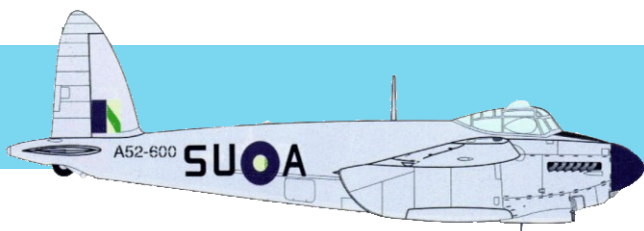
Geelong Flying School - CD & LF Pratt Pty Ltd Victorian State Library

There were already some established aerial companies in Melbourne so he relocated to Geelong, brought his three brothers over from NZ, trained two of them to fly and built an aerial business. Amongst all the joy riding, barnstorming and flying appearances he also became a professional aerial photographer leaving a large collection of historical images of Geelong, Melbourne and around the State of Victoria. These can now be viewed at the State Library of Victoria. An aerial collection we have here as the result of a fateful strike. The best description of the life of Charles Pratt is in the Aviation Historical Society of Australia Newsletter, Vol. 29, No.1, March 2013, Editor Neil Follett, if readers want more detail.

That concludes Part II. Part III will examine the role of aerial photography in WWII.

NB Glossary of terms used and some very brief notes  
on the technology of aerial photography on next page.

*Peter Lewis*



## Basic Technical Explanations

**Oblique photograph** – the camera axis is tilted, low oblique is 30 degrees from vertical and high oblique 60 degrees from vertical (the horizon is in view). Low oblique is mostly used for reconnaissance. Tilting distorts the resultant image.

**Vertical Photograph** – true vertical is difficult to achieve in practice, usually “near” vertical with deviation of two to three degrees from the vertical (plumb line) is acceptable for stereoscopy and photogrammetry.

**Stereoscopy** – the illusion of depth created when two overlapping slightly offset aerial images of the same ground taken side by side are examined in a viewer – a stereoscope, giving a stereoscopic image.

**Photogrammetry** – is the science of making measurements from photographs.

**Mosaic** – a composite picture assembled from a series of air photographs to produce a picture of an area too large to be captured in one photograph.

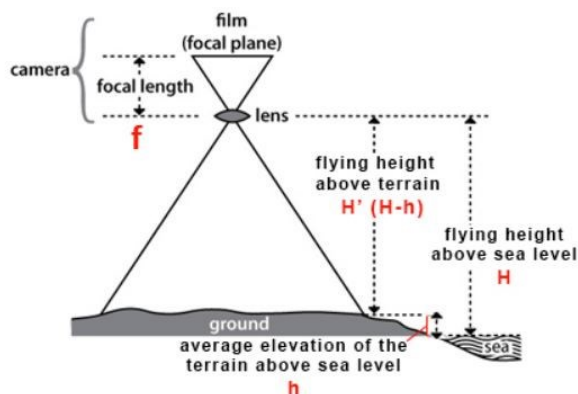
**Focal length** –  $f$  is the distance measured from the focal point of the lens to the focal plane (film surface) in the camera. As the focal length increases, image distortion decreases. Where height above sea level  $H$  is known, adjusted for the average elevation of the terrain  $h$ , the scale of the photograph  $S$  can be calculated using the formula  $S = f/(H-h)$ . The focal length is converted to metres, for example where  $f$  is 152mm it is expressed in this formula as 0.152m. See diagram and example below.

### Focal Length

If you know the camera focal length and the flying altitude of the aircraft you can also determine the scale of a photo.

$$S = \frac{f}{H-h}$$

$S$  = Scale  
 $f$  = focal length of the camera  
 $H$  = flying height above sea level  
 $h$  = average elevation of the terrain above sea level



**Example:** A camera with a 152 mm focal length takes an aerial photograph from a flying height of 2780m above sea level and the average average elevation of the terrain above sea level is 500m. What is the scale of the photograph?

Convert focal length to meters → 152mm = 0.152m

$$\text{Scale} = \frac{f}{H-h} = \frac{0.152 \text{ m}}{2780 \text{ m} - 500 \text{ m}}$$

$$\frac{1}{X} = \frac{0.152 \text{ m}}{2280 \text{ m}} \rightarrow 0.152X = 2280 \rightarrow X = 2280/0.152 \rightarrow X = 15,000$$

**Scale = 1:15,000**



# MAAA Merchandise Stock up for 2019

## ■ ■ ■ Gold Lapel Badges \$5.00



## ■ ■ ■ Stubbie Holder \$5.00



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Navy Blue with stripes

\* MAAA motif



## How to order

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- \* A52-600 motif embroidered
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- \* Adjustable - one size fits all



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- \* A52-600 motif with MAAA embroidered on front
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- A52-600 motif with MAAA embroidered on front
- \* Sizes - small, medium, large, 2XL and 3XL

